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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

E. A. SIMMONS, *President.*
L. B. SHERMAN, *Vice-President.* HENRY LEE, *Sec'y & Treas.*
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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	10 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

VOLUME 54. JANUARY 3, 1913. NUMBER 1.

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THE Interstate Commerce Commission has approved the California three-dollar demurrage rate for freight cars carrying interstate shipments, as noted in another column of this issue, and this is good news; but the approval appears to have been given with some reluctance. The railways have, indeed, "abundantly sustained" their claim that the high demurrage rate now imposed on intrastate freight is a benefit to the public, and it would have been impossible to maintain any rational argument for the continuance of the one-dollar rate; but Commissioner Lane slightly qualifies his approval of the decision, and Chairman Prouty dissents from it. Mr. Lane attributes the good conditions in California not to the rate but to Mr. Mote's efficient management of the demurrage bureau. What kind of instrument or weapon Mr. Mote could have used if he had not had available the money penalty is not clear, at this distance; but no one will quarrel with Mr. Lane on that point. Mr. Prouty objects to disturbing the uniform rate ($1) even on "the extreme edge" of the territory. His main argument is that, though exceptions are to be recognized, one dollar a day is, on the whole, sufficient. But there is one big exception that he overlooks; periods of widespread congestion, such as now prevails. In dull times a dollar a day is sufficient; and where track room is plenty and switching complexities are not burdensome even a smaller sum might be fair, were it not for the dilatory habits which such practice would encourage. But when cars are in urgent demand everywhere a charge of three dollars a day for a freight car is not too high; it is in many cases too low. The Canadian Railway Commission has done a good thing in giving emphasis to the feasibility of making demurrage rates higher at one season than at another.

A CORRESPONDENT, whose letter is published in another column, takes issue with our statement made in commenting on The New Haven Monopoly that "in the West . . . the movement for regulation of railways was born," and points to the fact that the Massachusetts railroad commission was created in 1869. That is true. And there was a railroad commission in Maine in 1857, and very early in one or two other states; but nevertheless the first active agitation for the regulation of railroads was the granger movement in the West in 1873-9. Our correspondent finds fault with the Massachusetts commission for not having more effectively "regulated" railroads. There is no gainsaying the fact that the Massachusetts commission has been a conservative commission, ever since it has been given the power to *order* a reduction in rates; but we can hardly agree with our correspondent that it has not been an effective and generally an efficient regulative body. The ideal aimed at in appointments to this state commission has been to have one "business man," one railroad man and one lawyer or economist; and it has had on it many strong men whose probity and judgment could be trusted. The system of radical versus mild regulation is too complicated a question to go into here, but the principles of representative government rest on the election of public spirited governors who will appoint, as they have done in Massachusetts, public spirited men to carry out their policies. When the Hadley Securities Commission was making its exhaustive study of the past experiences of railroad regulation in this country, the acts and methods of the Massachusetts commission were cited by men of widely varying opinion, but with almost unvarying respect. Of course, this inquiry was primarily on the question of the regulation of the issue of securities by railroad companies, and Massachusetts is one of the few states that has carried out for a number of years a consistent policy of regulation. The point that Mr. Carter makes in regard to the ineffectiveness of radical laws if unenforced by public opinion is a good one, but the implication that he makes that the Massachusetts railroad commission has failed in its duty, because it has not found it necessary to exercise all of the powers given it by law, we should hesitate to agree with.

THE problem of fuel economy has been given close attention on European railways, and especially in Germany, as indicated by the article by H. W. Jacobs in this issue. Two things are largely responsible for this—the high price of fuel and the relatively low cost of labor as compared to conditions in America. The question of fuel economy is being given more and more attention in this country, and several roads now have departments whose entire energies are given over to the promotion of the more efficient use of fuel. Splendid results have been obtained by closer inspection of the coal at the mines, by studying and re-arranging its distribution, by improving coaling facilities, by using more care in designing locomotives and equipping them, and by educating the engineemen to the proper use of the fuel. It is interesting to note, however, that some of the

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most important improvements in fuel economy have resulted not so much from the desire to save or conserve the fuel as to accomplish other objects. For instance, superheaters were first introduced on switching locomotives not so much to save fuel as to reduce the smoke nuisance. Superheaters, brick arches and other devices are being introduced rapidly and extensively on both passenger and freight power, not so much because of the fuel saving which results from their use as from the fact that the resulting improvement in the steaming capacity of the boiler makes it possible to get the trains over the road on time, or to haul heavier trains in the same time. Steaming capacity of a locomotive boiler has been likened to the lung capacity of an athlete, and the greater steaming capacity made available by the above means makes possible higher sustained speeds, or greater hauling capacity. The human factor is a most important item in the efficient firing of a locomotive, and the great problem has been to educate the engineemen to the proper use of the fuel. One thing that has helped to secure the co-operation of the engineemen has been not so much the interest or desire to save money for the company as the fact that the more intelligent use of fuel has greatly reduced the physical exertion required of the fireman. It might be well to emphasize this feature even more than it has been, in order to encourage and stimulate the fireman to still greater effort—and that of a mental rather than a physical nature.

EVER since James J. Hill called attention about five years ago to the necessity for large expenditures for increased railway facilities, and especially for terminals, this subject has been given much attention by the public generally, and by railway men in particular. Mr. Hill's recent address before the Railway Business Association on the same subject serves to again call attention to this condition and to emphasize its importance. In this connection it is worth while to consider the possibility of increasing the capacity of existing terminals by making careful studies of the methods of operation and observing the influence of the types of engines, number of riders and methods of returning them in hump yards, location of scales, lengths of track, etc. When designing a new terminal much time is devoted to a study of operating conditions and to the development of plans to meet those conditions. With the completion of the yard these studies usually stop until extensive improvements and additions are again necessary. That marked improvements can frequently be made in the operation of existing facilities will be evident from the following instances. While studying the economics of a proposed cutoff a few years ago, one eastern road found that the old line was not being operated to the best advantage, and important readjustments of pusher limits and tonnage ratings were made which affected very material economies without any expenditure. In another instance the operating department complained about the poor results that were being secured from the operation of a recently completed hump yard, and the men in charge of its design were called upon to investigate. After a careful study it was found that the principal difficulty arose from the use of light engines which did not have sufficient power to handle entire trains. The use of old engines for yard work, which are too light and in too poor condition for road service, is common and seriously decreases the efficiency of yard operation, especially during busy seasons when slight delays may cause serious congestion. While instances such as the above are by no means common, they are to be found often enough to warrant a study of old yards at intervals to see if the best results are being obtained. It is seldom possible to enlarge a terminal as soon as it becomes congested, for usually the demands for improvements elsewhere on the system are such that it must continue to be operated under unfavorable conditions for some time. It is not unusual for a careful study of the operating conditions similar to that made when designing a new yard to reveal opportunities for important improvements and increased capacity with a slight rearrangement of the yard. It also frequently happens that the traffic conditions for which the yard was designed have gradually changed since its construction, increasing the expense of operation, in which case such a study may show that a more or less extensive rearrangement is justified to suit the new conditions.

THE NEED FOR A HIGHER DEMURRAGE RATE.

THE recent action of the Canadian railway commission authorizing the Canadian Pacific, Grand Trunk, Canadian Northern and Michigan Central railways to increase their demurrage rates, contains an important suggestion for railway men and railway regulating authorities in this country as to a means of obtaining relief from shortage of the freight car supply. The order of the Canadian commission permits an advance from $1 per car per day to $2 for the first 24 hours after the expiration of free time and $3 for each succeeding day, effective from December 15, 1912, to March 31, 1913. The Canadian railways had asked for a rate of $2, $3 and $4 for the first, second and third days, respectively, but the $4 rate was not approved by the board.

At the last meeting of the American Association of Demurrage Officers a resolution was unanimously adopted in favor of an increased demurrage rate throughout the United States, and the railways of Michigan have recently submitted to the state railway commission the question of increasing the demurrage rate on interstate traffic. In view of the success that has attended the well known experience with a high demurrage rate in California, the subject seems likely to be brought into greater prominence before next season of heavy traffic. The movement also should be greatly helped by the Interstate Commerce Commission's approval of the California rate, which has just been issued. Beginning January 6, the California roads are free to carry out their plan, proposed early in the year, for an increase in the interstate demurrage rate from $1 to a parity with the state rate, which has been $3 since May 1, 1911, and was $6 from June 19, 1909 to May 1, 1911.

While the purpose of the Canadian commission's order is the same as that of the higher rate in California, viz.: to increase the car movement by eliminating unnecessary detention of cars by shippers and consignees, the fact that it is not to be applicable during the entire year and that it involves the idea of a sliding scale, increasing with the period of detention, would seem to be calculated to make it more acceptable to shippers.

Undoubtedly any effort to increase demurrage rates generally would encounter the opposition of shippers, particularly of those who pay the most demurrage, and who, of course, are those who have not provided themselves with sufficient loading and unloading facilities for handling their business promptly. These constitute the class which a higher demurrage rate is intended to reach and whose opposition is least entitled to consideration, while the general body of shippers can have no reason for protesting against an advance on the grounds that it will increase the revenues of the carriers, because a higher demurrage rate is intended to reduce the amount of demurrage payments by making the rate prohibitive.

Freight car shortages may be due to lack of enough cars to handle promptly the maximum traffic of the country or to failure to obtain the most efficient use of the available supply of equipment. One of the greatest causes of freight car inefficiency is the economic waste of using expensive cars and track room for warehouse purposes. To require the railways to own enough cars in addition to the average requirements of business to enable them to handle promptly the "peak load" of the traffic in addition to allowing many cars to be used as warehouses would involve an economic waste that somebody must make good; and that somebody, in the long run, is the shipping and consuming public. A large surplus of cars throughout the greater part of the year is expensive to own and to maintain, besides increasing the cost of operating the cars in service by clogging side tracks and terminals.

The responsibility for the proper use of equipment must be divided between the carriers and the shippers and any means of increasing efficiency of car service will be of advantage to both.

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Many shippers have made praiseworthy efforts to co-operate with the carriers in reducing the effect of the extraordinary pressure upon their facilities during the past few months. They can make the co-operation permanent by assuming a greater responsibility for cars while in their possession.

The demurrage rate has a dual function. It is to be regarded first as compensation to the carrier for the use of the car beyond the time contemplated in the freight rate, and, second, as a penalty to compel the prompt release of equipment in order that it may be available for further transportation service.

A freight car's chief value consists in its movability. To use it as a warehouse when it is required for transportation deprives it of its value, for which a rate of $1 per day is not compensatory during a time of heavy business, for the highest rate ever proposed is less than the earning capacity of a car at such a time. Moreover, the present demurrage rate was adopted at a time when the average capacity of cars was from 10 to 20 tons, while the capacity of cars today ranges from 30 to 50 tons and averages probably 37 tons. The increase in the capacity of equipment has been accompanied by an increase in its cost, so that a car which is detained by a consignor or consignee today represents a materially greater investment to the carrier than the equipment employed 25 years ago, while it also possesses a correspondingly greater earning capacity.

A demurrage charge falls short of its purpose if it fails either to yield the carrier proper compensation for the service which it covers or to accomplish the prompt release of cars and reform of methods. The insufficiency of the present rate in the latter respect has been thoroughly demonstrated. Just so long as it is cheaper for the shippers to pay demurrage than to provide themselves with proper facilities, cars will be kept out of service needlessly in addition to the natural and unnatural delays incident to operation for which the carriers are automatically penalized by a decrease of their earning capacity.

That a high demurrage rate is an effective remedy for car detention has been abundantly proved by the experience in California. E. E. Mote, manager of the Pacific Car Demurrage Bureau, has compiled tables showing comparative results for the period of 32 months from November 1, 1906, to June 30, 1909, when the rate on all traffic was $1, for the period of 22 months from June 30, 1909, to April 30, 1901, when the rate on state traffic was $6 and on interstate traffic $1; and for the period of ten months from May 1, 1911, to February 29, 1912, when the rate on state traffic was $3 and on interstate traffic $1. The number of cars held overtime at all California stations during the first period was 184,172, while the number held overtime during the corresponding time of the second and third periods together, when the higher rates prevailed, was 113,343, a decrease of 38½ per cent., and the number of cars handled during the second and third periods had increased 1,114,192 or 46½ per cent. The percentage of detention during the first period was 7.82 per cent.; during the second period the detention of cars on which the demurrage was $6 was 1.06 per cent.; during the third period the detention of cars on which the demurrage was $3 was 1.48 per cent., and during the second and third periods together the average detention amounted to 1.21 per cent. During the second period the detention of interstate cars subject to the $1 rate was 5.68 per cent., during the third period 5.32 per cent., and for the second and third periods together 5.56 per cent.

The net collections of demurrage during the first period throughout California amounted to $566,298, while during the second and third periods together the net collections amounted to $344,146, a decrease of $222,152 or over 39 per cent. During the first period the detention in excess of free time averaged 3.32 days per car, or 611,345 car days; during the second and third periods together the average detention of all classes of cars was 2.40 days or 170,164 car days, a decrease of .92 days per car and of 441,181 car days or 72.16 per cent.

These figures demonstrate beyond all question that the increased demurrage rate has been in no respect a burden upon the shipping and receiving public, but has been a very positive advantage to the railways and the shipping public as a whole. The Interstate Commerce Commission has said in the case of New York Hay Exchange Association vs. Pennsylvania Railroad Company, 14 I. C. C., 178: "The railway serves the entire public as a common carrier. In order to do this acceptably it must have the use of its equipment. The whole shipping public is interested in the prompt release of freight cars. It frequently happens that great inconvenience results from the insufficient supply of car equipment, so that it is for the interest of the entire public that cars should be promptly discharged." Cars are intended for moving freight, and the demurrage charge should, therefore, be high enough to force their release.

BLOCK SIGNALING FROM DIFFERENT POINTS OF VIEW.

THE signal engineer who wrote in our issue of December 13, page 1131, has aroused some pretty vigorous discussion. We cannot give space to all of the letters received, but the one printed last week and the others in this issue are fair samples. It seems desirable to summarize a few of the statements and arguments.

Taking matters chronologically, the first issue is, manual versus automatic signals. It is claimed, in substance, that the manual system is the safer. Can this be proved? With both systems there have been false clear signals, and a truly accurate, instructive and useful comparison is hard to make. But it is fair to assume that for the highest safety, either system needs something more than it now possesses. It is to be remembered that the public demands perfection, for a single bad collision in the United States, once in ten years, which would be such an infinitesimally small percentage of failures that the figures would be meaningless, would alarm the whole traveling community. And this demand of the public is not so unreasonable, after all; for the enterprising railroad president who is fully alive to this phase of his duty also aims at perfection; he calls on his subordinates to strive for perfection.

The problem, stripped of secondary matters is, simply, the prevention of collisions on the main line. Perfection of apparatus is an element of the question which we must not take up in this place for lack of time; and moreover, everybody aims to find a scheme of operation which will provide for safety in spite of failures of apparatus. The first point is obedience to signal indications. Our methods of discipline of enginemen, designed to enforce this obedience, are not perfect. Wise and competent managers will go on improving these methods. But the significant fact of the situation is that in England where, it is generally admitted, the percentage of obedience on the part of enginemen is very high, probably higher than in this country, the most advanced railway officers are looking to the automatic stop. They are not yet using it; we do not say that they will use it; but they recognize that moral or mental discipline alone is not sufficient. They recognize that the perfect engineman cannot be either discovered or trained. The small percentage of best enginemen now in the service became best by some process that the superintendent cannot copy. And signalman as well as the engineman is called on to be perfect; and the English roads, with the best signalmen in the world, nevertheless are making increased use of the "lock and block" or controlled manual system. While we cannot here go into the details of the subject we think it will be agreed that, with the manual system, the efficiency both of the signalman and the engineman must be improved by something more than mental and moral instruction or training. The human brain is the greatest machine known; but we recognize its limitations.

On the subject of automatic stops, we have nothing to say at this time, except to call attention to the statement of Mr. Winsor, of the Boston Elevated, who, speaking from an experience of ten years, says that the stops do enforce obedience to the visual signals. The last lines of his letter ought to have been printed in italics. Can anyone gainsay that testimony? It seems to us that this evidence—which is not the only evidence of the kind—

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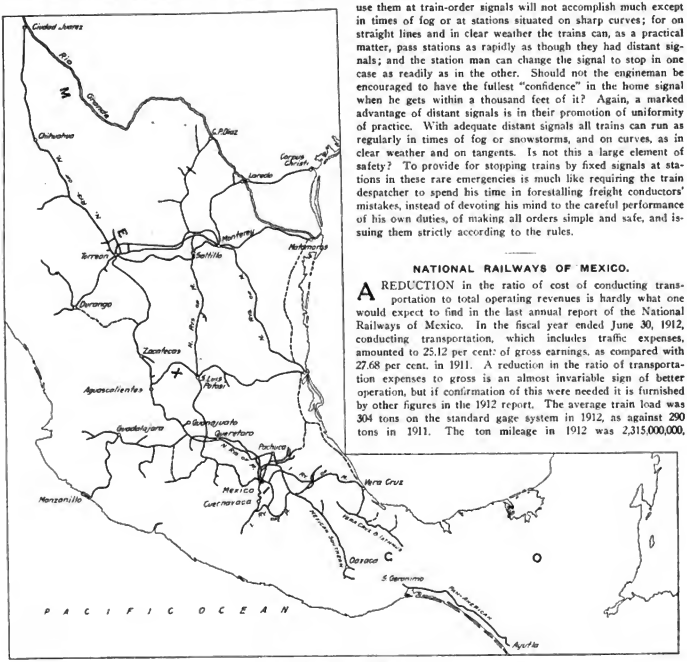
forever banishes from our discussions the old claim that a stopping apparatus is sure to weaken the engineman's sense of responsibility, and thus increase danger. The every-day function of a stop being that of disciplinarian, the apparatus would be very highly efficient even if it failed as often, say, as automatic signals fail—once in from one million to six million movements. We must honestly admit that, if a stopping apparatus weakens discipline the real trouble is in a grossly negligent method of managing the stops. It is true that stops located out in the wilds of the mountains are not so easily managed as on lines in New York, Boston or London, either as regards maintenance of apparatus or discipline of men; but if we use that as an argument we must then admit that we are going to put up with a lower degree of safety on the thin lines in the mountains. Safety costs money, wherever we go.

The third point that we wish to notice is our correspondent's argument against distant signals. His position seems to be that the utmost possible provision should at all times be made for giving stop signals in emergencies. If a station agent is ever likely to want to stop a train to prevent a collision, all trains should be required to slacken speed at the station so as to give the agent every possible chance. This road is a deceptive argument, resting on the assumption that emergencies should be dealt with after they arrive instead of being prevented. Ordinarily, we pursue that course only after every other resource has failed, or when there are other reasons to support our action. Steel passenger cars are in most cases probably better than wooden cars in a collision; but their use would hardly be justified on that ground alone; they are desirable for other reasons. They would be a detriment if they caused any relaxation of effort to prevent collisions. A railroad manager may be justified in getting along without distant signals if he is willing to slacken speeds, as is necessary to run at all times by the use of home signals alone; but if he does this, let the issue be plainly met. Distant signals are useful simply to facilitate fast running. A horse railroad, or one where trains run uniformly at six miles an hour, could get no profit out of them if they could be had for a cent apiece. Moreover, that committee which decided not to use them at train-order signals will not accomplish much except in times of fog or at stations situated on sharp curves; for on straight lines and in clear weather the trains can, as a practical matter, pass stations as rapidly as though they had distant signals; and the station man can change the signal to stop in one case as readily as in the other. Should not the engineman be encouraged to have the fullest "confidence" in the home signal when he gets within a thousand feet of it? Again, a marked advantage of distant signals is in their promotion of uniformity of practice. With adequate distant signals all trains can run as regularly in times of fog or snowstorms, and on curves, as in clear weather and on tangents. Is not this a large element of safety? To provide for stopping trains by fixed signals at stations in these rare emergencies is much like requiring the train despatcher to spend his time in forestalling freight conductors' mistakes, instead of devoting his mind to the careful performance of his own duties, of making all orders simple and safe, and issuing them strictly according to the rules.



National Railways of Mexico.

NATIONAL RAILWAYS OF MEXICO.

A REDUCTION in the ratio of cost of conducting transportation to total operating revenues is hardly what one would expect to find in the last annual report of the National Railways of Mexico. In the fiscal year ended June 30, 1912, conducting transportation, which includes traffic expenses, amounted to 25.12 per cent. of gross earnings, as compared with 27.68 per cent. in 1911. A reduction in the ratio of transportation expenses to gross is an almost invariable sign of better operation, but if confirmation of this were needed it is furnished by other figures in the 1912 report. The average train load was 304 tons on the standard gage system in 1912, as against 290 tons in 1911. The ton mileage in 1912 was 2,315,000,000,

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as against 2,438,000,000 in 1911. The miles run by revenue trains amounted to 11,169,000 in 1912, a decrease from 1911 of 10.34 per cent. In this year a good part of Mexico was supposed to be, and was actually, in a partial state of revolution.

Not only is this showing of importance to security holders of the National Railways of Mexico, but it is of especial interest to railroad men in the United States because of certain labor problems which the National Railways has had to solve. In 1910 4.12 per cent. of the total number of employees were foreigners, while at the end of 1912 but 639 men, or 2.05 per cent., of the total number of employees were foreigners. The greater part of foreign (mostly American) trainmen, including enginemen and firemen, went on a strike during the past year, and, as President Brown puts it, "the diminution in the number of foreign employees is principally due to the voluntary separation from our service in April last of the major part of the foreign trainmen." That the company was able to make a saving in wages in the transportation department is not surprising, but that there should also be better train loading and other evidences of more efficient operation is an important factor in the consideration of the future of the company. The good showing in the operating department may be a result of the use of Mexican employees more extensively or it may be in spite of it, but it is worthy of note. Ever since the consolidation of the Mexican Central and the National Railroad, forming the National Railways, the policy of the management has been to utilize as far as possible and develop native industry, and it would seem that this policy is meeting with success.

The Ferrocarriles Nacionales de Mexico (National Railways of Mexico) operate 6,008 miles of road, of which about 383 miles is narrow gage. Of the total main line and branches, about 758 miles is laid with 85-lb. rail, 1,549 miles with 75-lb. rail, and 1,546 miles with 56-lb. rail, the remainder being laid with various weights. The operating ratio in 1912 was 62.55, as compared with 63.42 in 1911. Maintenance of way consumed 18.46 per cent. of gross in 1912 and 18.02 per cent. in 1911; maintenance of equipment, 15.76 per cent. in 1912 and 14.19 per cent. in 1911; conducting transportation (including traffic expenses) 25.12 per cent. in 1912 and 27.68 per cent. in 1911, and general expenses, 3.21 per cent. in 1912 and 3.53 per cent. in 1911. The freight traffic density is 339,452 ton miles per mile of road, and the passenger density 78,344 passenger miles per mile of road. The average train load has already been mentioned. On about half of the total mileage oil is used as fuel, and the cost of fuel for locomotives in 1912 amounted to $2,231,000,* as against $2,666,000 in 1911.

Of the total tonnage carried in 1912, 49.76 per cent. was furnished by mineral products, 23.48 per cent. by agricultural products, 11.56 per cent., by products of forests, 11.19 per cent. by general merchandise† and 4.01 per cent. by live stock and animal products. The average receipts per ton per mile are high, amounting to 1.502 cents in 1912. The average receipts per passenger per mile, on the other hand, are low, amounting to 1.439 cents in 1912.

During the last half of the fiscal year operation was interfered with to a considerable extent by the insurrection in the northern states of Mexico; but notwithstanding total operating revenues in 1912 amounted to $30,724,000, as against $30,967,000 in 1911; and net revenue amounted to $11,507,000 in 1912, as against $11,328,000 in 1911. After the payment of interest and rentals there was a balance of $1,243,000 available for dividends in 1912 and $1,279,000 in 1911. The full 4 per cent. dividends were paid on the first preferred stock calling for $1,154,000. During the past four years interest charges have increased somewhat, amounting in 1912 to $8,702,000. The operating deficit of subsidiary lines has increased to a marked extent. In 1909 this totaled $11,427; in 1912, $417,167. The increase from $232,000 in 1911 to $417,000 in the deduction from income on account of the deficit of subsidiaries was in part offset in 1912 by a reduction in the amount appropriated from income pending charges on account of operating expenses. The amount so appropriated in 1911 was $1,074,000, and in 1912, $700,000.

During the year $1,386,000 was spent for additions and betterments, of which $453,000 was spent for increased weight of rail and $337,000 for additional ballast. The directors have approved the plans for a passenger station at Mexico City to cost in the neighborhood of $2,000,000. Plans for a freight station at Mexico City have not as yet been completed, but are under consideration.

At the time that the Mexican Central and the National Railroad of Mexico were consolidated the plans for making the operation of the combined properties more economical included the abandonment of certain parallel lines, and during the past year it was decided to abandon 289 miles and permission has been secured from the bondholders for this abandonment of property. Of course, the economies that may be expected to result can only be estimated, but should be considerable. In San Luis Potosi there are now two terminals, both of which are inadequate, and a new union terminal has been planned and work was begun during the past year.

Unlike the United States, Mexico had poor crops, so that there was no very heavy fall movement of crops to make demands on equipment. As a matter of fact, however, the equipment situation on the National Railways was worse at the end of the year than at the beginning. At the beginning of the year there were 652 standard gage locomotives in service, and at the end of the year 643; there were 441 standard gage passenger coaches, and at the end of the year 427; there were 18,471 freight cars, and at the end of the year 17,596. During the year orders were placed for 33 passenger train cars and 150 tank cars. When good crops, however, bring a return of prosperity, it is probable that the National Railways will find it necessary to make rather heavy orders for new equipment.

Like American railroads, the National Railways of Mexico have found considerable difficulty in doing new financing, and the £1,000,000 ($5,000,000) notes which fell due during the year were paid and to raise money it was found expedient to make another short term loan. A loan of $13,000,000 was raised in the United States at 5 per cent. for one year, the company depositing $12,500,000 prior lien bonds and $6,000,000 guaranteed general mortgage bonds. The cash position of the company was considerably better at the end of the year than at the end of the previous year. There was on hand $7,164,000, of which $3,660,000 was for payment of principal and interest on bonds, while at the end of 1911 there was $7,270,000 cash on hand, but of this amount $7,006,000 was for the payment of principal and interest on bonds. At the end of 1912 there was $24,423,000 notes payable, comparing with $16,405,000 notes payable at the end of 1911.

The following table shows the principal figures for operation in 1912, as compared with 1911:

	1912.	1911.
Average mileage operated	6,009	6,132
Freight revenue	$21,929,804	$22,598,874
Passenger revenue	6,774,194	6,328,555
Total operating revenues	30,723,896	30,967,211
Maint. of way and structures	5,670,017	5,580,965
Maint. of equipment	4,843,560	4,394,194
Conducting transportation (including traffic expenses)	7,717,811	8,570,708
General expenses	986,250	1,093,804
Total operating expenses	19,217,628	19,639,673
Taxes	239,304	206,772
Operating income	11,266,965	11,120,766
Gross corporate income	12,096,291	11,593,212
Net income	1,242,288	1,278,936
Dividends	1,153,316	1,153,316
Surplus	88,972	125,620

*All figures are in United States Currency.

†This apparently includes manufactures C. L. and merchandise L. C. L.

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Letters to the Editor.

AUTOMATIC STOPS AS SURPRISE CHECKERS.

Boston, Mass., December 16, 1912.

To the Editor of the Railway Age Gazette:

The position taken by the Signal Engineer whose letter is printed in your issue of December 13, regarding automatic stops and distant signals, is readily understandable. His experience has shown him that automatic devices, such as block signals and automatic stops, are subject to failures, some of which are unexplainable and some of which are unquestionably due to the failure of the maintainer. His experience also, no doubt has impressed him with the fact that some enginemen will expect an automatic device, primarily installed to check their work, to do their work for them.

I believe that the automatic stop is a very valuable device for two reasons: (1) that it will, under proper conditions and when properly installed, prevent an engineman who is incapacitated from overrunning a signal; and (2) that it will, when properly designed and installed, give a continuous surprise check on all enginemen. An engineman who at any time fails to obey a signal equipped with an automatic stop will have his brakes automatically applied and, if the installation is properly designed, this fact will come to the attention of his superiors.

This last is, in my mind, the greatest advantage of automatic stops. The failure of an automatic stop will not, if it is properly designed, in any way interfere with the proper working of the signal. The only results that can happen in case an automatic stop fails to work properly are, (1) to stop the train when the signal is clear; and (2) to fail to stop the train if the signal is adverse, and the engineer does not himself stop the train. In the first case the result is a delay, and a report of the occurrence; and in the second case there is no failure to stop the train unless the engineman also fails to observe the signal. The engineman will not shift to the automatic stop his duty to stop the train, as the fact that he did so would in every case come to the attention of his superiors.

Automatic stops are subject to failures, and such failures may be extremely annoying, but they can do no harm. The Boston Elevated, on which automatic stops have been used more than ten years, has had no difficulty in having failures recorded, and finds no more disposition on the part of the men to bide such failures than to hide any other failures that should be reported. While there have been comparatively few cases where the automatic stops have unquestionably prevented an accident, they have resulted in an obedience of signals to such an extent that the overrunning of signals is practically unknown.

Paul Winsor,
Chief Engineer M. P. & R. S.

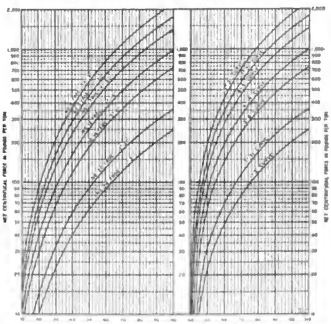
DISCIPLINE VERSUS AUTOMATIC TRAIN CONTROL.

New York, N. Y., December 6, 1912.

To the Editor of the Railway Age Gazette:

Owing to recent newspaper discussions regarding automatic train control or automatic stops as adjuncts to signal systems, and to the criticisms by more or less ill-informed people, of railroads for not immediately rushing into such schemes, it may be well to discuss first, speed on turnouts and second, the applicability of mechanical devices to control such speeds, and in general, to control the speeds of trains where there are already block signals in operation.

The following discussion of the physics of this problem is so elementary that it would seem unnecessary, except for the fact that some of the critics—and so-called scientific papers—who are loudest in their condemnation of railroad engineers for knowing nothing about centrifugal forces seem themselves to have no correct apprehension of the forces involved. The fundamental principle involved is Newton's first law: "Every body continues in its state of rest or of uniform motion in a straight line unless it is compelled by forces to change that state." Therefore, a moving mass, such as a railroad train, if uninfluenced by external forces would continue indefinitely at a uniform speed in a straight line. To deflect it from a straight line or tangent some force must be brought to bear. There is no mysterious force in a moving body which suddenly appears when it is taking a curvilinear motion and disappears when on a tangent or which acts upon a turnout and not upon the main line. It is the confusion of thought brought about by this misconception which obscures the problem. When it is desired to deflect a train which is moving on a tangent the curved outer rail furnishes the radially directed pressure which achieves the result. The more rapid the motion of the train and the greater the deflection in a given distance, the greater is the pressure which the rail must exert to attain the desired result. Furthermore, the diverting force of the rail is not on the same plane with, nor at the same height as the center of gravity of the mass deflected. The conse-



Turnout Curves are Theoretical.

Force Which Must Be Exerted on Outer Rail to Deflect a Moving Train.

quence of this is, that in endeavoring to resume its rectilinear motion, the mass is subject to a radial overturning moment. All this is very elementary, but its clear conception is necessary to the following statement, that so far as the so-called centrifugal force is concerned, there is no difference in the effect upon a moving train between a main line curve and a turnout or other curve under the same conditions of curvature. Therefore, theoretically, there is no reason why a train should not take a turnout curve at the same speed at which it takes a main line curve of the same curvature, so far as centrifugal forces alone are concerned.

But the requirements of the case necessitate a difference of construction of a turnout from a main line curve, as it is always possible to super-elevate the outer rail of a curve on a main line, a thing which cannot usually be done on a turnout. This super-elevation must be fixed for some average speed so that for a fast moving train the resultant of all the forces shall remain well within the base furnished by the rails, and for slow moving trains no undue portion of the load shall come upon the inner rail. The common practice on single track western roads is to

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super-elevate for a speed of 40 miles an hour, at which speed the resultant of the weights and forces is normal to the plane of the track near its center, and the curve can be taken at any speed in excess of this which does not throw this resultant beyond the outer rail. The turnout, however, cannot usually have super-elevation and must, therefore, be taken at a speed somewhat slower than a main line curve of the same curvature. For example, a train traveling at 50 miles an hour can take the lead to a turnout having a No. 14 frog with the same safety with which it could take a 9 deg. 31 min. main line curve, although this might be excessive in either case; and a train could take a turnout having a No. 20 frog at 50 miles an hour as safely as it could take a 4 deg. 14 min. curve at the same speed (see diagram). Owing, however, to the want of continuity of the rails, brought about by the introduction of the frog, and to reversal of curvature, the speed on a turnout is usually reduced to about one-third the speed on a curve of corresponding degree on main line. In point of fact the turnouts are really safe for a higher speed than this, as the overturning moment diminishes as the square of the velocity, and a restriction of one-third speed or one-ninth the moment should be well within the safe limit, with proper maintenance. If, however, the question should be asked as to what is the safe frog and turnout curve, the answer must be, that on any curve there is a limiting speed beyond which it is unsafe to run and the use of a long turnout is no more protection against reckless running than is low curvature on the main line.

This suggests the thought of mechanical adjuncts, such as automatic controls, to prevent reckless running. So far as developed none of these have yet proven successful in service tests under the operating conditions of a steam railroad, and if they should be required, they should be applied not only at turnouts, but at all curves, at the beginning of each down grade and at any other places where reckless running is possible. The function of the engineer then becomes merely opening the throttle. The machine does the rest—maybe—and the responsibility of running past signals or diminishing the speed to a safe one, on a curve or turnout, is shifted from the engineer, who has a personal interest in the safety of his train, to the track maintainers, and to the equipment maintainers, with the consequent impossibility of fixing the responsibility for a resulting accident on any particular person. The assertion is frequently made and is doubtless true, that it is after all a question of cost, but such cost does not appear to be justified by the present development of automatic control. If developed in the near future, it is a question whether the expenditure should be undertaken by any road when so much money is required for the extension and perfection of block signals, the elimination of grade crossings, increase of number of tracks, more extensive terminal facilities, etc.; all of which are urgently needed and are taxing the resources of all of the railroads in the United States. Many things may be desirable which are impracticable. For instance, to avoid accidents due to broken rails, policing of the track might be extended to having a watchman stationed at each rail; but it is to be hoped that the state and national commissions will not require this at present. Through the use of carefully designed, properly located and maintained automatic signals, surprise tests and efficient track maintenance, some of the principal trunk lines have now reduced their fatal accidents to an extremely small number per annum. To require such roads to impress on the already efficient engineers of their fast and heavy trains the idea that observation, care, knowledge of their runs, and obedience to rules, may all be abandoned and an automatic machine substituted for their intelligence—their functions being restricted to merely starting a train after it is once stopped—would be to undo the successful work of recent years of the best operating men in this country and to introduce new dangers in operating. Under such conditions the railroads would very properly employ a cheaper grade of men to run their engines and would have good grounds for doing so, just as in the case of the electrically controlled roads in certain subways and tubes, "a motorman can be made in two hours." A possible future development of a successful automatic train apparatus, applicable to the severe conditions of the steam roads, will inevitably lead to the abolition of expensive men on the railroads, and the substitution therefor of machines plus laborers.

It appears that our real trouble is our lack of help from the public in such matters. When it comes to navigating a ship, in case of disobedience of rules, neglect of duty or inefficiency, the government takes in hand the delinquent officer and suspends him, or deprives him of his license and prevents him from making a living at his profession. The engine runner holds the same relations to the public, as does the officer of a ship, and should be controlled in the same way. If the government, through its lawmakers would inflict a similar penalty on a reckless locomotive engineer, who disobeys the rules for the safety of the public, established by all of the leading roads in the United States, revoke his license and otherwise hold him responsible to his fellow citizens for want of care in most responsible duties, this would furnish a powerful incentive to vigilance. Instead of this the public says, in effect, to the railroad corporation: "If your men do not obey rules and an accident results it is your fault for not supplying some mechanical apparatus to take their places. We do not know what such an apparatus is, or whether such an apparatus can be made, but it is your duty to find one and apply it."

JOHN D. ISAACS,
Consulting Engineer, Harriman Lines.

WHY NOT EXPERIMENT ON THE PANAMA RAILROAD?

CHICAGO, Ill., December 14, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In reading your editorial on the Interstate Commerce Commission's report on the Westport derailment, it has occurred to me that the government has an exceptional opportunity to put the recommendations of the commission to practical test for the benefit of the railroads of the country. To the best of my knowledge there are no automatic stops on the Panama Railroad. There is a fine chance to "try it on the dog" going to waste. There has been some expression of a desire on the part of the railway officers of the country for a railway laboratory. The Panama Railroad could be used for this purpose to great advantage, and also to the great benefit of inventors who are now trying to get Congress to pass bills which will compel the roads to use their devices. Friendly congressmen should find no difficulty in loading the government road to its capacity with these devices, thereby making both votes and valuable contributions to knowledge.

BYSTANDER.

AUTOMATIC STOP DIFFICULTIES.

PITTSBURGH, Pa., December 25, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

That ten thousand dollar offer for an automatic stop, noted in your issue of December 20, page 1169, was, indeed, an "easy one." You might well have used even stronger language in showing how far behind the times that fifteen-word specification is. Signal engineers are acquainted with at least a dozen devices that would answer that requirement. You might also have used more emphatic language in your statement of the elements of the real automatic stop problem. Unfortunately, the devices which meet the requirement in that advertisement, when we take the specification literally, cannot be depended upon to work with that certainty and reliability which is required in a device which, to serve the purpose, must operate invariably.

But lack of mechanical certainty is only one of the reasons why, up to the present time, a stop that will satisfy the requirements has not been produced. Several of these stopping devices may work with a fair degree of regularity, but experience has shown that devices of the kind are apt to fail when they are most needed

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to check the action of the engineman. The road using such devices would, in the event of a failure of the device to work, be in the position of having provided at great expense a reputed "safety device" without really increasing in any reasonable degree the safe movement of its trains.

Under the varying conditions of service and the peculiar construction required by this class of apparatus, several of the train control devices have to be provided with a hand release, placed in the cab of the engine, convenient to the hand of the engineman, to permit him, when necessary to do so, to cut out the stopping device and release the brakes, allowing the train to proceed. Then the assumption is that the engineman may safely be depended upon not to "press the button" and release the brake when there is danger ahead; but experience has shown that the engineman cannot be relied upon to operate the release only when there is no chance of an accident resulting.

Under this general condition accidents are to be expected, notwithstanding an expensive device may have been installed. "Familiarity breeds contempt" is an old saying; and when, in addition, an engineman "gets the habit" of working the release, dependence for safe working cannot be placed on a train control or automatic stopping apparatus using a device of the kind as a necessary or permissible part of its equipment.

Then, again, the stopping devices that have been developed to the highest degree of efficiency require the use of the overlap, with its restriction of the capacity of a track measured by the number of trains that may be run in a given time; with the consequent complications of the signal apparatus and controlling circuits, and with the objectionable operating methods or practices which must be followed at interlockings. To be successful, from an operating standpoint, the train control device should work with safety and reliability without requiring the use of the overlap.

It is the opinion of many experienced signal engineers that the conditions which will be found necessary in the operation of trains when an automatic stop is in use will prove to be so difficult that but slight, if any, additional protection may be expected or will be secured by the use of the stopping device. Great difficulty will be experienced in maintaining the train control apparatus in perfect working order; and with the difficulty, if not impossibility, of securing reliable working with a device requiring a hand release in the cab, to be operated at will by the engineman, the advantages of being able to stop a train in a few (rare) instances will be more than offset by the increased hazard in every-day operation. It is hoped the New Haven will revise its specifications, stating more clearly and exactly the conditions as to permissible restrictions of traffic and the requirements essential to reasonably complete protection to be met. This side of the question must be fully dealt with before a train control device can be agreed on which can be considered as working with that degree of safety and reliability which will warrant its installation on the tracks of a trunk line railroad. C. S. N.

THE MASSACHUSETTS COMMISSION.

Boston, Mass., December 26, 1912.

To the Editor of the Railway Age Gazette:

I have read with much interest and entire approval of your piece "The New Haven Monopoly," as re-printed in the Springfield *Republican* of the 24th inst., but you say—"in the West where the movement for regulation of railways was born." Will you not give me the date of this birth? We have had a Railroad Commission in Massachusetts since 1869, and it was given the initiative and made its duty to regulate railroads in every particular; and it seems to me it should be called to account, first as our laws are ample and mandatory, although you would not even suspect it from the campaign that has been carried on here. I have followed public service corporation questions for twenty years and no state in the Union has so little excuse for bad conditions as ours and the whole trouble has been the excellent laws have not been enforced. Mr. Mellen could not be more truly sized up than you have done. Now why not do the same with our Railroad Commission? Is ours a government of laws or not? If public officials do not obey the laws how can you expect the people to? These laws affect life and limb, to say nothing of convenience and comfort, and they have been our laws for forty years. They were built on publicity and that has been ignored grossly, so that even legal lights like Mr. Brandeis seem to have completely lost sight of them. I have finally got Governor Foss to call upon the Commission for a full explanation and it ought to be interesting and bring the matter to a head. John H. Carter.

HEAVIER LOCOMOTIVES VERSUS GRADE REDUCTION.

Baltimore, Md., December 23, 1912.

To the Editor of the Railway Age Gazette:

I noticed an editorial reference in the issue of the *Railway Age Gazette* for November 1, page 821, calling attention to the proper design and selection of locomotives to suit particular operating and physical conditions, referring particularly to the Mallet locomotive and its limitations. While it must be admitted that a careful investigation and an analysis of conditions are necessary, and will oftentimes be a check on the promiscuous purchase of a type of motive power which, because of good results in certain work, is high in favor, I cannot admit that such an analysis will result in obviating the necessity for heavy expenditures to reduce grades, etc., as suggested by Mr. Beyer in his paper before the American Society of Mechanical Engineers, abstracted in your issue of December 13, page 1145.

As a general rule, capital expenditures for reducing grades, eliminating curves, etc., are confined to certain critical points of an operating division. As a chain is limited by its weakest link, so is the train load limited by the maximum grade on a division. This may be very short, but reducible at considerable expense, or there may be several maxima, similarly reducible. To attempt to largely save this expense by putting locomotives of greater tractive effort into service would probably not be seriously considered, as a short analysis will indicate.

It is not denied that increased capacity of motive power will result in increased train load. Economy in that direction has been improving steadily for years, and there now seems to be a feeling that the limit is not far off. Such increase cannot, however, prevent the rating of a train from being controlled by certain critical points above referred to. If the train is fully rated for the low grade portion of a division, it cannot be operated over the critical grades, and, conversely, if rated for the maximum grades, it is operated far below its capacity over the remaining territory. Such operation is far from efficient, and there seems to be no possible way to radically improve the situation except by reducing grades. Of course, results are being obtained without this, where the cost would be prohibitive, by operating certain districts as helper grades. This, however, saddles operation with the cost of helper service, and on a busy line would capitalize at an enormous figure. No type of road engine could save this expense. In short, the object of reducing a critical grade is not to enable a given standard engine to haul more cars, but to make possible an increased haul for *every* engine, without breaking load at the foot of the grade, or being operated below capacity before reaching it. Theo. Bloecher, Jr.

Belgian International Exhibition.—At the International Exhibition at Ghent next summer, all the leading Belgian industries will be represented. The field to be covered is a very wide one, including as it does railway and colonial enterprises, coal mines, iron works, copper mines, stone quarrying, blast furnaces, steel works, glass blowing, zinc works, plate glass manufactures, sugar refineries, rails and rolling stock. Besides all these, Ghent will show a marvelous field of activity in textile trades, while the horticultural and agricultural side of the exhibition will also be well worth seeing.

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THE HOPATCONG-SLATEFORD CUT-OFF.

Second Article, Describing Very Heavy Bridge Work, Including Largest Concrete Railway Bridges Ever Built in this Country.

By C. W. Simpson,
Resident Engineer, Delaware, Lackawanna & Western.

One of the distinctive features of the Hopatcong-Slateford cut-off of the Lackawanna, the general description of which was published in the *Railway Age Gazette* of December 6, is the almost exclusive use of concrete for structures. Out of a total of 67 structures at stream, highway and railway crossings only one is of steel. With a few exceptions these structures are of the arch type, with spans varying from three to 150 ft.

Fig. 1—Slab Type Highway Bridge Over Tracks

In some instances where there was not sufficient clearance to permit the use of the arch type, a reinforced flat slab type was used.

The structures may be classified roughly under four heads: reinforced slab or beam type, semi-circular arches carrying the railroad embankment and tracks, elliptical spans carrying the highways over the railroad, and long concrete bridges composed of several arch spans.

SLAB TYPE STRUCTURE.

The slab type is very well illustrated by two structures at Slateford, Pa., one designed to carry a highway over six tracks,

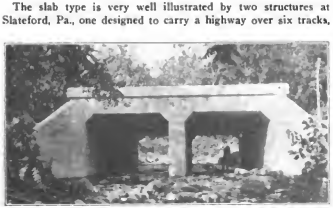

Fig. 2—Typical Slab Type Culvert for Waterway.

four of which have been laid, and one carrying four tracks across Slateford Creek. The highway structure is composed of three 37 ft. spans; the center line of the roadway being at an angle of 55 deg. 8 min. with the tracks. Each span consists of a 12 in. slab resting on eight longitudinal beams 20 in. deep, 10 in. wide at the bottom and 14 in. wide at the top, spaced 5 ft. center to center. The slab and beam concrete was placed at the same time so that they form "T" beams. Each beam is reinforced with six 1 in. square bars and the floor slab with ½ in. square bars spaced 4 in. center to center. The bottom of the face beams was curved to give the appearance of a very flat elliptical arch. The connection between the floor system and the piers and abutments is stiffened by 22 in., 45 deg. corbels. The piers are 2 ft. 1½ in. thick at bottom, 1 ft. 10 in. thick under the corbel, and 25 ft. high above the footings.

As the narrowness of the piers made it inadvisable to have a transverse construction joint in the floor system, the concrete was placed continuously from end to end, and two longitudinal construction joints, midway between beams, divided the floor into three construction sections. A railing composed of concrete posts and two lines of 2 in. pipe protect the roadway, which was paved with a 3 in. coating of Amiesite placed directly on the floor slab.

The structure over Slateford Creek is composed of two 14 ft. slab spans carried on two plain abutments and one plain pier, on gravel foundation. The pier is 2 ft. 6 in. thick above the ground surface and 4 ft. 6 in. thick at the bottom of foundation. The slab is 2 ft. thick and is stiffened at the pier and abutments by 24 in., 45 deg. corbels. The slab reinforcement consists of 1 in. square bars spaced 4 in. center to center,

Fig. 3—Typical Arch Culvert for a Highway.

with every third bar bent up at the quarter point. The top of coping is level with the top of the rail.

THE SEMI-CIRCULAR ARCH.

The semi-circular arch type is best illustrated by the arch over the Morris and Sussex turnpike near Andover, N. J. This is a combined highway arch and culvert, under an embankment 90 ft. high. Originally the stream and highway were 300 ft. apart, but the stream channel was changed so that both could pass through the same structure. The arch barrel is 221 ft. long, has an inside diameter of 33 ft. and varies in thickness according to the depth of the embankment over it. Thus the crown thickness at the center is 2 ft. 9 in., while at the ends it is 2 ft. 6 in., and the abutments are 22 ft. 2 in. broad at the center and 17 ft. 10 in. at the ends. The arch ring is reinforced longitudinally with ½ in. square bars spaced 2 ft. center to center near both the inside and outside surfaces. The culvert occupies the entire width between abutments, the roadway being carried on a 1 ft. 4 in. slab, reinforced transversely with ½ in. square bars spaced 6 in. center to center and longitudinally with ½ in. bars spaced 2 ft. center to center. The slab was built as an integral part of the abutment and is

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divided into two spans by a center pier 2 ft. wide, making the culvert a double box with 15 ft. 6 in. span. Beyond the arch barrel the culvert is carried along the wing walls until it clears the roadway.

ELLIPTICAL ARCHES.

A good example of the overhead highway arches is shown in one of the accompanying photographs. All arches of this type provide clearance for four tracks, requiring a minimum span of 56 ft. The highway at this point makes an angle of 74 deg. 15 min., with the tracks, requiring a span of 58 ft. 2 in. The intrados is a semi-ellipse having a rise of 9 ft. 6 in. The barrel is 18 in. thick at the crown and is reinforced longitudinally by 1 in. square bars spaced 12 in. center to center, near the upper and lower faces, and transversely by 1-in. square bars spaced 24 in. center to center. Spandrel walls, with a 2 ft. 6 in. coping, retain the spandrel filling and the roadway is protected by a concrete railing surmounting the coping. The concrete for the arch ring was placed continuously from springing line to springing line, and the spandrel walls, up to the bottom of coping, were placed at the same time.

Fig. 4—Elliptical Arch Carrying Highway Over Tracks.

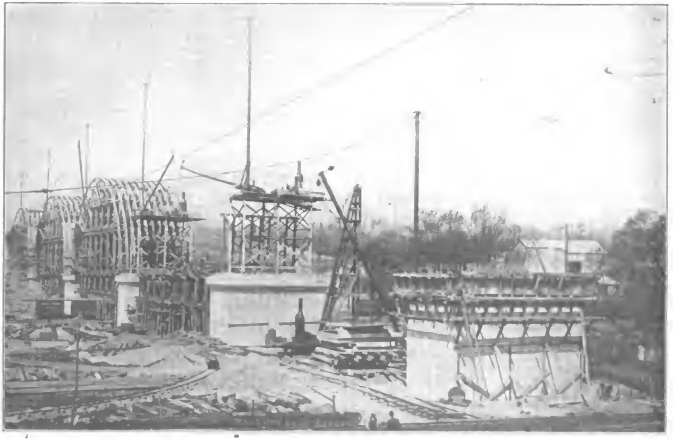

Fig. 5—Early Stages in Construction of Paulins Kill Viaduct.

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THE PAULINS KILL VIADUCT.

There are two structures of the fourth type; one at the crossing of the Paulins Kill river, the New York, Susquehanna & Western, and a highway at Hainesburg, N. J.; and one across the Delaware river, the old line of the Delaware, Lackawanna & Western, and two highways near Slateford, Pa. These bridges have been said to be the largest concrete structures yet erected for railroad purposes in America.

The Paulins Kill bridge is composed of five 120 ft. and two 100 ft. semi-circular arch spans, carrying a floor system composed of 13 ft. semi-circular spandrel arches. The abutments are a modification of the "U" type, being composed of three longitudinal walls carrying a reinforced floor slab. The embankment is allowed to take its natural slope between these two 6 in. centrifugal pumps, but the other excavation was so wet that the concrete was deposited by means of a tremie.

The construction work was carried on by a system of derricks, having 75 ft. masts and 65 to 80 ft. booms, operated by Mundy double drum hoisting engines. The derricks were first erected on the ground surface at each pier and from this position constructed the piers to a point about 10 ft. above the springing line. A steel tower 30 ft. high, composed of six 9 in. I beams braced with 5 in. channels was then erected on the pier and the derricks transferred to a platform at the top of the tower. From this position the derricks completed the main arches and two spandrel arches over the crown of each main arch. They were then moved to the top of these spandrel arches and from this location completed the remainder of the work.

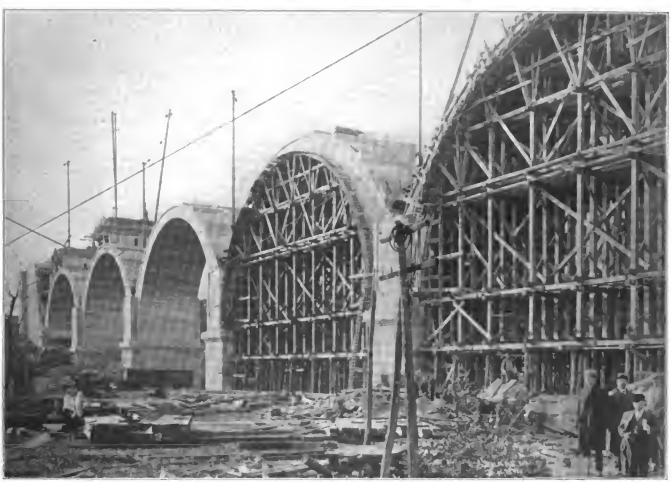

Fig. 6—Completing Arch Rings and Starting Spandrel Walls on Paulins Kill Viaduct.

walls so that they do not act as retaining walls and carry only the load transferred to them by the floor slab. The walls are stiffened by reinforced struts, extending from wall to wall. The viaduct is 1,100 ft. long end to end of masonry, and is 34 ft. wide face to face of arches, with the pier pilasters projecting 4 ft. The top of the coping, which is level with the top of rail is 120 ft. above the stream bed.

The floor is waterproofed with five layers of Neponset Water Dike felt and one layer of burlap, protected from injury by the stone filling with one course of brick. The joints in the brick protection coat were filled with a waterproofing compound. The foundations were carried to bed rock, which is near the ground surface except at the two piers near the stream, where the excavation was 35 ft. deep. These excavations were sheeted with 3 in. x 12 in. yellow pine driven the entire depth by a Vulcan steam hammer. The water was kept out of one excavation by

For constructing the main arches the contractor used one set of 100 ft. and three sets of 120 ft. timber centers. These centers were framed and assembled into units that could be handled by the derricks and narrow gage rolling stock, in a timber yard equipped with circular and band saws, a planer, and other wood working machinery. A large part of the forms were built in sections at the timber yard and were erected, taken down and re-erected by the derricks.

The concrete mixing plant was located about 300 ft. north of the bridge on the west side of the stream. Stone was quarried from a hill just back of the mixing plant and conveyed in dump cars to two Farrel jaw crushers from which it was taken by bucket conveyors to two 200 cu. yd. stone bins located over the mixers. Sand was dug from a pit about one-half mile from the mixing plant by a clam shell bucket and was conveyed to the sand bins, located alongside the stone bins, in 4 yd. 3 ft. gage side

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Fig. 7—The Completed Paulina Kill Viaduct.

dump cars. Measuring hoppers located below the storage bins discharged into two 1 yd. McKelvey mixers. Each mixer discharged into a hopper from which the concrete passed into 1½ yd. bottom dump buckets on 3 ft. gage flat cars. Twelve ton Baldwin locomotives hauled the cars to all parts of the work, crossing the stream on a temporary wooden bridge. A standard gage track connected the mixing plant with the N. Y. S. & W., and cement was unloaded from the original cars and placed in a cement house, on a level with the storage bins, by a derrick. This standard gage track extended under the storage bins and crushed stone for several smaller structures was shipped from this plant. This structure required 43,212 cu. yds. of concrete and 735.5 tons of reinforcing steel.

DELAWARE RIVER BRIDGE.

The Delaware river bridge, which is 1,476.8 ft. long end to end of masonry consists of five 150 ft. x 40 ft., two 120 ft. x 40 ft., and two 54 ft. x 16½ ft. elliptical arches, and is 34 ft. wide face to face of arches. The 150 ft. and the 120 ft. arches support a floor system composed of 13 ft. spandrel arches and the two smaller arches carry longitudinal spandrel walls, which retain the stone filling placed directly on the backs of the arches. The west abutment is of the ordinary "U" type, but the east

Fig. 8—The Delaware River Bridge in all Stages of Construction.

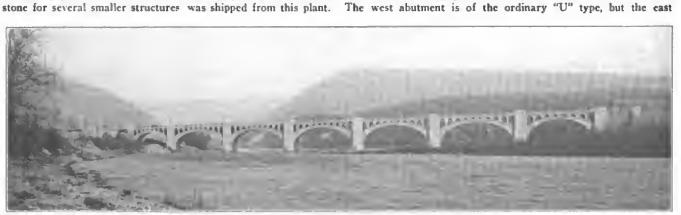

Fig. 9—The Completed Structure Across the Delaware River.

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abutment is modified in that the walls are not a gravity section, but are tied together at about one-third their height by reinforced transverse ties, and are heavily reinforced to act as cantilever beams above these ties.

The east two-thirds of the bridge is straight and the longitudinal axis of this portion makes an angle of 65 deg. with the centerline of the piers and with the elements of the main and

of solid concrete up to the extrados of the main arches, above which the pilasters and adjoining spandrel walls form a hollow pier. In constructing the main arches the work proceeded from the east end and five arches were turned during one season. As the piers were not entirely stable under the unbalanced thrust of one arch, and as it was unsafe to leave any centers in the river during the winter, on account of large amount of ice carried

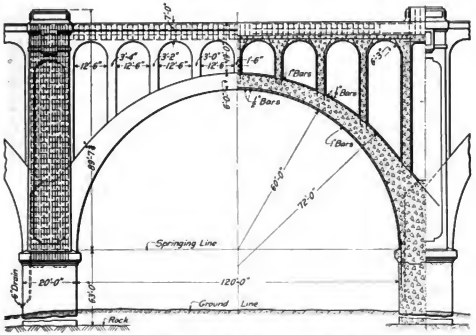
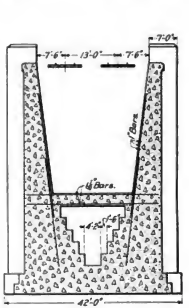


Fig. 10—Paulins Kill River Viaduct at Hainesburg, N. J.



Cross Section of Abutment of Delaware River Viaduct.

spandrel arches. The west one-third is partly on a 3 deg. 36 min. curve and partly on a spiral connecting the curve with the straight portion.

The west abutment and the pier between the two smaller arches rest on a gravel foundation, but all other foundations are carried to bed rock. The depth of the rock varied from 25 ft. in the center of the river to 60 ft. at the banks and no particular difficulty was encountered in making the excavations. The piers are

during that season, the last pier was considerably enlarged below the ground line and acted as an abutment pier.

The floor system above the springing line of the spandrel arches was constructed in sections about 90 ft. long, but the reinforcing bars were continuous past the construction joints, so that there are no expansion joints of any nature from end to end of the structure. The floor was waterproofed with a ¼ in. layer of a patented compound prepared and applied by the Masonry

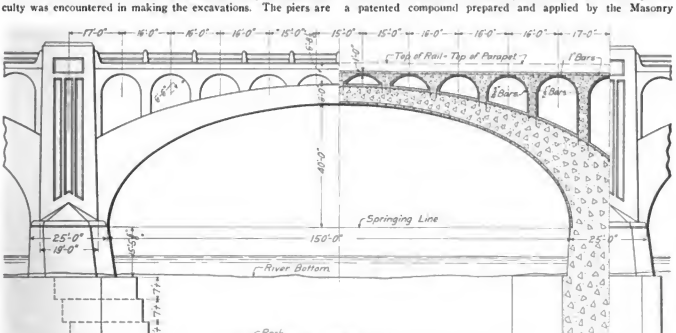


Fig. 11—Delaware River Viaduct at Slateford, Pa.

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Waterproofing Company, and protected against injury from the stone filling by a 3 in. layer of concrete.

The contractors used timber centering for the 54 ft. and 120 ft. spans and two sets of steel centering for the 150 ft. spans. The steel centers for one arch consisted of ten three-hinged arch ribs, supported at the piers by short steel columns resting on I-beam grillages which were supported on the footings of the adjacent piers. These ribs were joined together into a rigid structure by lateral and cross-frame bracing. The interesting feature of these centers was the device for lowering them. This consisted of an extension member and toggle on each side of the crown pin. The extension member is built up of two channels battened and latticed together and divided at the center to allow the insertion of an iron block pierced by a threaded hole in the end of each half. A heavy screw is worked in these blocks by means of a ratchet and lever, so as to lengthen or shorten the member. By lengthening this member the horizontal axis of the toggle is shortened and the centers are lowered. The centers were designed, built and erected by the McClintic Marshall Construction Company.

The construction work was handled by a combination of derricks and cableways. The cableway was composed of two 2¼ in. cables spaced 17 ft center to center, supported at each end by a timber tower 125 ft. high and near the center by a timber "A" frame with the legs resting on two concrete piers 30 ft. high. The "A" frame legs were spread so as to clear the bridge structure, and the concrete piers were removed after the completion of the work. The end towers were 1,950 ft. apart and rested on concrete pedestals. The "A" frame divided the cableway into four independent units operated by four 40 h. p., double drum, Florey engines with a carrying speed of 800 ft. per minute. The contractors maintained an independent organization and plant layout on each side of the river, material being received on the New Jersey side from a switch connection with the N. Y. S. & W., and on the Pennsylvania side from the old line of the D. L. & W. Sand cars were dumped from trestle into storage piles and the sand placed in elevated bins near the mixers by derricks operating clam shell buckets. Stone was hauled from the railroad excavations or waste banks by wagons to crushers located near the mixers and the crushed stone elevated to bins by bucket conveyors. Sand and stone were conveyed to the mixers by 24 in. gage cars. Each mixing plant consisted of two one yard Smith mixers located directly below the cableway.

A large part of the work was carried out on double shifts and an electric generating plant was installed to furnish light for night work. While concreting certain portions of the main arch rings concrete was placed continuously for three days and two nights and each section of the floor system required a continuous 24 hour run. This structure required 51,376 cu. yds. of conerete and 627 tons of reinforcing steel.

The conerete used on the cut-off was of three classes, known as "A," "B" and "C." "A" concrete was a 1:2:4 mixture, used only for thin walls and reinforced slabs; "B" concrete was a 1:3:5 mixture, used for arch rings and all work where other classes were not specified; and "C" concrete was the same mixture as "B" with two man stone bedded in it, used in massive piers, abutments and walls.

The structures were designed and built under the direction of Lincoln Bush, formerly chief engineer, and G. J. Ray, now chief engineer of the D. L. & W. F. L. Wheaton was engineer in charge of construction.

CENTRAL LONDON RAILWAY, ENGLAND.—The Central London Railway bill proposes to authorize the construction of railways from Shepherd's Bush through Chiswick to a junction with the London & South Western Railway at Gunnersbury, and to sanction working agreements, etc., to be made with the London & South Western, and the raising of additional capital for necessary expenditures.

RAILROAD ACCIDENTS, THEIR CAUSES AND REMEDY.*

BY D. F. JURGENSON,
Engineer Minnesota Railroad and Warehouse Commission.

Having found the fundamental causes of preventable accidents, the problem in hand is to accomplish their removal. It may be said in this connection that there is probably no industry in existence which depends so largely upon the human element for its safe operation as does a railway system; also in none of the ordinary walks of life are employees so well compensated for services rendered as are, generally speaking, those of American railways. Their hours of labor and rest have also been regulated by legislation to their advantage. The human equation is manifestly the most important element for consideration, and probably the most intricate to solve.

In our effort to eliminate the causes of collisions we should confine ourselves strictly to questions which are pertinent to the problem. In my judgment the wreck-resisting qualities of steel and wooden cars should not enter into consideration, because to anticipate the continuation of this feature of railroad operation, with a view toward the construction of wreck-proof cars and equipment, would be equivalent to a suggestion to the public that they should not expect to obtain satisfactory relief from preventable railroad accidents.

A notable feature in practically every report of collisions is the recital that one or several employees failed to do something which they should have done, and if they had obeyed the rules of the company the collision and consequential casualties would not have resulted. In this regard there is a marked contrast in sensibility to duty and appreciation of responsibility to society between the railway employees of this country and those of European railways. Whenever the European railway employee fails in performing his prescribed duty in train operation, and his failure of duty results in death or injury to persons, he is held accountable to the state, and it is an interesting fact that there are even less fatalities in connection with the operation of railways in Germany than with that of the agricultural pursuits of that country.

NECESSITY FOR AUTOMATIC TRAIN CONTROL NOT ESTABLISHED.

The necessity for automatic control of trains is not established until we have exhausted all means of prevention for errors in train operation now at our command. Some justification will then exist for seeking other fields for a remedy.

The automatic train-control device, if its realization was within the range of possibility, would at the very best be only an auxiliary to and of secondary importance to the signal system. This is so because past experiences have proven that practices not essential to the safe operation of trains are, as a general rule, not given the careful attention that the primary measures receive.

Except, perhaps, in a very few conceivable special cases, it is a question whether grave danger does not lurk in the introduction of a mechanical means that tends to make an automaton of a railway employee. This device is likely to make the employee careless of the responsibilitics which he has assumed. It may cause him to feel that he is a mere supernumerary who has been practically relieved of responsibility in the handling and control of the train, vigilance over track, signals, flags, and in fact will, to a certain extent, encourage the omission of many of the duties and requirements so essential and necessary to insure the maximum of safety in train operation.

The automatic train-control device might shift the responsibility of safe train operation from the high-grade and long-experienced engineman or train operator to the less experi-

*Abstract of paper submitted as the Report of the Committee on Safety Appliances at the annual convention of the National Association of Railway Commissioners, Washington, D. C., November 19-22, 1912.

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enced maintainer of mechanical devices. The successful working of any piece of mechanism is solely dependent at all times on the hand and mind creating it, so it must of need follow if the human agency fails, either directly as in the first instance or indirectly as in the second case, a calamity naturally will result.

Even if we were to realize the ideal automatic mechanical control of trains, it would still be extremely doubtful if such beneficial results could be obtained from the automaton as would be possible of attainment from the best efforts of the human agency, because it has been well demonstrated in the past that the skill of the human hand is capable of producing results which cannot be obtained by the most accurate machinery. No system of mechanical safeguards can be devised that will dispense entirely with human responsibility. Man's genius, with all its vast accomplishments in mechanical perfection, has not yet succeeded in developing the "fool proof" machine, but in every operation there appears at some point the dominating influence of the human mind. Let it relax or waver for an instant and all mechanical perfection is at naught.

AMERICAN RAILWAYS SUPERIOR IN MECHANICAL EQUIPMENT.

No railways anywhere are better equipped with mechanical devices for safeguarding human life than are the railways of this country. Cars and locomotives of the most modern construction, equipped with air brakes of the most efficient design, are in general use. Highly perfected automatic signal systems designed to preclude the possibility of collisions are in use on many lines. Their use is being extended, although not so rapidly as might be. Yet, with all these mechanical measures, lives are snuffed out by the score because some human mind failed. With all our perfection in this direction it appears as though we are encouraging carelessness among employees through overconfidence in mechanical perfection.

It is doing the American employee an injustice to contend that he is inferior, mentally and physically, to his European brother, and therefore that it is necessary to devise mechanical means to perform the services society is entitled to and which the employee is in duty obligated to render. If it is possible for the European railway manager, the American manufacturer, business man, contractor, and the government to obtain absolute reliability and precision from their employees, it ought not to be impossible for the American railway companies to get the same attention to duty and precision from their employees.

The railway employee should understand that a railway is a quasi-public corporation, and that when he accepts employment with it he becomes a quasi-public servant, and owes the same duty and responsibility to society as the company that employs him.

Since the foregoing statistics show that human fallibility is responsible for 59.7 per cent. of the deaths and 57.4 per cent. of the casualties resulting from all accidents for the period under consideration, it is apparent that serious investigation must be made to find an effective remedy. This is especially true since it has been demonstrated that it is not impossible to obtain reliability and precison from such employees in other countries and from employees in the other industries of this country.

There should be closer working relations between the managers and employees of railways for the purpose of encouraging open and free discussion on the subject of safety. The problem of making men trustworthy and dependable, if approached in the right direction, will not be found the hopeless task it is often assumed to be. Some of the railway companies have already formed "safety committees," with this very object in view. Their slogan is "safety first." They co-operate with all employees in devising measures of safety for the protection of life and limb in all branches of railway operation, and methods of this kind should be extended and encouraged.

RAILWAY EMPLOYEES SHOULD BE AMENABLE TO STATE.

What has been accomplished by Germany and other European countries in checkmating preventable accidents in railroad operation by making railroad employees amenable to the state for faithful attendance to and performance of their duties, might well be done in this country. Thus far, however, when effective disciplinary measures have been suggested as a remedy for human fallibility or carelessness in railroad operation, the difference in the sociological and political conditions existing here have been set forth as an insurmountable obstacle. Even though a majority of the European countries are in advance of us on this question, a start has only been made in the direction of eliminating the human equation from railroad operation. Can it be that the American people, the most efficient on earth, should continue to be led by Europe? A new idea cannot be perfected without some experiment, and until an honest attempt is made to find out how far the methods in vogue in the European countries may be relied upon in this country, it will not be known to what extent sociological and political conditions enter as factors into this problem.

The operation of railway trains is fast developing into an important and superior vocation, and all right-minded employees are beginning to realize the necessity for the introduction of effective means to protect them from the dangers attendant on the negligent acts of incompetent, careless or indifferent employees. It is conducive to their own interests and safety to encourage and advance such projects.

To accomplish this purpose, it may be necessary for the state to go beyond the corporate entity and its executive officers and hold each individual employee responsible for the proper and safe performance of his individual duty. This may be brought about in many different ways, and it is suggested that it may be effected in the following manner:

Employees engaged in train operation should be required by law to serve an apprenticeship of a sufficient duration to qualify themselves for the position they seek. Before the applicant is permitted to serve in any capacity in train service, he should be examined by a competent state board of examiners as to his physical and mental qualifications. Such examinations and tests should be graduated so as to meet the requirements of the different grades of the service, and a license must define the kind of service the applicant may perform. The state must reserve the right to revoke the license for good cause.

Many of the states have for a number of years been enforcing this very idea against the practitioners of medicine, lawyers, dentists, undertakers, electricians, horseshoers, plumbers, stationary enginemen, barbers, and others for no other purpose than to protect society, and excellent results have been secured. As far as the public is concerned it is difficult to understand how the ability and requirements of the doctor, pharmacist, dentist, and others are of greater importance to society than those of railway employees, and if it is possible to reduce indiscretions and incompetency in the classes mentioned by effective state legislation, it should not be difficult to extend similar legislation to railway employees.

The lack of uniformity and the varying degrees to which state laws affecting railroad operation are enforced in the different states is very marked. The measure of safety which the public is demanding from errors in railroad operation cannot be expected to be realized without uniform and concerted action on the part of the different states whose duty it is to care for the public interests in this respect. The advisability and fairness of some of the state laws now existing and affecting train operations are also open to question.

Because of the confusion which now exists in the different state laws, it appears that both the interests of the public and the railway companies in the matter of safety from errors in railroad operation would be materially advanced if all legislation pertaining to railroad operation was made uniform.

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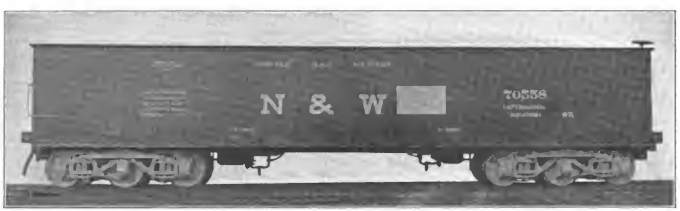
NINETY-TON HIGH SIDE GONDOLA CAR.

Developed on the Norfolk & Western and Equipped With Specially Designed Six-Wheel Equalized Trucke.

Cars larger than 120,000 lbs. capacity, if mounted on four-wheel trucks, involve pressures on the journal bearing which cause a large increase in the troubles with wheels and axles, as well as requiring much closer attention to prevent hot boxes. It therefore seems advisable to use six-wheel trucks under cars of extra large capacity. A six-wheel truck, as constructed for passenger cars, has been considered too expensive and complicated for satisfactory use in freight service, and with the exception of a few special cases, has not been so employed. When cars as large as 90-ton capacity, considered in connection with the usual 10 per cent. overload requirement, are to be built, a six-wheel truck is practically compulsory, and in connection with the design of such a car on the Norfolk & Western, the problem was solved by the development of an entirely new type of six-wheel truck, which permits the use of the ordinary 5½ in. x 10 in. M. C. B. journal box, while at the same time the weight is properly equalized and the truck is given the necessary flexibility.

These cars are of the high side gondola type and measure 9 ft. 6 in. in width, 6 ft. 6½ in. in height and 45 ft. 6¼ in. in length on the inside of the body. This gives a cubic capacity of 2,829 cu. ft. level full, and 551 cu. ft. in a 30 deg. heap, making a total of 3,380 cu. ft. Pocahontas run of mine coal is taken at 58.85 pounds to the cubic foot. The first load of coal hauled in the car was 95 tons, with some corners not quite filled out. The maximum outside dimensions are 48 ft. 4⅞ in. over bumping blocks, 10 ft. 4½ in. to the top of the side of the light car, 11 ft. 1 in. to the top of the brake shaft and 10 ft. 4½ in. extreme width over the body. The cars are provided with eight small drop doors in the floor, which are operated by a simple type of winding chain and shaft mechanism. The design is of the continuous center sill type. Cross beams or diaphragms are introduced to prevent deflection of the center sills, which, in a car of this length, would prove serious. This results in transmitting the load to the sides of the car which carry it, as plate girders, to the bolsters, whence it is transferred to the center plates. The stakes are on the inside and while interfering to a limited extent with lading other than coal, ore, or similar material, have a number of advantages. With outside stakes, the punching of the upper flange of the side of the car for rivets detracts materially from the strength of the section, this portion being in tension; while with inside stakes the rivet holes are on the compression side of the member. It has also been possible, with inside stakes, to do away with body cross ties, which are undesirable and form a fertile source of repair bills. Inside stakes are of particular advantage in this case, inasmuch as they form the means of powerful side stiffeners near the top chord angle of the side plates. As this car has been designed for use in a dumping machine, it will be readily seen that such construction is necessary.

Commercial shapes are largely used, special castings being incorporated at a few points only. The center sill consists of two 15 in. 33 lb. channels which are continuous for the full length over end sills. These are set 12¾ in. apart with the flanges extending outward and a 5/16 in. top cover plate extends continuous between the bolsters. The edges of the ¼ in. floor plates extend under this cover plate and are secured to the center sills by the same rivets. At the double body bolster there is a ½ in. plate 38 in. in width, and extending across the car, which forms the floor at this point. Between this and the end of the car the center sill cover plate is ¼ in. thick. At the bolster the center sill is reinforced at the top by 3½ in. x 3½ in. x ½ in. angles arranged as shown in the illustration. The three cross bearers each consist of a 3 in. x 2½ in. x ¾ in. angle continuous under the center sill and secured to the bottom of the side posts at either end. They also include a ¼ in. web plate on either side between the center sill and side. This plate is made in two parts, the outer end for a distance of 20¼ in. consisting of an extension on the wing or gusset plate which is carried nearly to the top of the sides. The remainder is a properly shaped plate which extends only to the floor. The joint between the two is made with a splice plate ¼ in. thick. The top member of the cross bearer consists of two 2½ in. x 2 in. x ¼ in. angles extending between the center sill and the side plate. The floor plates are of such a size that the joints come at the cross bearers and the edges are riveted to the angles.



Ninety-Ton Gondola Car Mounted on a New Design of Six-Wheel Truck.

Midway between the cross bearers and also between them and the bolsters are floor beams, consisting of 8 in. 11¼ lb. channels with the outer ends riveted to the bottom of the side posts and the inner ends secured to the center sills through the medium of ½ in. gusset plates and angles fastened on the webs of the center sill channels. The smaller wing or gusset plates are located above these floor beams and consist of triangular ¼ in. plates about 28 in. wide at the bottom and about 31 in. high riveted to the side posts and secured on top of the floor plates by angles of the proper length, the rivets holding the angles also extending through the flanges of the channels which form the floor beams. At both the floor beams and cross bearers there is a short reinforcing angle riveted to the top cover plate of the center sill, which is also the floor plate.

In view of the large weight concentrated at the center plate it was necessary to design a bolster of unusual strength and

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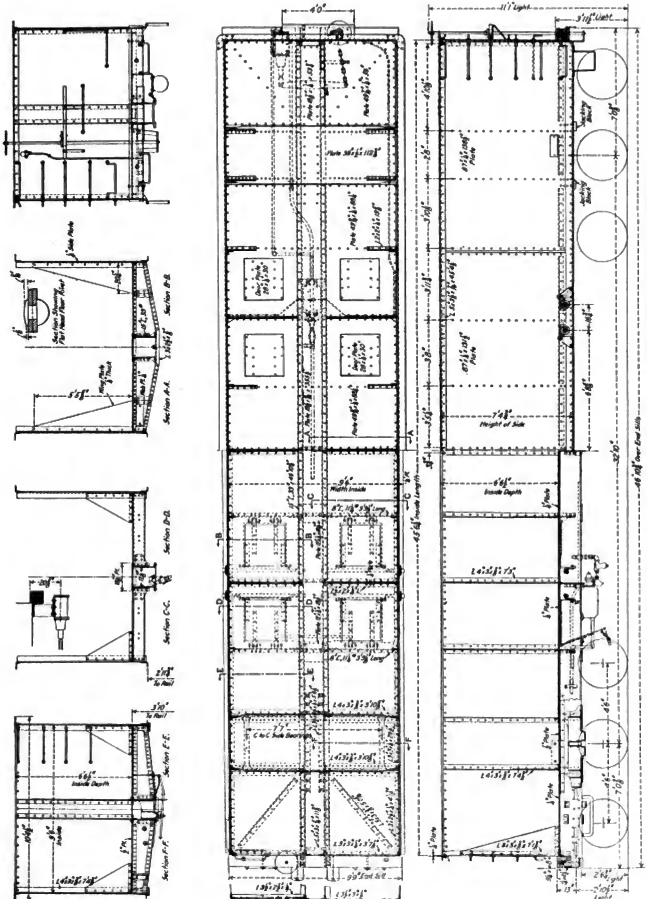

Ninety-Ton, High Side, Gondola Car Mounted on a New Design of Six-Wheel Truck; Norfolk & Western.

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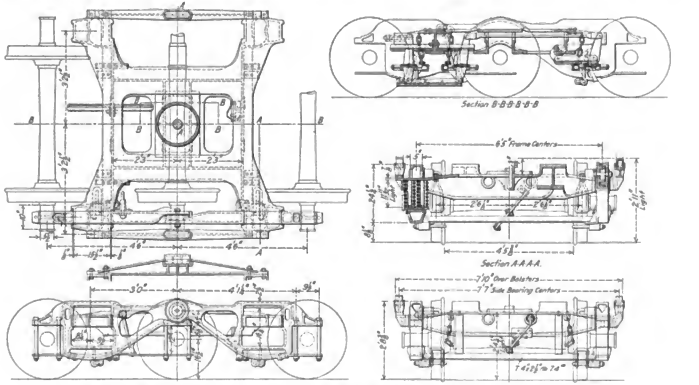
rigidity which would properly convey the load from the side girders, which carry the greater portion of it. Practically two bolsters, set 36 in. apart, have been employed and a large casting fitted between the center sill channels connects the two and includes the center plate. Each of these bolsters consists of a ⅜ in. web plate and a pair of 4 in. x 3 in. x ⅜ in. angles at the top. Similar angles at the bottom, which in both cases extend only from the side plate to the flange of the center sill channel, are also used. A ¾ in. plate, 16 in. in width at the center and tapering to a width of 8½ in., extends under the center sill and the center plate casting and is riveted on either side to the flanges of the bottom angles. At the junction of the side plate and each of the bolsters there is a jacking casting, formed to fit around the bottom end of the side post and strengthen the construction at this point. This gives four jacking points at each end of the car. A ½ in. top cover plate of sufficient width to include both parts of the double bolster extends across the car and is secured to the side plate by an angle. The side bearings are attached to angles. The end sill is of oak 8 in. x 9¼ in. and the center sill channels are cut out at the top sufficient to allow its introduction. The end sheet of the car extends behind the end sill which is also reinforced by the end posts and the angle to which the floor plates are secured.

The car has a Miner friction draft gear with Miner attachments. It will be seen that the gear is attached directly to the center sills with the usual reinforcing castings on the webs and that the coupler yoke passes below the wooden end sill, the carrier iron being bolted to the bottom flanges of the center sills. The rear casting of the draft gear has a minimum clearance of ⅛ in. from the extension on the center plate casting. The center of the line of draft is 3¾ in. above the bottom of the center sill channels.

Each car has two sets of brake rigging, including auxiliary reservoirs, triple valve, brake cylinder, etc. The reservoirs are supported below the center sills just inside of the truck and the train line passes between the two center sill channels for the dis-



Six-Wheel Equalized Truck with Journal Boxes Secured to the Side Frames; Norfolk & Western.

a properly shaped casting forming a bridge between the two bolsters and are located at a radius of 3 ft. 9½ in. from the truck center.

A large proportion of the load is carried by the sides of the car which consist of ¼ in. steel plates 87 in. in width and 138 in. in length. The vertical joints between these sheets are made by ¼ in. splice plates on the inside, and the double stakes at these points are set in enough to allow for them. This plate girder, of which the side plates form the web, has a 5 in. x 3 in. x 7/16 in. angle at the bottom with the flange extending outward, and a 5 in. x 3½ in. x 7/16 in. angle at the top. Both angles are continuous for the full length of the car. There are no diagonal braces and the plate is stiffened by the 4 in. x 3 in. x ⅜ in. angles forming the stakes, which are spaced as shown on the drawings. These angles continue to the bottom of the side plate and are fastened to the cross bearers and floor beams. As before mentioned the wings or gussets of two different sizes form the principal source of stiffness for these girders.

The construction at the end is practically the same as at the sides. The corner posts, however, are 3½ in. x 3½ in. x ⅜ in. tance between the bolsters. At the bolsters and to the end of the car it runs outside of the sills. The brake cylinders are located just under the end sill, there being one at either end of the car connected to the adjacent triple valve and reservoir. The hand brake is located on the opposite side of the car from this cylinder and connects to the opposite end of the same brake lever. This location of the brake cylinder is somewhat in the nature of an experiment and arrangements have been made for placing the cylinders between the trucks at about the usual locations if the present location should prove unsatisfactory.

A six wheel equalized truck without pedestals is a novelty and has been developed for use on this car by W. H. Lewis, superintendent of motive power and John L. Pilcher, mechanical engineer. It consists of a cast steel side frame in two parts and of peculiar shape arranged to carry three journal boxes at 4 ft. 6 in. centers. Directly above one of the journal boxes the castings are arranged for a swivel connection. In these two castings the openings for the ends of the bolster and for the group of coil springs are spaced at 3 ft. centers from the center axle, bringing them 18 in. from the outer axles. One of the illustra-

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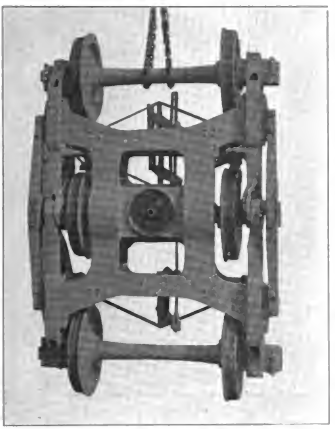
tions clearly shows the form and arrangement of the double cast steel bolster which carries the center plate. This rests on four nests of three double coiled springs each and has an extension beyond the side frame to allow the attachment of a bridge which carries the side bearing at the center of the truck. This bridge is bolted to the bolster extensions. Each group of springs consists of three nests of an outside coil of 1¼ in. diameter wire, 5 in. outside diameter, with an inside coil of 9/16 in. wire, 2¼ in. outside diameter. The springs work at 40,000 lbs. stress in the bar when the car is loaded to a 10 per cent. overload. The free height is 11½ in. with a total deflection, free to solid, of 1¾ in. The swivel joint in the side frame is so formed as not to give any shearing action on the bolt. This arrangement is shown in the sectional view through the center of the truck. This view also shows that the bolster is not as heavy as it might appear in the photograph. There are two 4 in. x 2½ in. tees bolted to suitably formed lugs on the bottom of the side frames and located midway between each of the pairs of wheels. These take the place of sand planks which are not feasible when the bolsters are arranged in respect to the wheels as they are in this case. It is possible that these cross ties may be omitted altogether. Tests will be made to determine this.



Top View of the New Six-Wheel Freight Car Truck.

The brake rigging on each truck is comparatively simple and arranged in a manner similar to a six-wheel passenger truck. Designs for carrying the brake beams from either the side frame or the bolsters have been prepared. The one given here shows the former. This truck has been patented by Messrs. Lewis and Pilcher.

The weight of the two trucks alone is 29,800 lbs., and of the car complete with trucks is 65,200 lbs., giving a total weight with lading, including a 10 per cent. overload, of 253,600 lbs., or an average weight per axle at the rail of slightly less than 44,000 lbs. With a 10 per cent. overload the proportion of revenue lading to total weight will be about 75 per cent., and it will be over 73 per cent. without the overload. It is expected that it will be possible to reduce the weight slightly, especially that of the trucks in later cars.

The entire car has been carefully designed with a view to ease of manufacture. To this end all plates and shapes are laid out for multiple punches, and care has been taken that if the plates, etc., come within the customary variations in shearing, no reshearing will be necessary. Duplication of parts has been carefully considered with good results.

OPERATING ORGANIZATION ON THE CANADIAN PACIFIC.

The Canadian Pacific lines west, including 7,000 miles extending from the Great Lakes to the Pacific coast, are divided for operating purposes into four divisions with a general superintendent in charge of each. These divisions are subdivided into districts in charge of superintendents. The vice-president and general manager in charge of operation on the lines west is assisted by an assistant general manager, chief engineer and other staff officers. The chief engineer approves standards and engineering practice and has direct charge of the building of new lines, reporting to the vice-president. The assistant general manager is assisted by a superintendent of motive power, engineer of maintenance of way, superintendent of car service and other staff officers. On each division the general superintendent is assisted by a division engineer, master mechanic and car service agent, the latter performing the usual duties of the superintendent of transportation, a title which is not thought to be as good as car service agent. Each superintendent has on his staff a resident engineer, district master mechanic, trainmaster, master carpenters, roadmasters, chief train despatchers, etc. The same general plan is followed in offices of all grades of having one clerical staff for the entire office and a general standard for office arrangement has been worked out which has effected a considerable saving.

The accompanying floor plan of the general superintendent's office in Winnipeg illustrates the general design of division and district offices. There is a private office for the general superintendent with smaller private offices for his assistants, and a single large room for the clerical force. A letter coming to the general superintendent, master mechanic, division engineer or car service agent, would be opened in the clerical office, most of the correspondence on all subjects being addressed to the general superintendent. If the letter treated of engineering, a reply would be written by the division engineer and placed before the general superintendent for signature. If mechanical, a reply would be dictated by the master mechanic, and if it treated of transportation, it would be handled by the car service agent. This practice enables the general superintendent to take advantage of the technical knowledge of his assistants and at the same time know exactly what is being done in each of the departments on his division and to maintain general supervision over all of the work. It also eliminates the large amount of inter-department correspondence common under the departmental organization. This system was introduced about the time that Major Hine started the unit system of organization on the Union Pacific. It is thought by the Canadian Pacific officers that the practice of allowing the technical men to retain their old titles adds prestige to their position which is not obtained in a system which calls them all assistants. The use of a single chief clerk for the entire office eliminates duplication of clerical work and friction between the chief clerks of the various departments. The clerical office is divided into departments which handle the statistics and filing for each of the departments of the division. Stenographers are used in common by the officers and all correspondence is kept in a common file.

It may be noted that on the western lines every superintendent is required to write a weekly news letter to the general superintendent. This letter, which is mailed every Saturday night, tells briefly what the weather has been, how traffic is moving,

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CANADIAN PACIFIC RAILWAY COMPANY

District _____ Division

Comparative Statement of Expenses, Month of _____ 191__ and 191__

ACCOUNTS	Mileage or Number Current Year	Corresponding Month Previous Year	Increase or Decrease Amount	Increase or Decrease Per Cent.	EXPLANATION OF INCREASES AND DECREASES (See Note)	New Lines (see note at foot) Less	New Lines
MAINTENANCE OF WAY AND STRUCTURES							
1 Superintendence							
2 Ballast							
3 Ties					Tons put in Track, 191 ; Average Cost per Ton ; 191 ; " " "		
4 Rails					Number of New Rails laid 191 ; " " Second-hand Rails laid, 191 ; " " "		
5 Other Track Material							
6 Roadway and Track					New Schedule represents Increase of $		
7 Bridges, Trestles and Culverts							
8 Ferry Steamers and Equipment							
9 Buildings and Fixtures							
10 Docks and Wharves							
11 Roadway Tools and Supplies							
12 Insurance							
13 Stationery and Printing							
14 Other Expenses							
15 Maintaining Joint Tracks, Yards & Other Facilities							
17							
					Mileage of Division, current month ; " " corresponding month previous year ;		
Total Maintenance of Way and Structures					Total M. W. & S. per mile of Road, current month $; " " " " " corresponding month preceding year $		

Notes:
Give reference or special Debits or Credits included in either year.
"New Lines"—Show in these columns all expenses for new lines included in current year's figures for which there were not any corresponding charges in preceding year.
This form must reach the office of Vice-President not later than morning of 20th of each month.

_____ Superintendent.
(Forms should be signed by Superintendent personally.)

Form for Recording Monthly Operating Costs on Canadian Pacific—Maintenance of Way and Structures.

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Form 699 B

CANADIAN PACIFIC RAILWAY COMPANY

District _____ Division

Comparative Statement of Expenses, Month of _____ 191__ and 191__

TRAIN MILEAGE (Figures furnished by Auditor of Disbursements)	Month or Current Year	Corresponding Month Preceding Year	Increase or Decrease (-) since 1st day of January		LOCOMOTIVE MILEAGE (Figures furnished by Auditor of Disbursements)	Month or Current Year	Corresponding Month Preceding Year	Increase or Decrease (-) since 1st day of January		ACTUAL GROSS TON MILEAGE (Figures furnished by Auditor of Disbursements)	Month or Current Year	Corresponding Month Preceding Year	Increase or Decrease since 1st day of January	
			number	per cent.				number	per cent.				number	per cent.
Passenger					Passenger					Passenger				
Through Freight					Through Freight					Through Freight				
Way Freight					Way Freight					Way Freight				
Mixed					Mixed					Mixed				
Special					Special					Special				
					Total Road Loco. Miles (exclusive of Switching and Terminal)									
					Switching and Terminal									
Total Train Mileage					Total Loco. Miles					Total N. G. Ton Miles				

SECTION 25	Month or Current Year	Corresponding Month Preceding Year	Increase or Decrease (-) since 1st day of January		EXPLANATION OF INCREASES AND DECREASES (See Note)	New Lines (See Note on Front) Less	New Lines (See Note on Front) Less
			number	per cent.			
TRANSPORTATION CHARGES							
16. Superintendence							
17. Dispatching Trains							
18. Station Employees					New Schedule represents increase of $		
19. Switch Yards and Grain Elevators					New Schedule represents increase of $		
20. Coal and Ore Docks							
22. Station Supplies and Expenses							
23. Switchmen and their Clerks					New Schedule represents increase of $ per cent.		
24. Yard Conductors and Brakemen					New Schedule represents increase of $		
25. Yard Enginemen and Firemen							
26. Yard Switches and Signals Tenders							
27. Yard Switches and Expenses					New Schedule represents increase of $ per cent.		
28. Yard Engineers					Increase or Decrease, excluding change in price, over corresponding Month Preceding Year $ per cent. Change in price represents Increase / Decrease of $		
29. Fuel for Yard Locomotives							
30. Water for Yard Locomotives							
31. Operating Joint Yards and Terminals, Dr.							
32. do do do Cr.					New Schedule represents increase of $ per cent.		
34. Wood Enginemen					Increase / Decrease		
35. Fuel for Road Locomotives					Increase or Decrease, excluding change in price, over corresponding Month Preceding Year $ per cent. Change in price represents Increase / Decrease of $		
36. Salaries of Persons							
37. Operating Joint Tracks, Dr.							
38. do do Cr.							
Total Transportation Charges					Total Train's Charges per 10,000 A. G. T.-M. Miles	Current month $ per cent. Corresponding month preceding year $ per cent.	Total Transportation Charges per Train Mile	Current month $ per cent. Corresponding month preceding year $ per cent.
Total Maintenance of Way and Struct., Form 699 A								
TOTAL EXPENSES								

Note.—If as reported from taken "Train Mileage," "Engine Mileage" or "Gross Ton Mileage" show increase, the accounts affected thereby will show corresponding decreases, otherwise an explanation should be given.
If as reported from taken "Train Mileage," "Engine Mileage" or "Gross Ton Mileage" show decrease, the accounts affected thereby will show corresponding increases, otherwise an explanation should be given.
Increase (-) or decrease in special Details or Credits included in current year's figures for which there were not any corresponding charges in preceding year.
Note.—Date in same columns all expenses for new lines included in current year's figures for which there were not any corresponding charges in preceding year.
This form must reach the office of Vice-President not later than morning of 20th of each month.

_____ Superintendent.
(Form should be signed by Superintendent personally.)

Form for Recording Monthly Operating Costs on Canadian Pacific—Transportation Charges.

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and recounts any unusual occurrences. It also gives the earnings at principal stations, the bank clearings at important cities, a brief statement as to crop conditions, new industries that may be productive of traffic, the developments being made by competing railways and any other news that may be of value in promoting economy or securing new business. These letters are summarized by each general superintendent and forwarded to the assistant general manager. This system of reports has been

CANADIAN PACIFIC RAILWAY COMPANY

COMPARATIVE STATEMENT OF MECHANICAL DEPARTMENT EXPENSES

District ____ Division. Month of ____ 191__

NAME OF ACCOUNT	Actual Labor & Material 191	191	INCREASE	DECREASE	EXPLANATIONS OF INCREASE OR DECREASE	* Scrap Expense, Scrap Credits, Miscellaneous & Indirect Charges 191	191
MAINTENANCE OF EQUIPMENT							
Superintendence—Motive Power Dept.							
Superintendence—Car Dept.							
Shop Locomotives—Repairs							
" —Renewals							
" —Depreciation							
" —Retirements							
" —Betterments							
" —Additions							
" —Net Charges							
" —Net Credits							
Shop Machinery—Repairs							
" —Renewals							
" —Depreciation							
" —Retirements							
" —Betterments							
" —Additions							
" —Net Charges							
" —Net Credits							
Power Plants—Repairs							
" —Renewals							
" —Depreciation							
" —Retirements							
" —Betterments							
" —Additions							
" —Net Charges							
" —Net Credits							
Power Transmission—Repairs							
" —Renewals							
" —Depreciation							
" —Retirements							
" —Betterments							
" —Additions							
" —Net Charges							
" —Net Credits							
Passenger Train Cars—Repairs							
" —Renewals							
" —Depreciation							
" —Retirements							
" —Betterments							
" —Additions							
" —Net Charges							
" —Net Credits							
Freight Train Cars—Repairs							
" —Renewals							
" —Depreciation							
" —Retirements							
" —Betterments							
" —Additions							
" —Net Charges							
" —Net Credits							
Work Equipment—Repairs							
" —Renewals							
" —Depreciation							
" —Retirements							
" —Betterments							
" —Additions							
" —Net Charges							
" —Net Credits							
Miscellaneous Equipment—Repairs							
" —Renewals							
" —Depreciation							
" —Retirements							
" —Betterments							
" —Additions							
" —Net Charges							
" —Net Credits							
Shop Machinery and Power							
Repairs							
Renewals							
Tool Room Machinery and Tools							
Injuries to Persons							
Stationery and Printing							
Other Expenses							
Maintaining Jt. Tracks, etc.							
" "							
" "							
TRANSPORTATION EXPENSES							
Engine House Expenses—Yard							
Lubricants for Yard Locomotives							
Other Supplies for Yard Locomotives							
Operating Jt. Yds. & Terminals—Dr.							
" " —Cr.							
Engine House Expenses—Road							
Lubricants for Road Locomotives							
Other Supplies for Road Locomotives							
TRAIN SUPPLIES AND EXPENSES							
Clothing Cars							
Heating "							
Lighting "							
Lubricating "							
Iving & Waiting "							
Other Expenses							
Total Train Supplies and Expenses							
Total Direct Charges							
Shop Expense, Scrap Credits, Miscellaneous and Indirect Charges (see detail)							
TOTAL							
NET INCREASE OR DEC.							

Form for Recording Monthly Operating Costs on Canadian Pacific—Mechanical Department Expenses.

found very valuable in keeping the general superintendent and vice-president in close personal touch with the conditions on their territories.

Each superintendent has an accountant and the necessary timekeepers. The accountant is required to furnish the superintendent a monthly statement of the detailed expenditures on his division. The forms used for these statements are reproduced herewith. These statements enable the superintendent to locate any unnecessary expense and to determine how he can best promote economies or reduce expenses in emergencies. Each superintendent is held responsible in a large measure for the financial showing made on his district. He is not asked to explain why operation was so costly, but to take immediate steps to remove the cause. These expense statements are forwarded monthly to the general superintendent who combines all the districts on his division and forwards them to the assistant general manager.

The present system of organization on the western lines of the Canadian Pacific has been worked out under the direction of George Bury, vice-president and general manager, to whom we are indebted for the above description.

LANCASHIRE & YORKSHIRE RAILWAY, ENGLAND.—New railways are proposed at Southport, Bolton, Royton, Knottingley and Goole. The new Southport line will run from Ainsdale to Kew Gardens; the Bolton line will connect with the Liverpool & Bury and the Bolton & Preston lines; the Royton line will connect with the Royton branch and the Oldham, Rochdale & Royton line; the Knottingley line with the Askern branch and the Wakefield, Pontefract & Goole line, and the Goole line will connect with the Axholme Joint Railway. Widenings to be made at Liverpool, at Farnherley and at Bolton are included in the plans, and it is intended to alter and enlarge Victoria station at Manchester.

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LIMITATIONS OF COMMISSIONS' POWERS.

Supreme Court Decisions Repeatedly Hold That Commission's Orders Must Show the Evidence on Which They Are Based.

By H. T. Newcomb,
Of the Bar of the District of Columbia.

Prior to August 28, 1906, the date on which the Hepburn act took effect, the Interstate Commerce Commission was required to make a report in each case in which it issued an order and to embody in each report the findings of fact on which the order was based. In all subsequent judicial proceedings such findings were made *prima facie* evidence. This provision, except in the case of orders for the payment of money, was omitted from the revision of 1906, apparently for the reason that it was assumed that the effect of the new legislative command to all concerned to obey the commission's orders, without the intervention of judicial approval, transformed the regulative body into a legislative agency which, in consequence, became one that need not assign reasons for or justify its action. It seems to have been assumed, in giving form to this legislation, that Congress could not only delegate power over rates which it might have exercised directly, but that it had power, also, to exempt the agency on which it conferred the extraordinary administrative power of rate-making from the ordinary inquiries concerning the exercise of its power to which every administrative agency is subject, namely, whether, in a particular case, its action was in good faith, with honest and upright purpose, and reasonable according to the standards expressed or implied in the grant of authority.

This was surely a violent assumption, and, perhaps, there was nothing else in the Hepburn act so significant of the disregard, on the part of President Roosevelt and those who aided him in enforcing his will upon a reluctant Congress, of the limitations upon the power of legislative bodies to entrust to others powers partaking of the legislative character.

When a legislative body acts within the scope of its constitutional powers, there is no authority which can inquire whether it acted reasonably and in good faith or arbitrarily and with fraudulent purpose (although, of course, some constitutional powers are limited to reasonable exercise and, in such cases, the inquiry as to reasonableness is an essential part of the inquiry whether the power exists); or, stated differently, there is a conclusive presumption, which no evidence could overcome, that, when the legislature enacts that which it has power to enact, it has acted reasonably and in good faith. There is a similar presumption, but of lesser degree, in favor of the acts of administrative officers; but, in this case, whoever may attack the act is permitted, if he can, to overcome the presumption by showing that it was arbitrary, unreasonable, committed in bad faith or with an improper purpose. Congress cannot confer, upon any officer or agency of government, power to act arbitrarily, and hence the inquiry as to the nature of the act is essentially an inquiry whether it is within the grant of power.

> "It is not to be supposed that Congress would ever authorize an administrative body to establish rates without inquiry and examination; to evolve, as it were, out of its own consciousness, the satisfactory solution of the difficult problem of just and reasonable rates for all the various roads in the country." *Interstate Commerce Commission v. Cincinnati, New Orleans & Texas Pacific Railway*, 167 *U. S.* 479, 509.

In the much later case, *Interstate Commerce Commission v. Illinois Central Railroad* (215 *U. S.* 452), in a luminous and frequently cited paragraph closely connected with the assertion that, "Power to make the order, and not the mere expediency or wisdom of having made it, is the question," (215 *U. S.* 452, 470), the Supreme Court, speaking through the present Chief Justice, intimated that the question whether, "even although the order be in form within the delegated power, nevertheless it must be treated as not embraced therein, because the exertion of authority which is questioned has been manifested in such an unreasonable manner as to cause it, in truth, to be within the elementary rule that the substance, and not the shadow, determines the validity of the exercise of power," is essentially a part of the inquiry which seeks to determine whether "the administrative order is within the scope of the delegated authority under which it purports to have been made." (215 *U. S.* 452, 470.)

In a still later case, *Interstate Commerce Commission v. Union Pacific Railroad* (222 *U. S.* 541) the Supreme Court, its unanimous judgment being expressed in an opinion by Mr. Justice Lamar, somewhat amplified the foregoing, holding that an order of the commission would not be final "if the commission acted so arbitrarily and unjustly as to fix rates contrary to evidence, or without evidence to support it; . . ." (222 *U. S.* 541, 547), and, further, in pursuance of the same thought, "Its conclusion, of course, is subject to review, but, when supported by evidence, is accepted as final; not that its decision, involving, as it does, so many and such vast public interests, can be supported by a mere scintilla of proof, but the courts will not examine the facts further than to determine whether there was substantial evidence to sustain the order." (222 *U. S.* 541, 547-8.)

From the foregoing declarations of a principle that needs only to be stated to approve itself to the understanding, to the observation in the just decided case of *United States v. Baltimore & Ohio Railroad* (*decision rendered on November* 18, 1912) that the orders of the commission cannot be sustained by facts not shown by testimony or by reports and records of which it is entitled to take notice and receive as evidence in the record, is but a short step and one that could not have been avoided. In the recent case Mr. Justice Holmes, speaking for the court, said:

> "We remark that it is stated in the commission's report that they base their conclusion more largely upon their own investigation than upon the testimony of the witnesses. It would be a very strong proposition to say that the parties were bound in the higher courts by a finding based on specific investigations made in the case without notice to them. *See Washington, ex rel. Oregon R. R. & Nav. Co., v. Fairchild*, 224 *U. S.* 510, 525. Such an investigation is quite different from a view by a jury taken with notice and subject to the order of a court, and different again from the question of the right of the commission to take notice of results reached by it in other cases, when its doing so is made to appear in the record and the facts thus noticed are specified, so that matters of law are saved."

The reference to *Washington, ex rel. Oregon R. R. & Nav. Co., v. Fairchild*, in the foregoing is significant. That case came to the Supreme Court on writ of error to the Supreme Court of the State of Washington, which had decided against the claim of the railroad that its property was taken without due process of law and in contravention of the Fourteenth Amendment to the federal constitution by an order of the state railroad commission requiring certain track connections to be made with lines of other companies. After referring to the character of this order, the court, speaking by Mr. Justice Lamar, said:

> "Its validity could not be sustained merely because of the fact that the carrier had been given an opportunity to be heard, but was to be tested by considering whether, in view of all the facts, the taking was arbitrary and unreasonable, or was justified by the public necessities which the carrier could lawfully be compelled to meet. . . .
>
> "So that, where the taking is under an administrative regulation, the defendant must not be denied the right to show that, as matter of law, the order was so arbitrary, unjust, or unreasonable as to amount to a deprivation of property in violation of the Fourteenth Amendment." 224 *U. S.* 510, 523-4.

As it appeared that the state commission, when it made the order, did not have before it evidence sufficient to sustain the taking of property which it involved, and as in the subsequent

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proceedings in the state courts no additional testimony was permitted, the judgment sustaining the order was reversed. The inference, otherwise possible, that this conclusion was in any degree controlled by the fact that the question arose in connection with an order requiring a physical connection to be made, rather than an order prescribing rates, is negatived by the fact that the first reference in support of the concluding sentence quoted above, was to *Chicago, Milwaukee & St. Paul Railway v. Minnesota* (134 *U. S.* 418), a rate case, that affirmed the principle expressed in the following frequently cited passage:

"The question of the reasonableness of a rate of charge for transportation by a railroad company, involving as it does the element of reasonableness both as regards the company and as regards the public, is eminently a question for judicial investigation, requiring due process of law for its determination. If the company is deprived of the power of charging reasonable rates for the use of its property, and such deprivation takes place in the absence of an investigation by judicial machinery, it is deprived of the lawful use of its property, and thus, in substance and effect, of the property itself, without due process of law and in violation of the Constitution of the United States; and in so far as it is thus deprived, while other persons are permitted to receive reasonable profits upon their invested capital, the company is deprived of the equal protection of the laws."

These extracts seem to support the view that not only would the Interstate Commerce Commission be usurping authority not within the scope of the grant of power under which it exercises all its lawful powers, if it should undertake to make an unreasonable or arbitrary order of any kind or one not sustained by evidence that it is entitled to consider, but that an attempt on the part of Congress to grant authority to make such an order, or to make any order under such conditions, would be unconstitutional and void.

The principle that every order of an administrative tribunal, federal or state, exercising rate-making power, must be sustained by a record containing evidence that the order is not arbitrary or unreasonable, and that those whom the order would bind must have notice of this evidence, was several years ago announced by the Court of Appeals of New York in *Saratoga Springs v. Saratoga Gas, Electric Light and Power Company* (191 *N. Y.* 123) as follows:

"It is also objected that any order made by the commission may be based, not only on the evidence and proceedings had at the public hearing provided by the statute as a prerquisite for making any order fixing maximum rates, but on the *ex parte* statement of the officers, agents, and inspectors of the commission, of which a company may have no knowledge, and to controvert which no opportunity is afforded. We do not so construe the statute. . . . As we read the statute, the investigation and report of agents and inspectors are to follow the filing of any complaint, and to precede or to be made during the public hearing. . . . It is plain that no corporation could make its defense until it was clearly notified of what was charged against it, and the proof in support such charge was given. While the commission might not be bound by technical rules of evidence, still it was plainly intended that the whole proceeding should assume a *quasi-judicial* aspect. . . . The commission being empowered to subpoena witnesses and take testimony, its inspectors or agents could be required to appear and verify any reports made by them; or, if we assume that such reports could be received in the first instance without verification, the inspectors or agents could be compelled to attend at the instance of either party, and be examined as to the truth of the statements in their reports and their knowledge of the facts therein contained." 191 *N. Y.* 123; 18 *L. R. A. (N. S.)* 713, 724-5.

Apparently the recent expression of the Supreme Court of the United States, by Mr. Justice Holmes, sanctions the foregoing and indicates its complete application to the Interstate Commerce Commission. The extent of the change in methods necessary to meet this requirement is perhaps exaggerated by contrasting it with the following declaration of the latter commission, taken from its Twenty-second (1908) Annual Report.

"Practically every complaint, formal or informal, which comes before the commission requires examination of tariff files and statistical reports of the carriers for the purpose of determining whether or not the complaints are well founded and accurately stated. With the present unification of these several branches of the work such reports are obtained in very short time. In fact, *the information necessary to intelligent action by the commission can frequently be obtained from a verbal interview with the head of the appropriate division*, and in a great many instances no further research is necessary. In this connection it should be remembered that for the heads of its tariff and statistical divisions the commission has chosen practical railroad men.

. . . . . .

"Moreover, it must be remembered that *the commission can seldom, if ever decide a case merely upon the evidence presented to it.* In this respect it is radically different from a court. The ordinary court determines only the rights of the parties before it, but every decision of the commission involves the rights of parties who are not present. Any important readjustment of rates applies not only to the complainant, but also to all shippers under those rates, and frequently, as a commercial necessity, to carriers who are not before the commission in a particular case; and in addition to the evidence actually presented to the commission, it must consider the effect of a ruling in any given case upon carriers, shippers, or localities who are not represented. It is obvious, therefore, that the determination of almost every case requires consideration of conditions, tariffs, and statistics which are not presented to the commission, but which it must take notice of in order to faithfully perform its duty, and the proper expedition of the commission's work requires that these aids to the final determination of cases arising before it should be as easy of access as possible. It is, perhaps, not too much to say that not a single case arising before the commission could be properly decided if the complainant, the railroad, or the commission were bound by the rules of evidence applying to the introduction of testimony in courts."

Despite the foregoing, it is not believed that in many important cases the Interstate Commerce Commission has based final action upon mere verbal statements of its employees or even upon considerations of commercial policy not supported by the record actually before it. So far as it has actually assumed the right to act upon such considerations it is evident that its practice must be revised and can be revised without detriment.

It is proper to notice, in conclusion, the very superficial suggestion, not infrequently heard, that the acts of regulative tribunals are made more vulnerable to attack when they are accompanied by statements of the reasons by which they were prompted. Some one, whom the writer does not recall, advancing this view, quoted the remark of a famous magazine editor who said that when he rejected a manuscript he was always right, when he gave a reason for the rejection he was always wrong. It is true that the commission has, from the beginning, and pretty consistently, followed the plan plainly intended by the law, of stating rather fully the reasons for its orders and that, in the relatively very small number of instances in which these orders have been attacked in the courts and judicially condemned, the courts have, quite uniformly, found that the statement of reasons pointed to the error that had been made. But the decisions in *Washington v. Fairchild, supra*, and the other cases herein cited, clearly show that if no reasons had been given, the facts would have been examined and the error traced to its source in the contents, or in the omissions, of the record on which the commission acted.

Among the conservative conclusions suggested by the rule laid down by Mr. Justice Holmes in the recent case, and by the New York Court of Appeals in the Saratoga Springs case, is that the regulative process might be simplified and strengthened by restoring the requirement, abolished by the Hepburn act, that all orders of the Interstate Commerce Commission should be supported by reports containing the findings of fact on which they are based. There would then be at least a *prima facie* showing, carrying a strong presumption of authority, with which judicial inquiry concerning the legality of any of the commission's orders would begin.

NORTH BRITISH RAILWAY, ENGLAND.—The North British Railway notice shows that the company is intending to construct 14 new railways for the purpose of giving additional facilities to the Lothian coal traffic, new railways in Linlithgow and Fife, and a pier at Arisaig. Power may be taken to restrict some of these proposed railways to the transportation of "such particular class or classes of traffic as the intended order may prescribe." It is also proposed to confirm agreements with the Caledonian Railway and the Edinburgh Corporation, to enable the Burntisland Harbor Commissioners to borrow and the company to advance further moneys, and to raise additional capital.

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IMPRESSIONS OF GERMAN RAILWAY PRACTICE.

The Handling of Locomotives at Terminals, the Economizing of Fuel and the Care of Employees Are Notable Features.

By Henry W. Jacobs.

Of all the countries in Europe the traffic conditions most nearly approximating those of the United States are found in Germany. The methods there used in operating and handling locomotives will therefore be of interest to American railway officers. German passenger and freight trains and locomotives are heavier than those commonly found elsewhere in Europe, and while the most modern of the express and heavy freight locomotives are of considerable size and power, compared even with American standards, their weights and dimensions, of course, do not nearly equal those found in our largest locomotives, the primary limitations being the axle load allowed by the track and bridges and the clearance limits of tunnels.

The use of freight locomotives without a leading truck is quite common practice, but not to the extent prevailing in England where leading trucks are seldom used on freight locomotives. Tank locomotives are frequently used in both freight and passenger service, and almost universally in switching service. An example of the types of locomotives prevailing upon a dense traffic division of a German railroad is given in the following table:

Type.	Service.	No. of Locos.
0-4-0 (tank)	Switch	9
2-4-0	Passenger	2
0-6-0	Freight	14
0-6-0 (tank)	Switch	23
4-4-0	Fast passenger	36
2-4-2 (tank)	Passenger	7
2-6-0	Passenger	7
2-6-0	Freight	25
2-6-0 (tank)	Passenger	33
0-8-0	Freight	15
Total		171

On some of the lines with heavy grades I observed freight engines with five pairs of drivers, but without leading or trailing trucks. As yet very few articulated engines of the Mallet type have been used in Germany, although they are being introduced to a certain extent in Belgium, Hungary and the mountainous Balkan regions. The principal reasons why French locomotives with their great tractive effort are not used in Germany are that the topography is generally favorable to moderate grades, and also because of the limitation placed upon train length, this limit being 120 axles, with a very few districts where 150 axles can be employed. Inasmuch as the German freight cars have a rigid wheel base with only two pairs of wheels, two German cars are about equal in capacity to one American freight car with its two four-wheel trucks, and we may consider the German limitation as to train length as equivalent to what would be a limit of thirty cars with us. This does not take into account the much greater clearance of our cars and the consequently heavier load carried per axle.

The handling of the locomotives at a terminal has features of interest to Americans and offers some contrasts to our practice. There are usually two freight yards at a large terminal. Passenger trains are assembled in a portion of these yards. One freight yard is devoted to arriving trains, the other to departing trains, both being worked like a hump yard in America. A locomotive is supposed to enter upon the classification tracks itself only when coupling on to its train to depart. This, of course, lessens the shock given the cars as they come together on the classification tracks, as they are propelled only by the gravity of a light grade and meet end on against the large side spring buffers. There is consequently very much less damage to rolling stock on account of rough handling than is the case in Americea where in the last two or three years freight car repairs have taken the first place away from locomotive fuel as the principal item of railroad operating expense. As car by car is uncoupled from the string of cars, and allowed to drift down on the classification tracks, a head switchman calls out a number which another switchman marks in large chalk figures upon one of the buffers. These numbers can be distinguished easily at a distance of 200 feet. The switch tenders are provided with very narrow but quite confortable shelter houses placed conveniently between the tracks. I have described the operation of the freight yard to some extent because the handling of the yard, as well as of the roundhouse, comes under a man holding the title of "Ausfahrrangierbahnhof Stationsvorstand," which being interpreted means "General Foreman of the Out-going Yard and Engine Terminal."

The roundhouses themselves are quite similar to those in America, the radius, however, being smaller and the turntable pits usually being covered. The turntables are generally operated by hand. I did not see any roundhouses in Germany with the central portion covered over, as was the case in France. Practically no work in the way of repairs is done in the roundhouses, such work being confined to the "adjusting shop buildings," the roundhouses serving for inspection, cleaning, oiling, etc. In the roundhouses are also found lockers which are assigned to the enginemen and in which they keep their clothes, tools, and other belongings.

The engineer and fireman of a German locomotive, although their duties have been much lightened during the past ten years, still give great attention to the maintenance and preparation of the engine and also in looking after it at the end of a trip. The engineer is scheduled to be at his engine an hour before the time of departure of the train; the fireman two hours before. The fireman builds and prepares the fire and hostles the engine until it is taken charge of by the engineer. The engine having been thoroughly oiled and any necessary supplies provided by the engine crew, it goes direct from the roundhouse to its train, stopping only to take water. At the end of the trip the engine goes first to the coaling platform, where coal is loaded on by a gang of men especially employed for the purpose. After being coaled it goes to the ash track, and there the fireman cleans the fire. The engine is then brought into the roundhouse where the engineer not only makes out his work report, but attends to minor adjustments himself. It is not the practice to keep engines under steam for many hours in the roundhouse, this being done only where a very large modern locomotive is double and, occasionaly, treble crewed. Engines are assigned, not pooled, but full service is gotten out of the larger power by the practice of double crewing. The men must have a minimum of eight hours' rest after a run.

Premiums are given for savings in oil and small supplies, although the room for economies in this direction would seem to be less than exists in the United States because of the very thrifty nature of the German people. It was surprising to learn that the German authorities should take the trouble to keep the necessary records for the payment of these small premiums.

The fires are built with bundles of faggots and small bundles of kindling impregnated with pine pitch. Many of these faggots appear to have been gathered up where they had fallen in the great State Forests, this being a practical application of the principle of conservation, that nothing should be wasted—wood, otherwise useless, should be put to a good purpose. As a consequence of this kind of policy, Germany's annual forest growth is almost equal to her annual needs for timber.

The Germans are very much more economical in fuel than the Americans, as the following comparative figures on fuel

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consumption per locomotive mile in different classes of service would indicate:

Class of service.	Pounds fuel burned per locomotive mile.	
	Prussian.	American.
Passenger	43.6	93
Freight	61.6	214
Switch	44.8	147

The above comparison is between a division of the Prussian State Railway and a division of a representative American road in a similar industrial locality.

The difficulty of mining coal in Germany makes it a much more expensive commodity than it is in the United States, and the Germans have not such rich deposits of good coal. The Prussian State Administration, for instance, has to pay about $2.75 per ton of 2,000 lbs., thus making economy of fuel in their railroad operations compared with cost of other items (such as labor, wages being about half those prevailing in the United States) a very important consideration. For this reason great care is used in the selection of the grades of fuel burned, in the utilization of the poorer grades for locomotive purposes, in the heat efficiency of the design of the locomotive, and in the care with which the locomotive is operated.

Germany was the birthplace, about 1895, of the Schmidt locomotive superheater, and from about 1901 on, after the preliminary experimental stages with this device, its application to old as well as new locomotives took on enormous strides, so that today, of the some 20,000 locomotives belonging to the Prussian State Railways, about 5,000 are equipped with superheaters.

From the poorest qualities of coal, called "brown coal," a shaley stuff between lignite and peat, briquettes are made having a very high fuel value. These briquettes are used where it is desired to avoid smoke, such as in passenger terminals, and also when it is desired to give the engine additional evaporative efficiency—as on starting a train and in climbing a steep grade. About 25 per cent. of the fuel burned on Prussian locomotives is in briquette form, and the storage coal that is kept through the winter season and to guard against irregularities in mining and commercial demands, is largely in briquette form also, these briquettes being very conveniently piled as we would pile bricks.

Engineers and firemen are also carefully trained as to fuel and steam use, and with the assigned engines the men act as if they were footing the fuel bills themselves. This, taken in conjunction with the eagle-eyed watchfulness of the fuel performance of each train by the railway administrative officials, makes for an astounding degree of efficiency, and is in a large measure responsible for the comparatively low fuel consumption shown in the figures above quoted. In these figures there is, of course, no indication of the relative amount of work done by the locomotives, nor of their size. It may be presumed that the American locomotives would require about twice as much coal as the German locomotives. Even allowing so great a margin—which is high, as the German locomotives are the largest in Europe—the discrepancy between the consumption in the two cases is very marked; and in view of the millions of dollars expended annually by every American railroad system for fuel, would warrant a most careful study as to causes and results, combined with an equal thoroughness in applying such practices as would be of benefit to American operating conditions.

One of the most modern coaling stations that I saw in Germany, not yet entirely completed, handled the coal in the following manner. Upon either side of a double track was a concrete wall or parapet, the level of the platform at the top of this wall being several feet above the top of the locomotive tender. The edge of the platform was bordered by a pipe railing, broken at intervals by small automatic shoots. About twenty feet back from the edge of the parapet was a pile of coal which was shoveled by hand from cars of the gondola type, whose sides, however, swung out somewhat like the sides of ballast cars, thus reducing the amount of hand shoveling required. Several laborers shoveled the coal from this storage pile into little hopper trucks of about half a ton capacity, which were then pushed by hand along a narrow gage track to the automatic shoots through which the contents were dumped into the tender of the waiting engine by pressure upon a single lever. The whole procedure worked with neatness and despatch, and a close record was kept of the amount of coal supplied to each locomotive. At the older coaling stations at smaller places the platforms are quite low and the coal was shoveled into straw baskets holding about 100 to 200 lbs. each which were lifted up by hand and dumped into the tenders. Finally, in connection with the fuel, it was observed that the practice of storing large quantities of coal, and particularly briquettes, was quite general. The sanding of the locomotives was done in the roundhouse by a man who carried the sand around from engine to engine in a wheel barrow.

While the wages generally among the railroad employees in Germany are low compared with our standards, some of the ordinary laborers getting as little as about 70 cents a day, the comfort and well-being of the men and their families is well looked after, it being customary to provide what are called "living colonies" where modern houses are provided at a considerably lower cost than the men could find elsewhere. These "colonies" are located with convenient access to the workshops or terminal yards where the men are employed, and are for the benefit of the men in train service, as well as for those stationed at the terminal. A visit through one of them gave somewhat the same impression as a visit through a college dormitory, so neat, orderly and well kept were they.

Not only are the ordinary employees provided with dwellings at low cost, but this is also done for the officers in direct charge of the terminal yards. These have their dwelling rooms on the upper floors of the handsome buildings that house the officers on the ground floors, and the group of buildings composing these combined offices and dwellings with their surrounding flower and vegetable gardens are located a short distance from the yard and roundhouse. As an indication of the way in which the general foreman of such a terminal is provided for, it may be said that at a place despatching over 150 trains a day the man in this position receives a salary of 6,000 marks, or $1,500 annually, and in addition is provided with ample living quarters for which a rental of $100 a year is charged. One of these foremen, after showing me his quarters, assured me that he could not do as well in the suburbs of the city for $25 a month. This makes his salary equivalent to about $135 a month.

Not only is the employee of the German State Railroad well looked after during his life of activity and health, but he is taken care of during times of illness, accident and in his old age, the whole scheme being worked out in a scientific manner so that the man can devote his life with entire confidence to his chosen profession of railroading, secure in the knowledge that he cannot be discharged or demoted without proceedings similar to a court trial in the army or navy; secure also in a certain minimum increase in wages with the completion of each period of service.

BELGIAN ROLLING STOCK OUTPUT.—Belgium is very much more than the most thickly populated country in Europe, for it presents within its narrow confines a splendidly developed industrial world. Railway engineering is one of the most prosperous undertakings in Belgium. The rolling stock output is about 1,000 locomotives, 8,000 passenger cars and 25,000 freight cars. Some idea of the Belgian foreign trade may be gathered from the fact that the annual export of railway material is something like $40,000,000. One may travel anywhere on the three thousand miles of Belgian State Railways for about $2.50 for a period of five days—which gives a rare opportunity to travel at a very low cost, while the steamer services are also excellent

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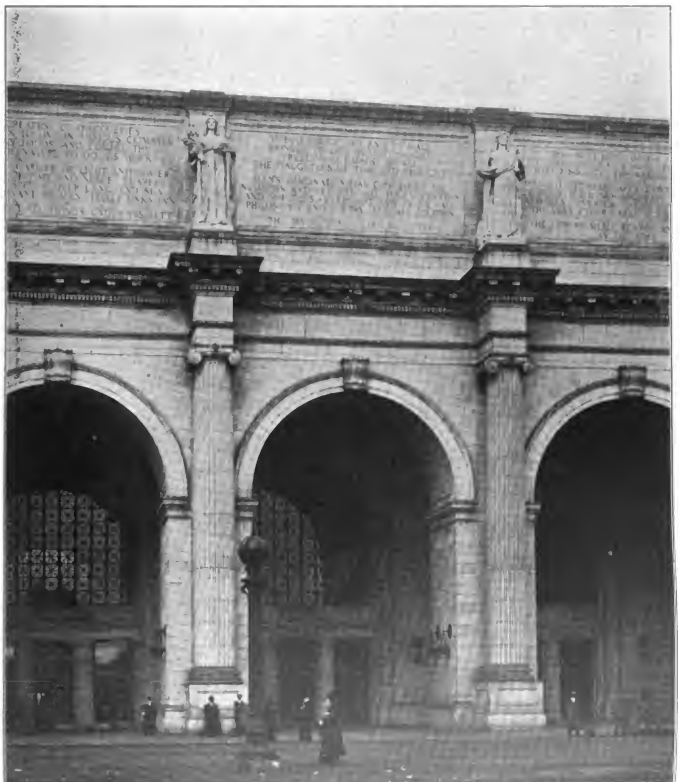
STATUES ON WASHINGTON UNION STATION.

The Union passenger station at Washington, D. C., which was put in use five years ago, and which was described in the *Railroad Gazette* of November 1, 1907, has only just been finished; that is to say, the six colossal statues, which form an important feature of the facade, have only just been put in place. A view, looking from the south, made from a photograph by G. V. Buck, of Washington, and showing the general appearance of these statues, is given herewith. The main entrance to the station is through three lofty arches; and there are six massive stone columns, two of which appear in the illustration. There are two others at the left of the left or western arch, and two at the right of the right arch. Each of these columns is surmounted by a statue about 18 ft. high.

Those on the west side of the entrance represent Prometheus



Main Entrance to the Union Station, Washington, D. C.—Statues by Louis St. Gaudens.

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and Thales, typifying fire and electricity; those on the east side represent Ceres and Archimedes, typifying agriculture and mechanics, while the two central figures represent Freedom and Imagination. Those on the west side represent two forces, the connection of which with railroad operation is obvious; and agriculture, nowadays, has a relation to transportation hardly less prominent than mechanics.

No less interesting than the statues are the inscriptions which accompany them, the author of which was Charles W. Eliot, President Emeritus of Harvard University. These inscriptions, not very clearly shown in the illustration, are copied in full below, including also those over the carriage and the state entrances, at the extreme west and east ends of the station. The columns flanking the carriage entrance and the state entrance are surmounted by stone eagles about 8 ft. high.

Inscription on Attic of Central Pavilion, Western Panel.

Fire—Greatest of Discoveries,
Enabling Man to Live in Various Climates,
Use Many Foods, and Compel
the Forces of Nature to Do His Work.

Electricity—Carrier of Light and Power,
Devourer of Time and Space—Bearer
of Human Speech Over Land and Sea,
Greatest Servant of Man—Itself Unknown.

Thou Hast Put All Things Under His Feet.

Inscription on Attic of Central Pavilion, Central Panel.

Sweetener of Hut and Hall,
Bringer of Life Out of Naught,
Freedom, O Fairest of All
The Daughters of Time and Thought.

Man's Imagination Has Conceived All
Numbers and Letters—All Tools, Vessels
and Shelters—Every Art and Trade—All
Philosophy and Poetry, and All Politics.

The Truth Shall Make You Free.

Inscription on Attic of Central Pavilion, Eastern Panel.

The Farm—Best Home of the Family—Main
Source of National Wealth—Foundation of
Civilized Society—The Natural Providence.

The Old Mechanic Arts—Controlling New
Forces, Build New Highways for Goods
and Men—Override the Ocean—And Make
the Very Ether Carry Human Thought.

The Desert Shall Rejoice and Blossom
as the Rose.

Inscription on Attic of Carriage Porch, South Elevation.

He that Would Bring Home the
Wealth of the Indies Must Carry
the Wealth of the Indies with Him.
So It Is in Traveling, a Man
Must Carry Knowledge with Him
if He Would Bring Home Knowledge.

Inscription on Attic of State Entrance, South Elevation.

Let All the Ends Thou Aim'st at Be
Thy Country's—Thy God's—and Truth's.
Be Noble, and the Nobleness that
Lies in Other Men, Sleeping but
Never Dead, Will Rise in Majesty
to Meet Thine Own.

Inscription on Attic of State Entrance, East Elevation.

Welcome the Coming,
Speed the Parting Guest.

Virtue Alone Is Sweet Society
It Keeps the Key to All
Heroic Hearts and Opens You
A Welcome in Them All.

General News.

Shop employees of the National Railways of Mexico struck on December 26, because of the refusal of the management to grant an 8-hour day and an increase in wages.

The Boston & Maine has applied to the Massachusetts authorities for permission to build four main tracks through the city of Salem, on the present location, and also for such legislation as may be necessary to authorize the electrification of the road between Boston and Beverly, 19 miles.

The Baltimore & Ohio last week put in use the new double-track Sand Patch tunnel. This tunnel is through the Allegheny mountains between Sand Patch and Manila, 30 miles west of Cumberland. Its cost is approximately $1,250,000, and it has taken about two years to complete it.

Parcel post troubles at the Gary (Ind.) post office began today, when W. H. F. Parry, a brick dealer, sent two wagon-loads of paving brick to be mailed ont the first thing on Wednesday morning. There were 1,000 bricks, each brick wrapped separately; and their total weight was 6,000 lbs. The bricks are being mailed as samples.—*Press Despatch, December 30.*

Bench warrants have been issued by the Criminal Superior Court at Bridgeport, Conn., for Henry J. Horn, vice-president; Benjamin R. Pollock, general manager, and Charles N. Woodward, general superintendent of the New York, New Haven & Hartford, charging them with manslaughter in causing the derailment at Westport, October 3. The warrants are based on the finding of Coroner Phelan.

By a bridge failure at Guyandotte, W. Va., on the Chesapeake & Ohio, January 1, seven men were killed and the lives of several others are believed to have been lost. A freight train crashed through a weakened bridge across Guyandotte river. A crew of thirty or more ironworkers were putting in a bridge for a second track, and the freight appears to have been running at very low speed. The cause of the accident is believed to be undermining of piling.

The Chicago, Burlington & Quincy began moving its general offices in Chicago on December 28, from the old headquarters at Adams and Franklin streets, to the company's new 16-story office building at Jackson Boulevard and Clinton street. This building was described in the *Railway Age Gazette* of December 8, 1911, page 1174. The moving will require approximately two weeks. The new structure contains 225,000 sq. ft. of floor space as compared with 75,000 sq. ft. in the old building. It has a frontage of 150 ft. on Jackson boulevard and 175 ft. on Clinton street.

The Canadian Pacific has petitioned the Parliament of Canada to amend the Act of 1906 incorporating the Toronto Terminals Railway Company. This is the Act providing for the construction of the Union Station at Toronto. The Toronto Terminals Railway Company was empowered to build a union passenger station and hotel. The Grand Trunk was authorized to transfer the union station property to the Canadian Pacific. The company was capitalized at two millions, the Canadian Pacific Railway and Grand Trunk Railway having each the right to hold half the stock. The station was to be built by February 23, 1908, or such later date as the Railway Commission might set.

A settlement has been reached between the striking Western machinists of the Grand Trunk Pacific and President E. J. Chamberlain, which will clear the way for the opening of the Transcona shops. The company agrees to reinstate all strikers who apply within 30 days. For the present the existing rate of pay and rules will prevail, 45 cents an hour for Rivers and east of Rivers, and 47½ cents west of Rivers. The company agrees that next spring, if the men so desire, the Western management will meet a committee of the men to decide upon a new agreement and a new schedule, and failing to arrive at terms the differences will be submitted to a conciliation board appointed under the Industrial Disputes Act.

At Indianapolis, December 31, sixteen officers and directors of the Cincinnati, Hamilton & Dayton and two trainmen were indicted, on charges of involuntary manslaughter, by the Marion

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county grand jury in connection with the collision near that city on November 13, when 16 persons were killed, because of a misplaced switch. Those indicted were: Daniel Willard, president; George F. Randolph, vice-president, and George M. Schriver, second vice-president; W. C. Loree, general manager; H. B. Voorhees, general superintendent; R. B. White, division superintendent; O. G. Murray, George W. Perkins, L. F. Loree, H. P. Davison, Frederick W. Stevens, Joseph Wood, E. R. Bacon, F. D. Underwood, Harry Bronner and Norman B. Ream, directors; Carl Gross, brakeman, and Willis York, engineman.

The postmaster general has written to the House Committee on Postoffices and Postroads recommending legislation to readjust the method of computing payments to railroads for transporting the mails. "On account of the institution of the parcel post system," says Mr. Hitchcock, "the weight of mail to be transported probably will be increased considerably and, under existing law, no additional compensation may be paid until there has been a weighing of the mails and a readjustment of the basis of pay." And he repeats the proposition, which he suggested a year ago, for substituting space for weight as the chief factor in determining compensation. Under this plan it would be possible to ascertain without delay what, if any, additional compensation should be given the railroads on account of the parcel post.

Record Rail Orders in 1912.

According to the *Wall Street Journal* rail orders in 1912 amounted to approximately 5,000,000 tons, a large part of which will be delivered in 1913. This paper goes on to say that this is the largest tonnage of this product ever ordered in one year.

Death and Injury Benefits for Government Employees.

The solicitor for the Department of Commerce and Labor, in a report summarizing his decisions under the law of May 30, 1908, providing for compensation to certain government employees in cases of injuries, fatal or non-fatal, received in the course of their employment, presents a statement showing that in about three years more than $800,000 has been thus paid out. The report says:

"The act has been in operation since August 1, 1908. Between that date and December 1, 1911, compensation was paid in 5,854 cases of injury, in 165 of which the injury resulted in death. On account of these fatal injuries $112,879 has been paid to surviving dependents. On account of the non-fatal injuries $704,815 has been paid to the injured persons themselves. (The figures given do not refer to claims arising on the Isthmian Canal since March 3, 1911, when the Isthmian Canal Commission was authorized to handle such claims directly.) These payments have been made, not out of any special appropriation, but from the ordinary current appropriations for salaries. The salary has simply been paid as if the injured man continued at his work, until his incapacity ceased or until the year had run. Owing to the limited scope of the act there have been naturally more accidents reported than claims filed, and there have been also a number of claims filed which could not be allowed either because they were not within the act or were not properly established. In the first year, the number of injuries reported was 4,862, and the number of fatalities 233, while the number of claims submitted was but 1,805, of which 1,689 were allowed. During the second year 6,984 accidents were reported and 226 fatalities; 2,624 claims were submitted and 2,469 allowed. Legislation to extend the benefits of the act has been recommended by the Secretary of Commerce and Labor, and measures designed to enlarge the scope of the act are now pending in Congress."

October Traffic Exceeds All Records.

The receipts and the expenses of the railways of the United States for the month of October, as compiled by the Bureau of Railway Economics, are greater than for any month in their history. Net operating revenue averaged $15.71 per mile of line per day, as compared with $13.74 for October, 1911. The summary covers 220,636 miles of line, or about 90 per cent. of all the steam railway mileage of the United States. The aggregate net operating revenue for this mileage was $107,440,518. The increases were due in greatest proportion to the freight traffic, which is always greater in October than in any other month of the year.

New Subways in Boston.

The Boston Transit Commission has opened bids for the construction of section 4 of the Boylston street subway, which includes the station in Copley square. The lowest bidder was the Hugh Nawn Construction Company, $743,700; four other bids ran from $750,050 to $927,945. About half of the Boylston street subway has been finished. The commission will soon advertise for bids for work on the Dorchester tunnel, which will pass beneath Fort Point channel.

Transportation Simplified.

The San Pedro, Los Angeles & Salt Lake announces that a small open gasoline motor car, with accommodations for about eight passengers and a small quantity of light baggage, has been put in service on the St. Thomas Branch from Moapa (Nevada) to St. Thomas, about 20 miles. The car will leave St. Thomas at 8:30 a. m., making connections with train No. 2, and returning will leave Moapa at 3:25 p. m., or on arrival of main line train No. 1.

The Pullman Company on the New Haven Road.

The New York, New Haven & Hartford announces the transfer of its parlor and sleeping car service to the Pullman company under a contract dated January 1, 1913, and running twenty years. The Pullman company will take over the parlor and sleeping cars owned by the New Haven, paying, it is understood, about $3,500,000, and will gradually introduce steel cars, the first replacement being on the limited trains. All of the employees of the New Haven service will be retained, their pay and relative positions being unchanged. They will be under the supervision of A. J. Grant, Pullman superintendent, Grand Central Terminal, New York City.

The parlor and sleeping car conductors of the New York, New Haven & Hartford have adopted resolutions reading in part: "Whereas in the vicissitudes of railroad life we are about to be transferred to the employment of the Pullman Company, and whereas the majority of our number having been employed by the New Haven road upward of 15 years, and whereas there has always existed a most cordial and just treatment of us by our superior, be it Resolved, That we extend to President Charles S. Mellen and the board of directors our thanks for the just and kindly consideration and treatment of us during our long years of service, and that we extend to our beloved superintendent, A. G. Webb, our sincere thanks for his just, kindly and courteous treatment. . . ."

A Correction.

In the item entitled Exhibition Run of Drake Gas-Electric Car, which appeared in the *Railway Age Gazette* of December 20, page 1221, the statement to the effect that the average consumption of gasoline was 2½ gallons per mile should have read 2½ miles per gallon.

"Safety First" in Utah.

The safety committee of the Utah division of the Oregon Short Line, as a result of a contest, announces that prizes of $10 and less have been awarded to Mrs. Joseph Severn, Mrs. Martha D. White, Mrs. Mary Anderson, Mrs. Mary Karren and Mrs. Ella Kelson for papers on "safety." Mrs. Severn is the wife of Joseph Severn, division accountant in Assistant Superintendent Malone's office, and her essay is as follows:

What "safety first" means to me: Home, comfort, magazines and books, pretty things, a little art, a little travel, children reared in a "homey" home with the inalienable right to educational advantages; fatherly as well as motherly discipline and comradeship; an occasional romp with "Dad"; the chummy, inadvertently given good counsel of father—these things go to make up a home, the maintenance of which rests in equal exchange between railroad and employee, of money and human energy.

A desolated home—the father's life sacrificed in service; no amount of poetry or eulogy can soothe the heart-ache or picture the shock; no life insurance policy or railroad settlement can

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put complacency in the place of distress. To a woman's heart such things are a mere insult when proffered as a substitute for the big, fatherly personality which has been sacrificed.

A nimbed home—a limb lost, or an eye; just so much earning capacity, to speak practically; just so much of one's right to complete life snatched away. To be crippled, what fortitude it demands! Here, again, money damages are an all too poor compensation.

To live one's complete life—this is what safety means to me; the maintenance of a home in exchange for a man's best energy. This is just and right and good, and safety first, aye, a man assured that the railroad regards him as a man, not a machine, and really cares for his safety and his home, what good service will he not heartily render!

Efficiency Society.

The annual meeting of the Efficiency Society will be held January 27-28 at the Engineering Societies building, New York. The program for January 27 will include a Symposium on Organization, a Discussion on the Necessity of Charts of Organization; a Symposium on Management; a Discussion on Democracy in Industry and Securing the Consent of the Governed; and a Symposium on Efficiency in Government Organization, National, State and Municipal. The program for January 28 will include a Symposium on Industrial Relations, a Discussion on the Relations between Employer, Employee and the Community; a Symposium on Industrial Hygiene and Safeguards against Occupational Diseases and Accidents; and a Symposium on Safety, including Safety in Land Transportation. This session will be illustrated by moving pictures and lantern slides demonstrating the efficiency obtained by conserving the human elements in industry. The officers of this association are as follows: President, James G. Cannon; first vice-president, Henry R. Towne; second vice-president, Melville W. Mix; treasurer, Theodore Hetzler; assistant treasurer, Francis W. Hoadley, and secretary H. F. J. Porter.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

American Association of Demurrage Officers.—A. G. Thomson, Boston, Mass.

American Association of General Passenger and Ticket Agents.—W. C. Hope, New York.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

American Association of Railroad Superintendents.—E. H. Hurman, St. Louis, Mo.; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Electrical Railway Manufacturers' Assoc.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

American Railway Association.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

American Railway Engineering Association.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

American Railway Tool Foremen's Association.—A. R. Davis, Central of Georgia, Macon, Ga.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—J. R. Wemlinger, 13 Park Row, New York; 2d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

American Wood Preservers' Association.—F. J. Angier, B. & O., Baltimore, Md. Convention, January 21-23, Chicago.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

Association of Railway Telegraph Superintendents.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 75 Church St., New York.

Bridge and Building Supply Men's Association.—H. A. Nealy, Joseph Dyckerhoff Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—J. N. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

General Superintendents' Association of Chicago.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago, Ill.

International Railway Congress.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

International Railway Fuel Association.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May, 1913, Chicago.

International Railway General Foremen's Association.—Wm. Hall, Chicago & North Western, Escanaba, Mich. Next convention, July 22-25, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

Maintenance of Way Master Painters' Association of the United States and Canada.—W. G. Wilson, Lehigh Valley, Easton, Pa.

Master Boiler Makers' Association.—H. D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

Master Car and Locomotive Painters' Assoc. of U. S. and Canada.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

National Railway Appliances' Assoc.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

New England Railroad Club.—G. H. Frazier, Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railroad Club.—C. L. Kennedy, C. M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Peoria Association of Railroad Officers.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Tuesday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Business Association.—Frank W. Noxon, 2 Rector St., New York.

Railway Club of Pittsburgh.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Electrical Supply Manufacturers' Assoc.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

Railway Gardening Association.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

Railway Development Association.—W. Nicholson, Kansas City, Southern, Kansas City, Mo.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

Railway Supply Manufacturers' Assoc.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

Railway Tel. and Tel. Appliance Assoc.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Telegraph Supts.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Signal Appliance Association.—C. C. Rosenberg, Paris, Ky., New York. Meetings with annual convention Railway Signal Association.

Society of Railway Financial Officers.—C. Nyquist, 1.a. Salle St. Station, Chicago.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., except June, July, March, May, Nov., Atlanta.

Toledo Transportation Club.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Track Supply Association.—W. Judd, Rumapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—L. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Traffic Club of St. Louis.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

Transportation Club of Buffalo.—H. C. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

Utah Society of Engineers.—R. R. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1767, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

In Mexico, as well as in other parts of the world, there is a shortage of freight cars. The activities of the rebels have decreased so that mines and manufacturing plants are resuming work, but they are much hampered by lack of transportation facilities. The government is using the lion's share of the cars to move troops and military supplies.

The two passenger trains between Weehawken, N. J., and Chicago, over the New York, Ontario & Western, and the Wabash, which hitherto have run over the R. W. & O. division of the New York Central, are now running over the N. Y. C. main line, connection with the Wabash being made at Buffalo and with the New York, Ontario & Western at Earlville.

All previous records for the production of coal in the United States were beaten in 1912, if both hard and soft coal be taken into account. But the production of hard coal alone fell below that of many previous years. Assuming that the December shipments were the same as in December, 1911, the total shipments of anthracite for the year 1912 amounted to 63,781,503 tons. This is a smaller tonnage than for any year in the last six except 1909, when the shipments were 61,969,885 tons. Assuming the quantity sold to local trade and employees at 3 per cent., then the total marketable output of anthracite in 1912 was 65,694,948 tons, as compared with 72,000,000 tons in 1911. The suspension of work for about seven weeks last spring was the cause of the falling off in production.

The Union Pacific has notified its competitors between the Missouri river and Denver and also the Denver & Rio Grande and Colorado Midland that it will no longer be a party to certain tariffs showing through rates for passengers and freight over these lines. The effect of the notice is to close the Denver gateway on January 1 to the Atchison, Burlington, Missouri Pacific and Rock Island with respect to traffic from east of Missouri River for certain destinations west of Denver. It applies only to traffic east of the river and bound for the Northwest; that which will be handled by the Oregon Short Line and Oregon Railroad & Navigation. It will not apply to traffic for California points. Neither will it apply to traffic originating at points between the Missouri River and Denver. The purpose is to secure for the Union Pacific the through haul between the Missouri River and Denver on traffic originating east of the river, but which has been delivered to the Union Pacific at Denver by lines competing with it between the Missouri River and that point.

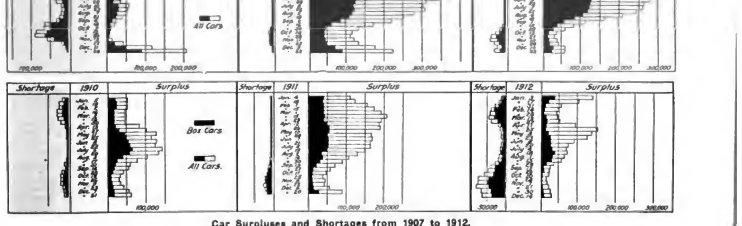
Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on Relations Between Railroads of the American Railway Association, in presenting fiscal bulletin No. 133A, giving a summary of car surpluses and shortages by groups, from September 13, 1911, to December 14, 1912, says: The total surplus on December 14, 1912, was 26,614 cars; on November 30, 1912, 26,135 cars; and on December 20, 1911, 88,646 cars. Compared with the preceding period, there is an increase in the total surplus of 479 cars, as follows: 231 box, 62 flat, 1,183 miscellaneous and a decrease of 997 in coal car surplus. The increase in box car surplus is in groups 1 (New England Lines), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), 9 (Texas, Louisiana and New Mexico), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona). The increase in flat car surplus is in groups 1 (as above), 3 (Ohio, Indiana, Michigan and Western Pennsylvania), 4 (the Virginias and Carolinas), 9 (as above), and 11 (Canadian Lines). The increase in miscellaneous car surplus is general throughout the country, except in groups 2 (New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania), 4 (as above), and 5 (Kentucky, Tennessee, Mississippi, Alabama,

CAR SURPLUSES AND SHORTAGES.

	Date.	No. of rmds.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—	December 14, 1912	7	187	391	56	95	729	482	131	498	431	1,542
" 2.—	" 14, 1912	27	351	23	691	120	1,185	1,232	11	3,491	558	5,292
" 3.—	" 14, 1912	31	54	212	177	696	1,139	7,654	10	3,515	1,117	12,296
" 4.—	" 14, 1912	10	186	40	725	447	1,398	4,091	1,156	4,547	653	10,447
" 5.—	" 14, 1912	23	7	0	9	66	82	4,577	1,490	3,418	107	7,592
" 6.—	" 14, 1912	27	1,087	291	1,528	2,378	5,284	6,269	490	1,469	880	9,108
" 7.—	" 14, 1912	4	0	57	61	472	590	577	46	0	0	623
" 8.—	" 14, 1912	16	171	110	994	1,055	2,330	1,894	301	196	284	2,675
" 9.—	" 14, 1912	13	1,635	205	204	849	2,893	726	9	9	6	750
" 10.—	" 14, 1912	22	1,939	1,283	2,157	4,774	10,153	2,021	63	260	821	3,165
" 11.—	" 14, 1912	6	96	369	0	366	831	7,008	90	0	418	7,516
Total		186	5,713	2,981	6,602	11,318	26,614	36,531	3,797	15,403	5,275	61,006

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages from 1907 to 1912.

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Georgia and Florida). The decrease in coal car surplus is in groups 2, 3, 5 (as above), 6 (Iowa, Illinois, Wisconsin and Minnesota), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8 and 9 (as above).

The total shortage on December 14, 1912, was 61,006 cars; on November 30, 1912, 62,536 cars; and on December 20, 1911, 11,832 cars. Compared with the preceding period; there is a decrease in the total shortage of 1,530 cars, as follows: a decrease of 2,192 box, 585 flat, 1,378 miscellaneous and an increase of 2,625 coal cars. The decrease in box car shortage is in all groups, except 3, 4, 6 and 7 (as above). The decrease in flat car shortage is throughout the country except in groups 4 and 7 (as above). The decrease in miscellaneous car shortage is in groups 1, 3, 5, 6, 8, 9, 10 and 11 (as above). The increase in coal car shortage is in groups 2, 3, 4 and 6 (as above).

Compared with the same date of 1911; there is a decrease in the total surplus of 62,032 cars, of which 17,772 is in box, 3,028 in flat, 28,807 in coal and 12,425 in miscellaneous. There is an increase in the total shortage of 49,174 cars, of which 26,866 is in box, 3,535 in flat, 13,934 in coal and 4,839 in miscellaneous cars.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report; and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1912.

Traffic Club of Chicago Favors Commissioner Clark.

The board of directors and governors of the Traffic Club of Chicago at a special meeting recently adopted the following resolutions addressed to President Taft urging the reappointment of Commissioner Clark:

Whereas, The Traffic Club of Chicago, is a voluntary association, the membership composed of representatives of the shipping public and representatives of carriers, about equally divided, to the number of nearly one thousand, and

Whereas, The Traffic Club of Chicago and its members, are vitally interested in maintaining the high standard of efficiency of the Interstate Commerce Commission, are familiar with the work of that commission, and understanding the necessity of practical and experienced men to handle the broad national matters that are involved, and having knowledge of the experience, efficiency and high order of ability of Edgar E. Clark; therefore be it

Resolved, That we do hereby earnestly request reappointment and confirmation . . . .

The President has reappointed Mr. Clark, but the confirmation, together with that of many other Republicans, was held up by a Democratic Senate.

The annual meeting and dinner of the Traffic Club of Chicago will be held on January 28. The programme has not yet been announced.

INTERSTATE COMMERCE COMMISSION.

Rates on Petroleum and Its Products Reduced.

National Refining Company v. Missouri, Kansas & Texas et al. Opinion by the commission:

The rate of 27 cents per 100 lbs. for the transportation of petroleum and its products in carloads from Coffeyville, Kans., to Joliet, Ill., was found to be unreasonable to the extent that it exceeds 22 cents per 100 lbs., which rate is prescribed for the future. (25 I. C. C., 374.)

Detroit, Mich., Discriminated Against.

Michigan Copper & Brass Company et al. v. Duluth, South Shore & Atlantic et al. Opinion by Commissioner Meyer:

The defendants maintain an all-rail rate on refined copper from points in the upper peninsula of Michigan to New York that is 3 cents per 100 lbs. higher than the all-rail rate from the same points to Detroit, Mich. The complainants allege that this differential is unduly low and that the all-rail rate of 32½ cents to Detroit is unreasonable. The commission found that the rate to Detroit is unjustly discriminatory as compared with the rate to New York; that the defendants subject the complainants and the locality of Detroit to undue and unreasonable prejudice and disadvantage; and that for the future the differential should not be less than 10 cents; also that the rate to Detroit is not, under the present conditions, unreasonable. (25 I. C. C., 357.)

Elevator Case Decided.

H. Gund & Company v. Chicago, Burlington & Quincy. Opinion by Commissioner Lane:

At the original hearing, 18 I. C. C., 364, the complainant asked reparation upon all grain passing through its country elevators at interior points in the state of Nebraska, which grain was shipped through Missouri river points to eastern destinations, upon the ground that an elevation allowance was made by defendant to complainant's competitor for elevation-in-transit at Nebraska City; but action by the commission was deferred pending decisions of the United States supreme court in the *Elevation cases*. Since then such decisions have been rendered; but, following them, the commission cannot hold that the discrimination complained of was undue or unreasonable, because under said decisions a railroad may for competitive reasons grant an elevator allowance, although no transportation service is rendered by the shipper owning the elevator. (25 I. C. C., 326.)

Complainant Discriminated Against.

Edward G. Murray Lighterage & Transportation Company v. Delaware & Hudson. Opinion by Commissioner Harlan:

The complainant seeks an order requiring the defendant to grant it through routes and joint through rates on interstate traffic between points in the harbor of New York City and points on the rails of the defendant in the states of New York and Vermont. The defendant contends that the complainant is not a common carrier. The commission found that the complainant was as fully equipped for the handling of northbound traffic as its competitors. The commission ordered the defendant not to withhold in future the through routes and joint through rates on northbound interstate traffic consisting of bulk shipments of sulphur, resin, sand and similar articles from points in the harbor of New York City to points on the lines of the defendant in the states of New York and Vermont so long as the defendant maintains through routes and joint rates on similar traffic from and to said points with the competitors of the complainant similarly situated. (25 I. C. C., 388.)

Furniture Rates Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of furniture from Napanee, Ind., to Chicago and other destinations. Opinion by Commissioner Meyer:

The commission found that the proposed advances in rates on furniture in carloads and less than carloads from Napanee, Ind., to Chicago, Ill., and Chicago rate points and also to points in Minnesota and Wisconsin on shipments via Chicago and Chicago junction points were not unjust or unreasonable. The order of suspension was vacated. The increases range from 2½ cents to 9½ cents per 100 lbs. on carloads, and from 8 to 10 cents per 100 lbs. on less than carloads. (25 I. C. C., 331.)

In re investigation and suspension of advances in rates by carriers for the transportation of furniture in carloads between points in Arkansas, Colorado, Florida, Kansas, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Washington, D. C., and other interstate points. Opinion by Chairman Prouty:

The advance in the proposed rates from St. Louis, Mo., to Texas common points is 6 cents per 100 lbs., from 79 cents to 85 cents, and there are corresponding increases to other Texas stations. The commission found that the proposed rates which had been suspended were not unreasonable. The order of suspension was vacated. (25 I. C. C., 299.)

California Demurrage Rate Increased.

In re Investigation and Suspension of Advances in Demurrage Charges on Interstate Traffic by Carriers Operating in the State of California. Opinion by Commissioner Clark:

Proposed increases in demurrage charges in the State of California applicable upon interstate shipments had been suspended by the commission. The commission found that upon this record the carriers have abundantly sustained the burden of proof to show that the increased charges are reasonable; and, that under

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the circumstances here shown it is not unjustly discriminatory against California or against shippers or receivers in California to maintain higher demurrage charges at points in that state than are contemporaneously maintained in other states served by respondents. The order of suspension was vacated.

The report summarizes the history of the high demurrage rate in California. [The principal points of this history are given in an editorial on another page in this paper.] The railroad companies called numerous shippers and receivers of freight to testify in their favor; these witnesses recounting their experiences and giving facts and figures to sustain their testimony. The carriers also laid emphasis on the fact that the freight movement from the east to California is heavy from December to June, but light in the other half each year, while the eastbound movement is heavy from June to December and light in the other half. It was shown that the opposition to the six-dollar demurrage rate, when it went into effect, subsided after the result of the increase became apparent. The Pacific Car Demurrage Bureau presented statistical records showing that if the higher rate could have been charged on interstate as well as intrastate shipments the supply of freight cars would have been increased 3,000 cars a month. Elaborate statements were also presented showing how consignees and shippers, doing heavy business, and in large numbers had paid smaller amounts, in the aggregate, for demurrage after the introduction of the higher rate. As between shippers and consignees it appears that only 5 per cent. of the total demurrage collections come from consignors. The commission considered the demand that additional free time be given for unloading because carloads are so much larger now than in former years; but to this claim it is replied that a given quantity of freight can be unloaded from one car as quickly and as cheaply as it could be unloaded from two cars.

Commissioner Lane, concurring in the decision, says that his controlling reason is that the high rate is unopposed by the shippers. The phenomenally excellent condition that obtains in California is due, in his opinion, to the presence of an effective, powerful and authoritative demurrage bureau. Where railway officers are lax and the supply of cars is inadequate a higher rate would not be the proper remedy. It would be only a penalty imposed on the public because of the railroads' delinquency. The present opinion is to be taken as a promise to those roads who believe in doing their duty that the commission will co-operate with them; and it is not to be understood as the endorsement of any particular rate of demurrage or as the establishment of any permanent principle.

Chairman Prouty, in a dissenting opinion, agrees that there is undue detention of cars employed in interstate traffic, and that something must be done; but an increase of the rate is not the best thing to do. The inefficiency of car service in this country is due more to the railroads than to the shippers. While it is possible that the Pacific coast states may be so isolated from the rest of the country that a different rule can be applied there, the problem, he thinks, will be difficult. It is most unfortunate to break into the uniform demurrage code even upon the extreme edge.

The tariffs increasing the demurrage rates in California were suspended last February, and on June 3 a further suspension was ordered. The suspending orders are now vacated, to take effect January 6. (25 I. C. C., 314.)

Rates on Grain and Flaxseed.

Superior Commercial Club, of Superior, Wis., v. Great Northern et al. Chamber of Commerce of the City of Milwaukee v. Chicago, Milwaukee & St. Paul et al. Duluth Board of Trade v. Great Northern et al. Opinion by Commissioner Clark:

The ruling in the original report, 24 I. C. C., 96, was rescinded and the commission ordered the defendants in future to maintain rates on grain and flaxseed from points on their lines in Minnesota, South Dakota and Iowa, to Superior, Wis., in no case exceeding for equal distances their rates from the same points of origin to Milwaukee, Wis. The defendants are also ordered in future to maintain rates on grain and flaxseed from points on their lines in Minnesota, South Dakota and Iowa to Superior, Wis., via Minneapolis, in no case exceeding by more than 4 cents per 100 lbs. their rates from the same points of origin to Minneapolis, Minn. They are also ordered in future to maintain rates on grain and flaxseed from points on their lines south and west of Willmar, Minn., to and including Sioux City, Ia., and Yankton, and Huron, S. D., to Superior, Wis., in no case exceeding by more than 3 cents per 100 lbs. their present rates from the same points of origin to Minneapolis, Minn. Future rates on grain and flaxseed to Milwaukee, Wis., from points on the lines of the defendants in Iowa, Minnesota and South Dakota on and south of the Winona & St. Peter lines of the Chicago & North Western from Sanborn, Minn., to Pierre, S. D., and on the east of the line of the Chicago & North Western from Iroquois, S. D., to Yankton, S. D., shall in no case exceed for equal distances the rates from the same points of origin to Duluth or Superior. Rates on grain and flaxseed from points on the lines of the defendants in Minnesota, South Dakota, and Iowa, to Duluth, Minn., shall in the future not exceed for equal distances the rates from the same points of origin to Milwaukee, Wis. Future rates on grain and flaxseed from points on the lines of the defendants in Minnesota, South Dakota and Iowa to Duluth, Minn., via Minneapolis, shall in no case exceed by more than 4 cents per 100 lbs. their present rates from the same points of origin to Minneapolis, Minn. Rates on grain and flaxseed to points on the lines of the defendants east and west of Willmar, Minn., to and including Sioux City, Ia., and Yankton and Huron, S. D., to Duluth, Minn., shall in no case exceed by more than 3 cents per 100 lbs. the present rates from the same points of origin to Minneapolis, Minn. (25 I. C. C., 342.)

Rose Hill, Ill., Discriminated Against.

Thomas W. Gilmore & Company et al. v. Chicago & North Western et al. Opinion by Commissioner Meyer:

On carload shipments of bituminous coal from Chicago to the complainants at Rose Hill, Ill., the freight charge is 20 cents per net ton in excess of the charge for similar transportation to Ravenswood, Ill., a point in the Chicago switching district for the Chicago & North Western. On anthracite coal the charge to Rose Hill is 10 cents per ton greater than to Ravenswood. The commission found that this rate situation subjects the complainants to unjust discrimination and Rose Hill to undue and unreasonable disadvantage, and ordered that for the future the defendants shall not require the payment for the interstate transportation of coal in carloads to Rose Hill of a charge in excess of 5 cents per net ton over the charge for similar transportation to Ravenswood. (25 I. C. C., 403.)

Elaborate Report on Freight Classification.

In re suspension of Western Classification No. 51, I. C. C. No. 9. Opinion by Commissioner Meyer:

Western classification No. 51, I. C. C. No. 9, was filed December 28, 1911, to become effective February 15, 1912, and was suspended by the commission, pending this investigation, until December 14, 1912. Carriers voluntarily extended this suspension until February 14, 1913.

After discussing some of the larger and more fundamental general questions involved in this proceeding, consideration is given the individual rules in controversy, and this is followed by a discussion of the individual items in No. 51, to which objections have been raised. In connection with the discussion of both rules and items the application of the general principles involved is given additional consideration. Attention can be directed, in these headnotes, only in a general way, to a few of the most important considerations.

Classification is a public function. Public business cannot be conducted in a private way. Hearings of classification committees should be made public, after due notice to interested parties, including state commissions and the Interstate Commerce Commission. A record of facts and arguments should be made. As rapidly as items, or groups of items, have been disposed of by the classification committee they should be published in accordance with law. In the case of a protest to this commission, the record made up before the committee should be promptly submitted to the commission. On the basis of this record, supplemented when necessary by additional inquiries, the commission will be able to decide whether or not to suspend a proposed change in classification.

A compilation of classification units, expressing the relation to one another of weight, space and value, should be made, as far as practicable, for every item in the classification, and given due consideration.

The work of classification should be confined to classification

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as such, entirely separate from the question of rates or revenues of carriers. Classification and rates and revenues should be treated separately. Having completed a new classification along the lines suggested, each carrier can readjust its rates on the basis of that classification in such manner as to preserve its existing revenues. The sufficiency or insufficiency of certain revenues and the level of particular rates or schedules are separate questions. A classification is a universal tariff from which the schedules of individual carriers should not depart, except in cases demanded by special conditions. Commodity tariffs in restricted number may always remain a necessity.

The classification movement since 1887, with a brief reference to conditions prior to that date, is described and mention made of the uniform classification of 1891.

The commission has repeatedly emphasized the necessity of greater uniformity in classification. Numerous quotations, bearing upon this subject, from decisions and annual reports of the commission are given. Reference is made to the past utterances of the commission with regard to the elements of classification, an enumeration of which is made.

Generally speaking, carload ratings should be established whenever carload quantities are offered for shipment and the public interest requires it. The relative merits of a system of any-quantity ratings as compared with a system of carload and less-than-carload ratings left for future consideration.

Liberal provisions should be made for mixtures. Artificial restrictions upon mixtures are restrictions upon the freedom of trade and commerce, with a tendency to militate against the small man. Mixtures result in a better utilization of car space; they lessen the demands upon terminal properties, they decrease the expense of operation and facilitate the movement of freight. A brief statement is made of the arguments for and against the incorporation in western classification of rule 10 of official classification.

An excessive difference between the carload and less-than-carload rates on the same commodity results in an undue preference to the carload shipper. Considerable diversity in the spread between carload and less-than-carload ratings is revealed. The relations between carload and less-than-carload ratings should be established in accordance with some consistent principle throughout the classification and the rate schedules which may be constructed upon it. In establishing a proper relation, consideration should be given to the relative cost of handling, the demands upon terminal properties and the utilization of equipment.

Generally speaking, freight cars should be made to fit the business. Within reasonable limits business may be required to adapt itself to the car.

Carriers should take into consideration both the physical minimum and the commercial minimum in deciding upon a classification minimum to govern carload shipments throughout the country and provide themselves with cars of corresponding sizes. What these shall be must be determined in the light of all the facts applicable to each individual case. The physical minimum is that minimum which represents the weight or bulk quantities which can be loaded into a car from the point of view of space or the theoretical number of packages capable of being loaded into a car, determined by dividing the cubical contents of the car by the cubical contents of one of the packages, multiplied by the weight of the package, possibly with some consideration of the dimensions of the package. The commercial minimum is that minimum which represents the unit of purchase and sale of the commodity in question as established by custom and the conditions existing in that trade and in the territory in which it governs at the time the minimum is established. The physical minimum would consider only physical loading capacity, while the commercial minimum would consider in addition trade requirements, conditions of manufacture, distribution and consumption.

From a classification standpoint, the security of a package may with propriety be considered in fixing the rating. A package which is less desirable from a transportation standpoint may be given a higher rating than one which is more desirable. The approval of this rule, however, does not sanction disproportionate and arbitrary increases in the rating of an article when offered in a less desirable package. There should be some relation between the increased rating and the increase in the risk, difficulty of handling, and other proper considerations.

In the present proceeding the discussion bearing upon a graduate scale has centered about rule 6-B. The principle of this rule is correct. It promotes economical use of car space and has a tendency to check the careless shipper. The restriction of the present rule to light and bulky articles is of doubtful propriety. On the other hand, a universal graduate scale probably cannot be devised. The loading possibilities of different commodities vary so widely in their relation to differing car dimensions that it may be necessary to adopt different scales for different classes of commodities.

The rule in *Southern Cotton Oil Company v. S. Ry. Co.*, 19 I. C. C., 79, approved. It is the duty of the initial carrier not only to advise the shipper of the lower rates applying in case of restriction of valuation, but when informed of the shipper's desire to avail himself of such lower rates to obtain the shipper's signature in accordance with the tariffs.

"Follow-lot" shipments should be marked by the shipper whenever they constitute an overflow resulting from the failure of the shipper to designate the dimensions of cars required. Where the shipment could be loaded in a car of the size ordered by the shipper and two cars are furnished by the carrier, the marking, where necessary, should be done by the carrier.

It is the duty of the delivering carrier to collect the lawful rates on shipments and to correct any errors that may have been made by the agents of the initial carrier in billing or in the collection of prepaid charges. This includes misbilling due to wrong description of the container. A provision should be inserted that, if the classification of a shipment is properly raised at the point of destination, by reason of the character of the container, the initial carrier shall be liable for the difference, unless misrepresentation was made.

Every effort of the carriers to compel accuracy and honesty in descriptions of freight deserves support. Inadvertent and unknowing misdescriptions are unfortunate in their possible discriminatory effect; conscious misrepresentations and misdescriptions are criminal and should be rigorously suppressed.

It is the right and duty of carriers to protect other freight from commodities which are likely to damage it. Certain perishable freight may at times, for sufficient reason, be refused under proper tariff provision or the classification.

If all the pieces constituting a completed article are offered as one shipment, under one bill of lading, the freight charge should be calculated upon a rating for the completed article. This does not prevent a shipper from billing separately each constituent part at its respective rating.

Carload quantities should not be received in freight houses. Storage space should be reserved for less-than-carload shipments. But when, for sufficient reason, a carrier has actually stored and handled carload quantities as it stores and handles less-than-carload quantities, it is entitled to fair compensation for the additional service performed.

Brunswick-Balke-Collender Company v. A., T. & S. F. Railway Company, 23 I. C. C., 395, affirmed, subject to the further investigation ordered in that case. (25 I. C. C.)

By requiring a substantial minimum to be loaded of each commodity in the mixture it would become impossible to defeat the minimum weight requirements of the others by including in the shipment a nominal quantity of one. Such provision should be inserted in rule 21-B.

It would hardly be in the public interest to require carriers to load or unload large, heavy, bulky less-than-carload shipments at any one of the thousands of stations in this country where they do not, and can not, maintain crews capable of handling consignments of this character. Carriers should advise shippers at the time shipments are received what is expected of them. This rule, like all others, must have a reasonable interpretation. Section crews should assist shippers wherever possible and practicable.

"Shippers' load and count." In connection with this subject a discussion is given of carriers' liability under ordinary bills of lading and those containing similar qualifying clauses. As this subject is covered by pending legislation of Congress fixing the liability of the carriers, the commission refrains from making recommendations.

The allowance of 500 pounds for "dunnage" should be continued.

The classification should either provide for the transportation of a necessary caretaker of perishable freight free of charge or require carriers to take care of stoves and replenish fuel in transit when such protection is required.

While carriers may provide by definite tariff provisions, free

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from undue discrimination, for the advancement of storage or transfer charges, the commission is without authority to compel them to do so.

In accordance with established law, classification properly may not be predicated upon the use to be made of an article. Use may, however, be considered as evidence of value. Value has a bearing upon rating in the classification.

The restriction of the mixture of machinery and machines to articles "necessary for the initial equipment" is unjustly discriminatory. If it is found necessary to restrict the mixture, this should be done by placing a limitation upon the quantity of each article that may be shipped in a mixed car.

In connection with the sliding scale of minima provided by rule 6-B, rules protecting the minimum on the size of car ordered, similar to those in effect in western trunk line exceptions to the classifications, and in accord with our decision in *Noble v. B. & O. R. R. Co.*, 22 I. C. C., 432, should be incorporated in western classification.

In instances where it is difficult to secure the actual weight of articles shipped, estimated weights per unit may be used. The standard weights per unit must be fair and should be the result of careful investigation. The simplicity and ease of determination under this system are commendable.

Individual items considered in this report are so numerous and varied that no reference can be made to them in the headnotes.

It is expected that carriers will revise No. 51 and direct the future development of classification in accordance with the views expressed in this report. (25 I. C. C., 442.)

STATE COMMISSIONS.

The Arkansas railroad commission has adopted "reciprocal" demurrage rules, to become effective January 1, providing for penalizing the railways at the rate of $1 per car for the first and second days, $2 for the third day, $4 for the fourth day, $5 for the fifth day, and each additional day, for failure to furnish cars when ordered by shippers. But the railways, so far as we have learned, continue to limit the charge against consignees to one dollar a day.

COURT NEWS.

The government has filed a complaint in the United States district court at Los Angeles in a suit against the Southern Pacific Company and subsidiary oil and land companies, attacking the railway's title to 45,726 acres of supposed mineral-bearing land in Fresno county, Cal. The action is based upon provisions of the act of Congress requiring the department of the interior to exclude mineral-bearing lands in issuing patents to railways.

Three judges of the federal court at Portland, Ore., have issued a temporary injunction on application of the railways of the state, restraining the enforcement of the law prescribing a percentage relation between the various classes of freight, which was passed by the voters at the recent election under the initiative. The railways were required to file bonds amounting to $55,000. The court overruled the demurrers of the attorney general to the petition of the railways, and stated that the entire issue should be disposed of within thirty days.

Judges Warrington, Knapp and Dennison in the United States Circuit Court at Columbus, Ohio, December 30, handed down a decision in the case of the government against the Lake Shore & Michigan Southern, the Chesapeake & Ohio, the Hocking Valley, the Toledo & Ohio Central, the Kanawha & Michigan, the Zanesville & Western, the Sunday Creek Coal Company, the Continental Coal Company and the Kanawha & Hocking Coal and Coke Company in favor of the government, declaring the roads guilty of restraint of trade in violation of the Sherman law. The government charged the railroads with attempting to control the mining, transportation and sale of bituminous coal from the mining districts of western Pennsylvania, West Virginia and Ohio. The Hocking Valley was accused of being the head of the alleged combination and, through its influence over the capital stock of other railroads and coal companies, with having decided the output of coal from these regions.

Railway Officers.

Executive, Financial and Legal Officers.

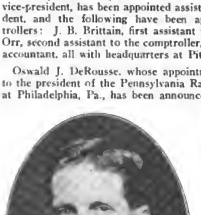
D. C. Eccles has been elected president of the Sumpter Valley, with headquarters at Ogden, Utah, succeeding his father, the late David Eccles.

George W. Perkins, chairman of the board of directors of the Pere Marquette, has resigned from the board, and Samuel M. Felton, president of the Chicago Great Western, also a receiver of the Pere Marquette, has been elected president of the Pere Marquette.

M. C. Kennedy, vice-president and general superintendent of the Cumberland Valley, has been elected president succeeding James McCrea, and Samuel Rea, president of the Pennsylvania Railroad, has been elected also vice-president of the Cumberland Valley, succeeding Mr. Kennedy, and president of the Pennsylvania Tunnel & Terminal, succeeding James McCrea.

G. L. Peck, general manager of the Pennsylvania Lines West of Pittsburgh, has been elected fifth vice-president in charge of the transportation department. C. M. South, chief clerk to first vice-president, has been appointed assistant to the first vice-president, and the following have been appointed assistant comptrollers: J. B. Brittain, first assistant to the comptroller, J. W. Orr, second assistant to the comptroller, and John Hurst, general accountant, all with headquarters at Pittsburgh, Pa.

Oswald J. DeRousse, whose appointment as general assistant to the president of the Pennsylvania Railroad, with headquarters at Philadelphia, Pa., has been announced in these columns, was born on February 18, 1867, and entered the service of the Pennsylvania Railroad on July 18, 1884, as a telegraph operator, at Philadelphia. On June 28, 1885, he was transferred to the service of the New York, Philadelphia & Norfolk, in the office of A. J. Cassatt, president, where he remained until March, 1897, when he was elected secretary of that company. Upon the election of Mr. Cassatt to the presidency of the Pennsylvania Railroad, on June 9, 1899, Mr. DeRousse was transferred to Broad street station and appointed chief clerk of the office of the president, which position he held at the time of his recent appointment as general assistant to the president of the same road, as above noted.



O. J. De Rousse.

The Chicago, Milwaukee & Puget Sound will hereafter be operated as the Puget Sound Lines of the Chicago, Milwaukee & St. Paul. H. R. Williams, president of the Puget Sound, has been elected vice-president with office at Seattle, Wash., and A. M. Ingersoll, vice-president of the Puget Sound, is vice-president at Tacoma. All subordinate officers of the legal and accounting departments of the Chicago, Milwaukee & Puget Sound are appointed to the same positions, respectively, with the Chicago, Milwaukee & St. Paul.

Ivy Ledbetter Lee, whose appointment as executive assistant, to the president of the Pennsylvania Railroad, has been announced in these columns, was born at Cedartown, Ga., on July 16, 1877; after graduation from Princeton University with the degree of A. B. in 1898, he did post-graduate work at Harvard and Columbia universities. He was then engaged in editorial work until his appointment as press representative of the anthracite coal operators, the Pennsylvania Railroad and other corporations. From 1908 to 1909 he was in charge of the publicity bureau of the Pennsylvania Railroad, and since 1910 was general European manager for Harris, Winthrop & Company, bankers,

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and now returns to the Pennsylvania Railroad as executive assistant to the president, with office at Broad street station, Philadelphia.

Albert John County, who has been appointed special assistant to the president of the Pennsylvania Railroad, as has been announced in these columns, was born in Dublin, Ireland, on August 1, 1871. He received his early education in that city, and was graduated from the University of Pennsylvania, Wharton School of Finance, Transportation and Accounting, in 1908, as Bachelor of Science in economics. He began railway work in July 1885, in the purchasing department of the Great Southern & Western Railway, of Ireland. On November 20, 1890, he entered the service of the Pennsylvania Railroad, as clerk in the secretary's department. In June, 1898, he was appointed chief clerk, and on December 1, 1900, was made assistant to the secretary. He was

A. J. County

appointed assistant secretary of the Pennsylvania Railroad in February, 1901, and later of the Philadelphia, Baltimore & Washington, the Northern Central, and other companies in the Pennsylvania Railroad System East of Pittsburgh and Erie, and also superintendent of the Pennsylvania Railroad Employees' Saving Fund. Since June, 1906, he has served as assistant to Samuel Rea, vice-president, and he now goes with him to the president's office. He is also secretary of the Richmond-Washington Company. Mr. County served with Mr. Rea as one of the mediators in the New York subway situation.

Operating Officers.

The title of G. W. Clark, superintendent of the Central New England, with office at Hartford, Conn., has been changed to general superintendent.

J. G. Code, general superintendent of the Wheeling & Lake Erie, has been appointed general manager of the Wabash-Pittsburgh Terminal, with headquarters at Pittsburgh, Pa., succeeding H. W. McMaster, resigned.

H. W. McMaster, receiver and general manager of the Wabash-Pittsburgh Terminal, has been appointed general manager of the Wheeling & Lake Erie, with headquarters at Cleveland, O. The position of general superintendent, heretofore held by J. G. Code, has been abolished.

D. J. Evans, trainmaster of the Lake Shore & Michigan Southern at Toledo, Ohio, has been appointed assistant superintendent of the Toledo division, succeeding W. F. Schaff, promoted, and W. H. Sullivan has been appointed trainmaster of the Toledo division, succeeding Mr. Evans.

J. A. Shepherd, general manager of the Western Maryland, at Baltimore, Md., having resigned, his former position has been abolished and A. R. Merrick, superintendent of the Saginaw-Ionia division of the Pere Marquette, with office at Saginaw, Mich., has been appointed general superintendent of the Western Maryland, with office at Baltimore.

Benjamin McKeen, general manager of the Vandalia, with office at St. Louis, Mo., has been appointed general manager of the Pennsylvania Lines West of Pittsburgh, succeeding G. L. Peck, promoted, and E. T. Whiter, superintendent of the Eastern division of the Northwest system, has been appointed general superintendent of the Northwest system, succeeding A. M. Schoyer, both with headquarters at Pittsburgh, Pa. Mr. Schoyer's new position has not yet been announced, as the meeting of the directors of the Vandalia has not yet taken place.

H. W. Sheridan, superintendent of the Sacramento division of the Southern Pacific at Sacramento, Cal., has been appointed general superintendent of the Louisiana Western Railroad and Morgan's Louisiana & Texas Railroad & Steamship Company, the Louisiana lines of the Southern Pacific, with headquarters at New Orleans, La., succeeding W. M. Hobbs, resigned to engage in other business.

E. E. Gray, assistant division superintendent of the Denver & Rio Grande at Gunnison, Colo., has been appointed assistant superintendent of the first division, with office at Pueblo, Colo., succeeding R. T. McGraw, who has been appointed superintendent of the Fourth division, with headquarters at Alamosa, Colo., to succeed I. H. Luke, who takes the place of O. J. Ogg, superintendent of the Second division at Salida, Colo.

The Chicago, Milwaukee & Puget Sound hereafter will be operated as the Puget Sound Lines of the Chicago, Milwaukee & St. Paul. P. C. Hart, general superintendent of the Puget Sound, has been appointed general superintendent, with office at Seattle, Wash., and all subordinate officers of the operating department of the Chicago, Milwaukee & Puget Sound are appointed to the same positions with the Chicago, Milwaukee & St. Paul.

Traffic Officers.

E. D. Perkins has been appointed general freight and passenger agent of the Bartlett Western, with office at Bartlett, Tex., succeeding E. J. Fitzgerald, promoted.

Thomas G. Smiley, general freight agent of the Western Maryland, at Baltimore, Md., has been appointed freight traffic manager in charge of the freight traffic department, with office at Baltimore, and his former position has been abolished.

A. K. Ragsdale, traveling passenger agent of the San Antonio & Aransas Pass at San Antonio, Tex., has been appointed general baggage agent, with headquarters at San Antonio, in place of I. N. Turner, who hereafter will have charge of the ticket requisitions.

J. B. Payne, who recently was appointed assistant general freight agent of the Louisiana Lines of the Texas & Pacific, with headquarters at New Orleans, La., has been appointed assistant general freight agent with office at Dallas, Tex., succeeding H. L. Redfield, resigned.

J. T. Hendricks, whose appointment as general traffic manager of the Missouri Pacific, with headquarters at St. Louis, Mo., was announced in our issue of December 27, will also have jurisdiction over the St. Louis, Iron Mountain & Southern. A sketch of Mr. Hendricks' railway career was published in the *Railway Age Gazette* of November 1, 1912, page 857.

R. J. McKay, general passenger agent of the Chicago & Alton, at Chicago, has been appointed first assistant general passenger agent with headquarters at St. Louis, Mo., to succeed T. G. Roehm, resigned, and the office of general passenger agent is abolished. W. C. Mneller, city passenger and ticket agent at St. Louis, has been appointed general agent of the passenger department, with office at St. Louis. O. P. Bennett has been appointed general agent of the freight department, with office at Minneapolis, Minn., and A. F. Sullivan has been appointed traveling freight agent, with office at Minneapolis.

J. G. Hollenbeck, assistant general passenger agent of the St. Louis, Iron Mountain & Southern, at Little Rock, Ark., has been appointed general passenger agent of the Missouri Pacific-Iron Mountain System, with office at St. Louis, Mo., succeeding B. H. Payne, who has been assigned to other duties in the passenger department at St. Louis, on account of continued ill health. F. E. Schroeder, chief clerk to the passenger traffic manager, has been appointed assistant general passenger agent of the Iron Mountain at Little Rock, succeeding Mr. Hollenbeck, and H. H. Butler, chief rate clerk in the passenger traffic department of the Missouri Pacific, has been appointed assistant general passenger agent, with headquarters at St. Louis, in charge of rates, tariff bureau, etc.

The Chicago, Milwaukee & Puget Sound will hereafter be operated as the Puget Sound Lines of the Chicago, Milwaukee & St. Paul. R. M. Calkins, traffic manager of the Puget Sound, has been made traffic manager, with office at Seattle, Wash. J. R. Veitch, assistant traffic manager of the Puget Sound, has

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been appointed assistant to the traffic manager, with headquarters at Chicago. F. D. Burroughs, general freight agent of the Puget Sound, has been appointed general freight agent, with office at Seattle. G. W. Hibbard, general passenger agent of the Puget Sound, has been appointed general passenger agent, with office at Seattle, and all subordinate officers of the traffic department of the Chicago, Milwaukee & Puget Sound are appointed to the same positions with the Chicago, Milwaukee & St. Paul.

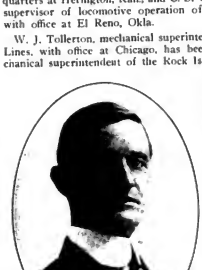
Engineering and Rolling Stock Officers.

Michael McGraw has been appointed master mechanic of the Chicago & Alton, with headquarters at Bloomington, Ill., to succeed W. E. Ladley, resigned.

The Chicago, Milwaukee & Puget Sound hereafter will be operated as the Puget Sound Lines of the Chicago, Milwaukee & St. Paul, and E. O. Reeder, chief engineer of the Puget Sound, has been appointed assistant chief engineer, with office at Seattle, Wash.

R. E. Wallace has been appointed supervisor of locomotive operation of the Chicago Terminal and Illinois divisions of the Rock Island Lines, with headquarters at Chicago. S. T. Patterson has been appointed supervisor of locomotive operation of the Arkansas division, with office at Little Rock, Ark. F. Connolly has been appointed supervisor of locomotive operation of the Kansas City Terminal and Kansas divisions, with headquarters at Herington, Kan., and C. S. Yeaton has been appointed supervisor of locomotive operation of the Oklahoma division, with office at El Reno, Okla.

W. J. Tollerton, mechanical superintendent of the Rock Island Lines, with office at Chicago, has been appointed general mechanical superintendent of the Rock Island Lines in full charge of the mechanical department. T. Rumney, assistant to second vice-president in charge of the mechanical department having resigned, his former position has been abolished. Mr. Tollerton was born in 1870 at St. Paul, Minn., and was educated in the public schools, and in high school. He began railway work as a machinist apprentice on the St. Paul & Duluth, now a part of the Northern Pacific, and after a short while was a fireman on the Omaha Railway. He went to the Union Pacific in 1890 as foreman, and afterwards was general foreman. In 1896 he was appointed master mechanic of the Utah division of the Oregon Short Line, and in 1903 was made master mechanic of the Idaho, Utah and Montana divisions of the same road with office at Pocatello, Idaho. He went to the Rock Island in July, 1906, as superintendent of motive power in charge of lines west of the Mississippi river, with office at Topeka, Kan., and was promoted in April, 1907, to assistant general superintendent of motive power of the Rock Island Lines, with headquarters at Chicago. In May, 1912, his title was changed to mechanical superintendent.



W. J. Tollerton

Purchasing Officers.

The office of H. W. Davies, purchasing agent of the Norfolk Southern, at Norfolk, Va., has been abolished, and Mr. Davies has been assigned to other duties.

W. G. Phelps, chief clerk to the second vice-president of the Pennsylvania Lines West of Pittsburgh, has been appointed assistant purchasing agent, with headquarters at Pittsburgh, Pa.

Special Officers.

F. G. Athearn, manager of the bureau of economics of the Southern Pacific, with headquarters at San Francisco, Cal., has resigned to engage in other business, effective January 1.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE LEHIGH VALLEY has ordered 10 mikado locomotives from the Baldwin Locomotive Works.

THE DELAWARE & HUDSON has ordered 15 consolidation locomotives from the American Locomotive Company.

THE CAROLINA & NORTH WESTERN has ordered 4 consolidation locomotives from the Baldwin Locomotive Works.

THE HARRIMAN LINES are closing negotiations for about 200 locomotives with the Baldwin Locomotive Works and the American Locomotive Company.

THE CUBA RAILROAD has ordered 4 ten-wheel locomotives from the American Locomotive Company. The dimensions of the cylinders will be 18 in. x 24 in., the diameter of the driving wheels will be 52 in., and the total weight in working order will be 127,000 lbs.

CAR BUILDING.

THE NEWBURGH & SOUTH SHORE is in the market for 175 freight cars.

THE MICHIGAN CENTRAL will build 400 box cars at the company's shops.

THE LEHIGH VALLEY is considering the purchase of some passenger equipment.

THE CHICAGO, ROCK ISLAND & PACIFIC has ordered 500 gondola cars from the Standard Steel Car Company, and is in the market for 1,000 box cars, 200 refrigerator cars, and 50 caboose cars.

IRON AND STEEL.

THE NEW YORK CENTRAL LINES have ordered about 2,400 tons of structural material.

GENERAL CONDITIONS IN STEEL.—There has been a let up in the volume of orders placed during the past week, particularly as regards the orders placed with the independent companies. Orders on the books of all the companies are so heavy, however, that they continue to operate at as near their full capacity as possible, and they are experiencing difficulty in delivering shipments in contract time. The orders placed with the Steel Corporation have been satisfactory and a considerable increase in the unfilled tonnage on the books of that company is expected for December. Prices are firm, but there does not appear to be any indication of increases in the near future.

MACHINERY AND TOOLS.

THE GRAND TRUNK PACIFIC has called for tenders for machines, tools, motors, furnaces, cranes, etc., for the equipment of its car shops at Transcona, Manitoba. Specifications and forms of tender may be obtained at the office of W. J. Press, mechanical engineer, Ottawa, Ont. All tenders must be in by February 13, 1913.

NORTH YORKSHIRE DALES RAILWAY, ENGLAND.—This company's bill will propose the incorporation of a company to construct railways which will in effect extend the Yorkshire Dales Railway from its present northern termination at Grassington so as to make junctions with the Northallerton & Hawes line of the North Eastern Railway at Leyburn and with the Richmond branch of the same company at Scorton. Running powers will be asked for over the Midland Railway from Colne to Skipton, over the Yorkshire Dales Railway from Skipton to Grassington, over the North Eastern Railway between Leyburn and Northallerton, with the use of these stations and intermediate stations, and over the North Eastern Railway between Scorton, Darlington and Middlesbrough, with the use of these stations and intermediate stations. Working and traffic arrangements are sought with the Midland, North Eastern and Yorkshire Dales railways.

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Supply Trade News.

The Dearborn Drug & Chemical Works, Chicago, has changed its name to the Dearborn Chemical Company.

The Dressel Railway Lamp Works, New York, has discontinued its office in the Peoples Gas building, Chicago.

Samuel E. Barrett, president of the Barrett Manufacturing Company, Chicago, with office in that city, died on December 29, at the Johns Hopkins Hospital, Baltimore, Md.

The Bucyrus Company, Milwaukee, Wis., has moved its New York office from 50 Church street, to 30 Church street. This office is in charge of C. S. Reed, eastern sales manager.

W. P. Steele has been appointed assistant to the president of the American Locomotive Company, New York, with office in that city. Mr. Steele will perform the duties heretofore assigned to him and such other duties as may be assigned to him by the president.

J. B. Ennis has been appointed chief mechanical engineer of the American Locomotive Company, New York, with office in that city. Mr. Ennis will perform the duties formerly assigned to the vice-president in charge of engineering, except the chief engineer will report directly to the president on construction and shop engineering matters.

Charles Kennedy, railroad representative for Brown & Company, Inc., Pittsburgh, Pa., with office at Chicago, died on December 18, at Niagara-on-the-Lake, Ont., at the age of 70. Mr. Kennedy was first engaged in building railroads in the oil country in Pennsylvania, and later became a locomotive engineman on the old Chicago, Burlington & St. Paul. He was chairman of the grievance committee at the time of the strike of the Burlington enginemen. Later he was connected with the National Tube Company and the Ewald Iron Company, at Louisville, Ky. He has been railroad representative for Brown & Company since 1898. He is succeeded by George H. Likert, formerly master mechanic of the Union Pacific.

The plant of the H. W. Johns-Manville Company, at Manville, N. J., which has just been completed, consists of nine buildings, each having an average length of 1,000 ft., and each being a separate factory capable of being operated as an independent unit. The total combined floor area of all the buildings is about 1,000,000 sq. ft. These buildings are of fireproof construction, being of brick, steel and concrete with roofs of J-M Asbestos roofing. The lighting and ventilating systems are so arranged as to afford the best operating conditions for the employees. The plant is located on a tract of 320 acres and the company's five mile railroad connects directly with the Central of New Jersey, the Lehigh Valley, and the Philadelphia & Reading. About 3,000 men will be employed at this plant, making a total of 7,000 who are now employed by the company.

C. W. Kelly, who for some years past has been connected with Fairbanks, Morse & Co. as railroad salesman for the city of Chicago and territory west, has resigned this position and has taken offices in the People's Gas building, Chicago, under the firm name of the Kelly-Derby Company. The new company will handle a general line of waterworks supplies, as well as wire cloth screens, crucible and rubber accounts. Mr. Kelly for many years before his connection with Fairbanks, Morse & Co. was connected with the Chicago & North Western in various capacities. His last seven years with the road were spent as superintendent of bridges and buildings and water service. He is a member of the board of directors of the National Railway Appliances Association, and of the Bridge and Building Supply Men's Association. Mr. Derby was for several years connected with the United States Wind Engine & Pump Company, later with Fairbanks, Morse & Co. for two years, and for the past two years has been president of the Tweedy, Hood & Finlen Company, which company has been merged with the Kelly-Derby Company.

TRADE PUBLICATIONS.

UNIONS.—The Jefferson Union Company, Lexington, Mass., has published an interesting little folder which outline the work of Bizmarck and discusses the advantages of Jefferson unions.

Railway Construction.

BURLINGTON BELT LINE.—Organized by residents of Burlington, Iowa, to build from Burlington southeast to Beardstown, Ill., about 65 miles.

CAROLINA RAILROAD.—Incorporated with a capital of $175,000 and headquarters at Kinston, N. C., to build from Kinston north to Snowhill, about 20 miles. The incorporators include I. C. Millard, M. S. Hawkins and H. Hanley, of Norfolk, Va., and W. H. Hayes, Kinston, N. C.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—A contract has been given Foley Brothers, Welch & Stewart, St. Paul, Minn., to build an extension from Ambrose, N. D., to a point in Montana 75 miles west of Ambrose.

MOBERLY, HUNTSVILLE & RANDOLPH SPRINGS.—Incorporated in Missouri with a capital of $500,000 to build from Randolph Springs, Mo., east to Moberly in Randolph county, 12 miles. The directors include C. H. Dameron, W. T. Dameron, G. P. Dameron and W. M. Evans, all of Huntsville, Mo.

MOUNT IDA, OUACHITA VALLEY & HOT SPRINGS.—An officer writes that in addition to the work being carried out under the direction of C. C. Godman, general manager and superintendent of construction, from Mount Ida, Ark., south to a connection with the St. Louis, Iron Mountain & Southern at North Caddo Gap, 10 miles, the company has projected a 40-mile extension from Mount Ida east to Hot Springs. Work on the extension is to be carried out during 1913. G. Cox, president, Mount Ida. (September 13, p. 491.)

NATIONAL RAILWAYS OF MEXICO.—The report of this company for the year ended June 30, 1912, shows that four contracts were entered into during the year with the Department of Communications and Public Works of Mexico. Two of the contracts modify concessions already granted and the other two relate to the construction of new lines. The amended contracts cover the line between Durango in the state of the same name and Canitis, Zacatecas, with a branch to Sombrerete, a total of about 175 miles. This work is nearing completion, and it is expected that the lines will be put in operation soon. The contracts also include the line to connect Penjamo, Guanajuato, with Ajuno, Michoacan. The work is well advanced. The new concessions call for the construction of a line from a point on the Interoceanic near San Francisco, about 28 miles from Vera Cruz, to be built via Tamos to the Port of Matamoros, in the State of Tamanhpas, and for a line from Allende to San Carlos, both in the State of Coahuila, with the privilege of extending the line to Las Vacas, in the same state. Authority has also been given to the company to take up certain portions of the existing lines to a length corresponding to some of the lines covered by the new concessions. During the year the company also carried out a large amount of betterment work, including the protection of banks and drainage, grade reductions and changes of line, tunnel improvements, improvements to bridges, trestles and culverts and putting in heavier rails to replace lighter sections; also new ballast. The unexpected difficulties encountered in the construction of the line from Durango to Llano Grande have somewhat delayed the work; it is expected that the line will be put in operation before the close of 1912. On the line from Durango to Canitas, on a section of 100 miles out of Durango about all the grading and masonry work is finished and 64 per cent. of the track laying has been finished. Work is under way on the rest of the line. The company expects to have the work finished from Penjamo to Ajuno and the line open for operation before the close of 1912. A contract was let early in 1912 to build from Allende Coahuila to Las Vacas, on the Rio Grande, opposite Del Rio, Texas, 73.32 miles. It is now proposed, however, to build only 49.71 miles to the Hacienda of San Carlos. A contract was entered into with the federal government of Mexico in March, to build a coast line from Matamoros, to San Francisco, a total of 560.48 miles. Under the terms of the contract 63 miles must be finished in two years from the time of the making of the contract, and 63 miles must be finished each succeeding year; the whole line to be completed within ten years. A contract has been let for carrying out the work on the first 63 miles from Tampico south.

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NIAGARA, ST. CATHARINES & TORONTO (Electric).—Application is being made to the Canadian parliament for an extension of time to build the following lines: From Port Colborne, Ont., easterly to Fort Erie and from Fort Erie to Niagara Falls; from Niagara Falls to Niagara on the Lake, thence to St. Catharines; from Welland westerly to Brantford; from the terminus of the St. Catharines and Niagara Central line to Fort Erie, and an extension via Hamilton to Toronto.

PACIFIC & HUDSON BAY.—Application is being made to the Canadian parliament for an extension of time to build from Kinsquit, B. C., at the head of Dean channel, northeast following the Dean river, Sigutla lake, Kwalchola lake, Entiaco river and the upper Nechaco river to Fort Fraser, thence via Fort St. James on Stuart lake, Fort McLeod, crossing the Parsnip river through the Pine river pass to Coalbrook, to Dunvegan along the Peace river to Peace River Landing, Alb., thence easterly via the headwaters of Bear river to Athabasca river and Fort McMurray, then crossing the Athabasca river and following the Clearwater and Churchill rivers to the proposed Canadian government Hudson Bay railway south of Washaiowaka lake and to Fort Churchill or Port Nelson on Hudson Bay. Permission is also asked to increase the capital from $5,000,000 to $25,000,000, and to authorize it to enter into agreements with other railways. W. F. Brougham, Vancouver, B. C., is acting for the applicants.

PARIS & MOUNT PLEASANT.—An officer is quoted as saying that as soon as the extension from Bogata, Tex., to Mount Pleasant, 28 miles, is put in operation it is the intention to extend the road northwest from Paris to Atoka, Okla., and to the Lehigh coal fields, about 60 miles, connecting with lines running to Oklahoma City. It is understood that an extension is to be built south from Mount Pleasant to a connection with the Missouri, Kansas & Texas, either at Daingerfield or at Pittsburg, about 15 miles. (June 7, p. 1263.)

RAILWAY STRUCTURES.

DALLAS, TEX.—It is announced that work is to be started within sixty to ninety days on a new union passenger station for the Dallas Union Terminal Company, which is to cost about $4,000,000. The city commissioners have passed the necessary ordinances, financial arrangements have been made, and the company has adopted the architect's plans. The building will be 350 ft. long, 210 ft. wide and 70 ft. high.

DULUTH, MINN.—The Duluth, Missabe & Northern will shortly let a contract for a new ore dock at the head of the lakes, to be built of concrete and steel, and to cost approximately $2,250,000. The dock will have 384 pockets of a storage capacity of 300 tons each.

MEXICO CITY, MEXICO.—The report of the National Railways of Mexico for the year ended June 30, 1912, shows that in order to provide a terminal station in the city of Mexico to accommodate all passenger and freight business, plans have been made and approved by the board of directors for a new station. No work has yet been done, but preliminary details are well advanced. Plans have also been made for putting up a new terminal station at San Luis Potosi. During the year new passenger stations were put up at Iguala, at Cuernavaca, at Colima and at Aguascalientes. New freight stations were built at Iguala and at Linares, and a combined passenger and freight station at Balsas.

ST. LOUIS, MO.—The St. Louis Southwestern has just completed a new freight house 750-ft. long, 30-ft. wide and 5 stories high, together with a yard of 10 tracks, a transfer platform 500-ft. long and a team track yard of 5 tracks.

SEATTLE, WASH.—The Chicago, Milwaukee & Puget Sound has taken out building permits for a new lumber dock and additions to its machine shops, roundhouse, blacksmith shop, woodworking shop and paint shop. Work is nearing completion on an ocean warehouse 500 x 175 ft.

SOUTH TACOMA, WASH.—The Northern Pacific has filed plans with the city for an addition to its shops in South Tacoma, including a new paint shop 144 ft. x 100 ft.

TACOMA, WASH.—The Chicago, Milwaukee & Puget Sound has filed plans with the city building inspector for new ocean docks of concrete steel construction.

Railway Financial News.

ATLANTA, BIRMINGHAM & ATLANTIC.—The federal court has appointed E. T. Lamb, general manager, as a co-receiver with H. M. Atkinson, succeeding S. L. Schoonmaker, resigned.

BALTIMORE & OHIO.—The following subsidiaries of the Baltimore & Ohio have been merged under the name of the Baltimore & Ohio Railroad in Pennsylvania: Pittsburgh & Connellsville, the Berlin Railroad, the Salisbury Railroad, the Mt. Pleasant & Broad Ford, the Ohio & Baltimore Short Line, the Somerset & Cambria, the Glenwood Railroad and the Fayette County Railroad.

CANADA SOUTHERN.—Ladenburg, Thalmann & Company, New York, are offering a part of the new $22,500,000 5 per cent. bonds at 106, yielding 4.68 per cent. income on the investment.

CHICAGO & NORTH WESTERN.—The Michigan railroad commission has authorized the issue of $10,000,000 equipment trust certificates. It is understood that no part of this issue is to be offered to the public at present.

DETROIT & CENTRAL NEW YORK.—Stockholders are to vote on January 13, on the question of leasing this road to the Delaware, Lackawanna & Western.

NEW YORK, NEW HAVEN & HARTFORD.—See an item in General News in regard to the contract with the Pullman Company.

NORWOOD & ST. LAWRENCE.—The New York Public Service Commission has authorized the company to sell $200,000 additional first mortgage bonds at 90.

PERE MARQUETTE.—George W. Perkins, chairman of the board, has resigned.

SAN DIEGO & ARIZONA.—It is rumored, according to press reports from San Diego, that Phelps, Dodge & Company, which own the El Paso & Southwestern, and a minority interest in the Rock Island Company, have bought the San Diego & Arizona, which runs from San Diego to Ysidro, Cal., 14 miles, and which started work some time ago on an extension through California, Lower California and Mexico towards Coyote Wells.

WHEELING & LAKE ERIE.—The receiver has been authorized to issue $2,425,000 receiver's certificates to pay for 1,300 freight cars, 20 locomotives, and to pay for bridge and dock work.

LONDON & SOUTH WESTERN RAILWAY, ENGLAND.—Widening between Twickenham and Richmond of the Windsor line and of the Kensington & Richmond line, and further money powers are among the chief objects of the bill to be promoted by this company. It is also proposed to cancel the existing leases of 1894 and 1902 to the company of the separate undertakings of the North Cornwall Railway known as the Launceston & Delabole and the Padstow lines, and to authorize a new lease in perpetuity to the company of the whole of the North Cornwall Railway undertaking, including the Launceston & Halwill, Launceston & Delabole, Wadebridge and Padstow lines.

NORTHERN JUNCTION RAILWAY, ENGLAND.—The Northern Junction Railway, a new company, seeks incorporation with power to construct 20 railways making connections with existing lines in the outskirts of London. The proposed lines will make junctions with the London & South Western and North & South Western Junction railways at Brentford, with the Ealing & South Harrow line of the Metropolitan District Railway near Hanwell, with the Acton & High Wycombe line of the Great Western Railway at Brentham Halt, with the Great Central Railway at Wembley Hill, with the Metropolitan & Great Central Joint Railway at Wembley Park, and with the following lines of the Great Northern Railway, *i. e.*, with the High Barnet branch at Finchley, and with the Enfield branch and the main line at Wood Green. The places to be traversed by the proposed lines will be Brentford, Ealing, Acton, Hanwell, Greenford, Perivale, Twyford, Wembley, Kingsbury, Hendon, Finchley, Friern Barnet, Hornsey, Wood Green and Southgate. The promoters ask for authority to enter into working and other agreements with the Great Central and Great Northern railways.

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[ADVERTISEMENT.]

ANNUAL REPORT.

FOURTH ANNUAL REPORT FERROCARRILES NACIONALES DE MEXICO.

(NATIONAL RAILWAYS OF MEXICO.)

MEXICO OFFICE:
SEGUNDA CALLE DA BOLIVAR, No. 19.

NEW YORK OFFICE:
No. 25 BROAD STREET.

To the Shareholders:

On behalf of the Board of Directors and in compliance with the provisions of Article 48 of the By-Laws of the Company, I have the honor to present to you the following report relative to the affairs of the Company for the fiscal year July 1, 1911, to June 30, 1912.

EXCHANGE AND PAYMENT OF SECURITIES CALLED FOR CONVERSION.

The deposit of securities under the Plan for the Readjustment and Union of Mexican Central Railway Company Limited and National Railroad Company of Mexico has continued, though in less number. The securities remaining undeposited are shown in the following

STATEMENT OF SECURITIES DEPOSITED TO JUNE 30, 1912, IN ACCORDANCE WITH THE PLAN OF APRIL 6, 1908.

SECURITIES OF MEXICAN CENTRAL RAILWAY COMPANY LIMITED.

	Issued.	Deposited.	Per Cent. Outstanding.	Per Cent.
Priority Five Per Cent. Bonds ...	$6,597,000.00	$5,223,000.00	79.17	$1,374,000.00 20.83
First Mortgage Bonds ...	264,062.50	262,715.00	99.49	1,347.50 .51
Consolidated Mortgage Bonds ...	109,020,000.00	109,001,000.00	99.98	19,000.00 .02
First Income Bonds	32,706,000.00	32,476,900.00	99.30	229,100.00 .70
Registered Income Bonds	325,200.00	317,000.00	97.48	8,200.00 2.52
Second Income Bonds ...	11,284,000.00	11,261,000.00	99.80	23,000.00 .20
Stock	59,127,100.00	59,064,400.00	99.89	62,700.00 .11
Total	$219,323,362.50	$217,606,015.00	99.21	$1,717,347.50 .79

SECURITIES OF NATIONAL RAILROAD COMPANY OF MEXICO.

	Issued.	Deposited.	Per Cent. Outstanding.	Per Cent.
Preferred Stock..	$32,000,000.00	$31,998,100.00	99.99	$1,900.00 .01
Second Preferred Stock	22,043,600.00	22,002,600.00	99.81	41,000.00 .19
Deferred Stock..	11,021,800.00	11,021,800.00	100.00	..... .00
Common Stock...	284,400.00	156,000.00	54.85	128,400.00 45.01
Total	$65,350,000.00	$65,179,000.00	99.74	$171,000.00 .26

TOTAL SECURITIES OF BOTH COMPANIES.

	Issued.	Deposited.	Per Cent. Outstanding.	Per Cent.
Bonds and Stocks.	$284,673,362.50	$282,785,015.00	99.34	$1,888,347.50 .66

NOTE.—All of the above amounts are in U. S. Currency.

As will be noted from the foregoing statement, practically all the securities deposited in the Plan have now been deposited. This result should be a source of satisfaction to all concerned, and is due largely to the efforts of the Readjustment Managers as well as to the fact, as was mentioned in last year's report, that on July 1, 1911, that is to say, at the beginning of the present fiscal year, the First Mortgage Bonds, Consolidated Mortgage Bonds and Registered Income Bonds of the Mexican Central Railway Company Limited matured, and such as had not been deposited previously were duly paid by your Company in accordance with the obligation assumed by it on the acquisition of the properties of the Central Company.

Having regard, therefore, to the small amount of securities still outstanding in comparison with the total number called for deposit under the Plan of April 6, 1908, it may be considered that the conversion has been practically consummated.

ISSUE OF BONDS AND NOTES.

As was mentioned at the Ordinary General Meeting last year, on account of the unfavorable financial conditions prevailing, it was not thought advisable to dispose of the bonds of the Company then in its treasury, and that accordingly two series of notes had been issued, one series maturing at the end of two years, the other at the end of one year. The latter series, amounting to £1,000,000 Sterling became due in the fiscal year under review, and was paid, together with $6,310,000 Prior Lien Bonds pledged as collateral security therefor being returned to the Company. The two year notes do not mature until July 1, 1913. The interest on both series of notes was paid when due.

The Board of Directors had hoped to be able to sell at a satisfactory price during the course of the present year all or a part of the treasury bonds, but unfortunately the markets for these securities showed no improvement over those of the previous year. Consequently, it was decided to defer any such sale until there was some improvement.

The inability to dispose of the treasury assets necessitated our making other arrangements for the funds to meet the financial requirements of the Company, and negotiations were successfully conducted for a loan of $13,000,000 United States currency for one year. This loan was obtained in New York, and bears interest at the rate of five per cent. per annum. The Company deposited as collateral therefor $16,000,000 Prior Lien Bonds and $6,000,000 Guaranteed General Mortgage Bonds.

In connection with the said loan, an option until August 15, 1912, was given for the purchase of the whole or any part of certain of the Company's Prior Lien and General Mortgage Bonds. Said option, however, was not exercised.

Of the other outstanding obligations of the Company, I beg to advise that Note No. 4, the last of those issued to the Southern Pacific Company at the time of acquiring from it certain shares of The Mexican International Railroad Company, was duly paid at maturity.

During the year under review Prior Lien Bonds were authenticated by the Trustee and delivered to the Company to the face amount of $2,526,368.56, in reimbursement of expenditures made to December 31, 1910, for improvements and betterments and in the construction of the line from Durango to Llano Grande.

SUBSIDIARY COMPANIES.

The operation of the various Subsidiary Companies and of leased and controlled lines has been continued, particular attention having been given to improving the properties. To this end and to aid in their development and progress financial assistance was given some of them during the year, it being considered inadvisable for said companies to endeavor to obtain the necessary funds in foreign markets owing to the difficulty of sale, at satisfactory prices, of Mexican securities.

To June 30, 1912, there had been loaned to the Vera Cruz to Isthmus Railroad the sum of $3,255,733.33 (pesos), at six per cent. per annum, to enable that company to meet expenditures in connection with the construction of branch lines. To same date there had been loaned to the Pan-American Railroad Company, under terms similar to those mentioned above, the sum of $2,102,582.32 (pesos) in order that it might meet its financial requirements.

From the amounts loaned to these Companies there should be deducted from that to the Vera Cruz to Isthmus Railroad $127,990.73 (pesos), and from that to the Pan-American Railroad Company $1,157,579.72 (pesos) representing deficit from the result of operations of the former road for the year ended June 30, 1912, and of the Pan-American for the two years ended the same date, caused principally by heavy expenditures for renewals and betterments. As the shareholders are aware, under the terms of the contracts whereby the shares of said companies were acquired, a like company obligated itself to meet such deficits.

Pursuant to the terms of the contract covering the purchase of shares of the Pan-American Railroad Company, the guaranty of Ferrocarriles Nacionales de Mexico has been placed upon bonds of said Company to the amount of $136,000 (pesos) on its First Mortgage Five Per Cent. Bonds and 13 an amount of $2,968,000 (pesos) on its General Mortgage Five Per Cent. Bonds.

NEW CONCESSIONS.

CONSTRUCTION OF LINES AND WORKS.

The Board has satisfaction in advising that during the year covered by this report, four contracts were entered into between the Department of Communications and Public Works of the United States of Mexico and the Company. Two of said contracts modify concessions already granted, the other two relate to the construction of new lines.

The amended contracts cover (1) the line between Durango, in the State of that name, and Cubitas, in the State of Zacatecas, with a branch line to Sombrete in the latter State, a total distance of approximately 270 kilometers, the construction of which has been pushed vigorously, is now nearing completion, and it is hoped will soon be in operation, And (2) the line which will unite Pesqueria, in the State of Guanajuato, with Ajuno, in the State of Michoacan, work on which is also well advanced.

One of the new concessions is for the construction of a line from a point on the Interoceanic Railway, near the Station of San Francisco (approximately 44 kilometers from Venezuela) which will pass by Tamos (on the San Luis-Tampico Line), and terminate at the Port of Manzanillo, in the State of Tamaulipas thus practically uniting, in connection with the lines of the Company already construed, the Ports of Tampico, Tampico and Matamoros and traversing a large extent of country adjacent to the Gulf of Mexico. The importance of this concession is obvious.

The other new concession is for a line from the station of Allende (on the former Mexican International Railroad) to San Carlos, both in the State of Coahuila, and with the right of extending said line to Las Vacas, in the same State.

As will be seen from the Balance Sheet which is to be presented, the amount expended in the construction of the new lines mentioned and of the Durango to Llano Grande line exceeds the sum of $10,000,000 (pesos).

In these concessions authority is given the Company to take up certain portions of its existing lines to a length corresponding to some of the lines covered by the new concessions, which will prevent the suppression of parallel or unnecessary lines, and consequently the discontinuance of an unprofitable service, which under the original concessions covering said lines, would have to be continued. It will also allow a more logical distribution of transportation facilities throughout the Republic, which was one of the objects of the consolidation of the National and Central lines.

To enable the Company to proceed with the work of taking up the lines referred to, steps were taken to obtain the consent thereto as required by the provisions of the Company's mortgages. It is satisfactory to report that same has been received.

In respect of important works other than the construction of lines of railway, mention should be made of the authority given by the Board of Directors for the construction of a new terminal and shops at San Luis Potosi, to provide adequate facilities to the ever growing traffic at that railroad center; also of the erection of two large steel bridges on the Monterey Division across the Pilon and San Juan Rivers, at a cost of $271,103.10 and $324,840.02 (pesos), respectively.

The attention of the Board was also directed to another important piece of work, namely, the construction of a large Terminal Station at the City of Mexico, which has been receiving consideration for the past three years. During the year to which this report refers, definite plans were formulated by the Executive President of the Company and drawings made for that part of the Terminal proposed to be utilized as a Passenger Station. These drawings were submitted to the Board of Directors, and in view of the recommendation of the Executive, the construction of the Passenger Station, at an approximate cost of $4,000,000 (pesos), has been authorized. Although the decision on the part of the Board of Directors was reached after the 30th of June last, mention thereof is made in this report in view of its importance. Definite plans with regard to the construction of the Freight Station have not been decided upon, and the matter is still under consideration.

The extensive operations carried out by the Executive Presidents of the Company to the Board of Directors is herewith submitted, and by examining same the shareholders will appreciate the work done by the Management in construction, maintenance and operation of the lines as well as the present physical condition of the railway lines and property of the Company.

BOARD OF DIRECTORS.

During the year covered by this report there were no changes in the personnel of the Board of Directors. The duties of the Directors residing in Mexico as well as those forming the New York Local Board, were performed with regularity and in compliance with the provisions of the By-Laws of the Company.

In accordance with Clause Fourteen of the Deed of Incorporation, the terms of office of the twenty-one Directors of the Company expire today,

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and the Board of Directors for the first time will be renewed in its entirety. The Directors elected at this meeting will hold office until the Ordinary General Meeting of the shareholders to be held in the year 1913. Two Commissaries and two substitutes also have to be elected to hold office until the Ordinary General Meeting of 1913, as the terms of office of those elected last year expire on this date.

RESULTS OF OPERATION AND DIVIDENDS.

Unfortunately, as the shareholders know, a state of revolution has continued in the Republic, principally in the northern part of the country and in the States of Morelos and Guerrero, which has been the cause of attacks upon and damage to transportation lines, resulting in the interruption and suspension of traffic for a greater or less time. This has proved detrimental to the Company not only through loss of traffic, but also on account of actual damage done to its lines and property. Nevertheless, as will be seen from the Income Account for the fiscal year ended June 30 last, the gross receipts of the Company almost equaled those obtained in the previous year, the significance of which is worthy of notice, as it manifests the stability of the Company as well as the vitality of the nation. Moreover, the Management of the Company, following a policy which merits the highest praise, has endeavored to reduce the cost of operation to a minimum, and as a consequence the net results obtained during the past fiscal year exceed those of the previous fiscal year by over $1,000,000 (pesos); the net Income Account for 1911-1912 reaching the sum of $21,888,033.49 (pesos), while for the year 1910-1911 it amounted to $20,504,140.19.

In view of these results of which the Board of Directors takes cognizance from month to month, and following the custom of former years and in exercise of the authority conferred by Article 50 of the By-Laws, it authorized the payment of two semi-annual dividends of two per cent. each on the Company's First Preferred Shares, which together constitute the four per cent. maximum that these shares may receive. The semi-annual dividends were duly paid as in former years, and the Board hopes that this action will be approved by the meeting.

The Balance Sheet, the Profit and Loss Account and the Income Account for the fiscal year July 1, 1911, to June 30, 1912, which will be submitted to the Shareholders having been approved by the Board of Directors, were passed to the Commissaries, who in turn had them audited by Messrs. Price, Waterhouse & Company, Chartered Accountants. The latter, after making a careful examination of the accounts, issued their certificate relative thereto.' The Commissaries have rendered their report recommending the approval of these accounts, which report will be submitted to the meeting.

The foregoing embraces what the Board considers of sufficient importance to be brought to the attention of the Shareholders, but at the same time it would be pleased to furnish any further information or explanation that may be desired by the meeting. The book containing the minutes of meetings of the Board of Directors as well as all documents relating thereto are at the disposal of the Shareholders in order that they may be fully cognizant of the work performed by it.

The Board begs to thank the Shareholders for the confidence reposed in it, and to express the satisfaction it would afford the members to know that their actions during the time they have directed the affairs of the Company are approved.

Mexico, D. F., October 29, 1912.

LUIS ELGUERO,
Chairman of the Board of Directors.

FERROCARRILES NACIONALES DE MEXICO.

(NATIONAL RAILWAYS OF MEXICO).

MEXICO, D. F., September 19, 1912.

Sr. Lic. D. Luis Elguero,
Chairman of the Board, Mexico.

DEAR SIR:

I beg to submit the following report of the operations of the Company for the fiscal year ended June 30, 1912:

RESULTS OF OPERATION.

The following statement shows in a condensed form the results for the year:

	Mexican Currency.
The Gross Earnings from all sources were	$61,447,790.71
The total Expenses of Operation were	38,435,254.74
Leaving Net Receipts of	$23,012,535.97
To which add:	
Interest and Dividends on Securities owned	$937,290.54
Sundry interests	721,361.95
Other Receipts	141,283.88
	1,799,936.37
Making	$24,812,472.34
From which deduct:	
Taxes and Rentals	$548,821.21
Operating Deficit of Subsidiary Companies	975,617.64
Sundry Adjustments of Operating Expenses	
Provision for expenses for repair and replacement of equipment	1,300,000.00
Reserve for Additions and Betterments, in ad- dition	100,000.00
	2,924,438.85
	$21,888,033.49
And:	
Interest on Funded Debt, Equipment and Collateral Trusts and Notes Payable	19,403,457.17
Leaving Balance carried to Profit and Loss Account	$2,484,576.32
And deducting:	
Five Per cent. of Net Profits transferred to Reserve Fund	$124,228.82
Dividend on First Preferred Shares, four per cent.	2,306,632.00
Government Bonds forfeited account failure to complete Jimenez to Parral line	7,000.00
Adjustment of market value of Bonds owned	41,587.38
	2,479,448.20
Leaving as Net Surplus for the year ended June 30, 1912	$5,128.12
To which add:	
Net Surplus at June 30, 1911	561,924.33
Which gives a total Net Surplus at June 30, 1912, of	$567,052.45

The succeeding statement, which it is thought will be of interest, shows somewhat more in detail the results for the four years that the Company has been in operation.

FERROCARRILES NACIONALES DE MEXICO.

COMPARATIVE STATEMENT OF INCOME ACCOUNT FOR THE FOUR YEARS ENDING JUNE 30, 1909, TO 1912.

	MEXICO CURRENCY.			
	1908-1909.	1909-1910.	1910-1911.	1911-1912.
GROSS EARNINGS.				
Freight	$40,901,478.00	$45,477,881.48	$45,197,748.27	$43,859,606.81
Passenger	11,274,095.80	12,234,007.92	12,657,110.32	13,548,386.95
Express	1,979,778.51	1,954,532.43	2,066,544.67	2,070,914.81
Miscellaneous	1,603,464.44	1,816,725.59	2,013,017.79	1,968,882.14
Total	$55,758,806.75	$61,483,147.42	$61,934,421.05	$61,447,790.71
OPERATING EXPENSES.				
Maintenance of Way and Structures	$7,483,894.80	$9,704,299.84	$11,161,931.14	$11,340,034.17
Maintenance of Equipment	7,158,947.16	7,766,515.84	8,788,387.92	9,687,119.41
Conducting Transportation	16,143,698.64	17,106,344.52	17,141,417.30	15,435,621.96
General Expenses	2,227,829.76	2,151,158.16	2,187,608.21	1,972,479.20
Total	$33,214,370.36	$36,728,318.36	$39,279,344.57	$38,435,254.74
EARNINGS OVER OPERATING EXPENSES	$22,544,436.39	$24,754,829.06	$22,655,076.48	$23,012,535.97
INCOME FROM INVESTMENTS	1,093,760.74	1,167,131.78	753,562.60	937,290.54
SUNDRY INTEREST LESS EXCHANGE	290,133.54	59,252.18	191,329.90	721,361.95
Total	$23,928,330.67	$25,981,213.02	$23,599,968.98	$24,671,188.46
From which deduct:				
TAXES	$299,770.31	$410,753.94	$413,545.18	$478,607.42
RENTAL OF LEASED LINES	77,397.10	67,076.51	70,045.64	70,213.79
OPERATING DEFICIT OF SUBSIDIARY COMPANIES	22,834.41	76,238.55	464,421.13	834,331.76
FUNDING CHARGES ACCT. OF OUTSTANDING NOTES	2,461,292.43	2,336,709.27	2,147,816.84	1,400,000.00
Total	$2,861,294.25	$2,890,778.27	$3,095,828.79	$2,783,154.97
NET REVENUE	$21,067,036.42	$23,090,434.75	$20,504,140.19	$21,888,033.49
From which deduct:				
INTEREST ON FUNDED DEBT, EQUIPMENT AND COLLATERAL TRUSTS, ETC., AND ON NOTES PAYABLE	18,466,663.88	18,562,603.78	17,946,269.32	19,403,457.17
SURPLUS	$2,600,372.54	$4,527,830.97	$2,557,870.87	$2,484,576.32

NOTE.—The above figures for the years 1908-1909 and 1909-1910 include those for the Mexican International R. R. Co., which were published separately as that line was not merged with Ferrocarriles Nacionales de Mexico until July 1, 1910.

AVERAGE LENGTH OF LINE OPERATED: The average length of line operated during the year was 9,668.461 kilometers, or 6,007.739 miles.

GROSS EARNINGS.

As already stated, the total Gross Earnings from all sources amounted to $61,447,790.71 Mexican Currency, for details of which, as well as comparison with last year, your attention is invited to the following statement:

1910-1911.			1911-1912.		
EARNINGS.	PERCENTAGE.		PERCENTAGE.	EARNINGS.	
$44,320,766.34	71.56	Commercial Freight	70.34	$43,220,949.51	
676,981.93	1.41	Construction Freight	1.04	638,657.30	
12,657,110.32	20.44	Passenger	22.05	13,548,386.95	
235,111.61	.38	Baggage	.35	215,046.92	
2,066,544.67	3.34	Express	3.37	2,070,914.81	
55,705.93	.09	Telegraph	.09	54,363.19	
130,757.74	.21	Rentals	.26	158,539.52	
44,512.39	.07	Floating Equipment	.05	33,084.72	
1,546,956.10	2.50	Miscellaneous	2.45	1,507,847.79	
$61,934,421.05	100.00		100.00	$61,447,790.71	

The movement of commercial freight by classes differed but slightly from that of the previous year, as will be noted from the following table:

1910-11.		1911-1912.
PERCENTAGE.		PERCENTAGE.
12.88	Forest Products	11.56
22.33	Agricultural Products	23.48
3.15	Live Stock and Animal Products	4.01
50.90	Mineral Products	49.76
10.74	General Merchandise	11.19
100.00		100.00

The Gross Earnings for the year show a slight falling off as compared with last year. Taking into consideration, however, the unsettled political conditions which have obtained throughout the Republic during the last five months of the fiscal year, the results can only be considered as remarkable and evidencing the wonderful vitality of the country. Notwithstanding that the earnings for the first six months of 1910-1911 were eminently satisfactory, we were able to show notable increases in the same period of the present fiscal year. On the other hand, however, our earnings for the last

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six months fell off very noticeably, and this accounts for the slight decrease in the year's figures. For details by months of the earnings your attention is invited to statement No. 6 as prepared by our General Auditor.

OPERATING EXPENSES.

Careful attention has been given the upkeep of that part of the property which has not been interfered with by the revolutionists and the physical condition is superior even to that at the close of the fiscal year ending June 30, 1911.

As will be seen from the details subsequently given in this report, considerable work in the way of improving the rail track has been done during the year, additional heavy rail having been laid, more line ballasted, and temporary bridges replaced by permanent structures.

The percentage of Operation to Earnings during the year was 62.55 per cent., comparing favorably with the figure of last year of 63.42 per cent., and which, when consideration is given the heavy burden thrown upon the Operation by reason of the revolution, should be a source of satisfaction to the shareholders.

The Sub-Accounts for the fiscal years 1910-1911 and 1911-1912 compare as follows:

1910-11. Percentage.		1911-1912. Percentage.
28.42	Maintenance of Way and Structures	29.51
22.37	Maintenance of Equipment	25.20
43.64	Conducting Transportation	40.16
5.57	General Expenses	5.13
100.00		100.00

The comparative percentage to Gross Earnings for the two years being:

1910-11. Percentage.		1911-1912. Percentage.
18.02	Maintenance of Way and Structures	18.46
14.19	Maintenance of Equipment	15.76
27.68	Conducting Transportation	25.12
3.53	General Expenses	3.21
63.42		62.55

STATEMENTS OF OPERATIONS.

Attached to this report will be found the various statements of accounts as prepared by the General Auditor. Same give in detail the results for the year as well as financial position of the Company.

As heretofore, the books and accounts have been audited by Messrs. Price, Waterhouse & Company, of London, New York and Mexico, and a copy of their certificate as to the correctness thereof accompanied this report.

The results of operation for the year are as follows:

1910-1911. Mexican Silver.		1911-1912. Mexican Silver.	Percentage of Increase or Decrease.
$61,934,421.05	Gross Earnings	$61,447,790.71	
39,279,244.57	Operating Expenses	38,435,254.74	
$22,655,076.48	Net Earnings	$23,012,535.97	
	Which, reduced to gold at the average price of the Mexican dollar for the year viz., 50 cents, equals gold	$11,506,267.99	
61.42	Operating percentage	62.55	Dec. 0.87
19,833,846	Kilometers run by revenue trains	17,974,817	" 10.34
3.1227	Gross Earnings per revenue train kilometer	3.4186	Inc. 8.65
1.9804	Operating Expenses per revenue train kilometer..	2.1383	" 7.33
1.1423	Net Earnings per revenue train kilometer	1.2803	" 10.78
6,275.94	Gross Earnings per kilometer of road operated	6,355.49	" 1.25
3,960.26	Operating Expenses per kilometer of road operated	3,975.32	Dec. 0.12
2,295.68	Net Earnings per kilometer of road operated	2,380.17	Inc. 3.55
6.55209	Average amount received for each ton of freight	6.67312	" 1.81
.01818	Average receipts per ton per kilometer	.01867	" 2.62
1.80069	Average amount received from each passenger	1.67340	Dec. 7.61
.01810	Average receipts per passenger per kilometer	.01789	" 1.17

Expressed in miles the figures show as follows:

1910-1911. Mexican Silver.		1911-1912. Mexican Silver.	Percentage of Increase or Decrease.
12,324,157	Miles run by revenue trains	11,169,012	Dec. 10.34
$5.0254	Gross Earnings per revenue train mile	$5.5016	Inc. 8.65
3.1872	Operating Expenses per revenue train mile	3.4412	" 7.38
1.8382	Net Earnings per revenue train mile	2.0604	" 10.78
10,100.18	Gross Earnings per mile of road operated	10,228.10	" 1.25
6,405.62	Operating Expenses per mile of road operated	6,397.62	Dec. 0.12
3,694.56	Net Earnings per mile of road operated	3,830.48	Inc. 3.55
6.55209	Average amount received for each ton of freight	6.67312	" 1.81
.02926	Average receipts per ton per mile	.03004	" 2.62
1.80069	Average amount received from each passenger	1.67340	Dec. 7.61
.02912	Average receipts per passenger per mile	.02879	" 1.17

IMPROVEMENTS TO PROPERTY.

Additions and Betterments.

From the organization of the Company to the close of the fiscal year under review, we have spent on additions and betterments the sum of $21,860,824.92, Mexican Currency of which amount $2,771,920.10 was expended by us during this fiscal year.

The particulars of the expenditures during the year are shown in the following statement:

	Mexican Currency Expended July 1, 1911, to June 30, 1912.
Right of Way and Station Grounds	$28,454.30
Real Estate, Purchase of Land at Santiago, Mexico, D. F.	20,975.42
Protection of Banks and Drainage	38,280.06
Grade Reductions and Changes of Line	23,103.95
Tunnel Improvements	100,360.09
Bridges, Trestles and Culverts	282,506.31
Increased Weight of Rail	906,143.29
Ballast	673,601.30
Sidings and Spur Tracks:	
Total Amount Expended $227,797.88	
Less: Value of Sidings Taken Up 49,427.00	178,370.88
Terminal Yards	81,492.09
Improvements of Crossings, Over and Under Grade	1,109.02
Interlocking Apparatus	3,214.96
Telegraph and Telephone Lines	2,491.76
Station Buildings and Fixtures:	
Total Amount Expended $134,283.46	
Less: Stations Destroyed and Not Replaced 6,538.39	
Roadway Buildings	127,745.07
Shops, Engine-houses and Turntables:	2,443.93
Total Amount Expended $303,528.87	
Less: Buildings Destroyed and Not Replaced 3,000.00	
Shops, Machinery and Tools:	300,528.87
Total Amount Expended $169,737.06	
Less: Value of Machinery Worn Out or Discarded 47,724.00	
Water and Fuel Stations	122,013.06
Electric Light and Power Plants	170,119.04
Additional Equipment	990.77
Freight Cars $14,364.35	46,578.10
Work Equipment 32,315.75	
Other Additions and Betterments	4.69
Change of Line and Change of Gauge between Acambaro and Uruapan	97,274.23
Tramline between Tecalete and Hacienda de Los Arcos	1,312.29
Preliminary Survey between Honey and Gulf Coast Line	18,156.10
Sundry Betterments Expenditures pending Formal Authorization	200,700.78
	$3,439,970.36
Less:	
Adjustments of Charges, Delayed Credits, etc., for Previous Year:	
Gas Plants $2,921.84	
Equipment 62,779.60	
Locomotives $48,717.22	
Passenger Coaches 14,074.88	
Connection between Ambos and Paredon	147.66
Allende-Las Vacas Line	147.20
Less:	
Floating Equipment, Sale of Tug "Colima" 42,557.98	
Sale of Tlalancingo Tramways 6,000.00	$114,567.28
	$3,325,403.08
Less: Reserve to Cover Debit to Additions and Betterments that may later be transferred to Operating Expenses	553,482.98
	$2,771,920.10

Bridges, Trestles and Culverts:

Permanent structures were erected during the year as follows:

Aguascalientes Division:

One 10.46 meter through plate girder span on masonry. Bridge 396-B.
One 3.18 meter "I" beam span, two on each side, on masonry. Bridge 469-B.

Cardenas Division:

Sixty-nine 4.57 meter "I" beam spans on masonry placed at various points on the Main Line.
One 4.57 meter "I" beam span, consisting of six stringers, on masonry. Bridge 291-A.
Two 3.18 meter "I" beam spans on masonry at various points on the Main Line.
Two 7.01 meter "I" beam spans on masonry. Bridge 268-B.
Eight 4.27 meter "I" beam spans on masonry placed in Main Line.
Three 2 meter arch culverts in place of "I" beams. Bridge 293-B.
Three 5.03 meter "I" beam spans on masonry. Bridges 308-A, 308-C and 310-D.
Two 6.88 meter spans, stringers on masonry. Bridges 311-A and 314-B.
Five bridges consisting of one span, three spans, two spans and two of one span each, respectively, of 6.17 meter "I" beams on masonry. Bridges 317-A, 335-A, 339-A, 344-A and 414-B.
Two bridges consisting of four and five 9.14 meter deck plate girder spans, respectively, on masonry and piers. Bridges 318-A and 322-A.
Two 17.07 meter deck plate girder spans on masonry. Bridges 431-A and 432-A.
One 3 meter arch culvert in place of through plate girder span. Bridge 530-A.
One 13.41 meter deck plate girder span. Bridge 531-A.
One 21.33 meter through plate girder span. Bridge 532-A.
One 13.71 meter through plate girder span. Bridge 533-A.
One span consisting of 18 rails of 32.204 kilograms per lineal meter (82-lb.). Bridge 536-A.
One .965 meter arch culvert in place of 3.048 meter rail span. Bridge 537-B.
Two 9.14 meter "I" beam spans on masonry. Bridges 560-A and 561-A.
Six bridges of 9.14 meter "I" beam spans on masonry with center pier. Bridges 581-A, 583-A, 598-A, 601-A, 602-A and 605-A.
Three bridges of 9.75 meter "I" beam spans on masonry supported by one new pier each. Bridges 643-A, 643-B and 646-B.
In addition to the foregoing, bridges 481-A, 526-A, 553-A and 665-A, referred to in last year's report, were duly completed during the year under review.

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Guadalajara Division:

In the Guadalajara Yard, wooden stringers are being replaced with "I" beams and rail girders on masonry. Work 50 per cent. completed at June 30, 1912.

Ameca Branch: Two spans of 24.84 meter deck plate girders on masonry. Bridge 41-A.

Mexico Terminal:

One 10.06 meter deck plate girder span on masonry. Bridge 9-E, Cintura Line.

Mexico-Queretaro Division:

Two 3.05 meter "I" beam spans on masonry. Bridges 0.78 and 0.89-A.

In addition to the above, bridges 0.87-A and 0.88-A mentioned in last year's report were completed during the year ended June 30, 1912.

Monclova Division:

Ten 2 meter arch culverts were put in, in place of timber trestles at bridges B-1-B, B-1-C, B-G and B-I-E, on Main Line, and three sidings.

Two 9.14 meter deck plate girder spans on masonry abutments and one pier. Bridge B-127-A.

Two 15.24 meter through plate girders on masonry. Bridge 134-A.

Two 4 meter arch culverts put in, in place of timber trestles. Bridge 135-A.

Two 3 meter arch culverts in place of timber trestles. Bridge 136-A.

Three 24.38 meter through plate girders on masonry abutments and two piers. Bridge 171-A.

Six 2 meter arch culverts replacing timber trestles. Bridges 172-A, 262-B, and 264-B, consisting of two arches each.

Two 9.14 meter deck plate girder spans on masonry abutments and one pier. Bridge 195-A.

Three 3.05 meter rail girder spans on masonry abutments and two piers. Bridge 264-A.

Two 5.18 meter "I" spans on masonry abutments and one pier. Bridge 269-A.

Three 5.18 meter "I" spans on masonry abutments and two piers. Bridge 269-B.

One 4 meter rail girder span. Bridge "E," Lampacitos Mine No. 4, Line.

Seven rail girder spans; two of 6.40 meters, one of 3.10 meters and four of 9.20 meters. Bridges A, B, E and F, Agujita Track, to Mine No. 7.

Northern Division:

One 3.05 meter "I" beam span on masonry. Bridge 928-A.

One 30.48 meter riveted truss span on masonry. Bridge 936-B.

One 17.07 meter deck plate girder span. Bridge 983-B.

One 7.01 meter "I" beam span. Bridge 984-C.

One 5.181 meter "I" beam span. Bridge 988-C.

One double arch culvert. Bridge 993-A.

One 5.18 meter "I" beam span. Bridge 1027-C.

One 11.58 meter deck plate girder span. Bridge 1116-A.

One 53.34 meter through pin connected truss span. Bridge 1119-B.

In addition to the foregoing, work on bridges 961-A, 986-A, 993-B, 993-C, 994-A, 994-B and 1117-A was completed during the year under review. These latter bridges were included in the report for last year.

San Luis Division:

Four 3.05 meter rail girder spans. Bridges 380-B, 448-A, 457-A and 464-A.

Masonry Boxes built at bridges 394-B, 395-C, 396-A, 396-B, 397-B, 428-A, 460-B and 468-A; also 8 rail and concrete spans at bridge 461-A, to replace wooden boxes.

One double 3.05 meter "I" beam span in place of light girder span. Bridge 906-B.

Matehuala Branch: One double and one single 5.18 meter "I" beam spans. Bridges 858 and 864.

In addition to the above, a number of small wooden openings were replaced with masonry boxes and concrete culverts; numerous bridges had masonry abutments raised and widened as well as being strengthened in other respects.

Torreon Division:

Two 3 meter semi-circular arch culverts to replace timber trestles. Bridges 639 and 640.

Two 7.62 meter "I" beam spans on masonry. Bridges 640-A and B.

Three 7.62 meter "I" beam spans on masonry. Bridge 640-C.

Four 4.57 meter rail girder spans on masonry. Bridge 641-A.

PURCHASES OF NEW RAIL:

During the year we purchased 21,251 tons of 42.164 kilogram (85-lb. A. S. C. E.) rail and 14,000 tons of 37.204 kilogram (75-lb.) rail from native producers and 12,300 tons of 37.204 kilogram (75-lb.) rail of foreign manufacture.

The domestic rail is being used in replacements and renewals; the foreign rail in the construction of new lines.

Of the above we received from the home source in the course of the year all the 42.164 kilogram (85-lb. A. S. C. E.) rail, and 6,368 tons of the 37.204 kilogram (75-lb.) rail; from the foreign manufacturers, 9,415 tons.

RELAYING WITH HEAVIER RAIL:

This also has received serious consideration during the year, and in order to take care of increased business and to improve the track generally the following replacements of heavy for light rail have been made:

Aguascalientes Division:

From kilometer 584.964 to kilometer 585.600, a total of 1536 track meters of 27.779 kilogram (56-lb.) rail replaced with 37.204 kilogram (75-lb.) rail.

Cardenas Division:

From kilometer 322.070 to kilometer 382.809, and from kilometer 618.759 to kilometer 653.000, a total of 79,916 track meters of 27.779 kilogram (56-lb.) rail, 13.165 kilometers of 32.739 kilogram (66-lb.) rail and 1.879 kilometers of 41.172 kilogram (83-lb.) rail replaced with 42.390 kilogram (85-lb. A. R. A.) rail.

From kilometer 291.963 to kilometer 309.070, or 7.727 kilometers of 32.739 kilogram (66-lb.) rail, and 9.380 kilometers of 41.172 kilogram (83-lb.) rail replaced with 42.164 kilogram (85-lb. A. S. C. E.) rail.

From kilometer 418.550 to kilometer 438.462, and from kilometer 457.069 to kilometer 462.160, a total of 25.003 kilometers of 37.204 kilogram (75-lb.) rail, was replaced with 42.164 kilogram (85-lb. A. S. C. E.) rail.

From kilometer 462.160 to kilometer 463.490, from kilometer 514.970 to kilometer 544.110, from kilometer 610.520 to kilometer 620.970 and from kilometer 661.440 to 667.000, a total of 46.530 kilometers, of which 40.979 kilometers were of 32.739 kilogram (66-lb.) rail and 5.560 kilometers of 41.172 kilogram (83-lb.) rail replaced with 42.164 kilogram (85-lb. A. S. C. E.) rail.

From kilometer 413.400 to kilometer 416.550, or 5.150 kilometers of track of 37.204 kilogram (75-lb.) rail was replaced with 42.390 kilogram (85-lb. A. R. A.) rail.

At Rincon, San Dieguito, Mieza, Rodriguez, Velasco, Anza, Escontria, La Labor, Espinazo, las Canoas, Zacate, Caferal, Tambaca, las Crucitas, San Mateo, Valles and Cardenas sidings, a total of 16.784 kilometers of track of 27.779 kilogram (56-lb.) rail was replaced with 41.172 kilogram (83-lb.) and 37.204 kilogram (75-lb.) rail.

Guadalajara Division:

Between Guadalajara and Orendain, Ameca Branch, and from Guadalajara Yard, 27.779 kilogram (56-lb.) rail to the extent of 14.501 kilometers was replaced with 34.723 kilogram (70-lb.) rail.

Manzanilla Line. Between Tuspan and Zapotillic 0.725 kilometers of 27.779 kilogram (56-lb.) rail was replaced with 37.204 kilogram (75-lb.) rail.

Gomez Palacio Division:

From kilometer 679.452 to kilometer 680.393 and from kilometer 704.925 to 705.492, a total of 1.508 kilometers of 27.779 kilogram (56-lb.) rail was replaced with 32.739 kilogram (66-lb.) rail.

Mexico Terminal:

At this Terminal a total of 1.635 kilometers of 27.779 kilogram (56-lb.) rail was replaced with 32.739 kilogram (66-lb.) rail.

1.380 kilometers of 27.779 kilogram (56-lb.) rail was replaced with 37.204 kilogram (75-lb.) rail, and fourteen switches of 27.779 kilogram (56-lb.) were replaced with 37.204 kilogram (75-lb.) switches.

4.819 kilometers of 19.842 kilogram (40-lb.) rail replaced with 27.779 kilogram (56-lb.) rail.

Mexico-Queretaro Division:

From kilometer 234.190 to kilometer 237.648 and from kilometer 237.967 to kilometer 251.209, or 16.700 kilometers of 27.779 kilogram (56-lb.) rail, was replaced with 32.739 kilogram (66-lb.) rail.

Monclova Division:

From kilometer 0 to kilometer 1.368 the old 30.507 kilogram (61½-lb.) rail was replaced with 37.204 kilogram (75-lb.) rail.

Monterrey and Gulf Division:

From kilometer 75.000 to kilometer 79.640 or 4.640 kilometers of 27.779 kilogram (56-lb.) rail was replaced with 34.723 kilogram (70-lb.) rail.

From kilometer 79.640 to kilometer 109.640, or 30.000 kilometers of 27.779 kilogram (56-lb.) rail was replaced with 34.723 kilogram (70-lb.) rail.

From kilometer 16.040 to kilometer 19.640 and from kilometer 109.640 to kilometer 239.640, a total of 33.600 of 27.779 kilogram (56-lb.) rail replaced with 34.723 kilogram (70-lb.) rail.

From kilometer 239.640 to kilometer 245.000, or 5.360 kilometers of 27.279 kilogram (56-lb.) rail was replaced with 34.723 kilogram (70-lb.) rail.

From kilometer 247.407 to kilometer 435.242 there were taken up 2.388 kilometers of 27.779 kilogram (56-lb.) rail and replaced with 34.723 kilogram (70-lb.) rail, in order to set new switches.

Northern Division:

Matamoros Branch: From kilometer 180.000 to kilometer 242.000 there were taken up 53.648 kilometers of 19.842 kilogram (40-lb.) rail and 7.450 kilometers of 27.779 kilogram (56-lb.) rail, a total of 61.098 kilometers replaced with 32.739 kilogram (66-lb.) rail.

In order to avoid bumping near frogs (as these were already of 37.204 kilogram (75-lb.) rail, from kilometer 87 to kilometer 319, there were taken up 0.085 kilometers of 19.842 kilogram (40-lb.) rail and replaced with 37.204 kilogram (75-lb.) rail.

Pacific Division:

From kilometer 36.388 to kilometer 49.622 and from kilometer 49.888 to kilometer 51.510, or 26.856 kilometers of 22.322 kilogram (45-lb.) rail, was replaced with 27.779 kilogram (56-lb.) rail.

San Luis Division:

From kilometer 562.000 to kilometer 575.000, or 13.000 kilometers of 34.723 kilogram (70-lb.) rail was replaced with 42.164 kilogram (75 lb. A. S. C. E.) rail.

From kilometer 575.000 to kilometer 595.832, or 20.832 kilometers of 34.723 kilogram (70-lb.) rail was replaced with 42.164 kilogram (85-lb. A. S. C. E.) rail.

From kilometer 595.832 to kilometer 603.832, or 8.000 kilometers of 34.723 kilogram (70-lb.) rail was replaced with 42.164 kilogram (85-lb. A. S. C. E.) rail.

From kilometer 603.832 to kilometer 740.364, or 136.532 kilometers of 34.723 kilogram (70-lb.) rail was replaced with 42.164 kilogram (85-lb. A. S. C. E.) rail.

TAMPICO TERMINAL:

At this Terminal there were taken up a total of 12.722 kilometers of 27.779 kilogram (56-lb.) rail and replaced with 32.739 kilogram (66-lb.) rail.

BALLAST:

We have followed up our policy of gradually improving our track by the placing of permanent ballast on the following Divisions during the year:

DIVISIONS.	LINEAL METERS.
Aguascalientes	11,380
Cardenas	98,743
Guadalajara	45,707
Hidalgo	940
Mexico-Queretaro	75,293
Monclova	1,927
Monterrey	05,638
Northern	15,172
San Luis	35,709
Tampico Terminal	10,215
Total	390,774

NEW SIDE AND PASSING TRACKS:

During the year new side tracks, passing tracks, cross-overs and extensions to existing side-tracks were built to the extent of 30.023 kilometers. The following statement gives detail of weight of rail used in these new tracks, viz.:

WEIGHTS OF RAIL.			KILOMETERS.
40 lb. rail (19.842 kilograms)			0.325
45 " " (22.322 ")			2.830
50 " " (24.802 ")			1.346
54 " " (26.786 ")			6.514
56 " " (27.779 ")			13.013
60 " " (29.763 ")			0.050

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			Weights of Rail.		Kilometers.
61½	"	"	(30.507	")	0.368
63	"	"	(32.243	")	0.453
66	"	"	(32.739	")	0.327
70	"	"	(34.23	")	1.366
75	"	"	(37.204	")	0.004
85	"	"	(42.390	")	0.274
					30.073
From which deduct—Tracks taken up:					
40	lb.	rail	(19.842 kilograms)		0.222
45	"	"	(22.322	")	1.359
50	"	"	(24.802	")	3.163
54	"	"	(26.786	")	0.558
56	"	"	(27.779	")	2.715
60	"	"	(29.763	")	1.034
63	"	"	(32.243	")	0.093
70	"	"	(34.723	")	0.036
75	"	"	(37.204	")	0.217
85	"	"	(42.390	")	0.184
					9.621
Net increase					20.452

New Terminal Station, San Luis Potosi:

At the present time the traffic originating at, destined to or passing through this important center is handled at two terminals, i. e., those of the Ex-National and X-Central. Both are inadequate for proper service, and in addition thereto cause unnecessary expense. A careful study of the matter having demonstrated the advantages to be derived from the construction of an up-to-date terminal, plans therefor were drawn and the works begun during the fiscal year under review.

New Stations:

We completed during the year the construction of Station Buildings at the following places:

Passenger Station at Iguala.
Freight Station at Iguala.
Passenger and Freight Station at Balsas.
Passenger Station at Cuernavaca.
Passenger Station at Colima.
Passenger Station at Aguascalientes.
Freight Station at Linares.

Thirteen sets of new Section Homes for the use of our track employees were also built in the course of the year.

Purchase of New Equipment:

Orders were placed during the year for ten first-class coaches; thirteen second-class and ten baggage, mail and express cars. Also for 150 tank-cars 12,000 gallons, 100,000 lbs. capacity. All for delivery during the latter months of this calendar year.

Construction of New Lines:

Durango to Llano Grande:

Due to unexpected difficulties encountered in the construction of this line, same has not as yet been fully completed. It is now expected, however, that the line will be finished and put in operation about the month of December next: 54.450 kilometers are now being operated. As of June 30, 1912, the amount expended on this construction was $3,966,904.06, Mexican currency.

Durango to Cadillas:

The building of this line has been carried on actively during the year. Practically all the grading and masonry work on the 160 kilometers out of Durango mentioned in last report has been completed, the percentage being, respectively, 99.83 and 99.57, while 64 per cent. of the rails have been laid.

The contract for the balance of the line, approximately 114 kilometers, was executed on April 2, 1912, and work commenced May 6. As of June 30, 13.3 per cent. of the grading and 3 per cent. of the masonry had been done. If no unforeseen difficulties are experienced, it is hoped to put the line in operation by April, 1913. To June 30, 1912, we had expended on this work $3,051,796.58, Mexican currency.

Penjomo to Ajuno:

The same remarks apply to the construction of this line. Subsequent to June 30, however, the work was seriously interfered with for some two or three weeks by very heavy floods in the section which the line traverses. Eighty per cent. of the grading and masonry was finished as of June 30, last. Unless unlooked for obstacles arise, the line should be ready for operation by December this year. The expenditures to June 30, 1912, amounted to $2,969,408.65, Mexican currency.

Allende to Las Vacas:

Under concession granted by the Federal Government on March 2, 1912, a contract for the construction of this line was let on April 12, 1912. The line runs from Allende in the State of Coahuila on the old Mexican International Road, to Las Vacas on the Rio Grande, opposite Del Rio, Texas, and will connect with the line of the Kansas City, Mexico & Orient Railway, now under construction. The total length of the line in 118 kilometers, or 73.32 miles, of which, however, it is now proposed to build but 80 kilometers, or 49.71 miles, to the Hacienda of San Carlos.

The line runs through a good agricultural country, susceptible of considerable development. Already several irrigation projects are under way. It is confidently expected that the line will prove a valuable feeder to the system. Eight per cent. of the grading has been completed at June 30th last. The amount expended to the close of the fiscal year was $57,638.39, Mexican currency.

Matamoros to San Francisco:

On March 2, 1912, a contract was executed with the Federal Government of Mexico covering the construction of this coast line, which will have an approximate total length of 902 kilometers, or 560.48 miles. In accordance with the stipulations in the contract 100 kilometers of said line must be completed in two years from the signing thereof, and 100 kilometers in each succeeding year. The whole line to be completed within ten years. Careful study and consideration having demonstrated the advisability of constructing that portion of the said line from Tampico south, the contract for the building of the first one hundred kilometers from that point was executed on June 5th last.

It is fully expected that this section of the line will prove to be a source of considerable net revenue to the Company, inasmuch as it will tap the major part of the oil fields in that region, as well as a good agricultural country.

IN GENERAL.

Employees:

At June 30, 1912, there were 31,179 employees in the service of the Company, of which number 639, or 2.05 per cent., were foreigners.

The diminution in the number of foreign employees is principally due to the voluntary separation from our service, in April last, of the major part of the foreign trainmen.

Statements of Equipment:

Accompanying this report are the usual statements of Locomotives and Cars on hand at the close of the fiscal year. It will be noted that we have suffered severely in the loss of cars through the activities of the revolutionists.

Express Service:

The operations of the Compañía Mexicana de Express, S. A., for the year have been more satisfactory, having regard in this connection also to the disturbances to business through uncertain conditions.

Fuel Oil:

The benefits which we expected to derive from the substitution of oil for coal as fuel have been fully borne out by the year's results, as will be noted from the decrease in cost of fuel shown in Statement No. 7, of the General Auditor.

It is, of course, economically impossible for us to use oil exclusively on our system, bearing in mind the long distances in some cases from the source of supply, and the proximity of coal in those districts. Where we have found it economical to use oil, same is being used. Of the total mileage of the system, approximately 50 per cent. is operated by oil and 50 per cent. by coal.

New Terminal Station, Mexico City:

Since the organization of the Company, the advisability of constructing a Terminal Station in the City of Mexico sufficient in size to accommodate all our Passenger and Freight business for years to come, has been given the careful consideration of the operating officers, and plans therefor have been drawn, and approved by the Board of Directors. No work as yet has been done in this connection, but the preliminary details are well advanced and the construction can be commenced as soon as the opportune time arrives.

Parallel Lines:

One of the considerations weighing in the merger of the Companies now forming this Company was the suppression of certain lines, principally of the old National Railroad Company and the old Mexican Central Railway Company, which parallel each other, the traffic of the region not being sufficient to sustain both tracks.

After careful and mature deliberation the Committee appointed to investigate the matter recommended the abandonment of the following lines:

			Kilometers.	Miles.
Mexican International		Anhelo to Ixtle	21.00	13.05
"		Horizonte to Bermejillo	22.53	14.00
"		Saucedo to Matamoros	210.00	130.49
National R. R.		Saltillo to K. 931	17.00	10.56
"		Jarita to Columbia	32.00	19.88
Mexican Central R. R.		Tepenaxco to Tulancingo	7.00	4.35
"		Cuyamaloya to Tasco (Branch)	36.00	22.37
"		Hercules to Adjuntas	15.00	9.32
"		San Luis to Estanzuela	9.00	5.59
"		Sandoval to Somoriel	20.00	12.43
Coahuila & Pacific		Rosarito to Saltillo	22.00	13.67
"		Agua Naval to Torreón	10.00	6.21
Hidalgo Railway		K. 13 (near Tultepec Station) to Magotes	43.00	26.72
			464.53	288.64

In accordance with the provisions of Section 22 of Article V, of our mortgages, the consent to the suppression of the concessions covering the said lines was requested, and received. The Department of Communications and Public Works having also signified its approval thereto, the necessary steps are now being taken looking to the said abandonment. It is confidently expected that same will benefit the property very materially by reduction of expenses.

Oil Industry:

Considerable impetus has been given to the development and production of oil in the Tampico and Tuxpan districts during the past year. New wells have been sunk in numerous places with gratifying results, while the old wells keep on producing as heretofore, or better. In all it is now computed that there are forty organized companies engaged in developing this industry, and the handling of the output should bring good results to the Company as soon as the line now being built south from Tampico is completed. The prospects of this business for the future look very promising.

Crops:

It is with regret that I have to advise that the outlook for the present crop is not at all satisfactory. The unusually heavy rains throughout the agricultural belt have had a very damaging effect, and as a consequence the yield is now expected to be below normal.

Statements of Accounts:

Accompanying this report I hand you a letter from the General Auditor, dated September 6, 1912; as also the ten statements of accounts as enumerated therein. A list of the Directors and Officers of the Company as at the close of the fiscal year is attached hereto.

Respectfully submitted,

E. N. BROWN,
President.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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L. B. SHERMAN, *Vice-President.* HENRY LEE, *Sec'y & Treas.*
The address of the company is the address of the officers.

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United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

VOLUME 54. JANUARY 10, 1913. NUMBER 2.

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THE Supreme Court of the United States, in refusing to approve of the distribution of the controlling stock of the Southern Pacific to Union Pacific stockholders, has used a blunt, common sense kind of reasoning that we have learned to associate with the decisions of this court that is in sharp contrast to the popular conception of the complexities of the highly trained legal mind. The court in the Union Pacific case says that "the ultimate determination of the affairs of the corporation rests with its stockholders and arises from their power to choose a governing board of directors." In theory, this was equally true in the Standard Oil case. If a certain group of men owned a controlling interest in the Standard Oil Company of New Jersey stock, and subscribed pro rata for their proportion of stock of each of the Standard Oil subsidiaries, under the plan of dissolution approved by the Supreme Court, this same group could elect a board of directors for each one of the subsidiaries which would carry out their policies. In the case of the Standard Oil Company, however, while this possibility existed in theory, the court was not of the opinion that it constituted a practical danger, and it is probable that most business men would agree with the court. It was not at all inconceivable that different individuals could gain control of different subsidiaries of the Standard Oil Company of New Jersey. On the other hand, the Supreme Court says in regard to the distribution of 46 per cent. of Southern Pacific stock to Union Pacific stockholders that "after such distribution as is now proposed, stockholders of the Union Pacific Company may dominate and control not only the Union Pacific Company, but the Southern Pacific Company as well," and that "this transfer . . . will not so effectually end the combination as to comply with the decree heretofore ordered to be entered by this court."

OF course, Southern Pacific stock could not be distributed to Union Pacific stockholders without substituting for this stock some other security—collateral or cash—under the Oregon Short Line bonds, which are at present secured by S. P. stock and some other investment stocks, unless the Oregon Short Line bonds were retired. In a published analysis of the effect of the Supreme Court's decision in the Union Pacific case, F. J. Lisman & Co. have brought out two quite interesting circumstances bearing on the case. They point out in the first place that the Union Pacific would hesitate a long time before retiring a 4 per cent. bond issue at par or at a premium, since in such a transaction the railroad company would be an inevitable loser. The company could not, in the present state of the bond market, issue securities to raise new capital for improvements, etc., on a 4 per cent. basis. On the other hand, the bankers' analysis points out that if the Union Pacific route from Omaha to Ogden is competitive with the Southern Pacific from New Orleans to San Francisco, the Central Pacific route from Ogden to San Francisco appears to be competitive with the Southern Pacific's New Orleans to San Francisco line. In other words, if the Union Pacific and Southern Pacific compete, so do the Central Pacific and Southern Pacific. The Southern Pacific owns the controlling stock of the Central Pacific. The suggestion is obvious that the situation can be met without the retirement of the Oregon Short Line 4's by an exchange, on some equitable basis, of Central Pacific stock for Southern Pacific stock. There is a further point that has not been generally discussed that deserves mention—regardless of what is done by the Union Pacific with its Southern Pacific *stock*, the Southern Pacific will still be a heavy debtor to the Union Pacific. On June 30, 1912, the Southern Pacific owed the Union Pacific $12,000,000 on demand loans, and in addition the Union Pacific owned $26,017,000 bonds of the Southern Pacific.

WE note with much regret the resignation of F. G. Athearn as manager of Bureau of Economies of the Southern Pacific. Mr. Athearn did not have a big title; but he is a very able man and was doing a very important work. As manager of the Southern Pacific's bureau of economies he labored zealously and effectively to establish better relations between the road, on the one hand, and its patrons and employees on the other. Being an educator—he maintained a connection with the University of California and also had charge of the Southern Pacific's student employees' course of study—his methods in dealing with patrons and employees were educational in the best sense. He sought to give the company the public's point of view and to give the public the company's point of view. He constantly furnished the press with a large amount of real news about the Southern Pacific, and in a single year he made 108 speeches on railway affairs, a great majority in California. Recently when a referendum on several railway measures was taken in Arizona Mr. Athearn, under the direction of President Epes Randolph of the Arizona Eastern and the Southern Pacific Lines in Mexico, conducted a campaign on behalf of all the railways against the measures with such effect

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that 40 per cent. of the voters voted against them; and they probably would have been defeated if the campaign had lasted a little longer.

THERE are, roughly speaking, two theories regarding the way the public relations of railways should be handled. Many men still think that the policy of seeking more or less secretly to manipulate and dominate politics is the only effective means of protecting large corporations against the attacks of demagogues and strike legislators. Many other persons, including most of those now prominent and influential in the councils of American railways, think that these methods are not only intrinsically wrong, but that they have forever lost their effectiveness, and that the only means by which railways can hope to establish and maintain in future satisfactory relations with the public and regulating bodies is, first, to try to give the public everything in the way of service and rates to which it is entitled, and, second, to seek, by the dissemination of literature on railway subjects and by public appearances of their responsible officers before railway commissions and legislative committees to so educate the public and the regulating authorities regarding railway affairs that they will be disposed to give the roads a square deal. Mr. Athearn is one of those who oppose attempts at political manipulation and favor educational methods. The experience of the past five or six years shows that, regarding the matter from a purely practical standpoint, those who advocate these methods are right. The special committee on Relations of Railway Operation to Legislation has used no other methods; and it has done the most effective work ever done on behalf of American railways regarding public regulation. That these methods have not been more extensively and effectively used has been partly due to the fact that there are still many men of influence in railway affairs who have shown and still show incapacity to adapt themselves to the conditions that have developed in recent years. If Dr. Osler's prescription could be followed and a large number of these gentlemen could be quietly chloroformed the immediate future of the railways would be greatly improved. Another reason why educational methods have not been more extensively and effectively used is that the number of men adapted to using them who have been developed is inadequate. Mr. Athearn is one of these men; and it is too bad that when so few of them have been developed any of them should be leaving railway service. When a nation or any kind of business sorely needs a particular type of men in its service, and it cannot get them, or cannot keep them after it does get them, it is evident that there is something wrong with its organization or management. The railways of the United States have developed innumerable good and many great executives; but in handling their public relations, and in developing and keeping men capable of handling them, they have quite commonly exhibited a very remarkable quality of ineptitude.

WHILE the orders for rails placed during the past few weeks probably have not exceeded those of similar periods in recent years to the extent which those for cars and locomotives have, they are unusual for their size at this season of the year. Most of the larger roads have now placed their orders for the major portion of this year's requirements, although supplementary orders will undoubtedly be given when the needs and the business prospects for the year are more definitely determined. The orders already placed are much heavier than those of the same roads for previous years and are nearly double those of last year, indicating that the railways are spending more for maintenance this year than previously, and that they are turning their attention to the deferred maintenance as fast as their earnings will permit. The order for 200,000 tons of rails representing an expenditure of approximately $6,000,000 given a few days ago by the Harriman Lines, is indicative of the amount of money which is being spent for this one item, for while the order is probably the largest individual order so far, other systems are making purchases equally as large in proportion to their mileage. Aside from the size of the orders, the early placing of them is unusual and the proportion of the season's requirements placed on January 1 far exceeds that of former years. Last year the ordering of rails had scarcely begun at this time and the roads did not enter the market actively until early spring and summer. Contrary to the general rule, there has been no period of dullness this year between the completion of the 1912 rolling and the beginning of work on the 1913 requirements. Even then it will be impossible for the mills to roll all orders promptly and deliveries will be slow, in spite of the fact that they are exerting every effort to keep up with the output and are establishing new records in several instances. The anticipation of late deliveries has undoubtedly been a primary reason for the early placing of orders, but at the same time they would not have been placed had the railways not been optimistic regarding the outlook for this year. Another interesting feature connected with the orders placed so far is the increasing use of the new specifications of the American Railway Engineering Association. As these specifications were not formally adopted until the annual meeting in March of last year, it was too late for many of the roads to incorporate them with their orders, although the Rock Island and Wabash did adopt them for their 1912 orders. Among other roads adopting them this year with slight modifications in some instances are the Baltimore & Ohio, the Louisville & Nashville, the Erie, and the Atchison, Topeka & Santa Fe, so that the tonnage of rails rolled under these new specifications this year will far exceed those of last year.

THE COMMISSION'S DECISION ON WESTERN CLASSIFICATION NO. 51.

AFTER having suspended Western Classification No. 51 since February 15, last, the Interstate Commerce Commission has issued its opinion and report, a synopsis of which appeared in last week's issue, ordering the carriers to revise it and direct the future development of classification in accordance with the views expressed therein. The importance and detail technicality of the varied issues passed on by the commission in a report of over 100 pages preclude any satisfactory estimate of the effect on the classification as a whole. It would seem that the carriers have been sustained on the larger proportion of the items reviewed, but on the other hand, it is apparent that a great deal of the work that has been done looking to uniformity of classification will have to be done over.

That the commission has at least had an abundant opportunity for recognition of the magnitude of the task is indicated in Commissioner Meyer's opinion. The number of changes in No. 51 against which protest had been made was estimated at from 1,500 to 2,000 out of the thousands of items involved. After nearly a year of investigation he says, "Where the number of changes is as great as is involved in this one proceeding, it is apparent that no body of men can in a relatively short time give such consideration of each item as will enable them to express their conclusions with reference to each with that degree of confidence as to their correctness that would be desirable." Therefore, the commission says that it will hold itself in readiness to modify any of its conclusions or suggestions as soon as sufficient reliable information making such modifications just and proper may become available.

Undoubtedly one of the most significant features of the report is the declaration by the commission as to the necessity of affording wider publicity and fuller public hearings in connection with the future development of classification, and the recommendation that the classification committee submit proposed changes in smaller installments, giving ample public notice of hearings to interested parties, and inviting representatives of the interested state commissions and of the Interstate Commerce Commission, to participate in all such hearings with a view to avoiding in the future such unwieldy proceedings as the recent investigation.

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The commission says that in recent years there has been a tendency toward greater publicity in classification matters, and since the investigation was instituted the carriers have invited the Interstate Commerce Commission to send a representative to classification meetings. This should silence the critics who have attempted to surround all classification procedure in the minds of the public with an idea of mystery because the work has been done by representatives of the railways alone, taking no note of the fact that the shippers have been given every opportunity to furnish information and to state their views. The presence of a representative of the commission should give assurance that public rights are not disregarded.

It has become quite common for railway officers to suggest that various perennial controversies be referred to the Interstate Commerce Commission for arbitration, and the railways have got beyond the idea that they can settle such important questions as those involved in the making of rates and classification entirely among themselves. There is room for grave doubt, however, whether the participation of state commissioners would not operate to make an unwieldy proceeding of every item in the classification, to the extent of seriously interfering with the obtaining of satisfactory results within a reasonable time.

State commissioners are notoriously, perhaps necessarily, advocates of sectional views. A classification, and particularly one covering many roads, and a large territory, must be based on considerations of the requirements of commerce as a whole. The entire proceedings during the commission's investigation have demonstrated for the hundredth time that most of the difficulty encountered in all classification work arises from the impossibility of reconciling the selfish viewpoints of individual and sectional interests with the welfare of the entire shipping public, to say nothing of the requirements of the carriers.

The commission apparently intends to see that future work on classifications shall proceed in accordance with certain more definite principles than have prevailed in the past. This is seen in its suggestion that in future items or groups of items be published as fast as they are disposed of by the classification committee, and that a record be made which may form the basis for an investigation by the commission. It is extremely doubtful if the necessity will ever arise for the suspension of an entire classification at one time again.

BOX CAR DESIGN.

A VISIT to a large freight car repair plant, and particularly to that part where the greater proportion of the box cars are repaired, is most instructive. From the maintenance standpoint the greatest difficulty has undoubtedly been caused by troubles with the draft gear, and this largely because of the manner of fastening the gear to the draft sills and the lack of strength in the sills themselves. On the more modern cars with steel underframes the trouble has been quite largely overcome, especially in cases where draft gear of larger capacity than standard has been introduced. A number of roads are applying steel sills or steel draft sills to old box cars when they pass through the shops for heavy repairs and where the condition of the other parts of the car is such as to warrant this expenditure. That the results obtained are satisfactory is indicated by the increasing numbers of such cars which are being so equipped on roads which have gone into the matter extensively.

Another weak point which is most noticeable at the repair tracks is that of weak box car end construction. The standard construction on cars built until comparatively recently was to use a light inside lining and the standard outside sheathing fastened to the wooden end and corner posts, thus making the end only a very little stronger, if any, than the sides of the car. This gave trouble in two ways—it did not provide adequate resistance to prevent the lading from bursting or bulging out the ends under the severe shocks met with in shifting the cars, or even in rough service on the road; also, combined with poor draft gear attachments and badly designed end sills, cracks and openings developed which were responsible for considerable losses due to the leakage of grain and similar commodities. In many cases the end of the car may appear to be tight and leakage-proof when standing still, but the vibrations during transit open up the cracks and allow the grain to leak out. Many provisions have been made to reinforce the ends to prevent this. The end construction used on the Santa Fe box cars was illustrated on page 959, of the April 26, 1912, issue of the *Railway Age Gazette*. In this case a ⅜ in. steel plate is fastened to the end sill and extends up under the sheathing. A heavier inside lining is used than is the common practice, and the sheathing is bolted to the frame and held by clamps. A reinforced box car end used on the Central of Georgia was described in the issue of May 10, 1912, page 1035, and the end on the Canadian Pacific cars with an outside steel frame was illustrated in the issue of May 10, 1912. A recent development which gives considerable promise is the all-steel end. Two different types have thus far been placed on the market, one in the shape of a heavy steel plate, corrugated with concentric rings; the other type used on the New York Central & Hudson River is illustrated elsewhere in this issue. The advantages of such ends are increased strength, no leakage and greater inside length of the car because of the elimination of posts, inside lining, etc.

That the side doors can be made burglar, cinder and waterproof was demonstrated in the second article in the series on "Defective Box Cars and Damaged Freight," which was published in the April 19, 1912, issue of the *Railway Age Gazette*. The past year has witnessed a marked improvement in the practice of applying side doors to box cars, both in the building of new cars and in the repairing of old ones. As in the case of box car ends there has been a tendency to develop doors of all-steel construction, although only a few have thus far been placed in service.

One of the most troublesome problems in box car construction is the roof, which should be maintained in a leakage-proof condition. Since the publication of an article on this subject in our issue of May 3, 1912, more and more attention is being given to this part of the equipment. The practice of submitting the roofs to leakage tests before assigning the cars to certain classes of service has been given more consideration, as has also the realization that the railways must do their part in systematically attending to the maintenance of the roofs, if satisfactory results are to be obtained. There is also a tendency to place the different types of roofs in comparative service in new orders of cars and in sufficient numbers of each kind to permit of a fair comparison being made. The stresses to which a box car roof is subjected, even with the strongest of framing in the body of the car, are such that it must be given a reasonable amount of attention when it is placed in service, and must not be practically neglected as is commonly the case on some roads.

It is rather surprising, when we consider the comparative ease with which experiments can be made to determine the relative frictional resistance of trucks on the track, that more attention has not been given to this subject. The American Steel Foundries retained Prof. Endsley, of Purdue University, to determine the relative resistance of square and loose trucks a couple of years ago. It seemed advisable to extend the investigations made at that time still further, and the results of a second series of tests are now being made public and are presented in abstract elsewhere in this issue. They indicate that better truck construction and more attention to the mating of wheels and other details are necessary if we are to secure the best results from operation. Every effort is being made to develop as powerful locomotives as possible within the limitations of clearance and weight of the different roads. If by more attention to the car truck construction it will be possible to reduce the train resistance an appreciable amount the demands upon the locomotive will be reduced in the same proportion. It is difficult to estimate exactly what expenditure would be justifiable in improving such

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conditions, but it would undoubtedly be a large one, for it would not only permit more cars to the train for the same locomotive capacity, but would probably also be responsible for a considerable reduction in the cost of maintenance of the equipment.

CRIMINAL INDICTMENTS OF RAILROAD OFFICERS.

A DOZEN railroad officers, an engineman, a brakeman and a lot of directors are now awaiting trial in Connecticut, New York and Indiana, charged with being criminals. The president of the New Haven road and the president and chairman of the Grand Trunk are accused of breaking the anti-trust law, and the others of manslaughter, or worse, in causing deaths of passengers. Mr. Mellen and the Grand Trunk officers, if they committed the crime charged, did it directly and personally, and the same probably is true of the engineman and the brakeman on the Cincinnati, Hamilton & Dayton; but in the case of all of the others the supposed crime is of a pretty shadowy nature. The legal representatives of the state propose to punish these officers and directors for misconduct or neglect which was participated in by many others; for acts, decisions or omissions which are made criminal only by legislative or judicial fiats, the real effect of which is uncertain until the lawyers have thrashed them out in court.

We do not propose to discuss the merits of these indictments, or of the laws under which they have been made; but, by way of preparing for the next stage of these proceedings it will be of interest to glance for a moment at the conditions which have led up to this unusual situation.

A grand jury is bound to find probable cause; but the members, in dealing with numerous questions of the application of statutes, must of course, be guided by the state's attorney. State's attorneys are supposed to prosecute only where they see a reasonable prospect of being able to secure conviction. But as even the Supreme Court of the United States is often said to be guided by changes in public sentiment, it is to be expected that these prosecuting officers will be sensitive to public opinion, especially where their own tenure of office depends on a popular election. And public opinion nowadays manifests itself in queer ways. In Massachusetts and Rhode Island the people (if the newspapers truly represent the people's views) desire to punish the Grand Trunk—which, surely, desires to get from those states all the traffic that it can, even at the very low rates which it must give, in competition with lines more favorably situated—for trying to find an economical way of carrying out its purpose; a way more economical than to build from 100 to 250 miles of road at a cost of 15 to 25 millions, when all of the prospective traffic must be carried at extremely low rates. In arguing against permitting the Grand Trunk to use Boston & Maine tracks Governor Foss, of Massachusetts, says: "A railroad which must create traffic over its lines to pay cost, upkeep and expenses, affords to the public the benefit of real facilities and real competition. A traffic agreement, by its terms, destroys this competition and makes sure the absence of these facilities. It leaves traffic to go, as formerly, over the existing lines, which the railroad controlling the traffic must pay for and support." In other words, to make a carrier compete energetically with others, compel it to maintain a costly and measurably useless plant.

And these New England states, aiming apparently to punish a wrong spirit rather than to secure economical transportation, seem to have convinced Attorney General Wickersham that to refrain from making a wasteful expenditure is a crime. With the Interstate Commerce Commission and five state commissions empowered to regulate rates—or, at all events, to use their ample powers of investigation, argument and criticism to expose every unjust rate—with these six semi-judicial bodies constantly "on the job," the only way that we have found to settle this purely economic question is to threaten three railroad officers, two of them subjects of the King of England, with imprisonment!

To some people the Federal indictment at New York looks as though the prosecutors were satisfied to hit anywhere, the discovery and description of the essential and important offense being immaterial. The Connecticut charges against the officers of the New Haven road, in connection with the Westport derailment, are even more awry. As to the danger of short crossovers, where adequate fixed signals are provided for the protection of trains, and the culpability of officers who are slow in the construction of long crossovers, the wildest anti-corporation lawyer would scarcely think of calling such officers criminals—except for the benefit of the galleries. Failure to make passenger cars fireproof, or to provide a larger force of trainmen or porters, may be things for which a railroad management deserves to be called to account, but, if prosecutions for manslaughter are the proper instrumentality by which to do this, the lessons of the past must be all wrong. The cause of the Westport derailment was the failure, incompetence, mistake, neglect or sickness of the engineman. Insofar as the selection, promotion or discipline of the engineman had been improperly managed some officer or officers should be held to account. But to get at the real issue by prosecuting Messrs. Horn, Pollock and Woodward as criminals, to the exclusion of other officers, is as illogical a dragnet proceeding as could be imagined.

The indictments against the officers and directors of the Cincinnati, Hamilton & Dayton are based on the alleged neglect of the company to comply with an order of the railroad commission to install automatic block signals; but since the action of the prosecutor it has been discovered that there was no such disobedience. Chairman Wood of the railroad commission has made public the orders issued by the commission relative to the installation of block signals on the road, and they show that the commission approved the manual block system in use on the line between Glenwood and Indianapolis until January 1, 1913.

But the point is that the block-signal order is not the real issue. With the improvement of the block signal system, probably this switch at Irvington would have been provided with additional safeguards; but misplaced switches sometimes cause trouble on lines equipped with automatic block signals. Should the settlement of the question whether a certain improvement shall be completed in 12 months or in 18 months decide whether or not a railway director should go to jail? The trial of the engineman and brakeman who are held responsible for leaving the switch wrong may make clear the whole situation in connection with the Irvington collision; but from the reports thus far published it appears that the neglect of the passenger engineman to watch for a switch light was a main element in the cause. This kind of neglect is not curable by prosecuting directors or officers for manslaughter; at least all efforts in that direction in the past have failed. It would seem to be the part of wisdom to try some other plan. Possibly the Indiana authorities have taken their present action because it is so popular nowadays to aim at the men "higher up," and because some of these men are so far away.

The present attitude of these public officers in New England and Indiana, and at Washington, is commendable in its purpose to put responsibility on the actual heads of the railways. The state should reach subordinates through the heads. Punishment of enginemen, conductors and brakemen in the criminal courts is very unpopular, to say the least. But if the state's control over the regulation of railroad tracks, switches and signals, and the management of difficult problems in discipline, cannot be exercised in any better way than by instituting these criminal prosecutions, the fact is a grave indictment of our whole scheme of railroad commissions. It is fifty years, more or less, since the English humorist pictured a railway director chained to the front end of the locomotive of an express train, as his idea of the way to prevent train wrecks; and it does not look as though that theory had made any progress, whatever, in the intervening half century. The prosaic and sane but persistent inquiries of the Board of Trade into railway operating questions, combined with the policy of holding the railways to rigid financial responsibility, are the instrumentalities to which the English attribute the

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great progress which has been made in that country in railway safety.

And, while the prosecuting attorneys are engaged in these erratic efforts in the criminal courts to promote the public good, the Interstate Commerce Commission, two and a half years after it received authority to investigate train accidents, presents in its annual report only one positive recommendation affecting safety, that calling for the requirement of the block system by law. (The recommendation that all passenger cars be made of steel is in the right direction, but the commissioners realize, as does every one else, that in this matter the government cannot do much; progress already is as rapid, probably, as it should be.) The rest of that part of the report dealing with safety is made up of generalities, and declarations of truths already well known.

NEW BOOKS.

Shop Notes. Edited by H. H. Winsor. 208 pages. 6½ in. x 9½ in. Illustrated. Bound in paper. Published by *Popular Mechanics*, Chicago. Price, 50 cents.

This is the ninth annual year book of the *Popular Mechanics* Shop Notes and is a collection of the articles published during the past under that head in the monthly edition of the magazine. It includes 595 easy ways of doing things in the several trades. The items are all original and are simple in construction, making it possible for a handy amateur to duplicate them. A complete index is given in the back of the book.

Diary of a Roundhouse Foreman. By T. S. Reilly. Bound in cloth. 158 pages. 5 in. x 7 in. Published by the Norman W. Henley Company, 132 Nassau street, New York. Price, $1.00.

The book is published in the form of a diary and gives in colloquial form the experiences and trials of the engine house foreman. The hero of the story is a young college graduate who is serving his apprenticeship and has endeavored to push his way to the top. Many suggestions are given for the diplomatic handling of men.

Density and Thermal Expansion of Linseed Oil and Turpentine. By H. W. Bearce, Assistant Physicist, Bureau of Standards. Technological Paper No. 9. Published by the Bureau of Standards, Washington, D. C.

This pamphlet has been prepared in response to a demand for a more complete knowledge concerning the physical properties of linseed oil and turpentine. Samples were taken from various manufacturers in different localities throughout the country. The apparatus and method of procedure used is thoroughly described, together with the results obtained and comparisons with previous tests. A good deal of the information is given in the form of tables of density, weight and volume as determined from the tests.

Coal. By E. E. Somermeier, Professor of Metallurgy, Ohio State University. Bound in cloth. 167 pages. 6½ in. x 9½ in. Published by the McGraw-Hill Book Company, 239 West Thirty-ninth street, New York. Price, $2.00.

The information is largely based on private notes, scattered general information, technical bulletins, and original papers in technical journals. The author has endeavored to keep in mind throughout the work the mechanical and power plant engineer, the chemical engineer and chemist, and the non-technical business man who has to do with the buying and selling of coal. The work is divided into 10 chapters, the first dealing with the composition and heating value; the second with the chemical analysis; the third, fourth, fifth and sixth with the testing of fuel; the seventh and eighth with the improvement by washing and the general purchase of coal under specifications; the ninth thoroughly discusses the method and theory together with the results obtained through gas analysis by the Orsat apparatus; the tenth chapter is given over to analytical tables, giving the composition of various kinds of coal found throughout the United States. The book contains a few diagrams, clearly illustrating the various methods used in the testing of coals.

Letters to the Editor.

"BASING POINT" RATES.

LONDON, December 16, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

"One man's meat is another man's poison." It may interest American students of railway rate questions to know that in the General Manager's Report on the South African Railways for the year ending December, 1911, there is a section headed "American Rates." "There appears," it says, "to be an idea entertained by certain members of the mercantile community that the adoption of what are known as 'basing point' rates would meet the requirements of the country and facilitate its development . . . better than the present system of distribution rates."

The report gives some account of the basing point system, and of the reasons which led to its introduction in the southern states; and declares that "the sparseness of the population in this country and the long distances between points of any importance are not conducive to the adoption of basing point rates." It further states that "it is doubtful," which is at least putting it mildly, "whether small towns, not of sufficient importance to be constituted basing points, would welcome a system whereby their goods would be charged higher rates than to the basing points." The general manager concludes as follows: "The present system of distribution rates is, in my opinion, better adapted to the conditions of South Africa than the American basing point system, which was introduced to meet local conditions of a unique character."

Managers of railways in the southern states who have to defend the basing point system against assaults from outside may be interested to see that in South Africa it is the railway management that resists, and the mercantile community that demands the introduction of the basing point system.

W. M. ACWORTH.

HEAVIER LOCOMOTIVES VERSUS GRADE REDUCTION.

NEW YORK, January 6, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

From the standpoint of a stockholder and observer of railway operation I would like to make a protest against the position taken by Mr. Bloecher in the issue of the *Railway Age Gazette* of January 3, page 8. It seems impossible to believe that any one would be willing to express the opinion that grade reduction always leads to cheaper operation than increasing the power of locomotives. This I understand to be the position taken by Mr. Bloecher. As I look at this problem each division and each grade needs to be considered independently and upon its own individual merits. Undoubtedly many cases exist in which cheaper operation may be obtained by cutting off the tops of hills, while many other cases exist in which cheaper operation may be found by increasing the power of the locomotives. In the interests of the public and the owners of railroad properties I would like to appeal for an individual study, such as is suggested by Mr. Beyer in his paper which was presented in abstract in your issue of December 13, page 1145. I hope the *Railway Age Gazette* will make clear to its readers the facts concerning decreased cost of operation which has been obtained on a number of railroads during the past two or three years through the introduction of more powerful locomotives. I believe the Delaware & Hudson, the New York Central, the Virginian, the Norfolk & Western, Chesapeake & Ohio, Chicago & Alton, and many other lines are in position to supply figures and facts concerning operation which will prove the statement made by Mr. Bloecher to be altogether too general and, therefore, unwarranted. I hope to see editorial comment on this subject in the *Railway Age Gazette*.

OBSERVER.

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GOVERNMENT REGULATION.

CHICAGO, December 24, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In the editorial in your issue of December 20, 1912, on "The Commission and Regulation of Operation," you make one statement which is prophetic, and that is: "And it will not be surprising if the future historian of our times writes that most of the regulation adopted hurried us along toward government ownership."

There is an excellent opportunity for the government to exercise its regulation of railways, not only to the extent of the operation, but by assuming the financial responsibilities, if it will take over either the Union Pacific or the Southern Pacific property at this time. This would be a means of carrying out amicably a ruling of the United States Supreme Court and give the government an opportunity to assume the full responsibility for the results of operation of railroad property, including the financial responsibility.

The Interstate Commerce Commission and the United States senators from each state through which the road operates should be made members of the board of directors. It is possible that by such a plan it could be developed whether government ownership is advisable, and it would also cause the Interstate Commerce Commission to hesitate in its regulations of railroads and impress upon it the due sense of its responsibilities.

L. C. FRITCH,
Chief Engineer, Chicago Great Western R. R.

TONNAGE RATINGS ON NEW AND OLD LINES.

CHICAGO, November 21, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

J. G. Van Zandt, in a letter in your issue of November 15, 1912, criticized some points in my article in your issue of August 23, 1912, on a method of finding tonnage rating for proposed as well as old lines.

The first point Mr. Van Zandt seems to object to is the use of averages. Practically all problems in economics are an application of general averages, especially in comparing two or more lines which are only on paper. We hope to find a train that will give an average performance over the line considered. The narrower the limits within which it must be worked out the more fortunate we are.

Bulletin 43 of the University of Illinois, compiled under the direction of Professor Edward C. Schmidt, is a very good presentation of the subject as applied to a given division. In so far as I am aware it is the most complete publication of the kind. But it must not be inferred from this that it is the only complete analysis of the subject, as a number have been made which have never gotten into print. Professor Schmidt's tests proved one thing conclusively, and that is that the best quality of maintenance is an economy, as it cuts down coal bills. The management of the road in question has improved the track standards, particularly as regards joints since that time. The truth of the matter seems to be that for speeds of 3 to 35 miles an hour, there will be no increase in resistance due to velocity unless the maintenance falls below a certain standard or the loading is not proportioned to the track structure. Since the days of Sir Isaac Newton it has always been customary to include a factor for velocity in all formulas if the problem involves the question of speed. It does not sound orthodox to omit it, but tests have shown that it has no place in this class of formulas for the highest degree of maintenance. In the beginning I think every investigator began looking for some function of the letter V, and was disappointed in not finding it. Tests made by D. E. Crawford on the Pennsylvania, A. C. Dennis on the Canadian Pacific, and those made on the Union Pacific which have been referred to by A. K. Shurtleff in various monographs on the subject fail to find a place for the letter V. These tests are much more numerous than those of Professor Schmidt, which included only 32 trains. They show the same fact that Professor Schmidt does, that for maintenance that is not exactly up to par, a wide variety of results are found. The most elaborate set of tests of this kind are those which have been made by R. N. Begien on the Baltimore & Ohio, the results of which will be published shortly by the American Railway Engineering Association. These tests prove the contention that for the present style of track and equipment the velocity does not enter into the subject for ordinary freight train speeds where the best class of maintenance is found. After mature consideration, the committee on Economics of Railway Location of this association, decided that the formula given in the manual of the association is correct for the comparison of different lines and preferred to use for that purpose a value for train resistance that is found in the best present practice. In the case of these tables I think it would be found that in comparing new lines (paper locations) the ratio between them will vary but slightly even if the Schmidt formula is used instead of four pounds per ton for speeds from 3 to 35 miles per hour.

I plead guilty to having used the method of computing available draw-bar pull recommended by the association and 11,000 B. t. u. Western coal as shown in the article. My reason for doing this was that I had never been able to run a dynamometer car on a paper location. On page 350 will be found the statement that a similar method may be used on old lines for tonnage rating. This was not gone into at length, but it would undoubtedly be better to use a dynamometer car to find what a certain class of engine is capable of doing on a given division, and also to ascertain the train resistance on that engine district also. This could be done for the four reasons with profit. The figures derived from this study can then be utilized for other schedules and loadings by the construction of tables and the use of a profile and train sheets which will give the time laid out for water, coal and passing stops.

The available draw-bar pull as computed from the tables in the Manual when 4,000 lbs. per hour of 11,000 B. t. u. coal has been used has not been found to give excessive results in my experience, although I have found that available draw-bar pull figured in this manner was less than the train resistance computed by the Schmidt formula for speeds in the neighborhood of 35 miles per hour, although there were records to show the train had been actually moved.

PAUL M. LA BACH,
Assistant Engineer, Chicago, Rock Island & Pacific.

THE MASSACHUSETTS COMMISSION.

BOSTON, January 4, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In the letter recently written to you I did not go into the regulation of railroads in Massachusetts at any length and shall not now, but I would like to make it clear that the keynote of regulation through the initiative by a railroad commission is the physical condition of the property and its upkeep. On rates and fares it should not act of its own volition, but wait for complaints and petitions, and in the first instance should not have much to say on operation, excepting as affecting safety. The fact is the railroads here had for years been "milked out" right under the eyes of our board, and Mr. Mellen and Mr. Van Etten (of the New York Central) inherited these skeletons. The railroad and street railway managers have always insisted, and still do, that the board should not use its initiative, and it has always coincided. I agree that the board's decisions have been of a very high order, where it has acted, but lack of action on its own initiative, as our laws said and intended, has been the trouble, and this is what must be remedied now. A people not strong enough to enforce its laws is not competent to own or operate or manage. The governor's notion of divided management, through state directors, is nonsense; we have tried that here on several roads and it worked just as it would again. Every one of us here who knows the "inside" knows that what is needed is a strong commission compelled to obey the laws. I believe you will soon see this brought about. JOHN H. CARTER.

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MECHANICAL TRANSFERENCE AT FREIGHT TERMINALS.*

Essential Principles Which a Successful System Must Fulfil and Extent to Which Various Types Comply with Them.

By H. McL. Harding,
Consulting Engineer, New York.

There are three great principles in freight handling which any machinery must possess to fulfil all terminal conditions. These constitute the touchstone by which any machinery should be tested to determine its value. First, the machinery itself should be able to serve every cubic foot of space which is to be utilized. Second, the machinery should do this without any rehandling by manual labor. Third, there should be continuous rapidity.

The first principle signifies that the machinery should be able to transfer and to raise and lower freight over any portion of a designated terminal space, to distribute it to designated consignment piles and to tier it. The whole space, vertical as well as horizontal, should be served.

The second principle stipulates that the load must be raised from the floor by the machinery and not by manual labor. When it reaches its destination, it must be placed upon the floor or tiered to the desired height by machine power. If two extra handlings or rehandlings are required the economy of the mechanism is lost, as each rehandling averages in cost from 15 to 20 cents per ton, depending upon the bulkiness of the freight. The familiar traveling shop crane will fulfil these first two requirements most successfully. It will raise, transfer, lower or tier anywhere within its parallel side tracks without manual labor for rehandling. Also little floor space is necessarily left unoccupied. However, there is a third condition which the shop crane does not fulfil and which is vitally essential to terminal work. This is continuous rapidity of movement without delay or congestion. By continuous rapidity is meant the following of one load after another so successively that there will be no delay at the starting point and no congestion during transit or at the receiving end. This can be best attained, or possibly can only be attained, by a threefold division of the transporting mechanism into tractors, trailers and containers. A tractor corresponds to the locomotive, the trailer to the freight car, and the container consists of flatboards, slings, nets, hooks, light trucks or even hand-trucks containing or holding the freight or articles to be transported.

By applying the above simple principles to any new proposed freight transferring mechanism, possible mistakes may be avoided. The vertical movements are often of more value than the horizontal.

FREIGHT MOVEMENTS.

Before referring to the adaptation of any type of mechanism, the terminal freight movements or operating conditions may be briefly described. At the outbound station these movements are the receiving, inspecting, assorting, scribing, starting, calling, weighing, routing, distributing, checking, stowing and rechecking. At the inbound, they are "breaking down," inspecting checking, routing, distributing, assorting, tiering, re-checking, and later, delivery to drays. At transfer stations the movements are principally between different cars, with the inspecting, checking, routing, distributing and stowage. Often the outbound, inbound and transfer are combined at one station, with a combination of the above operations. As far as possible, transfer stations should be removed from the centers of cities where land is of great value, thereby often partially relieving the congestion at the inbound and outbound stations. At transshipment sheds, the movements are between the ship's hold or the side of the pier, to or from any portion of the pier shed and the cars or the warehouses, with the usual operations of distributing and assorting. It is often necessary to serve the second or third floors and to open storage yards for coarse freight.

The operations of assorting and distributing are controlled by the number of consignments or separate shipments. The greater the weight of each consignment, the heavier the individual loads. In outbound freight, destination subject to classification may assist in increasing the weight of the separate loads from platform to cars, provided the weighing of individual consignments does not prevent.

The average weight of separate consignments at Boston is given at about 1,000 lbs.; at the New York Central and Erie stations in New York about 800 lbs.; at Providence, R. I., 1,000 lbs., and at Worcester, Mass., 1,600 lbs. The destination weight at Providence and Worcester doubles these weights. From figures at various freight stations it may be assumed that the average weight of miscellaneous or package freight is about 1,000 lbs. per consignment. It will be far heavier at stations where the manufactured products are of metal, as at Pittsburgh, and less where they are of wood, as at Grand Rapids. The heavier the individual consignment, the fewer the trips and the less the cost per ton.

The bulkiness of consignments, unless trailers are used, will also greatly increase the cost per ton of transference. A case of hats, 5 ft. x 5 ft. x 4 ft., weighing only 100 lbs., may occupy all the space of an individual container, necessitating twenty trips per ton. With four trailers, five trips would be necessary, costing but one-fourth.

At steamboat terminals, the weight of consignments generally averages far greater than the above. For outbound steamship freight, little or no attention is paid to consignments, the stevedore stowing according to the character of the goods—heavy material below and light material above, also, as to safety of stowage and avoidance of injury to fragile materials. Inbound cargoes must be distributed according to marks and cross-marks, and are frequently assorted not only according to the shipments, but according to the grades. In one case when the labor cost for outbound was $0.36 per ton, the inbound was nearly $0.40.

ASSORTING AND DISTRIBUTING.

Wherever possible the assorting should be done at the beginning of the movement, so that the distribution can proceed rapidly without interruption. As the machinery should be able to distribute to every cubic foot of space which it is desired to serve, the comparative value of different types of machinery should depend upon the extent of this cubic service, and this can be used as a unit of value. It is evident that the assorting and distributing must be performed correctly to fulfil the third principle of continuous rapidity. Tracing the movements of outbound freight may best illustrate the necessity for this third principle in mechanical freight handling.

At two outbound stations in New York City where about 700 tons of miscellaneous freight are handled by each daily, and two-thirds of this after 1 p. m., the receiving platform being in each instance less than 300 ft. in length, the operations are as follows:

As the freight is received from the dray it is assorted by the drayman, assisted by a man furnished by the railway, into separate piles on the floor, according to consignments. At one end of the platform groceries are chiefly delivered; another location is reserved for dry-goods, and others for different classes of shipments. This greatly simplifies classification. The average weight is somewhat less than 1,000 lbs. per consignment. As soon as the drayload is received, it is inspected by the receiving clerk, receipted for, placed on hand trucks, taken to the scales which are tared for the hand truck at 165 lbs., called

*Abstract of a paper read before the Western Railway Club, Chicago, on November 19, 1912.

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out, routed, checked, distributed to the proper cars and stowed, after which there is the re-checking upon the return of the truckman.

In some cities, the trucker enters the cars; in others he deposits his load at the car door for the stower and immediately returns with a waiting empty truck. This latter method avoids the truckman waiting while his truck is being unloaded, and reduces the number of truckers far more than it increases the number of stowers. The movements at the inbound house are similar, only in the reverse order. In either case only one consignment, or rather a portion of each consignment, is carried per trip, the load averaging about 250 lbs., or one-fourth of each consignment.

The movements at transfer stations are simpler, there being no weighing and no transferring first to the piles, although the piling was the earlier method. Distributing may be regarded as the chief operation. At the transfer station at Mantua, where the freight was originally assorted into piles in the transfer station and then transferred to the cars, the cost was $0.40 per ton above what it is now where the freight is trucked directly from car to car. It is not advisable to transfer to large trucks to obtain a large load, as the cost will be excessive, due to the rehandling.

When the inbound, outbound and transfer stations are combined into one, it may at first appear more complex than it is. Not only must any machinery be able to perform all the above movements to be successful, but it must accomplish them simultaneously with the greatest possible rapidity, consignment following consignment continuously, without delay or congestion.

TYPES OF MACHINERY.

The types of machinery, to which reference is here made, are those which pertain to miscellaneous or package freight, which must be moved quickly and which at present is largely moved by hand trucks. These machines consist of moving platforms, slot conveyors, portable conveyors, tiering machines, link belt conveyors, rubber belt conveyors, overhead chain and hook carriers, ramps; horse, motor, and derrick trucks; winches, elevators; cranes, such as the fixed jib crane and pillar cranes, or the movable cranes, as the gantry, walking, or traveling shop crane, transporters, overhead carriers, telphers, mantrolleys, transfers, and many others.

The general construction of the movable crane consists of a jib which can be raised, lowered and swung in a circle, a hoisting motor for raising and lowering the loads, and a traveling motor by which the whole crane can be moved. These are called gantry cranes, and are of the whole or half-arch type. There is generally a separate motor for each movement.

The traveling shop crane is not much used in freight handling, although there is a good example at the Texas City Terminal near Galveston. (See *Railway Age Gazette*, July 12, 1912.)

Applying the three principles to the platform, slot, link belt and those similar, it will be seen that in reference to package freight they fulfil the third condition as to continuous rapidity most successfully, but they fail in respect to the first condition of serving all cubic space and the second condition of rehandling. They are, however, exceedingly well adapted to moving bulk material or when the packages are of uniform size.

Winches, where there are several, may partially fulfil the third, but not the first two principles. Ramps are excellent for the purpose for which they are designed, but are not adaptable to the first two conditions, and the same is true of chutes. Overhead chain hook carriers and transporters of the usual form will also accomplish the third condition only. The traveling shop crane is a perfect adaptation of the first two principles only. The traveling half-arch gantry, as well as other movable jib cranes, are excellent within a very limited range for the first and second principles at certain steamship terminals. As to many of the other types, the principles can be readily applied without experiencing any difficulties. Floor space should not be occupied for freight transference where it can be avoided.

Attention is called to the latest types, especially those used at German and English terminals. These devices consist in overhead trackage and transferring and hoisting machinery. There are two leading types which will be described. The power is electricity, preferably of direct current of 250 or 500 volts. In one type, the overhead tracks consist of an I-beam supported from the structure of the building, or if outside, upon bents. Upon this I-beam, with an intervening strip of wood between, is placed a T-rail upon which the conveying mechanism travels. In the other type, the rails are placed upon the lower flanges of the I-beam; although this type has many uses, it is somewhat more difficult to serve the whole area between the fixed side tracks.

The whole of the main side-trackage in the sheds is fixed in a permanent position; but the cross trackage is fixed or movable, being attached to a traveling crane when movable, and is so arranged that the hoisting and transferring mechanism can pass from any point of the fixed side tracks to the movable cross track, and then upon the fixed track on the other side, and thus complete the circuit of the movements.

At the rear or sides of the buildings, the overhead track is in the form of a fixed closed loop which connects the different sheds and warehouses. By means of this loop the car platforms and open space to the rear of the sheds and warehouses can be served. Coarse freight and barrels can be placed in this area, and freight can be transferred between the stations or vessels and the cars.

This conveying mechanism consists of a transfer-tractor which draws after itself from one to four trailers, each trailer supporting an electric hoist. This transfer-tractor constitutes the traveling conveying mechanism, having a speed up to nine miles an hour with its complement of trailers and six tons of freight. It is controlled in the same way as an electric trolley car, by a transfer man in the transfer-tractor cab operating a drum controller, the current being taken by a contact wheel from a wire or other conductor located parallel to the track in the most convenient location, or in some special cases by a storage battery attached to one of the trailers.

Each trailer has suspended beneath it an electric hoist, which might be called a traveling electric winch. It has all the functions of the winch except that it is movable. The normal load of each hoist is two tons at a speed of 60 ft. per min., with a reserve capacity of 50 per cent. Two hoists combined can lift four tons. One ton would be hoisted at a speed of approximately 120 ft. per min. The three hoists would, therefore, have a combined capacity of six tons, not including the reserve. The hoists are also equivalent to traveling elevators. This conveying and hoisting machinery contains no new mechanism, and can be furnished by a number of manufacturers. The transporting machinery consists of two essential features—one mechanism which conveys, and another which hoists, and this mechanism is able to transfer the freight with one conveying movement.

Unless it is too large, each hoist takes only one consignment, so that there are at least three or more consignments hoisted and conveyed at a high rate of speed. All of these are under the charge and direction of one transfer man; and also as the goods are already assorted as described at the outbound platform, no later assorting or only a limited amount will be necessary. In order to obtain a greater load for each hoist, it often happens that there can be assembled on each flatboard or in each net, sling or other container many goods of one consignment. At inbound stations, when the goods reach their destination they are either left upon the flatboard or in slings in separate piles, according to the marks, or else are lowered, each consignment being kept by itself, upon the inbound platform if a drayman should be waiting or expected. This leaving the freight in slings has been adopted at several important terminals, so that when the load is ultimately wanted no manual rehandling will be required.

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If the freight is to be delivered to cars, it is either transported directly to the designated platform of the cars, or if there are no cars to receive it, it is placed where it can be held in the containers until their arrival.

The speed of hoisting with average loads is about 100 ft. per min., and the average speed of conveying, 900 ft. per min. The average load under the usual operating conditions of separate shipments is about 1½ tons per train, although the tractor and hoists have a normal capacity of six tons, and a total excess capacity of three tons additional, making a possible nine tons. A large consignment of many tons can be divided between the different trailer-hoists. To make a complete cycle, that is, hoisting the load about 20 ft., traveling 500 ft., lowering 20 ft., hoisting 20 ft., again returning 500 ft. and lowering 20 ft., it is estimated that about 20 trips per hour per transfer train can be made, that is, 30 tons per hour per train. Five trains would, therefore, transfer 150 tons per hour, the assorting being accomplished by means of the trailer hoists. Four times this amount can be transferred if the rated capacity of the hoists can be utilized.

The number of trains can be increased, operating upon the same or different loops, thereby attaining the greatest possible capacity. Should assorting not be necessary, as with cargoes of cement and iron, with few separate consignments or marks, this capacity per hour can be greatly increased with the same number of trains. The tracks are so laid out that the transfer-tractors and trailer-hoists can be concentrated upon any of the loops in any of the sheds.

It is essential for rapidity and to avoid congestion that the transporting mechanism should not wait for its loads, so that if the flatboard or other container be delayed, there is no loss of tractor time; also that one unit of power tractor can be attached to one or more units of carrying capacity. This gives a freedom of movement which can never be attained where each power tractor is permanently attached to its own carrying container.

COST OF INSTALLATION.

The transferage overhead runway, which should be made part of the shed structure, will cost the same as the other structural steel, varying with the price of the steel. The weight, including the brackets, etc., will average about 60 lbs. per lineal foot. This steel would be fabricated at the mill and erected simultaneously with the shed or warehouse.

There are various ways of computing the cost of train and track installations. One of the most satisfactory is to figure out the cost of serving a certain number of square feet of area or cubical feet of space, including a certain tonnage to be transferred within a specified time. There is also the cost per lineal foot of connecting the areas to be served. By knowing the weight of the structural steel and its cost per ton, the cost of the trackage can be closely estimated. As the sections of a terminal are developed they will be connected by overhead runways, so that the same transfer tractors and trailers can be used upon different sections.

Although the cost of transferring freight will largely depend upon its character, that is, upon the relative proportion of its bulkiness to its weight, the actual cost of hoisting and transferring should not average more than six cents per ton for a complete cycle. This does not include the expense at each end of each movement before the hoist hook is attached, and after the load is deposited, which on the average should add from six to eight cents additional.

The six cents for hoisting and transferring may be divided as follows:

Labor	15 per cent.
Interest and amortization	30 per cent.
Electricity	20 per cent.
Maintenance	20 per cent.
Incidentals	15 per cent.

It must be emphasized that all such figures must vary under different conditions or locations.

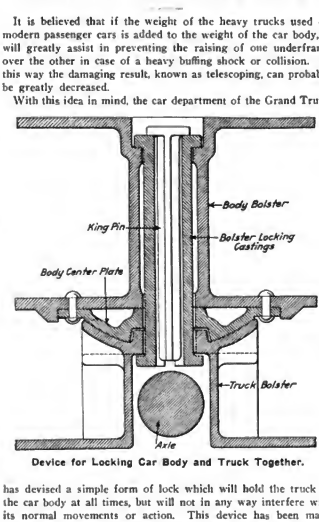
It is often desired to generalize upon the cost of machinery and its installation. To transfer a given tonnage of miscellaneous or package freight, say 1,000 tons per day, with a possible excess, at an outbound freight station of which two-thirds of this tonnage might be received within two or three hours in the afternoon, a capacity of 250 tons per hour should be provided. To be sure that there is ample capacity for contingencies and reserve, 30 carriers should be provided. This would mean that 10 tractors and 30 trailers or carrier-hoists, or 10 trains in all, corresponding to 30 motor-trucks would be required.

An investment of from $40,000 upwards would be required for these 30 carriers, and two-thirds of a mile of track, or about $1,300 per carrier, which includes the overhead trackage and the lifting as well as the transporting machinery. These figures are given as a close estimate for general guidance and may vary more or less, depending upon the specifications.

CAR AND TRUCK LOCKING DEVICE.

It is believed that if the weight of the heavy trucks used on modern passenger cars is added to the weight of the car body, it will greatly assist in preventing the raising of one underframe over the other in case of a heavy buffing shock or collision. In this way the damaging result, known as telescoping, can probably be greatly decreased.

With this idea in mind, the car department of the Grand Trunk



Device for Locking Car Body and Truck Together.

has devised a simple form of lock which will hold the truck to the car body at all times, but will not in any way interfere with its normal movements or action. This device has been made standard on that road and the Grand Trunk Pacific, and is being applied to a large order of new passenger cars now being built.

Reference to the illustration will show the form and appliation of the lock. It consists of two steel keys, with flanges at the top and bottom, of such a shape that they can be inserted in the somewhat enlarged center pin hole in the body and truck bolsters. Between them is inserted a center pin with ribs on each side that engage with the two keys and hold them in their proper position. When the center pin is inserted the flanges of the keys lap over the edges of the bolsters sufficient to prevent them from separating, while at the same time enough clearance is provided to allow the normal amount of free relative movement required in service. We are indebted to J. Coleman, superintendent car department, for this information.

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ROSWELL MILLER.

Roswell Miller, who died at his home in New York on January 3, belonged to the older generation of railroad executives to whom so much of the credit for American railroad pioneer work is due and who are out of sympathy with public interference with the right of a railroad manager to direct the affairs of his own company. Mr. Miller was president of the Chicago, Milwaukee & St. Paul from 1888 to 1899, and since 1869 has been chairman of the board of directors. He retired from the presidency because of ill health; but before this illness, his life had been a particularly active one and his work for the St. Paul of permanent importance. He was a naturally conservative man, reticent and self-reliant. Under his management as president little or no new territory was developed by the St. Paul, but the property was improved, intensively developed and raised to the first rank among the best managed railroads in the West. Despite the fact that the management of the St. Paul was in accordance with the older ideals of American railroad management, and Mr. Miller was a president who was not only able and willing to assume the entire responsibilities of the management of his property, but personally was wholly out of sympathy and resented public interference and advice, the St. Paul became, under Mr. Miller's guidance, a road that commanded to a rather unusual extent the loyalty of its shippers, and especially of the traveling public. In developing the physical property and in molding the organization of his officers and employees, Mr. Miller set his own ideals of service and discipline, and these ideals were high.

Roswell Miller.

Roswell Miller was born in Hartford, Susquehanna county, Pa., on October 28, 1843. He was the son of the Presbyterian minister of Hartford, and was one of a large family. His early railroad experience was on the Cairo & Vincennes, of which he was at one time secretary and later general superintendent. In May, 1882, he was made vice-president and treasurer of the Chicago & Western Indiana. He had valuable early financial training, having worked in the office of J. P. Morgan & Co., in New York. In April, 1883, he was made assistant to the general manager of the Chicago, Milwaukee & St. Paul, and in the following year the general manager's health failed and Mr. Miller was made assistant general manager, with much of the duties and responsibilities of the general manager's office on his shoulders. In April, 1885, the general manager died and Mr. Miller succeeded him. Three years later Alexander Mitchell, president of the St. Paul, died, and Mr. Miller was elected president, retaining for two years the general managership. In 1890 a general manager was appointed who took over a part of Mr. Miller's duties; but the development of the St. Paul and the success of its management were due directly to Mr. Miller up to the time of his ill health in 1899.

The extension of the St. Paul to the Pacific coast was in contrast to Mr. Miller's consistent policy of development of the existing property without extension during the time he was president. This Pacific coast extension was financed through the issue of stock, and when it became evident in 1910 that the St. Paul was failing to earn the 7 per cent. dividend that was being paid on the increased capitalization, Mr. Miller was one of the directors who first recognized and acquiesced in the necessity for reducing the dividend rate. His attitude in this respect was typical of the man. He did not believe in beating about the bush; he did not believe that there was any way of educating the public to the needs of railroads; he had little faith and less sympathy with the public, of which the politician was the spokesman and representative; he could see no object in hesitating to face the facts.

Refrigerator Cars in Europe.—A short time ago we gave some details regarding the actual extent to which refrigerator wagons are being used in France for the conveyance of foodstuffs and other perishable merchandise, from which it was apparent that as regards both the number of these wagons in service and the extent to which they are employed, cold storage transport on the railways was capable of great developments. In a recent issue the French newspaper *Le Journal des Transports* took the consignors to task for not making greater use of refrigerator cars. The French railway companies have done everything in their power to develop this form of traffic. All the lines have a special tariff, which gives the owner of a private refrigerator car a reduction of 10 per cent. on the ordinary rates for carloads of roughly five tons. In view of the fact that such perishable merchandise as fruit and flowers is likely to fetch a higher market price when transported in this way, it is a little difficult to see why the benefits of this tariff are not being made use of to a much greater extent than is actually the case, especially as a very large proportion of the traffic in this form of merchandise is of the long-haul order. For instance, there is a very important and steadily increasing fruit and flower traffic between the Riviera and Paris, while the English, German and Swiss demands also increase year by year. Conservatism is probably at the root of the matter, since by far the greatest use of refrigerator cars is made by consignors of meat, fish and dairy products, while the consignors of fruits and early vegetables disdain their use, according to the report submitted by M. E. Bougault at the recent International Cold Storage Congress at Toulouse, France.

Railway Extension in Russia.—The committee for new railways in Russia, after investigating plans, has decided to recommend the construction of a railway from Lodz to Lenchitza, passing by way of Alexandrov, Egerzh and Ozorkov. At the same time the committee examined plans for the construction of various electric tramways in the district of Lodz.

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TWO CONFLICTING THEORIES OF VALUATION.

Valuation Must Be Based on Market Value or on the Amount of the Investment. It Is Not Based on a Combination of the Two.

By Halbert P. Gillette,
Appraisal Engineer, Formerly Chief Engineer of the Washington Railroad Commission.

No one who has given much thought to appraisals can fail to have reached the conclusion that the *object* of the appraisal must be known before the problems can be correctly solved. If the object is rate regulation, we have still to consider the fundamental theories of rate regulation before we can safely attack all the appraisal problems. There can be only three theories of rate regulation, which the writer prefers to designate by the following terms:

1. Competitive theory.
2. The agency theory.
3. The combined agency and competitive theory.

Under the competitive theory the rates of a public service company are assumed to be regulated by the law of supply and demand acting under competitive conditions. This does not imply that there shall be actual competition. The competition may simply be potential, as when a shipper of freight by rail may be free to ship by water, or as when a user of electricity for light may be free to use gas or kerosene. Competition is still potential, and often of enormous force, even where there is no substitute for a given service in a given locality, for the user may move to another locality where lower rates prevail. There is also the potential competition of other companies who may come into an existing field where rates are high. Finally there is often severe competition for the markets of the country, as when the lumber of Oregan and Washington competes with the pine of the South, thus affecting freight rates of railways serving those districts.

In the competition of different things and of different markets—potential as well as actual—we have had a powerful and automatic regulator of rates. The potency of such competition has been far greater than is commonly believed. But this is not a subject pertinent to the present discussion. It suffices to call attention to the fact that the competitive theory of rate regulation has been until very recent years the predominating theory in America. And its past influence upon our minds has been so great that only by an effort can we free ourselves from its coerciveness when we approach problems of rate making based upon a theory that is wholly different. According to the agency theory of rate regulation, every public service company is an agent of the public, delegated to perform certain services and to collect payment therefor. Webster defines an agent thus:

"One who acts for, or in the place of, another by authority from him; one intrusted with the business of another."

Because a public service company is regarded as an agent, it may exercise the power of eminent domain, it may be required to make a periodic accounting of its stewardship, it may be required to limit its rates of charge for service, it may be protected against competition, it may be required to act in harmony with other public agents. It is always subject to control and to protection. According to the combined agency and competitive theory, an attempt is made to regulate rates in part by competition and in part by direct control. This is the present theory—a mongrel growth that marks the evolution from the competitive theory to the agency theory.

Every appraiser must adopt one of the three theories of rate regulation, whether he does so consciously or unconsciously. If he adopts the competitive theory of rate regulation, then a public service property is worth only what it will earn. In brief, its total value is its capitalized present net earnings plus or minus the present worth of any increment or loss in future annual net earnings. This is commonly called the "commercial value" of a property; and there are those who stoutly contend there is no other value. If we grant their tacit premise that competition is the only rate regulation, we must grant their conclusion that a property is worth what it will earn. But the moment we deny their premise, their conclusion is destroyed.

If the appraiser adopts the agency theory, the value that he seeks is the *investment value*, or more briefly, the investment or actual cost. An agent is certainly entitled to be recouped for all investments made in behalf of his principal. And it is equally certain that he is not entitled to receive payment for "values" not represented by actual outlay of capital on his part. Thus, if an agent buys copper at 15 cents per pound, and if it subsequently rises to 20 cents, the principal and not the agent should be the gainer by the increment in value.

In brief, then, the agency theory commits an appraiser to the policy of ascertaining the actual investment made by the agent, which investment is the "value" for rate making purposes. In such cases an appraiser follows what may be called the historical method of estimating the cost of reproduction of the property. He seeks to ascertain exactly what the public service company did to construct the given plant, and he estimates what it would reasonably have expended to create the plant and to develop its existing business. He checks his estimate against the available accounting records, or vice versa.

The appraiser who follows the agency theory is concerned with the past. His criteria are weighted average prices of preceding years and the accumulated deficits in fair return.

On the other hand, the appraiser who follows the competitive theory is concerned only with the *present* and the *future*. His criteria of value are present prices and present net earnings modified by the prospects of future change.

Having briefly stated the radical difference in these two theories, let us tabulate some of the more important appraisal corollaries that flow from each theory:

Agency Theory.	Competitive Theory.
1. Piecemeal prices allowed for piecemeal construction.	1. Only wholesale prices allowed for extensive work.
2. Weighted average prices of past years allowed.	2. Present prices, or those that may be expected in the immediate future, are used.
3. All work actually done by the company is appraised; e. g.: (a) Clearing rights of way as they existed at the time of construction. (b) Taking up and relaying pavements in streets, where it was actually done. (c) No allowance for increased value of a "seasoned roadbed" where nature has effected the solidification. (d) Pioneer surveys and other expenses necessarily incurred in pioneer days allowed.	3. Only that work that would need to be done today to produce an equivalent plant is appraised; e. g.: (a) Clearing rights of way as they exist now. (b) Taking up and relaying pavements necessary to duplicate the plant today. (c) Allowance for "seasoning" regardless of its cause or actual cost. (d) No allowance for pioneer costs now that pioneer conditions no longer exist.
4. Development cost calculated by ascertaining the actual residual deficits in fair return.	4. Franchise value calculated by capitalizing the annual net profits that may reasonably be expected.
5. No allowance for increment in values of land purchased for rights of way.	5. Allowance for all increments in land values.
6. No allowance for investments in property not now in use, or for losses in economic value.	6. No allowance for investments in property not now in use, nor for losses in economic value.

We might enumerate many other appraisal divergencies that occur in consequence of the two divergent theories of rate regulation, but the foregoing will suffice to make clear not only the fundamental difference of the two theories, but also the

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rarity with which either theory is completely followed by appraisers, by commissions or by courts.

The writer maintains that, before we can ever emerge from the present jungle of contradictions in public utility appraisals, we must not only recognize the existence of these two theories, but we must decide exactly to what extent the one or the other theory shall be adopted. Possibly for the present we must continue to use a combination of the two theories, in order to tide over the present transitional period of rate regulation; but ultimately we must adopt the agency theory in its entirety, for we cannot continue to subject public service companies to strict control without giving them perfect protection from competition of all sorts. The rise or fall of prices paid for materials or labor is itself the effect of competition of one sort or another, and such a change in prices is beyond the control of the agents of the public, i. e., the public service companies. How preposterous, under the agency theory, it is to appraise a public utility during an era of low prices, such as we have just experienced, and to apply those low prices to materials that were actually purchased during normal years!

Yet this result is precisely what is prescribed by the public service laws of certain states and even by a decision of the Supreme Court. Equally preposterous, under the agency theory, is it to apply wholesale prices to a plant that was necessarily built piecemeal. Nor is it one whit less objectionable to go to the other extreme and pay a public service company for the taking up and laying of a pavement that did not exist when the company built its plant. All these are preposterous appraisal acts, if the agency theory is adopted as sound.

Subconsciously certain appraisers and certain important commissions have been working toward the agency theory of appraisals, for if we study their findings we see that the findings correspond with nearly all the conditions above tabulated under the agency theory. In fact, the Wisconsin Railroad Commission may be fairly said to have come to almost complete adoption of the agency theory of appraisal. It did not reach this position at one stroke, nor has it apparently realized fully whither its decisions were trending. In the early appraisals of the steam railways of Wisconsin we find, for example, no development costs or going value allowed. The agency theory had not carried the commission that far at that time. The writer mentions this fact, in no spirit of criticism, for in his appraisal of the railways of the state of Washington the writer was by no means consistent with the agency theory, although the writer was careful to secure and present to the railroad commission the actual costs of construction and equipment, so that, in this way, the commission really had before them an appraisal based on the agency theory, as well as the cost of reproduction.

It would seem that some appraisers have fancied that a value for rate making is a sort of composite picture of actual cost, cost of reproduction, present value and market value of stocks and bonds. The writer is at loss to find any logical relation between these four things. They certainly are not factors whose combination can be made to yield a correct answer to the appraisal problem. The actual cost is, in fact, an appraised value arrived at according to the agency theory; whereas the market value of stocks and bonds is an appraised value arrived at according to the competitive theory. Hence we have two distinctly antagonistic values.

There can be but one value for rate making purposes, and it must be based upon some well defined theory. This is the conclusion toward which the science of rate regulation has been slowly trending. It seems to the writer inevitable that the agency theory will eventually be adopted in its entirety for the appraisal of public service property created in the future. In other words, the actual cost of the property, including the accumulated deficits in fair return, will be the "rate making value." Even increments in land value will be regarded as profits, that is, as part of the fair return. This is for future expenditures when public service company expenditures will be carefully scrutinized; that is, when the principal (the public) will carefully watch its agent (the public service company).

But what of the past? Upon what theory shall we base our appraisals of public service company property that has been built during an era of competition? Shall we apply the newly adopted "agency theory" to property that was built and operated upon a "competitive theory" basis? These are difficult questions to answer, quite as difficult, in their way, as was the slavery question. When a newly evolved code of morals made it reprehensible to own slaves, there were many who advocated freeing the slaves without giving compensation to their owners. It would have been more just had the general public been taxed to purchase freedom for the slaves, and it would also have been more economic than the war that made them free. Similarly, if it now seems unfair to have permitted public service companies to have capitalized their profits, we should realize that this is a new point of view—so new that we still see no injustice in permitting private companies to do the very same thing *ad libitum*. May it not, therefore, be both just and, in the end, a matter of public economy to appraise the franchise values of existing public service companies by capitalizing their net profits? The early decisions of courts all leaned in that direction, and a very recent decision of an important public service commission is distinctly in favor of capitalizing net earnings to ascertain total values of public utilities.

Certain it is that the capitalized net earnings of one class of public service property have been almost universally recognized as being a "fair value," namely the capitalized earnings from land and land entities (like water) owned by public service companies. All land values are based on capitalized land rentals, and appraisers are a unit in conceding that public service companies are entitled to the "unearned increment" on their land. Why, then, should they deny the companies the right to possess the earned increment on their business? In other words, why should land rentals be capitalized (which is essentially what is done in appraising land at its present value) while other profits are excluded from capitalization? The only logical answer to this question is that the "competitive theory" still holds as to land, whereas the "agency theory" has partly displaced the "competitive theory" as to the other property of public service companies. This is tantamount to the adoption of a mongrel theory that is a mixture of the two theories and for which there is really no logical defense except that it is expedient to compromise.

In view of the relative novelty of the agency theory, in so far at least as its actual application to public service companies is concerned, is it not more logical and fairer to apply the competitive theory in its entirety to public service company property that has been created prior to the general adoption of the agency theory? In other words, should not the present "commercial value" of the property of public service companies, including all capitalized profits, be regarded as belonging rightfully to the owners of the companies? In brief, should not the competitive theory be applied in appraisals of existing public utility property?

On the other hand, should not the "agency theory" be applied in its entirety to all future relations between the public and the public service companies? An appraiser of public utility property hereafter created would then seek merely the actual investment in the plant plus deficits in fair return—the development cost.

Those who have written and talked on the subject of appraisals have often started their discourse with a definition of the term value. But they seem rarely to have perceived that the definition of "value" rests upon one of two theories, which theories should themselves be defined. Market value rests on one theory; investment value rests on another theory. The first is predicated upon competitive conditions, the second upon agency conditions. It has seemed to the writer that these two theories should be the very first things to consider before any definitions of value are adopted, and before an appraisal for rate making is even begun.

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ERECTION OF KENTUCKY & INDIANA BRIDGE.

Details of Superstructure of Ohio River Crossing at Louisville, Including Two 620-ft. Simple Trusses Erected Cantilever.

The Kentucky & Indiana Terminal Railroad placed its new bridge over the Ohio river at Louisville, Ky., in service on Sunday, December 8, the formal opening being held November 27. This bridge is used by the Southern Railway; the Baltimore & Ohio Southwestern; the Chicago, Indianapolis & Louisville and an electric line connecting Louisville and New Albany, Ind. The old bridge was a single track structure built in 1886 and much too light for present day loading, handling from 175 to 180 movements a day over the gauntleted single track. The new bridge has been built at a cost of approximately $2,000,000, the work covering a period of over two years.

A description of the substructure of the bridge was published in the *Railway Age Gazette* of August 4, 1911, and a second article giving detailed information concerning the use of concrete piles in the foundations of two of the piers was published in the issue of September 8, 1911. This substructure work required the building of eight piers and two abutments, the maximum height of piers being about 122 ft. One of the typical piers contains 4,251 yds. of concrete and the north abutment contains 3,620 yds. The most interesting feature in the construction of these piers was the use of long steel spouts for dropping concrete to place from the deck of the old bridge. By the use of short tapered sections of pipe, which were described in detail in the first article mentioned above, the batches of concrete were made to drop for the entire distance, which reached a maximum of 115 ft., without enough separation of the constituent materials to injure the quality of the concrete. A photograph of this pipe in use is reproduced in one of the accompanying illustrations.

The superstructure of the bridge consists of five through trusses and a swing span carrying two steam and two electric tracks, gauntleted. The two long spans over the main channels are 620 ft. center to center of piers and the trusses used on these spans are the heaviest simple trusses ever built, the weight of each being 4,400 tons. A truss 373 ft. long spans a small island between the two main channels and an approach truss 275 ft. long is used at each end. The swing span is 400 ft. long, providing two clear channels each 172 ft. wide. The south approach consists of a steel viaduct 1,281.3 ft. long and the north approach consists of a fill 550 ft. long, a deck girder span over the tracks of the St. Louis division of the Southern and a 150 ft. deck truss. The trusses are 32 ft. center to center, and the maximum vertical distance between center of chords is 110 ft.

There is little unusual in the design of the superstructure, all compression members being latticed plate and angle sections and the diagonal tension members being I-bars pinned to the gusset plates. The heaviest section handled weighed 72 tons, being the lower half of the end post of one of the 620 ft. trusses. As an indication of the size of these trusses, the end pins are 21 in. in

Jacking Up a Span.

Erecting Plate Girders in North Approach.

Special Section at L9 for Closing Lower Chord of Long Spans.

Portal View of Kentucky & Indiana Bridge Across the Ohio River at Louisville, Ky.

Shore Span Erected. Traveler Used for this Span Is Seen at Left, Work on Long Span to the Right Is Just Beginning.

Setting up Traveler for Erecting Shore Span, Showing Relation of New Bridge to the Old.

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diameter and 7.5 ft. long, weighing 5.2 tons. The bridge received three coats of paint, the first a shop coat of 20 lbs. of red lead per gallon of boiled linseed oil, the second a field coat of the same quantity of red lead and the third Atcheson graphite. In applying the field coats an ingenious method of stirring the paint was devised which proved simple and efficient. Three-quarter

Dropping Concrete 115-ft. Into Bridge Piers.

inch pipes tapped into the main air line on the bridge were carried down to paint barrels, the lower end of these pipes being held in the paint near the bottom of the barrel so that the escaping air bubbled up through the pipe and prevented the settling of the lead.

The bridge deck will be laid with ties treated 30 min. in open vats. A hot application of creosote oil was first made and this was followed by a cold treatment. The ties were dapped in a special plant shown in one of the illustrations. A 35 h. p. auto-

Erecting Deck Truss on False Work with Derrick Car.

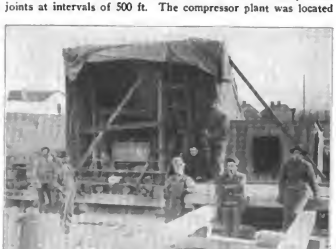
mobile engine was installed to run the dapping saws and proved very economical for this purpose. It operated at 1,600 r. p. m. and by exercising a little care to keep the cylinders cool, all trouble with the engine was eliminated. It was possible to dap 60 ties per hour with the plant shown. It was also used for guard rails and proved as efficient with beveled ties as straight ones. The stops which automatically regulated the points for dapping, could be set at any desired point, thus eliminating all measuring and greatly increasing the speed of the work. In placing the guard rails on the deck three wood boring machines were used to drill the bolt holes.

For tightening the bolts a "Little David" bolt tightening machine manufactured by the Ingersoll-Rand Company was used, with which it was possible for one man to tighten 17 bolts per minute. The single bolt tightening machine was able to place the bolts as fast as the holes could be bored with three machines. The tracks for steam service are tie plated and laid with 85 lb. rail. The electric tracks are laid with 75 lb. rail. An overhead trolley is provided to supply the operating current to the electric cars. The highways, which are carried on brackets outside the trusses, are floored with creosoted timbers covered by the waterproofing course, on which is laid a layer of concrete, then a layer of sand and then the pavement of creosoted blocks.

The steel for the bridge was stored in yards on both sides of the river and was handled in the yards and on the bridge by two 30-ton, one 40-ton and one 50-ton locomotive cranes. The lighter members were carried out for erection on 10-ton trucks operating

New Approach Viaduct on the South End of the New Bridge; Old Approach Seen to the Left.

on a track laid on the highway of the old bridge, which is closely adjacent to the new structure. The members which were too heavy to be carried out in this way were towed out into the river on barges. Compressed air for the pneumatic tools was supplied by a four-inch air line carried the entire length of the old bridge on the abandoned highway. It was provided with "U" expansion joints at intervals of 500 ft. The compressor plant was located



Tie Dapping Machine Operated by Automobile Engine.

on the south shore and contained two Ingersoll-Rand compressors supplying 800 cu. ft. of free air per minute. To expedite the erection, a telephone line was carried across the old bridge with instruments located at convenient points about 600 to 700 ft. apart. Connection could be secured from any point on the bridge with any other point, or with the office of the erecting engineer, the

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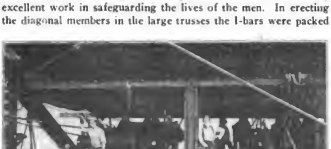
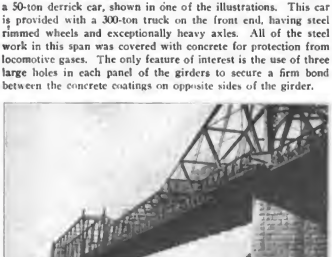
compressor plant or the storage yards. The smaller equipment used for the erection work was of the standard types used by the American Bridge Company on all of its large bridge erection, a noticeable feature being the attention paid to the elimination of accidents in this necessarily hazardous work. All needle beams are required to be made of four-inch I-beams, this being one of the orders of the company's safety committee, which is doing excellent work in safeguarding the lives of the men. In erecting the diagonal members in the large trusses the I-bars were packed



Operating House of One of the Big Travelers Used for the 620-ft. Spans.

on the center pin on shore and were erected by a toggle from the gusset plate.

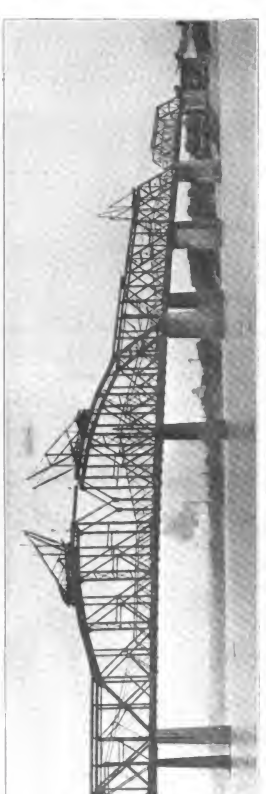
The plate girder span over the Southern tracks was erected by a 50-ton derrick car, shown in one of the illustrations. This car is provided with a 300-ton truck on the front end, having steel rimmed wheels and exceptionally heavy axles. All of the steel work in this span was covered with concrete for protection from locomotive gases. The only feature of interest is the use of three large holes in each panel of the girders to secure a firm bond between the concrete coatings on opposite sides of the girder.



Old Kentucky & Indiana Bridge.

The deck truss in the north approach was also erected with this derrick car, falsework being placed as shown in one of the illustrations. The shore spans on both sides of the river, and the short span over the island, were erected by travelers on falsework. On the north side the approach span was not over the river so that the falsework was supported on mud sills without the use of piling. The heaviest piece in these approach spans weighed 32 tons. The draw span was erected as a cantilever from the north end.

The two 620 ft. spans were erected as cantilevers from both



Making the Closure in the Top Chord of the 620-ft. Span over the North Branch of the River.

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ends and it is thought that these trusses are as long as any ever erected in that manner. Two mule travelers, each with two booms, 120 h. p. motors, four spools and two drums on each boom, were used in the erection of these spans. Power was supplied to the motors at 500 volts from a power line carried along the old bridge, the cable having a cross section of 800,000 circular mills. In order to close the spans a special section at the middle of the bottom chord was designed which could be slewed to take up the difference in the length of the chord during erection and after the truss was closed. It was calculated in the design of this section that at the end of the erection the lower chord would be eight inches shorter than after the closure was made and the slewing of this short section was designed to bring the two pins in the section eight inches closer together in the slewed position than when it was horizontal. The details of this member are shown in one of the photographs and drawings. It weighed 19½ tons. In order to make the closure of the top chord of these long spans the outer ends of the adjacent spans were jacked up allowing the entire section of the span being erected to tilt until the closure could be made. To move the draw span in this manner for the erection of the 620 ft. span over the south channel, it was jacked up about six inches at both ends so as to make it act as a simple truss. The end next to the long span was then carried on rollers and the other end could be jacked up to effect the same result as in the case of the simple span between the long channel spans. Roller bearings were provided under both ends of this 373 ft. span over the island, as it was necessary to use it in the erection of both long spans. After the erection was completed one of these roller nests was locked by a special arrangement which was also used in certain stages of the erection.

For jacking up these spans two 400-ton and two 500-ton hydraulic jacks were used. A hydraulic pump operated by two men was used to secure the pressure and a manifold was inserted between the pump and the jacks to distribute it. The two men were able to raise a span about four inches in an hour which was sufficient for purposes of erection, although if greater speed was desired a gasolene engine with the same jack equipment could raise a span about nine inches an hour. In jacking up the spans a half inch plate was inserted every time the clearance was sufficient and when five and one-half inch clearance had been secured, a rail was used, thus eliminating the possibility of a drop in case of failure of a jack. Water gages were provided to indicate the amount that the long trusses were being moved and a bell system was installed for signaling between the gage and the jacks. A table was calculated for the use of the operators of the jack from which the effect on the long span of any given raise of the opposite end of the adjacent span could be determined.

The old bridge will be dismantled by cutting off the steel with acetylene torches. No attempt will be made to salvage the metal in the old structure. The shore span and island span will be dropped from the piers and dismantled on the ground.

This bridge, as well as all the other improvements made on the Kentucky & Indiana Terminal, has been handled under the direction of W. M. Mitchell, formerly manager and chief engineer. James B. Wilson is resident engineer on the bridge work and J. E. Greiner and J. M. Johnson are consulting engineers. The substructure was built by the Foster-Creighton-Gould Co. of Nashville and the superstructure was erected and the old bridge dismantled by the American Bridge Company. T. J. McCoy, assistant engineer in the erecting department of the American Bridge Company, was in charge of the erection.

LONDON ELECTRIC RAILWAY, ENGLAND.—This company's bill will provide for the construction of an end-on junction between the Hampstead Tube and the City & South London Railway at Euston, new connections between the Hampstead and Highgate branches of the Hampstead Tube, and certain deviations of that tube, and a junction between the Piccadilly and South Western Railways at Hammersmith. Power to raise additional capital and to issue stock certificates to bearer will be asked for.

EFFICIENT METHODS OF HANDLING CORRESPONDENCE.

By JOHN L. HANNA.

The question of efficient office methods in handling correspondence has, during the past few years, been actively taken up by several of the greater railroad systems. The writer was chairman of a committee which investigated the subject several years ago for the Pennsylvania Railroad, and this article is based on the report made by that committee and the results obtained from the application of the methods recommended.

Successful office operation, with prompt dispatch of the business, depends in a large measure upon the methods of conducting and filing correspondence, statistics and other records. It is only recently, however, that the importance of this has been recognized, as in the past office files and records have usually been placed in charge of young and inexperienced clerks with little education and no conception of railroad operation. Officials may come and go, but the clerk in charge of the office records, if he sticks to the job, becomes more useful and valuable year by year.

The volume of correspondence on the great railway systems has, in recent years, increased to overwhelming proportions, keeping pace with the growth of business and is largely augumented by the creation of additional offices. Some reduction in the number of letters written is imperative to afford a measure of relief to those officers who are now tied down to a desk, by reducing to a minimum the time which they are required to devote to reading and answering correspondence.

CONSOLIDATION OF FILES.

Probably the most effective means of reducing the number of letters written is the elimination of correspondence, as far as possible, between the head of a department and his subordinates, or staff officers. This is facilitated and made practicable by combining all of the files of the various staff officers with that of the department head. The principle of consolidating files to effect economies in time and the elimination of unnecessary letters, has been in use by many of our largest commercial enterprises, as well as on several railroad systems, for a number of years.

To secure the best results from this method the offices of the staff should be located as near to that of the department head as possible, to permit and encourage frequent consultation and conference. Careful consideration should be given to the re-arrangement of the offices, as in many cases they are situated without any thought of the relationship of the officers to each other. One consolidated file should be established to serve the chief and as many of the staff as the location of their offices will permit, and all files in the offices so served should be abolished. Care should be exercised in the selection of an efficient and competent file clerk.

All mail for the chief and his staff should be opened in this general file room, the previous files, if any, attached, charged and distributed to the respective officers. All incoming and outgoing correspondence, whether initialed or in letter form, should pass through the central file to permit proper record of its disposition being made and to clear the "suspense file," which will be described in detail later on. In cases where a large number of letters have accumulated on one subject, a brief summary of the contents should be prepared by some competent person and attached to the last communication prior to its being placed before the chief, thus making it unnecessary for him to read through the entire file.

To carry the principle of consolidation to its logical conclusion would mean also the consolidation of all the clerical forces as well. That is, one set of clerks and stenographers to serve, say, the superintendent of a division and all of his staff officers. This is standard practice on one well-known system and the experiment is being tried on several other railways.

ELIMINATION OF UNNECESSARY LETTERS.

The key to the reduction in number of letters written is the manner in which the correspondence is distributed to the person

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who must take final action. All letters addressed to any officer included in the consolidation, requiring the attention of any other officer or subordinate, should be initialed to the proper party and sent at once to the file room. The central file takes a record of same on a simple form and sees that it is promptly dispatched. Your gain, under this arrangement, is in getting the correspondence into the hands of the party who takes action, at once, and the time formerly consumed in dictating and signing letters can be devoted to other purposes.

If this initialed letter requires no answer, it is simply noted and placed in the common file to which all have equal access. Should an answer be required it is prepared for the chief's signature, all letters between the staff officers being eliminated, so far as possible. The preparation of replies by the staff is not always satisfactory to the chief, but we find this condition can be overcome by having the staff officer first confer with the chief before writing a letter for his signature and in a very short time he should be able to prepare a letter from the chief's point of view, which will be signed by him when presented. This method is particularly effective with a division superintendent's organization.

In the consolidated file room all letters written on any particular subject, by the chief or any staff officer, will be filed together, so when papers are called for the file will produce everything written upon the subject. The possibility of two or more officers of the staff writing conflicting letters on the same subject is avoided.

Some officers take up with their subordinates, by correspondence, matters they should answer themselves. One prominent officer has stated that in his opinion too many unnecessary letters are written by the minor officers in order to place themselves on record, in the mistaken assumption they thereby relieve themselves of responsibility.

Through the medium of the central file it is possible for the several officers included in the consolidation to become more or less acquainted with the work of the other departments, and this enhances a spirit of co-operation, with a fuller realization that the primary object of the system is to expedite the handling of the business of the company.

In 1910 our committee had a count made of the number of letters written daily in all offices. On the twenty-one divisions, which have since adopted these methods, the number written by the superintendents and their staff officers was 2,700,000 per year, and what is known as "inter-staff" correspondence was a large proportion of this total. In response to a recent inquiry to ascertain the reduction that had been made, the estimates varied all the way from 10 to 60 per cent., but the average of all was 20 per cent. Using this as a basis these twenty-one divisions are writing approximately 540,000 fewer unnecessary letters per year than in 1910.

PROMPTNESS IN ANSWERING LETTERS.

The machinery of each office should be so adjusted that the cogs in every wheel fit into the cogs of the wheel in the next office lower down, that the whole may work in perfect unison. As far as the handling of correspondence is concerned the central file automatically does this for the offices included in the consolidation. One of the most important cogs in this machine is the method of keeping track of unanswered letters. Each office from the highest to the lowest should be compelled to maintain a so-called "suspense file."

The method which we have found most effective is to make an extra carbon copy on paper of some distinctive color (we use pink) of all letters written which require an answer. These are filed behind guide cards marked with the title of the officer to whom the letter is addressed. Immediately upon receipt of reply the "pink" copy is removed from this file. Opportunity must be given to clear the suspense file before the mail is distributed, or duplication of work results. Correspondence unanswered should be systematically hurried by the file clerk going over the "pink" copies daily. He should prepare, at least weekly, for forwarding to each of the subordinate addressees of the office, a statement showing date and subject of each unanswered letter. Statements exhibiting unusual delays should be signed personally by the head of the office, with request that these delays be explained. This method shows up who the delinquents are and if improvement does not ensue, persistently bad cases should be made the subject of discussion at staff meetings.

COURTESY TO THE OUTSIDE CORRESPONDENT.

Criticisms or suggestions from the public often result in improvement to the service, as there are many details of operation that do not come under the direct observation of the officials. Any communications, therefore, from the outside correspondent should receive prompt acknowledgment and courteous attention by the officer to whom they are originally addressed. If information is requested that, for any reason, cannot be furnished at once, the correspondent should be so advised, or if in the nature of a complaint it should be promptly investigated and the conditions corrected if possible, always advising correspondent of action taken.

PRESS COPYING OF LETTERS.

With a good filing system press copying of letters is unnecessary. Under modern methods the carbon copy of a letter written is filed with the other papers on the same subject and the press copy book should therefore be abolished. In those offices where the responsible officer wishes to read the letters that have been written and sent out over his signature, during his absence from the office, an extra carbon copy may be made of all letters and placed chronologically in binders.

While some economy is effected by discontinuing press copying its principal advantage is that it facilitates the despatch of the mail, as a letter can be sent out the minute it is signed. No need to hold over until the following morning, for copying letters signed late in the evening as is often the case, for many busy officers sign their mail the very last thing.

There has been a general hesitancy about abolishing the press copy book, due to a prevailing opinion that a carbon copy will not be accepted in court as secondary evidence, where the original letter cannot be produced. This has been investigated by President Taft's "Commission on Economy and Efficiency," and in a brief which they had prepared the conclusion is reached that "By the overwhelming weight of judicial authority the carbon is held to be primary evidence, and is thus placed upon a much higher evidential plane than the press copy, and its introduction as evidence is not dependent upon notice to the opposite party to produce the original or submit explanation as to its non-accessibility." This conclusion would seem to knock out the last prop in favor of continuing the press copying of letters.

UNIFORM SYSTEM OF FILING.

During the past three years the Pennsylvania Railroad has inaugurated a uniform method of filing in more than two hundred of its offices. The advantages of such a system is well expressed in the following extracts from the report of the President's "Commission on Economy and Efficiency," who investigated these methods, viz.: "The commission made a study of methods pursued in handling correspondence by railroads and industrial concerns. The results of this study show the subject is receiving careful attention from managers of large corporations, and its importance is coming to be fully recognized. The trend is away from the elaborate and in the direction of the simple system. * * * It is important, in the opinion of the commission * * * that the whole system of handling and filing correspondence should be uniform. Under such an arrangement the correspondence files throughout the branches of the service would become one comprehensive system, with each letter bearing the same file reference regardless of point of origin. Uniform classification would also permit file clerks experienced in one part of the service to be useful in another and result in their training along similar lines." Further the commission also recommends

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"That all correspondence * * * be filed upon a subjective classification arranged as nearly as possible upon a self-indexing basis, and where numbers are regarded as essential that a logical arrangement of numbers under a decimal or analogous system should be employed."

The system inaugurated in the two hundred offices referred to above is the "Railroad Correspondence File," better known as the "Decimal System," which was compiled by W. H. Williams, with revisions and supplements by the writer of this article. This self-indexing classification was reviewed at length in the *Railway Age Gazette* on September 15, 1911, so that it will be unnecessary to describe it further here.

SUPERVISION.

In conclusion attention is called to the importance of supervision. Any system will not in itself improve present practices. The introduction of methods such as recommended in this article should be placed in the hands of some competent person, who should personally supervise the inauguration and interest the employees in charge. As he will meet with some opposition from those wedded to old practices, or who prefer to go along the lines of least resistance, his position should probably be strengthened with some minor title, carrying with it sufficient authority to obtain results.

Wm. C. Endicott, late Secretary of War, in "Business Methods of the War Department," very aptly says: "The difficulty of overcoming bias in favor of existing systems is great, as routine and custom run in grooves which deepen with age. Reports and rules may point the way to improvements, and orders enforce them for a time, but persistent effort and efficient supervision is the only hope of accomplishing enduring results."

STEEL END FOR BOX CARS.

In the series of articles on "Defective Box Cars and Damaged Freight," published in the *Railway Age Gazette* during the spring of 1912, special attention was given to the poorly designed ends, in the issue of April 26, 1912, page 954. Not only is there a considerable loss of grain and similar materials because of leakage, due to weak ends, but much damage is often caused by shifting loads which break through the ends of the cars. The New York Central reinforced the wooden ends with the heaviest wooden construction, but still found considerable difficulty because of damage caused by shifting loads. As a last resort the steel end shown in the accompanying illustration was experimented with and has proved so successful that it has been placed on several hundred cars and will probably be used exclusively on new equipment and in rebuilding and strengthening old cars.

Steel End Applied to a New York Central & Hudson River Wooden Box Car.

Its great strength, as compared to the wooden end, prevents damage to both the car and the lading because of shifting loads and thus reduces the time the car must be held out of service for repairs. The steel construction is lighter than that of wood; the old style wooden end on a certain class of New York Central cars weighed 1,863 lbs.; a better design of reinforced wooden end weighed 1,790 lbs.; and the steel end for the same class of car weighs 1,607 lbs. No end posts are used with the steel end and the inside length of the car is thus increased by about one foot, with a corresponding increase in the cubical contents of the car. There is no possibility of the ends becoming loose and thus allowing grain or similar lading to leak out, as is so often the case with the wooden construction. If the end is seriously

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damaged it has a considerable value as scrap, while the wooden end is valueless.

The end is made in two parts to facilitate erection on the repair tracks or where an overhead crane is not available. If desirable the two parts may be riveted together in advance, if it is desired to apply them at shops where there is a good crane service. The two-part end has the additional advantage of reduced expense for replacement if one-half should be seriously damaged and need renewal. Since the lower half of the end is usually subjected to the greater punishment due to shifting loads, it is made slightly heavier than the upper half, being ½ in. thick, as compared to 3/16 in. for the upper half. The reduction in thickness of the upper half is estimated to save about 300 lbs. in the weight of the car. The lower half of the end is said to be equivalent in strength to a flat steel plate ¾ in. in thickness.

Experimental Steel Box Car on New York Central & Hudson River with Special End.

The illustrations show the door as applied to a wooden car and to a steel box car that is now being tested out on the New York Central. When applied to a wooden car, the lower edge of the end is flanged and fits under the floor plank of the car, effectually preventing any possibility of leakage of grain at the end. The door is manufactured by the Imperial Appliance Company, Chicago.

FLOWERS IN RAILWAY WORKSHOPS.—Mrs. Bowen-Cooke, wife of the chief mechanical engineer of the London & North-Western, of England, opened the yearly chrysanthemum show in the town hall, at Crewe, England, a short time ago. Many of the exhibitors were employees of the London & North-Western. C. J. Bowen-Cooke, commenting on the fine exhibits, said nothing gave him greater pleasure, when passing through the various shops of Crewe railway works, than to see beautiful little bunches of flowers arranged on the men's benches. On one occasion one of the foremen asked him if he objected to this, and he replied that, on the contrary, it pleased him immensely. No, one could put their heart and soul into their work better than those on whose benches those flowers were so artistically displayed.

ACCIDENT BULLETIN NO. 44.

The Interstate Commerce Commission has issued Accident Bulletin No. 44, containing the record of railroad accidents in the United States during the three months ended June 30, 1912. The number of persons killed in train accidents was 148, and of injured 3,294. Accidents of other kinds bring up the total number of casualties, excluding "industrial" accidents, to 19,486 (2,302 killed and 17,544 injured). The total number of industrial accidents to employees was 24,177; 93 killed and 24,084 injured.

Adding the casualties to employees in industrial accidents to the figures given in the larger table, the total number of employees killed, including those not on duty, is 736, and injured 35,263; and this makes the total number of persons killed, all classes, 2,395, and injured 41,628.

TABLE NO. 1A.—*Comparison of principal items with last quarterly bulletin and with one year back.*

	Bulletin 44.	Bulletin 43.	Bulletin 40.
1. Passengers killed in train accidents	14	33	21
2. Passengers killed, all causes	52	71	58
3. Employees (on duty) killed in train accidents	99	209	107
4. Employees (on duty) killed in coupling	46	49	37
5. Employees (on duty) killed, total (Table 1a)	534	884	512
6. Total, passengers and employees (items 2 and 5, above)	606	955	570
7. Other persons killed (including trespassers, trespassers, and employees not on duty), all causes	1,696	1,428	1,646
8. Employees killed in industrial accidents	93	98	87

As compared with the corresponding quarter of 1911, passengers killed in train accidents are decidedly fewer; but the number of employees killed in coupling increased from 37 to 46. Other items in Table 1A show no marked changes.

The total number of collisions and derailments in the quarter now under review was 3,398 (1,145 collisions and 2,253 derailments), of which 118 collisions and 257 derailments affected passenger trains. The damage to cars, engines, and roadway by these accidents amounted to $2,700,911.

Electric railways reporting to the commission (not included in the foregoing statistics) had 71 persons killed during the quarter and 1,018 injured; and there were 28 collisions and 17 derail-

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ANNUAL TABLE No. 1B.—CASUALTIES TO PASSENGERS, EMPLOYEES, AND OTHER PERSONS, YEAR ENDED JUNE 30, 1912.

	Passengers.		Passengers and employees not under agreement.		Total passengers.		Trainmen.		Trainmen in yards.		Yard trainmen.		Switchtenders, crossing flagmen and watchmen.		Trackmen and bridgemen.		Other employees.		Total employees on duty.		Employees not on duty.		Other persons not on duty passing.		Tres passers.		Total persons.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collisions	49	4,184	15	1,403	64	5,587	6	1,776	7	134	21	222	1	3	13	164	11	247	241	2,380	13	60	3	57	62	109	394	7,147
Derailments	65	3,096	3	172	4	463	72	4,541	191	1,610	7	134	21	222	1	3	13	164	11	247	244	2,380	13	60	3	57	62	109	394	7,147
Accidents at stations																												
Accidents to persons on trains		74		19		93		128		406		112			2	4	51	28	53	732	1	13		135		11	53	999
Burning of trains		1				1		6		13		4								10								34
Total train accidents	114	8,166	18	1,594	68	6,144	78	6,451	198	2,163	28	472	22	225	16	171	64	439	294	3,369	258	2,453	16	252	65	166	509	8,284
Accidents to employees not on trains and not in coupling or uncoupling cars		74		19		93		128		406		112			2	4	51	28	53	732	1	13		135		11	53	999
Coupling or uncoupling cars		1				1		6		13		4								10								34
Coupling cars		258		20		937	139	9,391	407	4,867	34	911	70	921	1	11	27	309	57	379	596	7,098	20	156	13	277	91	151	859	17,073
Uncoupling cars																												
Accidents to employees on bridges																												
Coupling or uncoupling cars																												
Coupling cars																												
Uncoupling cars																												
Coupling or uncoupling cars, not in trains, etc., except with levers																												
Coupling or uncoupling cars with levers																												
Coupling cars	5	14		2		19	7	27	45	635	7	297	17	540		3	3	11	5	37	77	1,523	1	12		3	34	70	120	1,635
Uncoupling cars	21	2,415	3	134	3	571	87	2,529	178	2,123	36	1,181	132	2,061	6	23	23	215	30	370	609	8,734	18	249	17	121	424	1,811	993	6,467
Other accidents on or around trains	2	2,589		276	4	492	6	3,367		14		11	1	33	13	357	44	898	58	1,327	2	142	16	633	27	271	199	5,632
Being struck or run over at highway crossings		103		1		6	30	110	62	112	80	187	100	325	43	72	206	305	206	475	697	1,476	107	117	121	261	1,083	1,016	2,038	2,980
Being struck or run over at other places																												
Being struck or run by cars																												
Being struck or run over at other places																												
Other accidents	3	751				3	5	66	60	180	1	2	8	86	2	35	359	39	73	64	542	357	105	42	201	2,048	1,486	3,712	2,992
Total, other than train accidents	31	5,912	3	413	7	1,097	185	6,297	346	3,072	127	1,678	258	3,045	64	490	640	1,477	379	1,000	1,924	12,240	149	1,151	179	1,000	3,775	3,131	6,872	29,311
Grand total	156	6,125	8	359	15	511	179	6,995	310	16,033	231	7,491	411	12,462	124	428	631	1,451	415	2,367	2,324	42,022	295	803	1,185	4,746	5,343	5,836	9,376	60,102
Total, other than train accidents	270	14,291	13	647	35	1,548	318	12,646	2,920	49,130	315	959	1,198	5,043	5,434	5,687	10,189	77,176	5,386	917	22,890	265	8,202	481	13,383	128	439	660	1,760	472

ments. Train accidents are charged with 3 fatalities. The total number of passengers killed from all causes was 7 and of employees 11 (6 in industrial accidents). The number of trespassers struck or run over by cars was 49; 26 killed and 23 injured.

YEARLY TABLES.

The summaries for the year ended June 30, 1912, show that the total number of casualties to persons for the year was 180,123; 10,585 killed and 169,538 injured. These figures include 400 employees killed and 92,363 employees injured, under the head of "Industrial accidents" (accidents to employees in and around shops, on boats and wharves, at stations, freight houses, etc., and all accidents not occurring in connection with the movement of locomotives or cars). The annual tables include statistics received after the quarterly bulletins were printed.

The principal table for the year, No. 1B, is reprinted herewith. The corresponding table for the preceding year was given in the *Railway Age Gazette* of November 10, 1911, page 959. The principal comparisons for the two years are shown in Table 1C, as follows:

ANNUAL TABLE 1C.—*Summary of casualties, years ended June 30.*

	1912.		1911.	
	Killed.	Injured.	Killed.	Injured.
Passengers:				
In train accidents	139	9,391	142	6,222
Other causes	179	6,995	214	6,711
Total	318	16,386	356	13,433
Employees on duty:				
In train accidents	596	7,098	620	6,601
In coupling accidents	192	3,234	209	2,966
Overhead obstructions, etc	73	1,523	76	1,510
Falling from cars, etc	573	13,874	539	12,989
Other causes	1,482	23,391	1,427	21,782
Total	2,920	49,120	2,871	45,848
Total passengers and employees on duty	3,238	65,506	3,227	59,281
Employees not on duty:				
In train accidents	20	156	13	174
In coupling accidents		2		15
Overhead obstructions, etc		12		15
Falling from cars, etc	53	312	49	357
Other causes	241	477	228	410
Total	315	959	292	954
Other persons:				
Not trespassing—				
In train accidents	13	277	11	175
Other causes	1,185	4,746	1,143	4,898
Total	1,198	5,023	1,154	5,073
Trespassers:				
In train accidents	91	151	81	141
Other causes	5,343	5,536	5,203	5,473
Total	5,434	5,687	5,284	5,614
Total	10,185	72,175	9,957	70,922
Industrial accidents	400	92,363	439	79,237
Grand total	10,585	169,538	10,396	150,159

Annual Table 2B.—Detail Causes of Derailments Due to Defects of Equipment.

Cause of accident.	1912				1911			
	Number.	Number of persons killed.	Number of persons injured.	Damage to road and equipment and cost of clearing wrecks.	Number.	Number of persons killed.	Number of persons injured.	Damage to road and equipment and cost of clearing wrecks.
Defective wheels:								
Broken or bursted wheel	867	3	37	$277,988	933	6	34	$291,986
Broken flange	1,197	2	44	405,962	1,081	11	36	382,369
Broken tire	1,242	2	20	97,671	1,021		23	96,389
Miscellaneous	1,197		15	109,419	1,152		13	93,567
Broken or defective axle or journal	610	2	104	302,146	555	9	98	319,788
Broken or defective brake rigging	628	4	157	411,294	562	9	121	398,998
Broken or defective draft gear	177	0	46	110,450	181	2	30	77,272
Broken or defective side bearing	177		94	135,780	79	4	39	66,586
Broken arch bar	367		130	279,820	158	1	47	126,170
Rigid trucks	184		66	124,978	85	1	30	46,913
Failure of power-brake apparatus, hose, etc	916		79	107,203	168	1	28	79,075
Failure of couplers	366		23	89,603	158		17	54,264
Miscellaneous	456	25	200	422,140	353	19	133	376,066
Total	8,847	68	1,197	3,165,603	3,934	64	689	2,279,074

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Annual Table 2a.—Detail Causes of Derailments Due to Defects of Roadway.

Causes of accident.	1912				1911				1910			
	Number.	Number of persons killed.	Number of persons injured.	Damage to road and equipment and cost of clearing wrecks.	Number.	Number of persons killed.	Number of persons injured.	Damage to road and equipment and cost of clearing wrecks.	Number.	Number of persons killed.	Number of persons injured.	Damage to road and equipment and cost of clearing wrecks.
Broken rail	203	93	1,005	$111,779	249	12	463	$202,749				
Spread rail	221	6	244	154,284	206	4	285	135,195				
Rail joints	227	13	304	256,676	308	6	418	49,189				
Rail other	85		20	51,492	41		17	18,472				
Gun kinks	39	3	61	11,214	30	3	62	61,307				
Irregular track	181	15	187	200,351	179	6	140	132,156				
Miscellaneous	331	14	317	226,071	466	26	569	333,331				
Total	1,077	102	2,766	1,541,466	1,235	57	1,960	1,007,460				

The reports from electric railways for the two years show:

	1912.		1911.	
	Killed.	Injured.	Killed.	Injured.
Passengers	35	2,862	105	2,283
Employees	46	439	36	363
Employees, not on duty	1	24	4	18
Other persons, not trespassing	118	659	133	481
Trespassers	100	128	117	119
Total	300	4,112	410	3,264
Industrial	24	550	10	399
Grand total	324	4,662	420	3,663

EMPLOYEES IN SERVICE.

The total number of railway employees in service June 30, 1912, was 1,729,144, or 81,111 greater than the number correspondingly reported for 1911.

Employees in service of steam railroads on June 30, 1912.

Class of employees.	Number of persons.
1. Trainmen (enginemen, firemen, motormen, conductors, brakemen, rear flagmen, train baggagemen, parlor cars porters [not including duties of trainmen])	245,653
2. Other persons employed on trains (dining-car employees, train porters, when actually employed by the respondent carrier)	11,461
3. Yardmen (all employees in yard train work and switching)	104,125
4. Switch tenders, crossing tenders, and watchmen	32,876
5. Bridgemen and trackmen	479,221
6. Other employees (station and miscellaneous employees, shopmen, etc.), excluding all officers, clerks, indoor employees, and others engaged in work in which they are not specially exposed to railway accidents	328,345
7. Total	1,201,681
8. Employees excluded from item No. 6 above	527,463
9. Total persons employed by steam roads on June 30, 1912	1,729,144

Ratios of Casualties.

Class.	Number employed June 30.	Killed. 1912.	Injured. 1912.	Number employed for one killed.	Number employed for one injured.
Trainmen	245,653	1,182	30,592	208	8.0
Yardmen	104,125	481	13,383	216	7.8
Switch tenders, crossing tenders, and watchmen	32,876	125	439	263	74.9
Trackmen and bridgemen	479,221	828	22,099	579	21.7
Total employees specially exposed to railroad accidents	1,201,681	3,635	142,442	330	8.4
Total employees in service	1,729,144	3,635	142,442	476	12.1

The bulletin contains accounts of investigations, by the commission's inspectors, of the following train accidents:

Collisions.

Detroit, Jackson & Chicago	Dexter, Mich. April 15
Illinois Central	Iowa Falls, Ia. April 21
Delaware, L. & W.	Baldwin, N. Y. May 21
New York, Susq. & W.	Macopin Lake Junction June 4
Chesapeake & Ohio	Silver Grove, Ky. June 8
Chicago, Ind. & Louisville	Bedford, Ind. June 8
New York, Chicago & St. Louis	Crayton, Pa. June 22

Derailments.

Missouri Pacific	Lyndon, Kan. Jan. 14
Wabash	West Lebanon, Ind. Mar. 7
New York Central	Hyde Park, N. Y. Mar. 31
Southern	Moorhead, Miss. April 2
New Orleans & N. E.	Estabuchie, Miss. May 6
Kansas City Southern	Blanchard, La. June 3
Chicago & Alton	Shirley, Ill. June 8
Nashville, C. & St. L.	Dalton, Ga. June 12

PROSECUTIONS UNDER THE 28-HOUR LAW.

The law forbidding the confinement of animals in cars without feed or water for a longer period than 28 hours (36 hours under certain conditions) is the subject of a chapter in the annual report of the solicitor of the department of agriculture.

The Agricultural Department reported to the attorney-general during the last fiscal year 631 cases of apparent violation of the law, which is 33 more cases than in the preceding year. Nearly 1,000 cases were pending at the close of the fiscal year, some having been carried over from the preceding year. Penalties were recovered in 357 cases and 96 cases were dismissed. Penalties aggregating $28,400 were recovered during the year. The inspectors of the department say that there is no determined effort on the part of the railways in general to obey the law.

The report gives a list of the cases which have been prosecuted, with names of roads and amounts of penalties. The solicitor says that to recover the minimum penalty of $100 does not operate as an effective deterrent. He calls upon the court to fix penalties and in many cases insists on the maximum of $500. The report gives also the substance of eight decisions of the courts affecting the administration of this law.

The law prohibiting interstate movement of diseased live stock and regulating the movement of interstate shipments from quarantined districts has also been the subject of much attention from the department during the past year. One hundred and thirty-five alleged violations of these laws have been dealt with. Seventy-one suits have been decided during the year in favor of the government, usually by pleas of guilty. The government has lost a considerable number of cases because the courts have decided that as the carriers who were prosecuted had received the animals outside of the quarantined district and had transported and delivered them wholly outside that district, penalties could not be enforced.

ANNUAL TABLE No. 2.—COLLISIONS AND DERAILMENTS, YEARS ENDING JUNE 30.

	1912			1911			1910		
	Number.	Damage to road and equipment and cost of clearing wrecks.	Killed.	Injured.	Number.	Damage to road and equipment and cost of clearing wrecks.	Killed.	Injured.	Number.	Damage to road and equipment and cost of clearing wrecks.	Killed.	Injured.
Collisions, rear	1,142	$1,292,895	117	2,019	1,099	$1,241,192	109	1,526	1,211	$1,396,763	119	2,324
Collisions, butting	1,284	1,414,222	157	3,195	959	1,020,614	157	2,010	985	1,154,381	134	3,009
Collisions, trains separating	353	144,695	4	138	370	145,390	7	103	418	164,863	5	197
Collisions, miscellaneous	3,264	1,575,584	100	2,656	3,527	1,564,994	133	2,065	3,437	1,551,253	115	2,226
Total	5,853	4,330,396	378	7,948	5,605	4,363,096	406	6,904	5,961	4,639,379	453	7,756
Derailments due to defects in roadway, etc.	1,077	1,541,466	102	2,766	1,235	1,007,460	57	1,960	1,115	914,642	42	1,337
Derailments due to defects of equipment	1,947	3,165,033	68	1,197	2,854	2,279,074	64	689	2,734	2,227,352	40	636
Derailments due to negligence of trainmen, signalmen, etc.	423	228,389	18	548	297	219,351	36	508	377	298,843	23	311
Derailments due to unforeseen obstructions of track, etc.	412	478,675	61	664	359	336,195	66	602	300	464,414	18	625
Derailments due to malicious obstruction of track, etc.	75	109,614	18	378	84	102,161	16	176	66	165,185	18	327
Derailments due to miscellaneous causes	1,981	1,904,081	129	1,663	1,421	1,885,512	110	1,374	1,270	1,184,341	159	1,478
Total	5,915	7,197,262	394	7,147	6,250	5,549,734	349	4,799	5,918	5,194,679	340	4,814
Grand total	13,098	11,527,658	772	15,095	11,855	9,912,830	755	11,703	11,779	9,834,058	773	12,570

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FREIGHT CAR TRUCK EXPERIMENTS.

Effect of Degree of Curvature, Condition of Rails, Wheels and Trucks and the Use of Summer and Winter Oils.

In 1910 Professor L. E. Endsley, of Purdue University, made an extensive series of experiments at the Granite City, Ill., plant of the American Steel Foundries on the frictional resistance of various types of freight car trucks. A full account of these experiments was published in the *Railway Age Gazette* of March 24, 1911, page 691. The results showed that a truck constructed in such a way that it would remain square and hold the axles radially with the curve would pass over the curve with considerably less resistance than a truck otherwise constructed. In order to obtain additional information another series of tests has been conducted by Prof. Endsley, the results of which are briefly summed up in the following article:

The tests were conducted on an arch bar truck and an An-

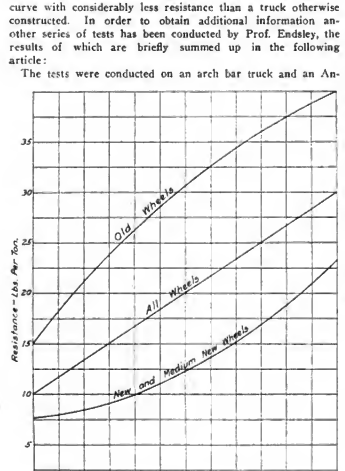

Fig. 1.—Resistance Curves with Different Conditions of Wheels and on Various Curves.

drews side frame truck. The arch bar truck conformed closely to standard practice in its design and details of construction, and was the same as truck *B* used in the previous tests, weighing 22,886 lbs. The Andrews side frame truck was of standard design with the exception of a heavier cast steel bolster, which brought the weight of the truck, with 650 lb. wheels, up to 12,034 lbs., which with the cast steel block, gave a total weight of 22,400 lbs. A 13-in. channel was used as a spring plank and was fastened to each side frame by eight tapered bolts instead of being riveted, as is customary. The truck was tested both with and without these bolts. When the bolts were removed, the side frames were spaced apart the proper transverse distance by a boss on each end of the spring plank, which fitted into recesses drilled in the center of the spring seat of each side frame. These two conditions are called the square and loose trucks. Thirty-two different wheels were used in such combinations as to make ten sets. In seven sets cast iron wheels were used, while the Davis cast steel wheels were used in the other three. New, medium new and old wheels were used so as to obtain as wide a variation in wheel conditions as is met with in practice. The wheels were in some cases mated, and in other cases where non-mated, the difference in circumference in one case being as much as $\frac{5}{8}$ in.

Tests to the number of 184 were made with the Andrews side frame truck and 146 with the arch bar truck. One of the principal objects of the tests was to obtain sufficient data on which to establish a conclusion as to the effect of different degrees of curvature on frictional resistance. The curves in Fig. 1 were obtained by finding the average resistance in pounds per ton for all truck and wheel conditions for new, medium new and old wheels, as recorded on the Andrews side frame truck. The straight line for all wheels which was established from the results from ten different sets of wheels, conforms to the generally accepted theory that the frictional resistance, for average operating conditions, increases in direct proportion to the degree of curvature. Figs. 2, 3 and 4 show the difference in frictional resistance of different arrangements of wheels on new and old rails.

Wheel Conditions and Truck Resistance.—The condition of the flanges and the tread of a set of wheels has quite an influence on the frictional resistance of a truck regardless of its type. Table I shows to what extent the frictional resistance was affected by wheel contours. The sets of wheels are divided in five groups, as follows: Mated wheels (sets A, C and D); non-mated new and medium new (sets B and E); non-mated old (sets F and G); non-mated medium old (set H); and special, no coning (sets I and J).

TABLE I.—AVERAGE RESISTANCES FOR DIFFERENT GROUPS OF WHEELS.

Track.	Wheel Set. A-C-D	B & E	F & G	H	I & J
Tangent	6.90	7.53	12.82	9.96	14.25
3 deg. curve.....	8.43	7.99	19.50	14.08	21.27
6 deg. curve.....	10.49	11.43	30.03	20.22	33.79
12 deg. curve.....	20.10	25.20	57.70	38.16	45.97

From these values it is obvious that the condition of the mating and of the contours of the wheels has a very important bearing on the friction resistance of a truck. The flanges and treads of the first two groups of wheels were in good condition. The three remaining groups produced considerably more friction, due to the high and sharp flanges and to the absences of coning.

Square and Loose Trucks.—The Andrews side frame truck was tested in both the loose and the square condition and all of the ten sets of wheels were used. Fig. 5 shows resistance for all wheels tested on the new rails. The resistance curves for new and medium new wheels are shown in Fig. 6. From Fig. 5 it will be seen that the saving in favor of the square truck varies from 3.54 per cent. on a straight track to 30.47 per cent. on a 12 deg. curve, and taking 4 deg. as the average main line curve, the saving is 20.72 per cent. in favor of the squared truck, which checks very closely with the 1911 report.

Use of Winter and Summer Oils.—Tests were also made to determine the frictional resistance due to the use of winter and summer oils. They were made in the first week in November. The Andrews side frame truck with mated Davis cast steel wheels was used; the truck was square and was run on a tangent track. The analysis of the oil was as follows:

	Summer Oil.	Winter Oil.
Flashing point (degs. F.).....	386	240
Burning point (degs. F.).....	420	317
Specific gravity (Beaume)	21.5	24.5
Loss at 100 deg. F. for 3 hours.....	0.001	0.017
Ash (per cent).....	0.05	0.03
Cold test (degrees at which it flows).....	55	32
Viscosity at 350 deg. F. (time in seconds for 100 c. c. to flow from Dudley pipette.....	39	34

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One hundred and forty-six tests were made and the average resistance for the summer oil was taken at 14.77 lbs. per ton and 8.41 lbs. per ton for the winter oil, the average temperature for the former being 41 deg. F., and for the latter 48 deg. F.

CONCLUSIONS.

From the experiments made the following conclusions seem to be justified:

First.—The curve friction of a freight car truck is almost directly proportional to the degree of curvature. If the wheels under the truck are new and in good condition, the increase of frictional resistance due to curvature is not so great on the flat degrees of curvature as it is on the sharp degrees. If the wheels under the truck are old and have flange heights approaching

Third.—A truck equipped with old wheels and high flanges gives a frictional resistance of approximately 100 per cent. higher than that given when the truck is equipped with new wheels. The wheels should be exactly mated in order to give least resistance. The coning on the wheels is of great value in reducing the flange friction on low degrees of curvature.

Fourth.—A truck constructed so that it will not get out of square will have less friction both on a tangent and on any degree of curvature than a truck that does not remain square.

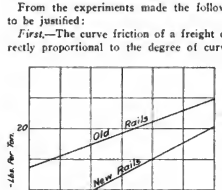

Fig. 2—Resistance Curves of All Wheels on Old and New Rails.

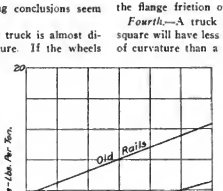

Fig. 3—Resistance Curves of New and Medium New Wheels on Old and New Rails.

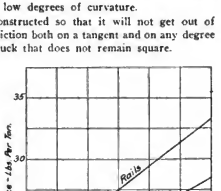

Fig. 4—Resistance Curves with Old Wheels on New and Old Rails.

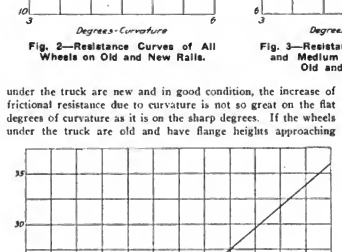

Fig. 5—Resistance Curves of Loose and Square Trucks for All Classes of Wheels.

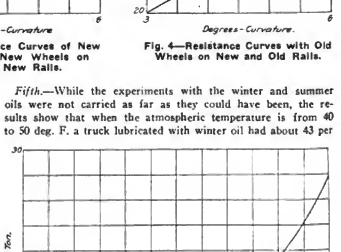

Fig. 6—Resistance Curves of Square and Loose Trucks with New and Medium New Wheels.

M. C. B. limits, just the reverse is true; that is, with old wheels the increase of frictional resistance due to curvature is greater for flat degrees than for sharp degrees of curvature.

Second.—The frictional resistance of a truck equipped with wheels of average contour on new rails is from 10 to 25 per cent. less than for the same wheels on old rails. In the case of high flanges, on old wheels, however, this statement does not hold true.

Fifth.—While the experiments with the winter and summer oils were not carried as far as they could have been, the results show that when the atmospheric temperature is from 40 to 50 deg. F. a truck lubricated with winter oil had about 43 per cent. less friction than one lubricated with summer oil, all other conditions being equal.

The Illinois Central furnished the wheels and axles, and the Missouri Pacific the old rails used on the 3 deg. and 6 deg. tracks. L. W. Wallace, assistant professor of car and locomotive design at Purdue University, and L. C. Farquhar assisted Professor Endsley.

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FRANKLIN K. LANE.

Franklin K. Lane, of California, a member of the Interstate Commerce Commission since 1905, has been elected by the commission to serve as chairman, succeeding Charles A. Prouty. The chairman, it will be recalled, is elected for one year beginning January 13. In the rate advance cases Chairman Prouty wrote the opinion of the commission refusing the application of the eastern railroads to make increases in rates, and Commissioner Lane wrote the opinion in the western case. While Mr. Prouty's opinion in these cases was generally considered a rather closely reasoned expression of opinion, Commissioner Lane laid himself open to easy refutation in regard to a good part of what he had to say.

Mr. Lane's style is somewhat florid, and for this reason, probably, his critics have at times had a show of justice in accusing him of being more concerned with producing an effect than with dealing out strict justice. As contrasted with Mr. Prouty, Commissioner Lane has not hesitated to place himself on certain occasions in the position of a prosecutor or, as he would probably prefer to call it, a regulator of the railroads, rather than an impartial judge.

Mr. Lane was born in Prince Edward Island on July 15, 1864. He was the son of Dr. C. S. Lane, and moved to California when a small boy. He went to public school at Napa and to the high school at Oakland, Cal. After leaving high school he went into newspaper work and at the same studied law. He was graduated from the University of California with the class of 1886 and took a three-year course at Hastings Law College, doing the three years' work in a year and a half. After graduation he was engaged in the practice of law and was corporation counsel for the city of San Francisco from 1897 to 1902. He was a candidate for governor of his state in 1902. He received his party's vote in the legislature of California for United States senator in 1903, and was appointed a member of the Interstate Commerce Commisison in December, 1905. At one time he ran for mayor of San Francisco, but was defeated by the labor union candidate.

Franklin K. Lane.

Commissioner Lane, in his opinion in the rate advance cases and a number of times since in public utterances, has spoken strongly of the necessity for railroads to earn a sufficient return on the money at present invested in their property to make similar future investment attractive when compared with industrial enterprises and with railroad enterprises in other countries. Mr. Lane's early training was not of a kind calculated to make an unbiased and non-partisan administrator; but, on the other hand, since 1905 he has had an opportunity to deal with large questions—to inform himself very fully of the problems that are presented by the transportation question in this country—and it may well be that with the added responsibility of the chairmanship he will take a rather broader view of his responsibilities and of the responsibilities of the commission to the country as a whole. The position is one of really great responsibility and possibly never more so than in this coming year. With a return of prosperity, another year of large crops and the natural development of the country, which has been retarded since 1908, the railroads of this country will need all of the co-operation that the Interstate Commerce Commission can give them to handle the business offered adequately and satisfactorily. They will need all of the moral support that the commission can give in raising capital for improvements, which have been awaiting the end of this industrial depression, and the commission will necessarily have to accept some responsibility, together with the managers of the railroads, for the provision of sufficient facilities to furnish satisfactory service.

While Mr. Lane's activities have been such as to cause him to be loked upon chiefly as a "friend of the people," he is to be credited with a signal service which will be remembered by railroad officers with very definite appreciation—his championship of the uniform demurrage rules for freight cars. This reform in the freight service was not popular with shippers, though it was really in their interest, and Commissioner Lane helped the railroads to win success in a hard campaign.

PANAMA TOLLS.*

The sentiment in Congress and elsewhere in favor of relieving the coastwise shipping from the payment of Panama tolls seems to be due largely to the belief that if tolls are collected from the steamship lines the freight rates which they charge and the rates of the transcontinental railroads will be higher by the amount of the tolls, and the public will thus pay more in added freight rates than it will gain in tolls received. This argument, however, assumes an improbable adjustment of rail and water rates. The rates of the steamship lines and the railroads will not be higher if Panama tolls are collected from the coastwise line.

In order to bring about this adjustment of rail and water rates there must be, first, active, rate controlling competition among the water lines, and, second, it must be the policy of the railroads to fix rates so as to compete actively with the carriers by water for practically all traffic moving between the two seaboards. Will these conditions exist? Steamship lines, when operating between common termini, adjust services and rates by "conferences."

Whether there be canal tolls or not, rates by water carriers will be such as the traffic will bear; the upper limit of what traffic by water will bear will be the lower limit to which rates are brought by the railroads; and the tolls will be paid by the owners of the steamship line instead of by the shippers in additional rates.

*From an address by Emory R. Johnson, special commissioner on traffic and tolls, before the Western Society of Engineers, Chicago, January 8, 1913.

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General News.

W. C. Brown, president of the New York Central lines, will be the principal speaker at a highway improvement convention to be held at Springfield, Ill., on January 31.

The "Banner Limited," of the Wabash, running between Chicago and St. Louis, is now made up wholly of steel cars. This is the first of ten new solid steel trains to be put in service by the Wabash.

The federal grand jury at New York City this week resumed its inquiry into the alleged illegal doings of the New York, New Haven & Hartford and the Grand Trunk. Two clerks of the New Haven road were examined at length concerning the steamer lines owned by the New Haven.

An aviator, Faller, at Berlin, Germany, on January 4, remained up in the air for more than an hour, with five passengers; and on January 5, he ascended with seven passengers and remained up seven minutes. The seven passengers, with the aviator, weighed 1,242 lbs.

Governor E. M. Ammon of Colorado, proposes to recommend the abolition of the state railroad commission and the establishment, in place of the commission, of a public utilities court. Mr. Ammon believes that the public body which regulates the railroads ought to have the powers of a court.

The railway commission of Canada has issued a general order, No. 96, prescribing specifications for automatic audible signals at highway grade crossings. Besides having a bell, to be rung on the approach of every train, such signals must bear the word "danger," in letters 6 in. high, and be illuminated so that this word will be visible in the night.

The Committee on Rules of the lower House of Congress has decided to lay on the table indefinitely the resolution, proposed by Congressman O'Shaunessy, of Rhode Island, calling for an investigation of the New York, New Haven & Hartford and the Grand Trunk. The majority of the committee believe that the Department of Justice, which is prosecuting these roads, should have a free hand, with no interference by Congress.

At hearings before the Senate Committee on appropriations at Washington this week, representatives of numerous mercantile bodies presented arguments in favor of the continuation of the Commerce Court. B. A. Dean, of Auburn, N. Y., appeared for the National Hay Association; Luther M. Walter, of Chicago, for the Railroad Commission of Louisiana, the Yellow Pine Manufacturers' Association and others; and E. E. Williamson, of Cincinnati, for interests in that city.

The fourth annual meeting of the American Society of Engineering Contractors will be held on Tuesday, January 14, in the United Engineering building, 29 West Thirty-ninth street, New York. In addition to the transaction of routine business, William L. Bowman, civil engineer and attorney-at-law of New York, will read a paper entitled "Legal Hints to Contractors" and Edward F. Croker, ex-chief of the New York Fire Department, will give a talk illustrated by lantern slides on "Fire, Its Effects and Its Prevention."

Senator Bristow, of Kansas, has introduced in Congress a bill to provide for a national commission with authority to regulate industrial concerns doing an interstate business, in the same way that the Interstate Commerce Commission regulates interstate carriers. In the legislature of the state of New York Senator Healy has introduced a bill to consolidate the two public service commissions of the state, which now have authority over the First district and the Second district respectively, into a single commission of seven members. There are now five men on each commission.

A strike of conductors and motormen at Yonkers, N. Y., last week has resulted in the complete suspension of street railway traffic in that city for more than seven days. It appears that some months ago the street railwaymen's union induced the city government of Yonkers to pass an ordinance forbidding the employment in that city of any motorman who has not had fifteen days' experience or instruction in that work, on lines within that city. The company, therefore, has made no effort to engage men from other cities to take the place of the strikers. The street railway men are now trying to get similar ordinances adopted in Mount Vernon, N. Y., New Rochelle and in White Plains.

President Miller, of the Chicago, Burlington & Quincy, has announced that it is proposed within the next few months to transfer the auditing department, now in the general office in Omaha, to the new general office building in Chicago, a change which will affect about 200 employees. Mr. Miller gives as the reason for the change the very large increase in recent years in the volume of statistical information required both on account of the increase in business and the demands of public authorities, which require a concentration of the department where it can be most efficiently managed. Mr. Miller's announcement was given in confirmation of rumors which have caused vigorous protests for several days by the Omaha newspapers and by the Commercial Club, which seem to feel that "the great city of Omaha is being reduced to the condition of a way-station."

The Tennessee state legislative board of the Brotherhood of Firemen, which has outlined its wants for presentation to the new legislature, will include among other requests one that the pay of members of the legislature shall be $8 a day; also one that railway crossing flagmen shall not be required to work over eight hours a day. These unselfish requests are accompanied by the usual demands for the repeal of laws which are thought to be unjust to labor unions and for an electric headlight bill and a bill forbidding railway black-lists. The president of the legislative board for the ensuing year is H. V. Reid, of Memphis, and the secretary is D. J. Bennett, of Jackson. Mr. Reid says that the brotherhood desires the repeal of the fellow servant law of Tennessee, which prevents employees from suing for damages for injuries in cases where a fellow servant is partly responsible for the injury.

A committee of officers of the Panama Railroad was appointed on December 18, 1912, by Col. George W. Goethals, to review plans for some proposed transmission line bridges, to consider the various features of proposed telephone and telegraph lines, to report on the adjustment of the proposed signals to the new conditions, to consider possible forms of intercommunicating systems from both the operating and military viewpoints, and to make a preliminary study of the proposed electrification of the Panama Railroad. This committee consists of Edward Schildauer (chairman), Lieut. Frederick Mears, Capt. W. H. Rose, C. L. Bleakley, W. R. McCann and W. H. Penley, the last named the signal engineer of the road. A sub-committee consisting of Messrs. Fenley and McCann was also appointed to make a preliminary report on electrification, as all of the other propositions to be considered by the committee will be fundamentally affected by the kind of motive power that is employed.

St. Paul Electrification.

The Secretary of the Interior has this week granted the Great Falls Power Company, of Great Falls, Mont., authority to construct over government lands a transmission line for electric power which is intended to provide for the electrification of the road of the Chicago, Milwaukee & Puget Sound for a distance of 450 miles, from Harlowtown, Mont., to Avery, Idaho. The grant is for fifty years and is subject to readjustment every ten years; and the government retains rights in relation to the regulation of rates and service. The permit cannot be transferred without the approval of the Secretary of the Interior.

The officers of the Chicago, Milwaukee & St. Paul say that preliminary plans for this electrification are now being made. The line in question includes the sections over the Bitter Root, the Rocky and the Belt mountain ranges. The maximum grade on this part of the road is 1.7 per cent. eastbound, and 2 per cent. westbound. Included in this section are the St. Paul Pass tunnel, nine thousand feet long, the Donald tunnel and several smaller tunnels. From Lombard east to Summit, 44 miles, there is a continuous ascending grade averaging 1 per cent.

Power will be delivered to the railway line at five points, Bowen, Harlowtown, Deer Lodge, and at three points between Deer Lodge and Avery. It is expected that the overhead trolley will be used, with a working current of probably 2,400 volts;

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and the alternating current on the transmission line will probably be 100,000 volts. It is expected that the work will be begun within two years.

A "Clear Failure."

It seems to us perfectly clear that the present controversy between the New England States and the New Haven railroad makes it manifest that State regulation of great industrial combinations is a failure. We think there must be and will be a steady trend towards federal regulation. Moreover, if it is wrong for the New Haven to control the water transportation of Long Island Sound and of the Maine coast or of the suburban electric lines, there ought to be some authority which can tell the railway so before it buys its steamships and trolley lines. That authority, it seems to us, can be exercised efficiently only by the federal government.—*The Outlook:* Lyman Abbott, Editor; T. Roosevelt, Contributing Editor.

The New York Barge Canal.

John A. Bensel, State Engineer of New York, in his annual report, says that the cost of the barge canal system will be more than $101,000,000, which is the amount appropriated to build it. More funds must be appropriated within the next two years. The additional expense is due principally to the increase in the cost of lands and waters taken for canal purposes above the estimate of 1903 and the increased price of labor and materials. The new canal will be ready to open in 1915, and at the rapid rate at which work is going on, the Champlain canal will be completed next year. If progress on the Scotia dam is rapid the canal between the Hudson River and Oswego will be ready in 1915.

A large number of bridges must be built along the canal, and the demands of the highway traffic call for bridges of greater width and length than were provided for in 1903. In the 1903 estimate there was included an item of $729,644 for machinery for locks, which were to be twenty-eight feet wide. The locks are being made 43 feet wide, which will increase their cost and the cost of the operating machinery. Poughkeepsie, Newburgh and other cities along the Hudson desire to have barge canal terminals.

"To the People of Texas."

The above is the headline of a half-page display advertisement, signed "General Managers Texas Railroads," which has lately appeared in the newspapers of that State. We quote a portion of this manifesto:

"If you owned several thousand acres of land covered with valuable timber remote from market and desired to have that timber cut and hauled to a city where you could sell it to the best advantage; and if you should make a contract with Bill Jones to get that timber to market; he to furnish the wagons and teams and hire all labor, and you to pay all his expenses incurred in carrying out the contract, such as wages, repairs, damages, etc., and in addition thereto, pay him a fair return on the value of his outfit, would you want his expenses to be reasonable or unreasonable? Would you force him to employ more men than he needed? Would you want to put him to any unnecessary expense? And if he could, by borrowing money and buying new wagons and better teams and improving the roads, reduce the expense of getting your timber to market, without additional cost to you, would you be willing for him to do so? And if any man, or set of men, should, for selfish and pecuniary gain, undertake to increase Mr. Jones' expense (which you must in the end pay), would you encourage and help them do that? Or would you assist Mr. Jones in holding down the expense to as low a sum as possible, consistent with justice and fair dealing?

"What would be your answers to the foregoing questions? Why, of course, you would say, 'I have bound myself to pay all the expenses of every character connected with, or connected with, the business, and I want these expenses to be as small as possible. And if Mr. Jones can, by improving the roads over which the logs are hauled, and by getting better wagons and teams decrease the costs, I not only want him to do so, but I will help him. And I will certainly not do anything to increase the expense, but, so far as I can, will keep others from doing so.'

". . . You act through agencies created by you, the Legislature, Courts and Commissions, and these agents should, and we believe will, look out for and protect you against unnecessary and unjust expense. The Legislature can help the railroads decrease the expenses without additional cost to you. In spite of all we can do to prevent it, the expenses of operating the railroads are increasing more than the revenue, and unless these expenses are arrested an increase in freight rates will be the result. We sincerely regret this condition, and will do all we can to prevent it, but we need your aid and cannot succeed without it. . . ."

The Right to Run Past Signals.

The cable reports that Knox, an engine driver on the North-eastern Railway of England, has been suspended for running past signals. He had just been put back on his run after a strike in defense of the right to get drunk on his own time. It remains to be seen what position the union will take in support of the right to run past signals at discretion. In support of "personal liberty" to drink there was a strike which cost the North-eastern $250,000, and the British journals estimated the aggregate loss of all trades which were embarrassed by the tying up of the Northeastern at $5,000,000. The strikers won a nominal victory, for investigation showed that Knox had not been "drunk in law," and he was ordered reinstated. But the victory cost the strikers a week's wages for breach of their contract of employment, and it is now "up to them" to say what they are willing to pay to vindicate the right to run past signals. This is a more interesting question here than the "personal liberty" question which was the subject of many stump speeches by the British walking delegates and the politicians in sympathy with them and hungry for the labor vote.

The claim of locomotive engineers to indulge at discretion is preposterous, and yet the public opinion of railway riders and unionists in this country tolerates a more dangerous fault. Our railway administrators do not venture to enforce discipline about signals. It has been stated publicly that one of the roads now on trial before its passengers and the Interstate Commerce Commission for its accidents has a record of eighteen such drivers as Knox, and has not disciplined them for fear of the union.

Is not improvement in discipline quite as valuable as ordering the railways to carry full crews, to install safety appliances of uncertain value and in unlimited quantities, and to do many other things at an aggregate cost of hundreds of millions of dollars which the roads are not allowed to charge rates to cover? If the Interstate Commerce Commission is to press the railways on these points should it not also take charge of the unions?—*New York Times.*

Governor Foss on the Massachusetts Railroad Problem.

Governor Eugene N. Foss, of Massachusetts, in his inaugural address, called for immediate action looking to rigid regulation of railways, declaring this to be the alternative to national ownership and operation of the railroads of the country. He said:

"The greatest problem before the American people is to maintain the government above railroad domination. This problem has reached a crisis in Massachusetts. It is clear that if a commonwealth does not control the railroad situation the demand for control by ownership and operation by the federal government will soon become irresistible.

"The only way to postpone government ownership is to retain in the commonwealth the power to regulate the transportation system, to assert that power at once, and to apply it without delay."

Governor Foss urged the dissolution of the holding company, through which the New Haven controls the Boston & Maine. Continuing, he said:

"In my two previous inaugural addresses I urged upon the Legislature this dissolution, and the last Legislature appointed a commission to report to the next session upon the desirability of prohibiting holding companies in this Commonwealth. Since the appointment of that commission events have occurred which have brought into high relief considerations which far outweigh any arguments on one side or the other which that commission may adduce in support of its recommendations. . . . The expressed will of the people in the November election, the overt act of the New Haven [in the Grand Trunk matter] and the decisions of the Supreme Court of the United States are a combination which leaves no loophole for independent opinion on the part of the Legislature.

"If the Boston & Maine and the New Haven are not com-

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peting lines, and if the people of New England believe that this section can best be served by a consolidation of these lines, then the full responsibility of such a combination should be assumed, and proper arrangements should be made in Greater Boston and elsewhere for bringing about an actual physical connection of these railroads. . . ." Governor Foss would like to see the six New England States co-operate in their dealings with the railway problem.

Firemen's Wages.

The committee representing the eastern railroads on Monday of this week submitted to the representatives of the firemen a proposal that the questions of wages and other conditions now at issue between the companies and the men be settled mainly on the lines of the award recently made by the arbitration board in the matter of enginemen. The main feature of this offer is a minimum rate, but with modifications for locomotives weighing over 70 tons on the drivers. As in the case of the enginemen, the proposed schedule would increase the pay of firemen on many smaller roads, but not much on the larger systems. The principal rates are: passenger engines, $2.40 per 100 miles; over 70 tons and up to 87½ tons, 10 cents additional; 87½ tons and over, 15 cents additional, but with a maximum of $2.70. Through freight, $2.75; engines weighing over 70 tons, 10 cents additional, with a maximum of $3; engines weighing over 87½ tons, 15 cents additional with a maximum of $3.25; switching engines $2.45. Mr. Carter, president of the firemen, in a letter written on Tuesday rejected the offer of the companies and suggested that no more time be lost in "useless conferences," but that matters be at once submitted to arbitration under the Erdman act. He said that the firemen would waive the clause in that act requiring a settlement in thirty days and would be willing to make the time limit sixty days. He submitted a tentative draft of an agreement to arbitrate. The roads replied that they wanted seven arbitrators, not three, which is the number provided for by the Erdman act.

Guyandot Bridge Failure.

The failure of a bridge at Guyandot, W. Va., on the Chesapeake & Ohio, January 1, was noticed in our last issue, page 28. An officer of the road sends us the following details of the accident:

"This bridge is about three miles east of Huntington, W. Va. It has heretofore consisted of three iron, single-track, through-truss spans, each about 150 ft. long, erected about twenty years ago. On account of the introduction of heavier engines these spans are being replaced by heavier steel, double track, through truss spans. Traffic continues to move over the bridge during the erection of the new spans. The west span was completed about December 1. The trusses of the middle or channel span had been taken down and the track and floor system of the new span were carried on falsework. This falsework consisted of piles driven through 7 to 17 ft. of sand to bedrock. The third span of the old bridge at the east end had not been disturbed.

"The steel bridge was being erected by the railway company's forces, and the foreman in charge of the work as well as the general bridge foreman had been in the employ of the Chesapeake & Ohio for more than twenty years in their respective positions; were experienced, capable men and knew the character of the Guyandot river.

"On the day of the accident fifteen trains had passed over the bridge between 6 a. m. and the time of the accident, 10:40 a. m. The bridge was carefully watched by the bridge gang during the passage of all of these trains to see if there was any settlement. None was observed even when the train preceding the one that fell passed over the bridge, one hour previous to the accident. At that time there was nothing to indicate that the falsework had been undermined and there was no settlement at any point.

"The wrecked train was a westbound manifest freight, consisting of a Mikado locomotive and 39 loaded box cars; and while it was crossing the bridge at a speed of four or five miles an hour the falsework suddenly settled on the up-stream side, and the engine and one car turned over up-stream and fell into the river, carrying the falsework down with them.

"The Guyandot river enters the Ohio about one mile below the bridge. The track is 55 ft. above low water, and 75 ft. above bed rock. Ordinarily there is but little current in the Guyandot at this point, but snow and rains on December 30 had caused a rise in the river, so that on January 1 it was about 8 ft. above low water mark, and the Ohio being low, there was a swifter current in the Guyandot than at any time since the track had been carried on falsework. The watershed of the Guyandot is heavily timbered and extensive logging operations have been carried on for many years. The logs are floated down the Guyandot and into the Ohio river, to be sawed at mills along that river. There were some logs running on the day of the accident, and it is believed that some oak or other heavy logs had lodged against the bottoms of the piles and caused eddies that undermined them, resulting in the accident.

"The engineman went down with the engine and was killed. Before crossing the bridge the train had been flagged by the bridgemen on the east side, and while it was standing there the fireman and one of the brakemen walked out on the bridge to the point where the bridge men were at work; and instead of returning to the east side to get on the train, they went to the west side, because it was a more convenient place to get on, and not through any fear they had of the bridge. These men fortunately were saved. At the time of the accident there were fifteen bridgemen on the bridge and six of them were carried down and were lost, making the total number of employees killed seven. One other employee had his hand broken, but there were no other injuries of importance. No persons other than these employees were killed or injured.

"The supervisor of bridges and buildings of the division, a man of forty years' experience, and especially well acquainted with this river, had examined the bridge before the passage of the wrecked freight train and pronounced it safe."

The John Fritz Medal.

The John Fritz medal of the four national engineering societies was presented to Captain Robert W. Hunt on Thursday evening, December 5, 1912, in the Engineering Society's building, New York, for meritorious work in connection with the development of the Bessemer process for the manufacture of steel. Captain Hunt is at the head of the Robert W. Hunt & Co. testing and inspection bureau of Chicago. He was born at Fallsington, Bucks county, Pa., on December 9, 1838, and began work in a rolling mill at Pottsville, Pa. In 1870 he established the first chemical laboratory in America in connection with an iron and steel manufacturing plant, at the works of the Cambria Iron Company, Johnstown, Pa. Suspending this work temporarily while participating in the Civil War, he resumed it with the same firm in 1865 in an experimental Bessemer plant. He aided greatly in the development of the Bessemer process at various mills until 1888, when he organized the testing and inspection bureau bearing his name.

In addition to being president of the American Society for Testing Materials at the present time, Captain Hunt has been president of the American Institute of Mining Engineers at two different times, has been president of the American Society of Mechanical Engineers and of the Western Society of Engineers. He has given special attention in recent years to the steel rail problem and is one of the leading authorities on this subject.

Signals Imperfectly Displayed; Stop!

The Railroad Commission of Indiana has issued the following circular, and calls on the railways, steam and electric, to say that they will obey it:

"Information has come to the commission that many railroad companies have not required strict compliance with the rule that: 'A signal imperfectly displayed, or the absence of a signal at a place where a signal is usually shown, must be regarded as a stop signal, and the fact reported to the proper official.' The proper construction of this rule is that when switch signal lights are found to be out, the train or car shall stop, the switch examined and the light relit. Trains or cars should stop in all cases where the lights are out; not slow down, but stop. The commission recommends that this strict construction of the rule shall be enforced by all companies."

This order seems to have been occasioned by the collision at Irvington, November 13. This collision occurred at 3 a. m., killing 15 persons. It was at a misplaced switch, a passenger train running into a freight train standing on a side track; and, according to the published reports, there was no light on the switch; and the line was straight so that the absence of the light should have been discovered by the engineman of the passenger train.

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Western Society of Engineers.

The annual meeting of the Western Society of Engineers, Chicago, was held January 8-9. The annual dinner and business session was held on Wednesday evening. The new station of the Commonwealth Edison Company, in which 20,000 k. w. turbo-generator units, the largest in operation, have been installed, was visited on Wednesday, while on Thursday the new plant of the Corn Products Refining Company, Argo, Ill., was visited. The session closed with a smoker at the society's rooms on Thursday evening.

Albert F. Reichman, resident engineer of the American Bridge Company, New York, with office in Chicago, since 1900, and formerly in charge of the bridge engineering office of the Chicago, Milwaukee & St. Paul, was elected president of the club; A. Bement, first vice-president; H. E. Grant, second vice-president; J. H. Hayford, third vice-president; C. R. Dart, treasurer, and F. E. Davidson, trustee for three years.

Central Railway Club.

The annual dinner of the Central Railway Club, was held on January 9, at the Hotel Statler, Buffalo, N. Y. The speakers comprised Riley Williams, vice-president of the Schuylkill & Canastoga Valley Railroad; George M. Basford, of the American Locomotive Company, New York; A. J. Grymes, manager of the marine department of the Erie; William McClellan, electrical engineer of the New York Public Service Commission, Second district; and the Hon. Devoe T. Hudson, Buffalo, N. Y.

American Society of Mechanical Engineers.

At the meeting of the American Society of Mechanical Engineers, to be held January 14, there will be a report of the committee on meetings in New York, followed by a discussion of this report. F. A. Waldron, industrial engineer, will then present a paper on the numerous phases of scientific management not closely related to labor problems. This paper will be followed by a discussion. An informal dinner will precede the meeting.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRICAL RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 13 Park Row, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Convention, January 21-23, Chicago.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in May, Oct., Nov., Dec., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 784, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next meeting, September, June 18, Buffalo, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—F. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May, 1913, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, Chicago & North Western, Escanaba, Mich. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—F. P. Dane, B. & M., Reading, Mass. Next convention, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES' ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—C. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July and Aug., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Thursday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C. M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Ellison, 2 Rector St., New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Am. Elec. Ry. Assoc.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-22, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—F. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOCIATION.—Grant Hall, 32 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and August, St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La. Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—Wm. Duncan, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; 1st Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting, November 20; Boosters' meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 2042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

The Wells-Fargo Express Company announces at San Francisco that it will soon make rates to compete with the new parcel rates of the post office department.

For the convenience of the growing Yellowstone Park and Pacific northwest travel, arrangements have been made by the Denver & Rio Grande with the Oregon Short Line to interchange passengers passing through Colorado and Utah at Salt Lake City without extra charge. The Ogden interchange will also continue as heretofore. This new arrangement becomes effective February 1.

Industrial Commissioner P. H. Burnett, of the Lehigh Valley, announces a two-day meeting of farmers in the court house at Towanda, Pa., January 10 and 11. E. H. Dollar, president of the New York State Dairymen's Association, and others, will tell of up-to-date farming methods; and the problems of farmers' wives will be discussed by Miss Martha Van Rensselaer, of Cornell University.

On January 6 a daily time table for a "Seeing the Canal" train was put in effect on the Panama Railroad. On three days of the week it provides for a trip over the Pacific division in the morning, and through Culebra Cut in the afternoon. On the return from the Pacific division trip a lecture, illustrated by the use of models, is delivered at the tourist station at Ancon. On three days of the week the trip includes a visit to Gatun.

The Lehigh Valley and the New York, Chicago & St. Louis were fined $1,000 each by the federal court at Chicago on December 30, on charges of paying rebates to A. Booth & Co., Chicago, on shipments of fish and oysters, Booth & Co. having been fined a similar amount some time ago. The Chicago, Rock Island & Pacific and the Illinois Central were also fined $1,000 each on charges of issuing annual passes instead of trip passes to care-takers in charge of banana shipments from the south to Chicago.

J. M. Daly, general superintendent of transportation of the Illinois Central, addressed the Traffic Club of Chicago at its monthly luncheon on January 8, on the subject of "Car Efficiency." The programme of the entertainment committee of the Traffic Club provides for a ladies' night on January 14, and a monthly luncheon on January 22, at which Professor P. G. Holden, director of the agricultural extension department of the International Harvester Company, will speak on "Greater Efficiency in Agricultural Production."

The Industrial Bureau of the New England Lines, which is run by the New York, New Haven & Hartford and the Boston & Maine, jointly, reports that during the first 18 months of its activities 68 new manufacturing concerns have been established in New England, employing 3,600 persons and representing an investment of over $2,600,000. A circular has been issued giving the names and locations of some of the principal new industries. The manager, W. H. Seeley, says that the local boards of trade have very effectively co-operated with the bureau.

The number of freight cars moved over the Middle division of the Pennsylvania Railroad in the twelve months of 1912 is reported as 2,075,912, this being the count made of the cars in trains passing Denholm. This is less than the number recorded in 1907, which was 2,225,789, but the tonnage has been greater during the past year, as an overwhelming majority of the cars now carry about 50 tons, whereas five years ago 20-ton, 30-ton and 40-ton cars were common. The heaviest freight movement of the past year was in March, when the number of cars recorded was 203,920.

Robert E. Strahorn, for several years past prominently connected with the Harriman Lines in Oregon, and now one of the vice-presidents of the Oregon-Washington Railroad & Navigation Company, was this year chosen president of the National Apple Show at Spokane, an instance of amicable relations between the mercantile community and railroad officers quite in contrast with those in some other parts of the country—New England, for instance. Mr. Strahorn not only presided with acceptance over the doings of the annual apple exhibit, but was also the leader in a new and forward step, viz., in securing the co-operation of prominent men in the apple growing industry, in effecting a permanent organization which called a convention for December 16, to consider means of improving the marketing and distribution of the fruit products of the northwest. Something of this kind had become an absolute necessity, because of the very rapid increase in the fruit production of Washington, Oregon and Idaho. The convention of December 16 brought together 400 representatives of the fruit growing interests, as well as a large number of prominent railway officers. These fruit growers are dyed-in-the-wool shippers, and Mr. Strahorn frankly told them that he was likely to say or do things which would not please men who had always looked upon reductions in freight rates as the most important desideratum in their business; but they stood pat, unanimously, and Mr. Strahorn is at the head of a committee of nine, which is to take up the questions indicated.

"Progressive" Commissioners.

"Suspends freight advances", is a headline relating to the work of the Interstate Commerce Commission that has become so familiar of late as almost to warrant keeping it standing in type. The suspensions thus effected have usually been crystallized into refusals to permit the advances referred to to take effect. If the commission would use somewhat greater discrimination in its action, there would be greater confidence that the policy of holding rates down was being applied with wisdom and in a way that would not damage the carriers' best interests. Recent indications that the commission is again divided within itself with regard to the general freight rate question show the difficulty of the subject. The so-called "progressive" element in the body needs to proceed with caution in order that it may not incur the danger of having its policy reversed instead of modified, in consequence of public demand.—*Journal of Commerce, New York.*

Summary of Revenues and Expenses of Steam Roads in October.

The Bureau of Railway Economics' summary of revenues and expenses and comments thereon for October are as follows: The railways whose returns are included in bulletin No. 42 operate 229,636 miles of line, or about 90 per cent. of all the steam railway mileage of the United States. The total operating revenues for the month of October, 1912, amounted to $290,795,383. This includes revenues from freight and passenger traffic, from carrying mail and express, and from miscellaneous sources. Compared with October, 1911, the total operating revenues of these railways show an increase of $34,986,768. These total operating revenues per mile of line amounted to $1,318 in October, 1912, and $1,177 in October, 1911, an increase for 1912 of $141, or 12.0 per cent. This increase was the resultant of increases in each revenue account as follows: freight revenue, 14.8 per cent.; passenger revenue, 3.5 per cent.; other transportation revenue, 8.6 per cent.; non-transportation revenue, 21.4 per cent.

Operating expenses, which include all the costs of maintaining track and equipment, operating trains, securing traffic, and of administration, amounted in October to $183,354,865. This was $20,116,643 more than for October, 1911. These operating expenses per mile of line amounted to $831 in October, 1912, and $751 in October, 1911, an increase for 1912 of $80 per mile, or 10.7 per cent. Four of the five primary operating expense accounts showed increases in 1912. In the cost per mile of maintaining way and structures, i. e., track and buildings, there was an increase of 11.6 per cent.; in the cost per mile of maintaining equipment an increase of 14.9 per cent.; in transportation expenses per mile an increase of 9.5 per cent., and in general expenses per mile an increase of 5.4 per cent. Traffic expenses per mile decreased 1.3 per cent.

Net operating revenue, that is, total operating revenues less operating expenses, amounted in October to $107,440,518. This was $14,870,125 more than for October, 1911. Net operating revenue per mile of line amounted to $487 in October, 1912, and $426 in October, 1911, an increase for 1912 of $61 per mile, or 14.4 per cent. The net operating revenue for each mile of line for each day in October averaged $16, and for October, 1911, $14. It should be recalled that net operating revenue represents gross income before anything has been taken out for taxes, rentals, interest on bonds, appropriations for betterments, or dividends.

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Taxes for the month of October amounted to $10,281,961, or $47 per mile, an increase of 2.8 per cent. over October, 1911.

The operating ratio for October, that is, the per cent. of total operating revenues which was absorbed in operating expenses, was 63.1 per cent., which is comparable with 64.3 per cent. in September, 1912, and 63.8 per cent. in October, 1911.

The eastern group of railways shows an increase in total operating revenues per mile of line as compared with October, 1911, of 11.8 per cent., the southern group an increase of 8.9 per cent., and the western group an increase of 13.4 per cent. Operating expenses per mile increased 11.0 per cent. on the eastern railways, 9.6 per cent. on the southern railways, and 10.9 per cent. on the western railways.

For the eastern group of railways net operating revenue per mile increased 13.4 per cent., for the southern group it increased 7.3 per cent., while for the western group it increased 17.2 per cent.

The increase in taxes per mile was 5.0 per cent. in the southern group, and 7.2 per cent. in the western group; in the eastern group there was a decrease of 2.2 per cent.

Comparison of the returns for the four months of the fiscal year with those of the corresponding months of the previous fiscal year reveals an increase in total operating revenues per year 1912 to date. The following table shows the per cent. of operating revenues consumed by each class of expenses:

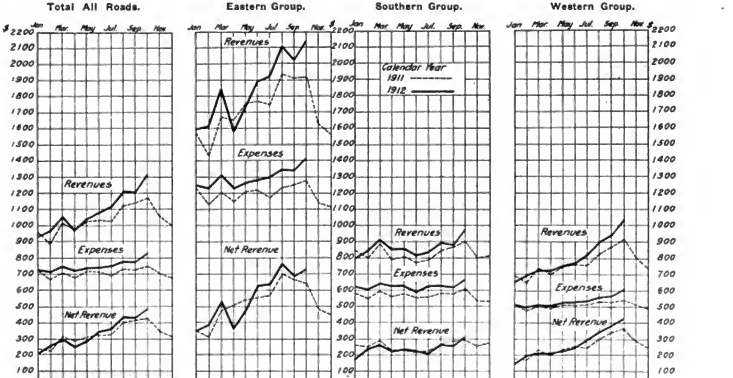
PER CENT. OF TOTAL OPERATING REVENUES.

	October,		Fiscal year ended June 30,		Calendar year ended December 31,	
	1912.	1911.	1912.	1911.	1911.	1910.
Maint. of way and structures	12.5	12.5	12.7	12.9	12.7	13.3
Maint. of equipment	14.9	14.5	15.8	15.5	15.5	15.3
Traffic expenses	1.7	1.9	2.2	2.2	2.1	2.1
Transportation expenses	32.0	32.7	35.9	35.5	35.4	34.7
General expenses	2.0	2.2	2.5	2.5	2.6	2.4
Total operating expenses	63.1	63.8	69.1	68.6	68.3	67.8

INTERSTATE COMMERCE COMMISSION.

The commission has suspended until April 25 certain schedules in F. A. Leland's tariff, which advance the rate for the transportation of cotton linters from points in Texas to Minneapolis, Minn., and other points.

The commission has further suspended the supplement to the tariff of the Tennessee Central, which advances rates for the



Monthly Revenues and Expenses Per Mile of Line in 1911 and 1912.

mile of 9.0 per cent., an increase in operating expenses per mile of 8.2 per cent., and an increase in net operating revenue per mile of 10.3 per cent. This net operating revenue per mile of the eastern group of railways increased 9.2 per cent., as compared with the corresponding period of the previous fiscal year, and that of the western group increased 15.1 per cent., while that of the southern group decreased 1.9 per cent.

When the returns for the ten months of the calendar year 1912 are compared with those of the corresponding months of 1911, they show an increase in total operating revenues per mile of 5.2 per cent., an increase in operating expenses per mile of 6.0 per cent., and an increase in net operating revenue per mile of 3.5 per cent. There was an increase in net operating revenue per mile of 4.2 per cent. in the eastern group, an increase of 6.1 per cent. in the western group, and a decrease of 5.5 per cent. in the southern group.

The diagram shows the variations in total operating revenues, operating expenses and net operating revenue per mile for the several months of the calendar year 1911 and of the calendar

transportation of phosphate rock, in bags, from points in Tennessee to Norfolk, Va., and other points.

The commission has further suspended from January 2, until February 15, certain tariffs, which advance rates for the transportation of salt from Kansas points to stations located on the Wichita Falls & Northwestern in the state of Oklahoma.

The commission has further suspended from December 31, until June 30, schedules in certain tariffs, which advance rates for the transportation of various commodities from eastern shipping points to points in California, Oregon, Washington and British Columbia.

The commission has further suspended from December 30, until June 30, certain tariffs which advance rates for the transportation of lumber, in carloads, from producing points in Tennessee, Mississippi and other states to destinations north of the Ohio river and to Canadian destinations.

The commission has further suspended from December 30, until June 30, the supplements to tariffs of the Chesapeake

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& Ohio and the Norfolk & Western, which advance rates for the transportation of pig iron, in carloads, from Buena Vista, Va., and other points to Philadelphia, Pa., and other destinations.

The commission has suspended from January 1, until March 31, an item in a supplement to the tariff of the Minneapolis & St. Louis, which advances rates for the transportation of flax tow, flax moss, and flax fiber from St. Paul, Minn., and other points to St. Louis, Mo., and other points. The present rate from St. Paul to St. Louis is 12½ cents per 100 lbs., and the proposed rate 18 cents per 100 lbs.

The commission has suspended from January 1, until May 1, various items in Hosmer's tariff, which advance rates for the transportation of butter and eggs, in carloads and less than carloads, from Topeka, Kan., to Mississippi river crossings and stations in Illinois, Indiana and Kentucky. The advances which have been suspended amount to about 11 cents per 100 lbs. on carloads and 15 cents on less than carloads.

The commission has suspended, until May 1, certain tariffs, which advance rates for the transportation of some twenty commodities between Missouri river points. Taking Omaha and Kansas City as representative points, the advances on certain commodities are as follows: Sulphuric acid, 2½ cents per 100 lbs.; blue vitriol, 2½ cents per 100 lbs.; canned goods, 2½ cents per 100 lbs.; furniture, 3 cents per 100 lbs., and malt, 7½ cents per 100 lbs.

Confirming the general principle of an order entered and announced on January 26, 1911, the commission has held that when a carrier, in obedience to the requirements of the Fourth Section, has, after August 17, 1910, corrected discriminations against intermediate points, it may not lawfully restore such discriminatory rates unless, upon formal application, the commission finds justifying circumstances and authorizes a deviation from the long and short haul rule.

The commission has ordered that an inquiry be held into the rates, practices, rules and regulations of the Great Northern, the Duluth, Missabe & Northern, and the Duluth & Iron Range, governing the transportation of iron ore from producing fields in the state of Minnesota to the docks at Duluth, Minn., and Superior, Wis., when destined to points beyond the docks and without the state of Minnesota, and when such transportation forms a part of the carriage of such ore to a point or points without the state of Minnesota.

The commission announces that as a result of correspondence with the Pennsylvania Railroad relative to complaints received from New York, Pennsylvania, Maryland and Wisconsin, directed against the recent order of the Pennsylvania Railroad forbidding the presence of blind persons on the railroad company's passenger trains, unless accompanied by a caretaker, the road has modified its rule so that blind persons who are capable of traveling alone will not be required to have a caretaker, and they will be assisted by station men and trainmen when necessary.

Complaint Dismissed.

French Paper Company et al. v. Michigan Central et al. Opinion by the commission:

The commission found that the rate of $1.90 per net ton on bituminous coal from points in West Virginia to Niles, Mich., was not shown to have been unreasonable.

Lindsay Brothers v. Pere Marquette. Opinion by the commission:

The complainant contended that the defendant's rate and minimum weight for the transportation of sleighs in carloads from Wayne, Mich., to Milwaukee, Wis., was unreasonable and unduly discriminatory. The commission found that the evidence was not conclusive. (25 I. C. C., 368.)

Corporation of the Cathedral of the Incarnation v. Long Island Railroad. Opinion by the commission:

In taking advantage of the low price of coal, the complainant ordered at one time an unusual quantity of coal for delivery upon its private siding. Due to the lack of facilities for accommodating the unusual number of cars delivered, certain demurrage charges were assessed, which the complainant alleges were unjust and unreasonable. The commission found that the defendants can not be required to be at all times prepared to furnish more than the reasonable facilities necessary for the usual amount of business done at a particular point upon its line, and in this case it can not be said that such facilities were not furnished the complainant. (25 I. C. C., 399.)

Board of Railroad Commissioners of the State of Montana v. Chicago, Burlington & Quincy et al. Opinion by the commission:

The commission found that the double first-class rating applied to the transportation of two rocking chairs, set up, with rockers detached and tied to back, from Lincoln, Neb., to Helena, Mont., was not excessive or unreasonable. (25 I. C. C., 371.)

Ford Manufacturing Company v. Illinois Central, et al. Opinion by the commission:

The complainant contends that the rate of 27½ cents per 100 lbs. for the transportation of roofing paper from Vandalia, Ill., to Toronto, Ont., is unreasonable and seeks reparation. The commission found that the evidence was not conclusive. (25 I. C. C., 432.)

In re investigation and suspension of advances in rates by carriers for the transportation of petroleum oil and other commodities from Wellsville, N. Y., and other points to Cincinnati, Ohio, and between other points.

The proposed increased rates on petroleum and its products from refineries in the so-called Buffalo group to points in southern Ohio and Indiana were found to be unreasonable and unjustly discriminatory. The tariffs under suspension are required to be withdrawn. (25 I. C. C., 349.)

Fullerton Lumber & Shingle Company, Limited, v. Bellingham Bay & British Columbia et al. Opinion by the commission:

Unjust discrimination, if any, in combination rates charged for the transportation of lumber from points in Washington to points in Canada exists wholly as to the rates for transportation in Canadian territory, over which this commission has no jurisdiction. The joint rates complained of were not found to be unreasonable. (25 I. C. C., 376.)

Wisconsin Lime and Cement Company v. Cleveland, Cincinnati, Chicago & St. Louis et al. Opinion by the commission:

The complainant contracted for the delivery at Englewood, Ill., of paving brick to be shipped over defendants' lines from Danville, Ill. At the time of the contract there was a published rate of 65 cents per ton on the traffic in carloads, from Danville to Englewood, and a part of the brick was moved under that rate. By permission of the commission, upon application by defendants, the rate was increased to 80 cents per ton upon five days' public notice, and the remainder of the brick was moved under the increased rate. Damages are claimed in an amount equivalent to the additional charges which the complainant was required to pay. The commission found that as no violation of the act to regulate commerce by defendants was shown, no grounds exist for an award of damages. (25 I. C. C., 366.)

Reparation Awarded.

A. Leach v. Northern Pacific et al. Opinion by the commission:

The commission found that the charges assessed on an emigrant movable outfit, including 15 head of live stock, loaded into a single car, were unreasonable in that they exceeded the tariff charges for two cars of emigrant movables. (25 I. C. C., 275.)

Arabol Manufacturing Company v. South Brooklyn Railway et al. Opinion by the commission:

Joint rates for the transportation of seventeen carloads of sizing from Bedford, N. Y., via Weehawken, N. J., to Carthage and other New York points were found to have been unreasonable to the extent that they exceeded the aggregate of the intermediate rates. (25 I. C. C., 429.)

Conifer Lumber Company v. Louisville & Nashville et al. Opinion by the commission:

The commission found that the routing instructions on a carload of lumber shipped from Brewton, Ala., to New Haven, Conn., and reconsigned to East Cambridge, Mass., were not followed and that the complainant had been deprived of its privilege of reconsigning the shipment through action of the Baltimore & Ohio Southwestern, and that therefore the shipment had been misrouted. (25 I. C. C., 272.)

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1912.

Name of road.	Average mileage operated during period.	Operating revenues			Maintenance		Operating expenses				Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$109,321	$39,336	$158,934	$23,864	$32,444	$3,757	$52,403	$7,710	$121,374	$37,556	—$84	$7,225	$30,247	—$16,167
Atchison, Topeka & Santa Fe	8,262	6,690,872	2,126,252	8,661,408	1,370,126	1,331,479	169,679	2,452,433	158,323	5,482,039	3,179,369	.....	339,176	3,040,193	147,662
Arizona Eastern	366	174,528	38,869	236,401	21,317	16,275	2,472	56,749	13,403	112,257	114,144	123	5,096	109,171	53,502
Ann Arbor	252	117,838	44,354	173,855	24,562	22,553	4,297	65,424	6,766	123,937	49,918	534	13,950	35,454	20,891
Atlanta, Birmingham & Atlantic	662	231,249	54,466	294,273	48,364	43,447	15,045	103,972	12,765	223,613	70,660	.....	13,875	56,785	—962
Atlantic & St. Lawrence	167	98,721	24,325	133,911	41,174	20,106	3,940	60,259	3,261	128,740	4,571	.....	7,314	—2,743	9,873
Atlantic City	167	64,974	51,244	124,728	33,492	12,600	1,706	74,495	1,129	123,432	1,295	—4,569	9,060	—12,370	—796
Atlantic Coast Line	4,611*	2,157,541	685,127	3,071,528	419,936	461,724	53,680	1,072,060	73,731	2,080,140	991,031	.....	125,060	866,031	—63,409
Baltimore & Ohio System	4,455*	7,311,783	1,201,298	9,040,332	1,162,521	1,502,497	187,161	3,250,868	271,299	6,318,923	2,721,429	—61,639	575,764	2,434,026	503,659
Bangor & Aroostook	631*	216,214	58,172	286,707	48,429	33,782	2,165	88,778	9,244	183,398	103,369	.....	10,500	93,068	4,852
Bessemer & Lake Erie	264	643,632	25,695	679,848	81,857	130,459	10,024	169,329	9,645	401,159	278,689	.....	15,000	263,689	75,387
Boston & Maine	2,244*	2,729,063	12,275,452	16,011,862	1,534,550	1,989,257	310,340	1,955,765	95,487	4,285,846	749,441	7,848	183,490	574,199	250,528
Buffalo & Susquehanna R. R	265	141,553	8,286	154,228	31,126	22,056	1,695	53,586	5,843	113,456	40,617	.....	1,500	39,117	—6,625
Buffalo & Susquehanna Ry	91	44,763	8,950	56,038	12,578	20,769	361	32,472	2,618	68,227	—10,179	—3	1,500	—11,682	—4,675
Buffalo, Rochester & Pittsburgh	574*	792,141	87,331	918,611	132,328	187,635	11,578	307,753	18,403	657,697	260,914	—992	17,900	242,022	22,320
Burlington, Cincinnati & Pacific	46	93,338	10,707	113,612	11,460	22,330	615	55,762	2,048	93,215	20,597	.....	10,000	1,004	15,270
Canadian Pacific Lines in Maine	233	56,499	30,583	93,507	20,027	12,787	4,678	39,152	5,063	84,553	11,004	.....	8,000	116,296	21,363
Carolina, Clinchfield & Ohio	238	198,342	12,978	215,981	15,252	25,063	6,417	35,297	8,261	90,285	124,796	.....	500	8,735	1,642
Carolina, Clinchfield & Ohio Ry. of S. C	58	12,311	1,654	14,118	829	158	1,041	2,474	405	4,863	9,255	.....	500	8,755	5,262
Central of Georgia	1,915	1,139,272	312,063	1,555,814	185,909	207,767	39,533	420,398	37,436	891,043	364,768	5,237	46,430	325,575	25,263
Central of New Jersey	669*	1,833,340	414,449	2,369,314	204,811	325,905	28,049	741,226	43,005	1,343,560	1,025,754	15,237	65,914	944,607	76,257
Central New England	252	271,981	90,030	411,742	46,140	57,662	1,118	90,654	2,748	198,323	213,419	.....	6,000	50,124	16,804
Central of Southern Carolina	141	129,482	31,673	179,227	25,895	19,653	3,171	61,830	4,254	115,103	55,124	.....	2,000	50,124	16,804
Chesapeake & Ohio Lines	2,815*	3,861,660	709,560	4,791,315	553,193	646,745	56,800	948,634	63,613	2,000,273	862,084	2,192	102,153	762,029	6,669
Chicago & Alton	1,076	1,666,707	1,063,807	3,08,348	1,061,185	212,294	326,894	46,649	512,671	34,420	1,132,938	228,257	—4,631	36,900	185,626	11,909
Chicago & Eastern Illinois	1,275	1,085,660	250,139	1,432,617	171,188	278,841	26,559	522,394	42,268	1,040,552	392,065	3,049	50,000	339,046	6,397
Chicago & Northwestern	7,992*	9,978,551	1,653,053	12,123,986	1,961,114	940,090	106,879	2,715,401	127,718	4,771,206	2,472,606	—13,661	303,160	2,085,835	532,309
Chicago Burlington & Quincy	9,133*	6,170,568	1,739,236	8,617,536	764,846	1,328,950	123,689	2,538,251	194,583	4,950,320	3,667,208	—15,183	274,350	3,377,437	806,510
Chicago Great Western	1,496	852,324	258,617	1,176,762	144,113	164,294	14,668	356,271	24,474	708,820	432,213	.....	50,000	382,265	67,030
Chicago, Indiana & Southern	356	311,601	72,999	398,189	44,296	85,831	6,329	119,087	9,182	265,215	114,926	617	20,000	95,593	80,891
Chicago Junction	12	.....	.....	169,348	20,938	13,195	1,064	80,398	3,537	119,532	49,816	2,730	75,000	877,473	182,426
Chicago, Milwaukee & Puget Sound	2,041*	1,747,490	390,659	2,346,067	239,324	314,453	31,038	634,668	40,349	1,259,832	1,086,235	4,399	208,757	1,957,774	686,587
Chicago, Milwaukee & St. Paul	10,241	8,894,052	1,225,354	10,724,271	807,083	986,579	111,031	2,541,630	79,258	4,525,501	2,198,770	4,399	236,687	1,957,774	686,587
Chicago, Peoria & St. Louis	755	114,891	26,749	149,142	30,305	14,140	2,071	74,958	5,653	131,963	—2,821	.....	4,800	—7,621	23,580
Chicago, Rock Island & Gulf	427	290,923	61,531	377,132	37,844	24,409	9,947	109,664	7,853	170,717	206,415	.....	3,595	200,392	82,531
Chicago, Rock Island & Pacific	7,868*	8,041,537	1,559,068	9,956,271	945,527	857,066	153,353	2,394,230	133,182	4,483,358	1,473,413	—18,976	246,848	1,207,589	9,892
Chicago, St. Paul, Minneapolis & Omaha	1,744	1,960,542	423,074	1,582,026	212,313	194,587	29,332	390,414	18,173	844,820	737,206	—2,591	86,885	647,806	—41,313
Cincinnati Northern	338	1,160,106	14,420	1,182,159	13,602	16,252	2,867	52,981	2,899	88,401	43,258	.....	3,500	38,458	23,015
Cleveland, Cincinnati, Chic. & St. Louis	2,011	2,140,620	608,996	2,995,368	294,345	530,103	71,414	1,110,110	61,153	2,082,124	928,244	—2,581	113,000	816,663	315,867
Colorado Midland	235	141,308	41,253	172,116	17,709	25,255	6,310	58,622	5,701	125,897	51,264	—405	10,000	40,859	1,774
Colorado & Southern	1,073*	694,382	98,888	838,760	111,722	154,525	9,857	234,451	21,146	531,731	302,038	—1,870	79,175	276,493	25,526
Cumberland Valley	162	226,449	56,649	295,869	38,665	37,645	4,442	92,993	7,295	203,292	90,077	—91	5,612	84,374	8,791
Delaware & Hudson Co.—R. R. Dept	1,454	1,506,617	278,307	1,865,745	179,345	286,712	23,827	709,170	53,295	1,244,169	694,338	—2,771	49,000	632,567	648
Delaware, Lackawanna & Western	959*	2,764,410	856,300	3,665,305	422,366	489,230	60,300	1,156,470	67,368	2,200,670	1,465,727	81,607	125,760	1,421,444	240,586
Denver & Rio Grande	1,889	1,716,539	413,453	2,193,532	320,153	318,675	31,505	577,438	32,854	1,280,625	912,906	.....	230,500	682,406	5,916
Denver, Northwestern & Pacific	.....	71,659	13,143	89,332	15,023	13,324	3,190	33,628	3,050	67,815	31,417	—72	9,409	21,936	3,513
Detroit & Mackinac	413*	61,976	29,540	99,232	15,023	13,324	3,190	33,628	3,050	67,815	31,417	—72	9,409	21,936	3,513
Detroit, Toledo & Ironton	441	130,591	12,782	155,043	38,781	22,642	2,978	71,249	4,870	140,494	14,549	.....	6,000	8,549	—10,852
Detroit, Grand Haven & Milwaukee	301	146,803	63,009	239,975	65,324	25,126	6,814	113,771	4,866	215,921	23,054	—36	2,953	20,065	—9,191
Detroit River Tunnel	.....	.....	.....	99,963	2,350	6,917	.....	9,142	74	18,483	81,480	.....	4,500	80,980	636
Duluth & Iron Range	274*	741,249	23,279	872,250	79,866	72,850	747	114,007	9,572	269,438	102,626	6,868	16,739	92,755	41,308
Duluth, Missabe & Northern	351*	699,314	32,832	653,074	70,904	77,686	1,967	146,731	13,583	339,871	344,393	4,977	26,901	322,279	229,226
El Paso & Southwestern Co	948	585,709	87,250	784,032	77,936	89,989	13,006	172,702	13,287	366,920	315,825	—1,795	43,438	270,592	13,886
Elgin, Joliet & Eastern	239	1,038,200	60	1,132,844	118,609	156,561	6,432	307,382	16,176	603,721	533,923	.....	23,333	510,590	209,301
Florida East Coast	648*	214,983	110,033	367,992	58,728	52,251	5,231	131,063	14,266	267,136	100,856	—926	15,500	84,430	21,670
Fort Worth & Denver City	454	461,841	142,358	668,896	45,198	83,866	2,502	174,928	14,853	344,654	244,357	—517	11,700	232,035	36,902
Gulf, Colorado & Santa Fe	1,328	1,714,674	464,665	1,038,928	118,107	160,401	35,079	390,471	33,986	767,984	270,994	—4,687	31,177	236,130	21,894
Gilkerbolt, Hattiesburg & San Antonio	307	197,084	27,454	290,496	34,635	53,668	11,018	140,001	8,053	247,315	43,181	.....	2,978	40,203	—63,454
Georgia	1,292	1,009,731	67,111	1,224,424	84,654	78,214	7,356	169,641	9,962	379,873	843,501	.....	14,075	29,426	14,690
Georgia, Southern & Florida	295	178,181	.....	214,227	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grand Rapids & Indiana	578*	283,195	114,516	455,265	66,373	67,053	12,941	184,145	15,815	346,327	108,938	—234	26,142	82,562	37,320
Grand Trunk Western	547	421,000	186,090	646,020	61,847	94,611	21,007	256,274	18,104	471,643	174,377	1,106	29,027	143,394	45,806
Great Northern	7,719*	6,135,659	1,336,376	7,821,727	715,254	759,893	102,144	2,034,130	100,968	3,712,509	4,209,218	3,726	342,855	3,872,089	251,295
Gulf & Ship Island	308	127,999	31,047	171,402	28,170	34,436	3,544	64,114	8,305	118,569	52,833	.....	5,040	47,793	—9,032
Gulf, Colorado & Santa Fe	1,596*	1,078,897	281,025	1,411,317	167,926	182,796	26,059	494,460	40,444	912,101	499,216	.....	36,838	462,378	83,785
Hocking Valley	353*	572,337	72,446	688,796	68,440	142,459	8,992	196,111	13,094	429,096	259,700	.....	44,400	215,300	5,675
Houston, East & West Texas	191	85,143	31,308	174,655	32,242	15,696	1,483	32,519	3,899	89,949	84,706	.....	2,278	82,428	—9,932
Houston & Texas Central	789	466,095	167,703	614,498	103,107	112,586	16,869	239,646	14,225	486,367	128,131	—1,312	15,756	111,063	39,503

Average mileage operated during previous period—† 7,613; † 4,513; † 4,434; † 628; † 2,225; † 572; † 672; † 2,242; † 7,764; † 9,074; † 2,059; † 7,551; † 246; † 1,107; † 852; † 930; † 358; † 263; † 328; † 902; † 842; † 583; † 687; † 7,345; † 1,603; † 353. — Indicates Deficits, Losses and Increases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1912—(CONTINUED).

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Operating expenses—Maintenance—Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Illinois Central	4,763	$3,727,575	$3,089,729	$8,499,158	$742,642	$1,216,484	$116,573	$2,155,382	$130,356	$4,341,442	$1,157,716	-$7,627	$237,250	$912,839	$582,996
Indiana Harbor Belt	105[a]	.....	.....	262,429	29,285	33,883	2,527	112,438	9,141	184,294	78,135	1,271	5,560	73,846	39,115
Lake Erie & Western	390	413,236	64,297	505,531	37,231	70,638	12,564	187,261	10,937	344,431	161,102	.....	20,548	140,554	74,978
Lake Shore & Michigan Southern	1,823[b]	3,305,613	877,034	4,723,153	538,255	788,521	103,966	1,494,389	89,460	3,026,291	1,696,862	7,866	150,000	1,554,728	326,069
Lehigh & Hudson River	92	141,474	57.2	153,132	21,803	1,280	1,796	76,883	4,422	99,933	53,199	.....	4,000	49,199	4,965.73
Long Island	396	322,765	485,619	860,369	163,232	95,894	13,256	289,615	22,733	684,730	175,639	31,108	36,450	139,297	65,469
Louisiana & Arkansas	255	167,182	22,960	215,027	23,073	23,073	2,262	36,474	4,681	86,573	48,514	.....	3,833	44,681	—7,040
Louisiana Ry. & Navigation	251	139,429	27,295	187,811	17,845	20,044	5,345	79,933	7,428	136,875	39,936	.....	5,500	25,436	—35,746
Louisville & Nashville	4,729[c]	3,837,400	968,187	5,154,110	857,324	998,275	111,755	1,624,967	117,257	3,670,378	1,533,332	—2,900	153,242	1,377,190	—46,243
Louisville, Henderson & St. Louis	276	314,116	31,009	397,125	37,662	53,840	4,696	37,598	3,246	87,042	20,083	415	3,000	17,498	—5,720
Maine Central	1,061[d]	678,317	251,649	940,439	149,637	144,814	7,301	146,237	15,822	663,911	276,528	—1,861	42,870	231,799	14,113
Michigan Central	1,817[e]	1,957,022	636,042	2,898,481	338,939	395,553	69,980	1,164,360	48,712	2,017,944	880,537	7,318	106,000	781,855	31,512
Midland Valley	257	94,995	43,854	148,844	13,382	21,360	2,344	49,812	3,974	111,616	37,228	198	5,468	32,958	—1,915
Minneapolis & St. Louis	1,586	675,276	138,476	861,159	125,036	99,252	16,747	325,379	21,602	597,486	263,673	—91	32,392	240,590	139,457
Minneapolis, St. Paul & Sault Ste. Marie	3,709[f]	2,456,876	574,240	3,098,178	256,636	308,028	50,281	901,349	69,917	1,586,411	1,512,077	9,222	121,985	1,399,344	590,834
Mississippi Central & Texas System	3,816[g]	2,276,580	840,516	3,293,324	378,496	372,494	65,883	1,197,186	94,370	2,023,081	1,270,143	—6,094	114,664	1,149,585	517,263
Missouri Pacific	3,500[h]	1,811,871	407,578	2,419,692	472,336	448,295	64,867	1,039,835	68,339	2,048,865	370,827	—4,058	93,290	273,479	145,793
Mobile & Ohio	1,114	965,224	171,819	1,201,158	125,612	202,755	35,163	367,099	33,706	762,596	298,559	—1,148	29,859	238,552	—20,727
Monongahela	65	139,564	2,432	143,900	18,114	8,443	440	27,864	1,927	51,558	92,342	.....	3,000	89,342	30,966
Nashville, Chattanooga & St. Louis	1,231[i]	972,473	233,609	1,331,090	165,142	209,764	40,210	425,851	26,286	867,253	263,327	—124	25,416	237,787	24,208
Nevada Northern	162	109,471	13,703	136,225	12,270	14,351	.....	24,533	1,735	54,396	71,659	.....	5,956	65,827	13,274
New Orleans & North Eastern	196	245,209	51,576	318,662	34,387	66,231	9,350	121,486	14,758	246,612	72,070	210	13,900	58,380	—26,684
New Orleans Great Northern	282	185,774	28,177	231,203	31,800	16,089	2,527	40,741	6,745	99,961	41,221	—81	1,250	39,390	2,462
New Orleans, Mobile & Chicago	542[j]	313,851	28,315	353,371	37,576	23,155	4,424	80,725	7,883	151,762	101,499	—146	4,315	97,106	30,233
New York Central & Hudson River	3,654[k]	6,102,447	2,535,001	9,644,184	1,333,478	1,643,058	165,822	3,397,306	219,439	6,738,823	2,905,361	65,704	538,355	2,432,710	642,726
New York, Ontario & St. Louis	196	168,424	36,775	212,186	22,256	27,494	6,021	446,400	3,166	456,037	242,169	—430	36,000	417,644	177,806
New York, New Haven & Hartford	1,091	3,994,489	2,274,211	6,835,357	695,855	759,335	28,475	2,332,963	146,218	3,953,046	1,882,311	—84,711	300,000	1,667,022	—30,738
New York, Susquehanna & Western	173	965,220	36,173	1,026,609	125,612	203,755	4,296	123,332	12,544	218,830	67,970	.....	6,909	61,070	—1,412
Norfolk Southern	2,019[l]	3,077,888	358,609	3,550,507	444,320	660,538	55,052	1,061,824	73,717	2,291,581	1,258,967	—2,137	120,000	1,136,830	40,459
Norfolk & Western	843	191,169	62,645	276,618	31,349	35,545	4,411	84,371	15,830	172,097	104,521	—231	7,510	96,780	62
Northern Central Ry.	473[m]	459,374	1,021,158	1,521,258	124,194	225,746	16,008	298,308	27,943	744,396	241,906	173	82,898	158,581	—82,624
Northern Pacific	6,233[n]	5,445,939	1,271,573	7,136,248	705,096	709,672	94,235	1,308,774	115,658	3,699,435	3,436,813	25,442	311,000	3,150,826	642,583
Oregon Short Line R. R. & Nav. Co.	1,454[o]	1,455,078	401,195	2,044,368	240,212	171,447	45,330	540,332	47,958	1,085,279	958,589	—6,514	113,942	838,133	129,446
Oregon Short Line	1,764[p]	1,593,656	475,561	2,206,102	266,472	221,283	50,837	576,859	59,027	1,267,869	1,096,782	—211	126,000	970,571	74,975
Texas & Northern Texas	479[q]	167,483	41,857	229,526	25,794	40,044	3,254	68,860	6,177	144,129	128,397	.....	2,450	122,937	78,604
Pennsylvania Co.	1,215[r]	4,165,915	1,290,227	5,993,152	1,211,200	1,304,373	151,984	3,426,134	162,587	4,428,152	1,555,420	—8,916	249,419	1,297,385	193,495
Pennsylvania Railroad	4,018	18,405,569	9,278,840	15,467,103	1,815,856	3,549,134	185,157	5,466,229	360,581	11,324,798	4,142,305	—11,921	693,264	3,437,120	1,141,142
Philadelphia, Baltimore & Washington	1,015	3,592,486	2,672,012	6,390,411	413,887	664,457	41,728	1,395,855	60,978	2,516,905	1,873,506	31,973	85,946	1,819,533	200,314
Pittsburgh & Lake Erie	347	1,609,735	1,763,418	3,604,914	268,182	526,820	28,889	1,000,289	43,355	1,877,535	1,727,379	.....	68,000	1,659,379	247,008
Pittsburgh, Shawmut & Northern	178	1,479,757	136,559	1,622,496	113,435	240,650	18,056	372,424	25,559	806,154	816,345	—497	31,000	784,844	222,454
Pittsburgh, Shawmut & Northern	1,467	2,862,875	619,485	3,607,678	661,484	725,155	69,967	1,370,195	69,301	2,896,802	966,596	—586	143,123	822,897	12,737
Pittsburgh, Shawmut & Northern	1,727	46,040	9,720	59,559	6,050	6,264	960	20,715	3,640	41,111	47,942	.....	1,500	46,362	2,091
Port Reading	21	134,876	.....	136,446	11,691	193	30	37,445	124	49,483	87,165	10,136	3,000	89,301	—3,065
Richmond	90	112,096	49,256	176,536	19,107	52,413	8,336	19,575	6,864	106,295	62,157	.....	13,195	48,964	—2,078
St. Louis, San Francisco & Southern	2,818[s]	2,213,333	560,476	3,081,164	563,357	417,149	55,425	501,478	64,836	2,004,245	1,075,219	—4,271	90,795	980,153	94,660
St. Louis Southwestern	986[t]	864,618	137,706	1,027,394	100,054	112,891	30,313	199,211	26,505	459,004	418,932	969	24,058	293,365	—22,006
San Antonio & Aransas Pass	727	331,417	70,976	464,316	67,705	51,762	6,210	167,853	30,184	311,196	153,151	.....	12,000	141,151	19,142
Southern	7,036[u]	4,181,117	1,186,991	6,044,147	849,697	976,760	165,859	1,996,122	128,837	4,158,715	1,885,432	8,574	202,297	1,691,709	145,618
Southern Illinois & Missouri	241	95,015	33,508	136,729	23,500	9,854	2,180	48,372	4,112	88,493	48,236	.....	6,762	53,498	6,643
Southern Kansas of Texas	125	9,818	3,415	15,631	3,587	30,552	1,965	40,268	3,609	86,381	66,250	.....	861	65,389	24,056
Southern Pacific Co.	8,127[v]	8,846,046	2,552,593	8,431,846	1,008,013	1,164,942	154,310	2,297,497	213,688	4,948,447	3,486,399	201,224	358,397	3,289,026	41,699
Spokane, Portland & Seattle	1,567	1,281,264	1,191,993	2,491,469	229,474	361,431	43,604	373,578	31,721	1,134,647	1,287,752	—796	82,459	1,204,496	56,265
Tennessee Central	284	103,859	35,067	146,793	33,251	14,309	6,429	53,030	2,211	114,250	32,543	.....	4,265	28,278	9,285
Tennessee, R. R. Ass'n. of St. Louis	340	.....	766	766	41,994	15,061	942	95,736	7,244	160,975	105,101	8,218	26,990	86,619	22,256
Texas & New Orleans	456	253,411	103,404	363,165	76,759	80,114	8,384	134,949	9,746	309,752	53,413	9,485	9,900	52,998	42,411
Texas & Pacific	1,985	1,367,745	398,065	1,953,739	190,238	241,999	35,192	782,424	47,891	1,297,745	656,014	4,027	55,160	604,931	13,568
Toledo & Ohio Central	443	454,514	89,146	603,357	57,052	92,266	6,912	185,530	10,682	294,362	308,995	3,116	19,793	183,453	85,357
Toledo, St. Louis & Western	451	310,919	75,546	417,243	45,584	41,852	15,919	176,287	9,494	245,531	171,712	.....	14,400	110,912	42,753
Toledo, Peoria & Western	241	126,025	46,397	186,420	18,450	31,615	9,004	88,172	14,062	252,952	138,284	.....	4,150	134,134	63,063
Union Pacific	3,581[w]	1,624,361	881,424	4,866,716	570,142	554,270	92,969	1,306,530	114,695	2,638,920	2,227,796	—6,987	186,892	2,033,712	324,896
Union R. R. of Baltimore	31	7,922	22,996	47,687	11,189	.....	868	5,298	2,898	21,263	126,432	.....	5,243	121,187	13,850
Union R. R. of Pittsburgh	87	.....	29,463	456,683	67,418	69,969	4,236	108,490	8,737	224,380	132,302	4,249	12,400	169,651	34,379
Vandalia	852	667,909	193,656	978,525	125,085	181,756	26,305	365,184	18,241	718,938	260,491	.....	32,981	238,410	60,230
Vicksburg, Shreveport & Pacific	221	96,965	16,619	139,416	29,124	26,383	3,345	47,790	5,238	106,199	33,217	—118	4,300	48,799	5,771
Virginian	434	417,696	21,963	456,683	67,418	69,969	4,236	108,490	8,737	224,380	132,302	4,249	12,400	169,651	34,379
West Jersey & Seashore	315	153,129	314,206	494,496	73,034	62,748	11,142	216,237	13,586	383,652	16,847	—3,304	11,099	2,444	57,963
Yazoo & Mississippi Valley	1,324	881,290	249,783	1,161,544	128,433	136,889	15,128	367,223	27,281	724,954	442,590	112	37,000	405,702	113,877

Average mileage operated during previous period—[a] 103; [b] 1,776; [c] 4,705; [d] 1,180; [e] 1,805; [f] 3,270; [g] 3,398; [h] 3,916; [i] 1,255; [j] 404; [k] 3,391; [l] 562; [m] 2,005; [n] 472; [o] 6,019; [p] 1,689; [q] 296; [r] 1,416; [s] 3,978; [t] 213; [u] 240; [v] 8,314; [w] 842; [x] 7,089; [y] 6,184; [z] 551; [a] 35; [b] 3,506. —Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

FIVE MONTHS OF FISCAL YEAR, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Maintenance		Operating expenses				Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total. Inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans-portation.	General.	Total.					
Alabama & Vicksburg	143	$506,841	$213,682	$771,278	$112,291	$132,564	$18,156	$261,696	$28,469	$553,276	$218,002	—$1,056	$31,125	$185,821	$27,983
Ann Arbor	292	528,000	265,647	901,670	113,151	113,623	20,693	307,369	38,248	593,784	307,886	492	69,650	238,728	—60,275
Arizona Eastern	366	812,812	187,249	1,060,772	185,230	91,271	28,843	408,227	46,924	479,423	570,349	419	40,482	530,286	231,230
Atchison, Topeka & Santa Fe	8,203	28,569,042	10,623,087	42,292,081	7,017,251	7,004,318	$17,216	11,654,993	814,851	27,309,129	14,982,952	———	1,653,744	13,299,208	1,493,818
Atlanta, Birmingham & Atlantic	662	986,818	301,271	1,375,098	213,574	211,136	81,530	538,994	58,351	1,103,585	271,513	———	67,725	203,788	—130,911
Atlantic & St. Lawrence	167	118,640	159,973	328,178	216,114	29,340	19,533	248,812	17,175	532,974	—5,231	———	36,500	—41,730	—41,730
Atlantic City	167	342,363	754,149	1,159,408	129,942	64,452	16,498	575,316	7,066	742,274	417,134	—19,475	45,000	353,659	—26,066
Atlantic Coast Line	4,418	9,052,527	2,762,102	13,466,027	2,015,176	2,239,346	241,343	4,584,902	372,973	9,854,308	3,611,869	———	625,000	2,986,869	—459,263
Baltimore & Ohio—System	4,854	34,509,470	7,150,140	44,146,215	6,231,399	7,623,964	816,982	14,960,489	831,658	30,448,492	13,697,749	—353,484	1,142,250	12,199,015	817,255
Bangor & Aroostook	631	934,819	313,278	1,327,655	247,458	151,499	18,871	397,155	57,175	872,158	455,493	———	52,500	402,993	—78,515
Bessemer & Lake Erie	294	4,343,743	184,416	4,829,210	412,266	496,316	48,079	1,009,926	47,034	2,179,569	2,403,130	———	51,000	2,352,130	174,218
Boston & Maine	2,445	12,366,671	7,894,056	21,757,285	3,602,170	3,078,747	185,383	9,317,674	483,980	15,712,867	6,039,498	80,695	883,733	5,236,460	739,358
Buffalo & Susquehanna R. R.	765	691,713	45,212	758,057	151,308	110,995	6,168	351,862	29,426	549,759	208,298	———	11,000	197,298	59,148
Buffalo & Susquehanna R. R.	765	54,053	28,251	111,790	17,164	12,442	2,445	110,486	13,183	155,166	—43,395	—136	2,500	—47,031	—17,214
Buffalo, Rochester & Pittsburgh	574	4,115,291	525,855	4,839,016	770,332	941,359	58,976	1,473,459	91,803	3,335,929	1,503,107	—999	85,000	1,417,108	133,599
Butte, Anaconda & Pacific	46	438,582	68,414	546,897	75,946	106,950	3,638	211,814	15,405	415,757	93,050	———	10,000	83,050	—129
Canadian Pacific Lines in Maine	253	231,135	113,853	385,178	161,283	39,723	29,066	167,024	23,225	440,321	—55,193	———	50,000	—105,193	—40,762
Carolina, Clinchfield & Ohio	238	929,012	81,763	1,043,492	72,525	103,443	33,990	174,585	35,310	419,882	623,525	———	40,000	583,525	145,369
Carolina, Clinchfield & Ohio R. S. of S. C	18	51,402	6,545	61,115	2,736	466	5,163	12,157	13,960	33,482	27,632	———	3,500	24,132	7,727
Central of Georgia	1,915	3,843,725	1,718,122	6,070,026	858,373	1,047,689	178,665	1,999,148	197,608	4,281,683	1,797,393	31,573	252,230	1,576,736	—151,015
Central of New Jersey	667	9,416,967	2,588,838	12,676,196	1,001,270	1,708,688	161,226	3,819,138	207,460	6,626,589	5,907,907	83,817	606,250	5,385,488	705,265
Central New England	113	1,019,429	336,466	1,612,273	241,940	173,856	9,400	417,233	17,765	798,594	818,777	44	50,000	768,821	128,409
Charleston & Western Carolina	241	560,307	160,650	761,138	114,495	128,414	17,075	299,202	23,456	602,592	158,546	———	25,000	133,546	—88,543
Chesapeake & Ohio Lines	2,715	13,133,165	4,679,052	14,952,618	1,960,133	1,932,687	278,096	4,459,840	327,561	9,958,317	4,917,169	—17,962	1,392,775	4,524,394	—23,192
Chicago & Alton	1,026	4,533,552	1,922,593	6,943,319	966,029	1,419,567	211,840	2,321,546	160,224	5,079,226	1,864,093	—11,636	190,000	1,662,457	—23,192
Chicago & Eastern Illinois	1,275	5,162,821	1,335,231	7,045,556	929,676	1,392,240	123,552	2,310,102	127,181	5,172,750	1,872,806	11,046	211,000	1,650,163	—27,650
Chicago & Northwestern	8,070	34,360,099	9,426,519	47,107,873	4,912,967	4,983,072	572,130	13,574,493	628,151	24,906,838	12,498,935	18,332	1,315,000	11,202,267	1,471,728
Chicago, Burlington & Quincy	8,302	36,702,357	10,263,501	48,585,271	4,802,096	6,680,867	673,156	12,230,174	1,086,043	25,581,590	17,903,681	47,870	1,385,605	15,568,706	2,756,128
Chicago Great Western	1,499	4,174,602	1,454,642	6,008,472	761,104	852,543	123,109	2,209,979	164,950	4,111,685	1,896,787	—227	272,500	1,351,514	201,386
Chicago, Indiana & Southern	339	1,615,638	142,213	1,815,071	245,033	459,321	40,152	$72,105	41,828	1,358,439	456,632	4,531	79,000	382,163	231,119
Chicago Junction	22	———	———	847,092	102,318	55,771	6,135	382,274	18,260	564,648	282,444	———	9,000	273,387	33,304
Chicago, Milwaukee & Puget Sound	2,004	7,806,053	1,425,792	9,346,622	1,252,762	1,260,815	260,033	2,757,078	112,278	5,642,965	3,703,657	44,265	375,000	4,033,192	1,218,609
Chicago, Milwaukee & St. Paul	7,511	23,447,404	7,353,772	33,642,792	4,161,928	4,303,532	527,769	11,531,419	372,665	20,947,343	11,695,449	56,923	1,178,413	10,573,959	4,099,504
Chicago, Rock Island & Pacific	4,747	17,577,765	5,272,467	23,141,668	3,271,364	3,196,259	376,056	8,041,082	245,466	15,129,927	8,011,741	———	1,150,902	6,860,839	—4,339,304
Chicago, Rock Island & Gulf	477	1,075,716	296,302	1,450,715	186,097	120,956	51,631	463,316	39,335	861,335	598,380	—3,069	35,556	559,764	99,961
Chicago, Rock Island & Pacific	7,356	30,137,477	8,732,513	39,647,789	4,681,237	4,161,096	777,947	11,267,411	688,863	23,676,554	8,971,035	—74,533	1,187,046	7,709,456	1,218,876
Chicago, St. Paul, Minneapolis & Omaha	1,241	4,393,009	1,429,459	37,191,873	4,962,972	4,983,072	572,130	13,574,493	628,151	24,906,838	12,498,935	18,332	1,315,000	11,202,267	1,471,728
Cincinnati Northern	337	528,322	103,678	662,341	102,287	105,600	13,145	250,674	16,085	488,511	124,390	———	26,500	147,890	50,792
Cleveland, Cincinnati, Chicago & St. Louis	1,911	10,140,555	2,570,195	14,103,813	2,214,127	2,133,842	281,031	5,301,008	295,421	10,545,893	3,152,142	—11,242	495,000	2,648,400	782,844
Colorado Midland	339	745,299	144,137	961,276	123,362	120,138	36,300	402,850	27,567	760,157	201,619	—1,710	43,600	156,309	—23,442
Colorado & Southern	1,023	2,856,068	698,760	3,756,735	542,318	824,654	54,313	1,086,023	107,531	2,613,399	1,171,345	—2,941	184,875	1,022,529	—86,932
Cumberland Valley	238	2,875,000	236,317	3,427,455	264,909	168,436	52,900	1,437,378	32,710	1,956,333	534,372	—5,808	47,000	507,492	92,014
Delaware & Hudson Co. & R. Dept	854	9,286,832	1,573,030	10,713,273	873,143	1,371,109	126,281	3,414,256	269,240	6,954,029	4,759,744	—57,247	244,098	3,958,404	169,570
Delaware, Lackawanna & Western	1,139	27,274,790	5,274,814	32,703,018	17,007,232	2,536,020	333,058	5,119,660	317,060	16,940,449	15,716,882	781,549	735,000	14,200,333	2,500,000
Detroit, Toledo & Ironton	457	374,790	174,284	573,870	85,358	83,158	9,381	166,286	18,267	363,800	210,018	———	17,500	192,518	—22,902
Detroit & Mackinac	411	358,902	165,394	537,360	98,312	66,651	11,792	184,338	14,268	365,851	171,509	2,078	44,053	129,476	16,479
Detroit, Toledo & Ironton	641	1,617,009	766,579	2,566,529	340,867	403,833	41,494	729,453	59,927	1,596,723	1,030,806	—11	80,000	950,795	—28,268
Detroit, Grand Haven & Milwaukee	191	632,000	333,000	1,097,891	328,614	125,903	34,663	306,861	24,581	1,015,542	82,349	—327	14,765	67,457	—183,183
Detroit River Tunnel	2	———	———	445,002	10,558	24,203	———	40,645	165	65,811	419,190	———	22,500	396,690	8,305
Duluth & Iron Range	574	4,721,488	140,603	4,945,215	339,425	5,389	838,631	52,646	1,681,922	2,740,115	26,041	205,478	2,560,678	—46,140
Duluth, Missabe & Northern	351	4,932,910	191,563	5,168,012	423,693	432,571	9,075	876,496	52,284	1,799,769	3,368,303	26,475	242,297	3,152,481	451,031
El Paso & Southwestern Co.	1,196	2,875,000	414,843	3,427,455	242,572	455,870	63,515	1,437,378	32,710	1,956,333	1,574,972	—5,808	112,391	1,433,278	457,925
Elgin, Joliet & Eastern	203	5,104,414	———	5,535,867	578,956	806,912	23,252	1,493,192	79,281	2,891,593	2,644,274	———	107,665	2,536,609	857,405
Florida East Coast	664	804,117	481,206	1,475,682	331,620	261,661	25,259	396,209	55,774	1,270,493	205,194	—5,259	77,500	122,165	40,650
Fort Worth & Denver City	454	1,616,676	278,204	2,040,242	311,813	272,311	38,664	1,037,357	53,437	1,713,582	326,660	981,304	—2,237	58,590	326,051
Galveston, Harrisburg & San Antonio	1,135	3,703,027	1,110,956	5,271,064	450,921	1,064,129	158,831	1,990,281	155,363	3,729,525	1,541,539	—25,064	169,827	1,346,648	95,878
Georgia	307	607,140	330,932	1,276,191	167,264	247,887	58,282	452,998	41,199	1,168,142	110,049	———	14,567	95,082	—329,579
Georgia, Southern & Florida	197	545,845	249,707	1,036,853	175,145	260,236	37,392	413,887	48,068	833,211	194,141	———	36,579	157,562	—66,440
Grand Rapids & Indiana	578	1,257,363	910,139	2,481,909	304,542	346,627	58,494	977,176	77,257	1,764,146	716,943	118	116,598	600,153	31,535
Grand Trunk Western	347	1,676,090	1,161,000	3,187,750	396,770	421,826	101,443	1,221,182	73,398	2,211,809	858,971	—6,910	149,386	702,675	51,911
Great Northern	7,713	28,559,536	6,564,504	37,136,272	5,027,323	3,870,041	490,455	9,149,574	532,666	19,070,049	18,492,224	133,911	1,618,339	17,007,796	1,978,112
Gulf & Ship Island	304	558,731	181,886	846,562	123,469	156,121	13,933	229,054	42,619	564,596	275,966	———	25,302	250,664	7,141
Gulf, Colorado & Santa Fe	1,096	4,461,920	1,400,955	6,191,485	931,303	839,997	119,821	2,062,193	161,126	4,084,435	2,107,050	———	198,580	1,908,470	656,096
Hocking Valley	315	2,001,117	411,552	2,526,870	369,653	697,690	43,923	981,853	70,723	2,159,842	1,417,028	———	193,000	1,223,828	126,460
Houston, East & West Texas	104	344,670	155,911	542,998	105,939	71,750	10,906	182,292	17,991	387,985	155,016	———	15,633	176,383	—10,772
Houston & Texas Central	259	2,067,695	862,935	3,118,410	355,868	498,522	89,726	1,145,687	81,195	2,170,998	947,412	—2,174	95,930	844,308	106,981

Average mileage operated during previous period—7,613; 4,513; 4,434; 4,628; 2,225; 4,572; 7,672; 2,242; 7,764; 9,074; 2,059; 7,881; 246; 1,107; 852; 930; 358; 263; 328; 902; 842; 583; 887; 7,345; 1,603; 353. — Indicates Deficits, Losses and Decreases.

Reparation Awarded.

Paducah Cooperage Company v. Illinois Central. Opinion by the commission:

The minimum weight of 20,000 lbs. applicable to shipments of barrels in carloads from Paducah, Ky., to New Orleans, La., was found to have been unduly discriminatory to the extent that it exceeded 12,000 lbs. subject to rule 24-C of the Southern classification, which provides for a graded increase in the minimum on larger cars. (25 I. C. C., 372.)

Bar Iron Rates Reduced.

W. C. Norris v. St. Louis & San Francisco et al. Opinion by the commission:

The commission found that the rate of 40 cents per 100 lbs. on bar iron in carloads from St. Louis, Mo., to Tulsa, Okla., was unreasonable, and unduly discriminatory as compared with a rate of 34 cents per 100 lbs. on sucker rods and pull rods, minimum weight 40,000 lbs. The commission ordered that in future this rate should not exceed 31½ cents per 100 lbs., minimum weight 40,000 lbs. (25 I. C. C., 416.)

Flaxseed Rates Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of flaxseed from Minneapolis, Minn., and other points to Chicago, Ill., and other destinations. Opinion by Commissioner Lane:

The tariffs under suspension advance the proportional rates on flaxseed in carloads from Minneapolis and other points to Chicago and other points. The commission found that the proposed advances are just and reasonable. The order of suspension was vacated. (25 I. C. C., 337.)

Fourth Section Applications Denied.

In re Southern Railway and Louisville & Nashville. Opinion by Chairman Prouty:

The applications to continue to disregard the fourth section from points upon the Cumberland Valley division and the Clear Fork branch of the Louisville & Nashville and from points upon the Clear Fork branch of the Southern Railway to the Buffalo-Pittsburgh territory, via Cincinnati were denied; but with reference to the circuitous routes via Norton and Knoxville no order will now be made, pending readjustment via the short-line routes. (25 I. C. C., 407.)

Anacostia, D. C., Discriminated Against.

Anacostia Citizens Association v. Baltimore & Ohio et al. Opinion by Commissioner McChord:

The denial of free store-door pick-up and delivery of certain less-than-carload traffic to the citizens of Anacostia, D. C., which is a section of southeast Washington, D. C., while such free service is extended to other sections of the city of Washington, was found to be unjustly discriminatory in so far as the Philadelphia, Baltimore & Washington is concerned, but not with respect to the Baltimore & Ohio, which maintains a freight station in Anacostia. Defendants, by arranging to place their baggage checks at the residences of passengers in certain sections of Washington to the exclusion of passengers located in Anacostia, unjustly discriminate against the latter and are ordered to remove the discrimination. (25 I. C. C., 411.)

Grape Fruit Rates Reduced.

Lindsay & Company, Ltd., v. Great Northern, et al. Opinion by the commission:

The complainant contends that the through rate of $1.80 per 100 lbs. for the transportation of grape fruit from Jacksonville, Fla., to Helena, Mont., is unreasonable and seeks reparation. The commission found that the rate complained of was unreasonable to the extent that it exceeds $1.62½ per 100 lbs., and prescribed that rate for the future. Reparation was awarded. (25 I. C. C., 424.)

Rates on Lumber and Crossties Reduced.

Charles R. Ball Lumber Company v. Texas & Pacific, et al. Opinion by the commission:

The complainant contends that the rate of 27½ cents per 100 lbs. for the transportation of lumber and crossties from points in Louisiana to Acme, Tex., is unreasonable and seeks reparation. The commission found that the rates charged on these shipments were unreasonable to the extent that they exceeded 21½ cents per 100 lbs. from all points of origin except Mansfield, La., and that the rate from the latter point was unreasonable to the extent that it exceeded 22½ cents per 100 lbs., and prescribed these rates for the future. Reparation was awarded. (25 I. C. C., 437.)

Whiskey Rates Reduced.

Julius Kessler & Company v. Louisville & Nashville. Opinion by the commission:

The commission found that the joint rate of 75 cents per 100 lbs. on whiskey in glass, any quantity, from Albertonville, Ky., to Mobile, Ala., and New Orleans, La., was unreasonable to the extent that it exceeds the combination of rates to and from Louisville, Ky., which are 63½ cents per 100 lbs. (25 I. C. C., 367.)

Rates on Distillers' Dried Grain Reduced.

S. J. Greenbaum Company v. Chesapeake & Ohio Railway Company et al. Opinion by Commissioner Clark:

The commission found that the rates on distillers' dried grain in carloads from Midway, Ky., to Norfolk or Newport News, Va., when for export, were unduly discriminatory as compared with rates on same commodity to same destinations from Louisville, Ky., and prescribed the latter rates for the future. (25 I. C. C., 352.)

Rates on Furniture Reduced.

Southern Furniture Manufacturers' Association v. Southern Railway et al. Opinion by Commissioner Lane:

The commission found that the rates on bedroom furniture and chairs from points in Carolina territory to Pacific coast points, north Pacific coast terminals, and points taking the same rates, were unjustly discriminatory as compared with rates upon the same commodities to the same destinations from Virginia cities and points in eastern and New England territories, and those rates were prescribed for the future. The fourth-section application seeking authority to continue lower rates on furniture and chairs from Basic City, Galax, Burkeville and other points in Virginia to Pacific coast terminals and Pacific slope points, than are concurrently maintained upon the same commodities from Carolina territory to the same destinations, was denied. Reparation was not awarded. (25 I. C. C., 379.)

Demurrage Charges and Inadequate Facilities.

Benisch Brothers v. Long Island Railroad. Opinion by the commission:

The defendant has a hand derrick at its Atkins yards, East New York, for unloading heavy freight, that is not of sufficient capacity to unload all the heavy freight received there within 48 hours of arrival. Collection of demurrage and track-storage charges on heavy freight which was delayed in unloading beyond that time, under such circumstances, was found to be unreasonable. Reparation was awarded. (25 I. C. C., 439.)

Reconsignment Charges at Detroit, Mich.

The Detroit Reconsigning Case. Opinion by Commissioner Harlan:

Upon the facts shown of record, the proposed charge of $2, for reconsigning carload shipments received at Detroit to points within the switching district, found to be unreasonable unless the consignees are advised of the arrival of the cars at Toledo on the tracks of the carriers making delivery at Detroit, so that the consignees may have an opportunity to give their reconsigning orders before the cars reach the latter point. When tariffs, carrying out these views have been filed an order will be issued permitting the proposed charge to be made under the conditions suggested. (25 I. C. C., 392.)

STATE COMMISSIONS.

New cartage tariffs of 50 cents a ton and 15 cents for packages known as "smalls" have been prescribed by the Canadian Railway Commission at the conclusion of the hearing on the application of the railways for authority to increase the rates to 60 cents and 20 cents, at Toronto, Hamilton and Montreal, and 50 cents

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and 15 cents at other points. The shippers made a compromise offer of 40 cents on some classes and 45 cents on others of freight, and 15 cents for "smalls," so the decision splits the difference.

COURT NEWS.

See editorial columns for decision of the Supreme Court relative to distribution of Southern Pacific stock owned by the Union Pacific.

The Supreme Court of the United States, in an opinion by Chief Justice White, reversing the Supreme Court of Minnesota, holds the reciprocal demurrage law of that state invalid, its provisions being in conflict with those of the interstate commerce law relating to the same subject.

The Supreme Court of Vermont has declared void the law of that state regulating demurrage on freight cars, in which there is a provision allowing four days' free time for unloading. The court says that this Vermont act conflicts with the interstate commerce law.

The federal court at Louisville, Ky., has granted an injunction on the application of the Western Union Telegraph Company to prevent the Louisville & Nashville from removing the telegraph company's equipment from the road. The contract between the telegraph company and the railway expired last August, and it is said the telegraph company will now institute proceedings to condemn the right of way along the railway.

The Supreme Court of the United States, reversing the Supreme Court of Nebraska, sustains the contention of the Chicago, Burlington & Quincy that the road is not liable, under the law of Nebraska, for damages to a horse shipped from a point in Iowa to a point in Nebraska. The road's defense was based on the claim that its liability for the loss of freight in transit had been fixed by the interstate commerce law, and that the federal law was supreme.

The Supreme Court of Indiana has affirmed a decision of a lower court sustaining the law of Indiana requiring all locomotives and cars to be equipped with grab irons. The Southern Railway was fined $100 for a violation of this law, and in defense claimed that the conviction was unconstitutional because the federal government had passed a law regulating the use of grab irons. The court holds that the state law is not a regulation of interstate commerce, but is a police measure for the protection of trainmen at work within the state, and therefore valid.

The Supreme Court of the United States, reversing the Supreme Court of Kentucky, holds that a shipment made by express from Cincinnati, Ohio, to Augusta, Ga., is subject to the federal law and not to state laws. In the case in question a bill of lading had been issued by the Adams Express Company in which there was a provision that the carrier should not be liable for more than $50 on any shipment unless the value of the same had been disclosed by the consignor. The federal supersedes state laws and the federal law allows carriers to insert reasonable conditions of liability in bills of lading.

The Supreme Court of Colorado has rendered a decision sustaining an order of the Colorado railroad commission of November 29, 1911, on complaint of the Breckenridge Chamber of Commerce, ordering the Colorado & Southern to restore through freight and passenger service on its South Park branch narrow gage line between Denver and Leadville, by way of Breckenridge and Como, a distance of 21 miles, on which service had been abandoned on account of the expense of conducting a light traffic over Boreas Pass, 11,400 ft. high. The cessation of service on this line required freight and passengers from Breckenridge and Leadville to travel by a very roundabout route over the Denver & Rio Grande instead of by the direct route. The court held that the law imposes on the Colorado & Southern the duty of furnishing adequate facilities to the public on its entire system, not a part, and that it cannot be excused from performing its full duty merely because by ceasing to operate a part of its system the net returns would be increased, so that it cannot be said that requiring the road to perform its duty to the public by furnishing an adequate service between Denver and Leadville, although a pecuniary loss is entailed, is unreasonable or deprives it of any constitutional rights.

Railway Officers.

Executive, Financial and Legal Officers.

W. E. Crane has resigned as vice-president of the Ft. Smith & Western.

F. A. Clark, auditor of the Erie at New York, has been appointed general auditor.

George W. Seevers, general counsel of the Minneapolis & St. Louis, has resigned, to engage in the general practice of law at Oskaloosa, Iowa.

G. H. Hunt has been appointed freight claim agent of the Chicago Great Western, with office at Chicago, succeeding J. H. Howard, resigned.

H. B. Helm, second vice-president and treasurer of the Louisiana Railway & Navigation Company, has been appointed first vice-president, with headquarters at Shreveport, La., succeeding C. B. Rodgers.

T. B. Koons, freight traffic manager of the Central of New Jersey, with headquarters at New York, now has the title of vice-president and freight traffic manager, having been elected vice-president on January 1.

J. H. Howard, freight claim agent of the Chicago Great Western, has been appointed freight claim agent of the Chicago & Alton, with headquarters at Chicago, succeeding S. R. Murphy, acting freight claim agent.

E. W. Huben, assistant superintendent of the Orange & Northwestern, with office at DeQuincy, La., has been appointed auditor and general freight and passenger agent, with headquarters at Orange, Tex., succeeding E. H. Golden, resigned.

At a meeting of the board of directors of the Grand Rapids & Indiana, held on December 23, Edward B. Taylor was elected vice-president, in charge of the treasury and accounting departments, with office at Pittsburgh, Pa., and T. H. B. McKnight was elected treasurer, both with headquarters at Pittsburgh, Pa., succeeding W. R. Shelby, retired. H. F. Schieman was appointed assistant treasurer, with office at Grand Rapids, Mich. Effective January 1.

C. E. Hildum, auditor of disbursements of the Erie and the New York, Susquehanna & Western, at New York, has been appointed auditor of freight accounts, succeeding C. D. Ward, transferred, and A. P. Dishrow, chief clerk in the office of the auditor of disbursements, succeeds Mr. Hildum.

W. L. Seddon.

William Little Seddon, whose appointment as assistant to president of the Seaboard Air Line, with headquarters at Norfolk, Va., has been announced in these columns, was born on October 14, 1862, in Stafford county, Va., and was educated at the University of Missouri. He began railway work in 1898 in the engineering department of the Seaboard Air Line, and the following year he was appointed resident engineer. In 1900 he became assistant engineer of the Seaboard Air Line, remaining in that position until 1905, when he was appointed chief engineer, and on January 1, 1913, was promoted to assistant to president of the same road, as above noted.

Albert McElevey, assistant comptroller of the Pennsylvania Lines West of Pittsburgh, with headquarters at Pittsburgh, Pa., has been retired under the regulations of the pension system,

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and J. H. Walker has been appointed general accountant, with office at Pittsburgh, succeeding John Hurst, promoted.

W. S. Cooke, auditor of the Mobile & Ohio and the Southern Railway in Mississippi, with office at Mobile, Ala., has been appointed assistant to comptroller of both companies. W. W. Middleton has been appointed auditor in charge of freight, passenger and station accounts, and J. H. Patterson has been appointed freight claim agent.

H. B. Chamberlain, vice-president of the Tennessee Central, with office at Nashville, Tenn., and W. K. McAlister, have been appointed receivers of the Tennessee Central. S. W. Fordyce, Jr., vice-president, at St. Louis, Mo., has been appointed general counsel, and Walter Stokes has been appointed general attorney for the receivers. (See Operating Officers.)

H. R. Payne, vice-president of the Union Tank Line Company, having retired, William M. Hutchison, secretary and treasurer, with headquarters at New York, has been elected vice-president, succeeding Mr. Payne. Mr. Hutchison retains the office of treasurer. E. F. Cook has been elected secretary, succeeding Mr. Hutchison, and E. L. Gridley has been appointed assistant treasurer, all with offices at New York.

Moorhead Cowell Kennedy, whose election as president of the Cumberland Valley, succeeding James McCrea, has been announced in these columns, was born on March 10, 1862, at Chambersburg, Pa. In 1880 he graduated from the scientific department of Phillips Academy, Andover, Mass., and in 1884 from the John C. Green School of Science of Princeton University, with the degree of civil engineer. From 1887 to 1889 he was in the banking business in Kansas, and in June, 1889, entered the service of the Cumberland Valley as assistant to the president. Three years later he was elected vice-president of the same road, and on January 1, 1903, was given entire charge of its operation, and in addition to his duties as vice-president was made general superintendent, which position he held at the time of his recent election as president of the same road.

M. C. Kennedy.

Operating Officers.

Charles W. Karcher has been appointed car accountant of the Boston & Albany, with office at Springfield, Mass.

William J. Kleck has been appointed assistant superintendent of transportation of the Texas & Pacific, with headquarters at Dallas, Tex.

R. J. Lockett has been appointed superintendent of the Ft. Worth Belt Railway, with office at Ft. Worth, Tex., succeeding W. S. Woodward, resigned.

L. A. Boyd has been appointed superintendent of the Raleigh, Charlotte & Southern, with headquarters at Biscoe, N. C., succeeding Frank Page, resigned.

W. F. Hayes has been appointed superintendent of time service of the Missouri, Kansas & Texas System, with headquarters at Dallas, Tex., effective January 1.

D. B. Carson has been appointed assistant general manager of the Nashville, Chattanooga & St. Louis, and will perform such duties as are assigned to him.

Hermann Hall, division engineer of the Louisiana Southern, has been appointed general superintendent, with office at New Orleans, La., succeeding W. H. DeFrance, resigned.

A. B. Newell, president of the Tennessee Central, with headquarters at Nashville, Tenn., has been appointed general manager for the receivers. (See Executive Financial & Legal Officers.)

H. S. Smith, assistant trainmaster of the Baltimore & Ohio Southwestern, at Seymour, Ind., has been appointed trainmaster, with headquarters at Seymour, succeeding C. A. Plumly, transferred.

A. M. Schoyer, general superintendent of the Northwest system of the Pennsylvania Lines West of Pittsburgh, has been appointed general manager of the Vandalia, with office at St. Louis, Mo.

M. J. Kennelly, formerly division superintendent of the Chicago, Rock Island & Pacific, has been appointed general manager of the Kansas City, Mexico & Orient, succeeding Edward Dickinson, of Kansas City.

Grant Hall, assistant general manager of the western lines of the Canadian Pacific, at Winnipeg, Man., has been appointed general manager of the western lines, in charge of maintenance and operation, with office at Winnipeg.

L. W. Karnes, trainmaster of the Wabash at Springfield, Ill., has been transferred to Decatur, Ill., as trainmaster in place of E. A. Sollitt, who has been appointed assistant superintendent of the Detroit division, with office at Detroit, Mich.

L. J. Ferritor, formerly superintendent of the Northern and Southern divisions of the Chicago & Alton, has been appointed superintendent of the Scranton division of the Delaware, Lackawanna & Western, with headquarters at Scranton, Pa.

J. M. Doughty has been appointed assistant division superintendent of the Galveston, Harrisburg & San Antonio at Victoria, Tex., in place of J. F. Hough. J. H. Walsh has been appointed assistant division superintendent at San Antonio, Tex.

E. C. Sicardi has been appointed superintendent of car service of the Union Tank Line Company, with headquarters at New York, and hereafter all correspondence relating to the movement and operation of Union Tank Line cars should be sent to him.

E. F. Kearney, superintendent of transportation of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, has been appointed general superintendent of transportation, with office at St. Louis, Mo., and his former position has been abolished.

H. S. Badgett, trainmaster of the Orange & Northwestern at DeQuincy, La., has been appointed assistant superintendent, with headquarters at DeQuincy, succeeding E. W. Huben, promoted. Steel Campbell has been appointed trainmaster at Anchorage, La.

F. D. Batchellor, division engineer maintenance of way of the Baltimore & Ohio Southwestern, at Seymour, Ind., has been appointed to the position, recently created, of an additional assistant to general superintendent of the Baltimore & Ohio Southwestern and the Cincinnati, Hamilton & Dayton.

L. M. Jones has been appointed assistant to general manager of the Norfolk Southern, in charge of purchases, fuel and statistics, with office at Norfolk, Va., and C. W. Akers has been appointed superintendent of the Southern division, with headquarters at New Bern, N. C., succeeding Virgil Walker, resigned.

J. W. Eber, general superintendent of the Toronto, Hamilton & Buffalo, at Hamilton, Ont., has been promoted to general manager, with office at Hamilton, and his former position has been abolished. A portrait of Mr. Eber and a sketch of his railway career were published in the *Railway Age Gazette* of July 5, 1912, page 34.

J. J. McCullough, inspector of terminals of the Northern Pacific at St. Paul, Minn., has been appointed superintendent of the Puget Sound division, which has just been created and extends from Keith, just north of Seattle, to the yard limits of South Tacoma, including the terminals at Tacoma and Seattle. Mr. McCullough will have offices at Tacoma and Seattle, Wash.

William O'Herin, heretofore superintendent of machinery and equipment of the Missouri, Kansas & Texas, with headquarters at Parsons, Kan., has been appointed assistant to the general manager of the Missouri, Kansas & Texas Railway System, the Beaumont & Great Northern, the Texas Central and the Wichita Falls Lines, with headquarters at Dallas, Tex.; effective January 1.

Frank E. Clarity has been appointed superintendent of transportation of the Denver & Rio Grande, with headquarters at

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Denver, Colo., and will have charge of all matters pertaining to the movement of traffic, and the distribution and movement of equipment that have heretofore been handled by the assistant general manager and the car accountant. B. M. Loser, chief despatcher, at Glenwood Springs, has been appointed assistant superintendent of the Third division, succeeding E. E. Gray, transferred.

W. A. Whitney, superintendent of the Western division of the Southern Pacific, at Oakland Pier, Cal., has been appointed superintendent of the Sacramento division, with office at Sacramento, succeeding H. W. Sheridan, resigned to accept service with another company. J. D. Brennan, superintendent of the Stockton division, at Stockton, succeeds Mr. Whitney. C. H. Ketcham, assistant superintendent of the Western division, at Oakland Pier, succeeds Mr. Brennan and B. A. Campbell succeeds Mr. Ketcham.

W. Franklin Eckert, whose appointment as superintendent of the Wilmington & Columbia division of the Philadelphia & Reading, with headquarters at Reading, Pa., has been announced in these columns, was born on October 26, 1861, at Locust Dale, Pa. He began railway work on January 1, 1881, as a telegraph operator on the Philadelphia & Reading, and in May, 1886, was made train despatcher. In September, 1900, he was appointed assistant trainmaster and later in the same month was made chief train despatcher of the New York division, and now becomes superintendent of the same road, as above noted.

Charles H. Ewing, whose appointment as general superintendent of the Philadelphia & Reading, with headquarters at Reading, Pa., has been announced in these columns, was born on May 28, 1866, in Chester county, Pa., and was educated in the high schools. He began railway work on August 1, 1883, in the engineering department of the Philadelphia & Reading as a rodman, and was later transitman and then assistant engineer. From 1889 to 1892 he was assistant supervisor and supervisor of track, and then for two years was engineer of the New England division. He was appointed chief engineer of the Central New England in 1894, and left that position in 1902 to become division engineer of the Philadelphia & Reading. He was appointed engineer maintenance of way of the same road in 1903, and on October 17, 1910, was made superintendent of the Atlantic City Railroad, and now becomes general superintendent of the Philadelphia & Reading, as above noted.

C. H. Ewing.

Robert S. Parsons, who has been appointed assistant general manager of the Erie lines east of Buffalo and Salamanca, with headquarters at New York, graduated from Rutgers' College in 1895 with the degree of civil engineer. The same year he entered the engineering department of the Erie, and until 1901 held various positions in the engineering department. From 1901 to 1905 he was engineer maintenance of way, and in 1905 was appointed superintendent. He was subsequently transferred in the same capacity to various divisions, and at the time of his recent appointment was superintendent of the New York division of the same road at Jersey City, N. J.

W. B. Wood, superintendent of the Cleveland & Pittsburgh division of the Pennsylvania Lines West of Pittsburgh, Northwest System, has been appointed superintendent of the Eastern division, Northwest system, with headquarters at Allegheny, Pa., to succeed E. T. Whiter, promoted. I. W. Geer, superintendent of the Logansport division, Southwest system, with office at Logansport, Ind., succeeds Mr. Wood, with headquarters at Cleveland, Ohio. H. E. Newcomet, division engineer of the Cleveland & Pittsburgh division, Northwest system, has been appointed superintendent of the Louisville division, Southwest system, with headquarters at Louisville, Ky., in place of F. J. Kron, who succeeds I. W. Geer.

Harry Ward McMaster, who has been appointed general manager of the Wheeling & Lake Erie, as already announced in these columns, was born September 29, 1860. He received a common school education and entered railway service in 1873 as an operator and agent for the Detroit, Lansing & Northern. From 1878 to 1882 he was operator and train despatcher of the Grand Rapids & Indiana and the following two years was train despatcher of the Chicago & North Western. He then went to the Union Pacific, where he remained five years as chief train despatcher and trainmaster, leaving in 1889 to become chief train despatcher and trainmaster of the Northern Pacific. In May, 1900, he was appointed superintendent of the Toledo division of the Wheeling & Lake Erie, and from November, 1904, to September, 1905, was superintendent and superintendent of telegraph of that road and the Wabash Pittsburg Terminal at Canton, Ohio. He was then promoted to the general superintendency of those roads and the West Side Belt, which position he held until he was appointed receiver of the Wabash Pittsburgh Terminal on May 29, 1908, and one month later receiver also of the West Side Belt. He now resigns as receiver of these to become general manager of the Wheeling & Lake Erie, as stated above.

H. W. McMaster.

Joseph A. Gordon, whose appointment as general superintendent of the Pere Marquette, with headquarters at Detroit, Mich., has been announced in these columns, was born November 10, 1865, at Cincinnati, Ohio. He was graduated from St. Xavier College, Cincinnati, in 1884, and began railway work soon after with the Cincinnati, Hamilton & Dayton, where he remained until 1887 as telegraph operator and clerk in the local freight office at Cincinnati. During 1888 he traveled in Europe, returning to railway service the following year as clerk in the auditing department and station agent of the Cincinnati, Hamilton & Dayton at Cincinnati. From 1890 to November, 1893, he was chief clerk to the superintendent of the Cincinnati division; then was promoted to trainmaster of that division, and in March, 1896, was made superintendent of the Wellston division. In May, 1902, he was transferred to the superintendency of the Southern division, and on November 4, 1904, was appointed general superintendent of that road. From September, 1909, to April 10, 1910, Mr. Gordon traveled on the Pacific Coast and in Mexico, and then accepted the position of superintendent of the Kansas City division of the Chicago Great Western. He was transferred to

J. A. Gordon.

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the Chicago division as superintendent February 15, 1911, resigning December 15, 1912, to become general superintendent of the Pere Marquette.

Anthony Douglas MacTier, whose appointment as general manager of the Eastern lines of the Canadian Pacific, with headquarters at Montreal, Que., has been announced in these columns, was born on December 27, 1867, at Blairgowrie House, Scotland, and was educated at Sedbergh school, Yorkshire, England. He began railway work in May, 1887, in the general baggage agent's office of the Canadian Pacific, and was later in the general superintendent's department. He was then in the department of the superintendent of sleeping, dining and parlor car stores, and later in the car service department. In April, 1896, he was appointed general baggage agent, and in November, 1899, became general fuel agent. He was appointed assistant to the vice-president of the Canadian Pacific in June 1907, and now becomes general manager of the Eastern lines of the same road.

Albert J. Stone, general superintendent of the Erie lines east of Buffalo, N. Y., and Salamanca, with office at New York, has been appointed general manager, with office at New York. Robert S. Parsons, superintendent of the New York division, at Jersey City, N. J., has been appointed assistant general manager, lines east of Buffalo and Salamanca. Henry O. Dunkle, general superintendent of the lines west of Buffalo and Salamanca, at Cleveland, Ohio, has been appointed general manager of the lines west. Edgar W. Batchelder, assistant general superintendent of the lines west at Marion, Ohio, has been appointed assistant general manager, lines west, and the offices of general superintendents are abolished. John B. Dickson, general agent at Chicago, has been appointed superintendent of the New York division and branches, and of the New Jersey & New York, with office at Jersey City; A. C. Elston, superintendent of the Buffalo division at Buffalo, succeeds Mr. Dickson, and Franklin G. Robbins succeeds Mr. Elston.

Perry Seymour Sampson, who was appointed superintendent of the St. Louis division and St. Louis terminals of the Chicago & Eastern Illinois, with headquarters at St. Louis, Mo., effective November 15, 1912, was born at Brazil, Ind., June 12, 1865. He was educated in the public schools of Brazil, Ind., and Sedalia, Mo., and began railway work in June, 1882, as operator and clerk in the maintenance of way department of the Pittsburgh, Cincinnati, Chicago & St. Louis at Richmond, Ind. In May, 1884, he went to the Grand Rapids & Indiana as operator and bill clerk and one year later entered the service of the Baltimore & Ohio in a similar capacity, resigning in 1886 to engage in other business. Mr. Sampson again took up railway work in December, 1889, with the Chicago & Eastern Illinois; eight months later he was promoted to conductor; in January, 1894, was made train despatcher, and in September of the following year was advanced to chief despatcher of the Indiana division. He was transferred to the Illinois and St Louis divisions as chief despatcher in April, 1903, and in March, 1905, became trainmaster of construction of the Illinois division. In November of that year he returned to the Indiana division as chief despatcher and in April, 1906, was promoted to superintendent and track supervisor of that division, with headquarters at Brazil. He was transferred to the superintendency of the Illinois division on July 1, 1911, which position he held at the time of his recent appointment, as noted above.

P. S. Sampson.

Traffic Officers.

B. S. Barnes has been appointed foreign freight agent of the Erie, with office at New York.

Harry J. Bills, traveling passenger agent of the Lehigh Valley at Chicago, has been transferred to Kansas City, Mo.

W. H. Tayloe has been appointed traffic manager of the Chesapeake Steamship Company, with office at Baltimore, Md.

E. A. Senneff has been appointed agent of the Erie Despatch, with headquarters at Spokane, Wash., succeeding H. L. Tibbetts.

E. L. Jones has been appointed general agent of the traffic department of the Minneapolis & St. Louis, with office at San Francisco, Cal.

Hugh C. Couch has been appointed soliciting freight agent of the Atchison, Topeka & Santa Fe, with headquarters at Dallas, Tex.

Charles Scott has been appointed general freight and passenger agent of the Lexington & Eastern, with headquarters at Lexington, Ky.

G. H. Geagan, general freight and passenger agent of the Tremont & Gulf, at Winnfield, La., has resigned, and his former position has been abolished.

B. J. Libbe, special agent of the traffic department of the Chicago & Alton, has been appointed general agent of the freight department, with office at Chicago.

George F. Clough has been appointed commercial agent of the Lake Shore & Michigan Southern, with office at Cleveland, Ohio, succeeding George T. Rowe, deceased.

T. J. Cumming, traveling freight agent of the Georgia Southern & Florida, at Cordele, Ga., has been appointed commercial agent, with office at Valdosta, Ga., succeeding B. P. Miller, resigned.

W. E. Van Dreser has been appointed Northwestern agent of the Traders Despatch, with headquarters at Minneapolis, Minn., in place of George B. Norris, resigned to engage in other business.

U. G. Soule has been appointed commercial agent of the Southern Railway, with office at Denver, Colo., succeeding W. H. Tayloe, general agent, resigned to accept service with another company.

G. F. Snow, traffic agent of the Bangor & Aroostook at Bangor, Maine, has been appointed general agent of the freight and passenger departments, with headquarters at Presque Isle, Maine, and his former position has been abolished.

T. D. Hobart, coal and coke freight agent of the Norfolk & Western at Roanoke, Va., has been appointed general coal freight agent, with office at Roanoke. He will have charge of all matters pertaining to coal and coke rates.

Elbert Blair, commercial agent of the Missouri, Kansas & Texas of Texas, at Denison, Tex., has been appointed general freight and passenger agent of the Texas Central, with headquarters at Waco, Tex., in place of W. E. Seifer.

W. H. Bissland, assistant general passenger agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, at St. Louis, Mo., has been appointed general baggage agent, with office at St. Louis, succeeding Benton Quick, deceased.

F. S. Fisher, commercial agent of the Missouri, Kansas & Texas of Texas, at Waco, Tex., has been transferred to Denison, Tex., in a similar capacity to succeed Elbert Blair. L. T. Fowler, chief clerk in the office of commercial agent at Ft. Worth, Tex., succeeds Mr. Fisher.

H. R. Lewis, division freight agent of the Baltimore & Ohio at Baltimore, Md., has been appointed general freight agent, with headquarters at Baltimore, succeeding T. W. Galleher, deceased, and W. R. Askew has been appointed division freight agent, with headquarters at Baltimore, succeeding Mr. Lewis.

E. A. Oliver, live stock and freight agent of the Pittsburgh, Cincinnati, Chicago & St. Louis at Union Stock Yards, Chicago,

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has been relieved of the duties of freight agent and hereafter will be in direct charge of the solicitation of live stock traffic at Chicago and territory tributary thereto, under the immediate direction of the general western freight agent.

N. R. Williams, traveling passenger agent of the Chicago, Peoria & St. Louis, has been appointed general agent of the freight department, with headquarters at Minneapolis, Minn., succeeding O. P. Bennett, resigned. S. B. Wade, traveling freight agent, with office at St. Louis, Mo., has been appointed commercial agent, with headquarters at Little Rock, Ark.

W. D. Skinner, assistant traffic manager of the Oregon-Washington Railroad & Navigation Company, has been appointed traffic manager of the Spokane, Portland & Seattle, the Oregon Trunk, the Oregon Electric and the United Railways, with headquarters at Portland, Ore., succeeding W. E. Coman, resigned, whose title was general freight and passenger agent, and which office is now abolished.

J. G. Carlisle, division freight agent of the Central of Georgia at Macon, Ga., has been appointed assistant general freight agent, with headquarters at Savannah, succeeding J. B. Parker, resigned. T. L. Collings, commercial agent at Atlanta, succeeds Mr. Carlisle. E. E. Ellis, contracting freight agent at Atlanta, succeeds Mr. Collings, H. R. McLean, commercial agent at Athens, succeeds Mr. Ellis, and B. R. Bloodworth has been appointed acting commercial agent, at Athens.

L. H. McArthur, traveling passenger agent of the Cincinnati Hamilton & Dayton, with headquarters at Dayton, O., has been appointed city passenger agent of the Baltimore & Ohio Southwestern at Kansas City, Mo. George F. Scheer has been appointed traveling passenger agent, with office at St. Louis, Mo. H. C. Stevenson, division passenger agent at Chillicothe, O., has been appointed traveling passenger agent, with headquarters at Denver, Colo., in place of S. M. Shattuc, deceased.

E. E. Carter, division freight agent of the St. Louis & San Francisco at Wichita, Kan., has been appointed general agent at that point; W. B. Craig, local agent at Tulsa, Okla., has been appointed general agent at that place; R. C. Mills has been appointed general agent, with headquarters at Oklahoma City, Okla.; S. B. Haas, division freight agent at Ft. Smith, Ark., has been made general agent, with office in that city; M. J. Conley, local agent at Joplin, Mo., has been appointed general agent at Joplin; and Warren Baker, division freight agent at Cape Girardeau, Mo., has been made general agent at that point. The above changes are in accordance with a new plan of the Frisco to have general agents in charge of both traffic and operating matters at points where formerly only traffic representatives have been located.

S. S. Bridgers, who has been appointed assistant general freight agent of the Norfolk & Western, with office at Roanoke, Va., was born in 1874 at Petersburg, Va., and was educated in the public schools and at the Virginia Polytechnic Institute. He began railway work in 1891 on the Chesapeake & Ohio and the following year went to the Norfolk & Western. He was in the general offices at Roanoke until 1900 when he was made commercial agent at Indianapolis, Ind., and three years later was transferred in the same capacity to Pittsburgh, Pa. For one year from 1908 he was division freight agent at Roanoke, Va., of the same road and was then appointed assistant general freight agent at Columbus, Ohio, which position he held at the time of his recent appointment as assistant general freight agent at Roanoke, Va., of the Norfolk & Western; also as manager of the Great Southern Despatch, the Southern States Despatch and the Shenandoah Despatch Past Freight Lines.

Engineering and Rolling Stock Officers.

Lloyd B. Jones has been appointed assistant engineer of motive power of the Pennsylvania lines west of Pittsburgh, with office at Toledo, Ohio.

Fred Mertsheimer, superintendent of motive power and car department of the Kansas City, Mexico & Orient, with office at Wichita, Kan., has resigned.

J. B. Randall, assistant master mechanic of the Louisville, Henderson & St. Louis, at Cloverport, Ky., has been appointed master mechanic, and his former position has been abolished.

H. A. Cassil has been appointed division engineer of the Baltimore & Ohio Southwestern, with headquarters at Seymour, Ind., succeeding F. D. Batchellor, promoted. (See Operating Officers.)

R. J. Middleton, assistant engineer of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has been appointed engineer of track elevation, in charge of the Bloomingdale Road elevation in that city, effective January 1.

H. F. Passel, division engineer of the Cincinnati, Hamilton & Dayton, at Dayton, Ohio, has been appointed division engineer, with headquarters at Indianapolis, Ind., succeeding T. B. Conlyn, resigned, and H. G. Snyder succeeds Mr. Passel.

Seely Dunn, who formerly was manager of the Southern Car Service Association, and later engaged in the railway equipment business at New Orleans, La., has been appointed division engineer of the United Fruit Company, with headquarters at New Orleans.

John McMullen, shop superintendent of the Erie at Buffalo, N. Y., has been appointed mechanical superintendent of the Erie and subsidiary companies in charge of the car department, with headquarters at Meadville, Pa., succeeding E. A. Wescott, assigned to other duties. Adam Trautman, shop superintendent at the Kent, Ohio, car shop of the Erie, has been appointed shop superintendent of the Buffalo, N. Y., car shop, and William Miller has been appointed shop superintendent of the Kent car shop, succeeding Mr. Trautman.

G. R. Barry, division engineer of the Pennsylvania Lines West of Pittsburgh, Central system, at Zanesville, Ohio, has been appointed division engineer of the Logansport division, Southwest system, with headquarters at Logansport, Ind., to succeed E. B. Taylor, Jr., transferred. S. W. Hodgin, division engineer, Southwest system, at Cambridge Ohio, has been appointed division engineer of the Richmond division, Southwest system, with office at Richmond, Ind., to succeed F. N. Crowell, who has been appointed division engineer of the Cincinnati division, Southwest system, with office at Cincinnati, Ohio, in place of E. F. McCrea, transferred. R. C. Harris has been appointed supervising engineer, Southwest system, attached to the staff of the general superintendent, with office at Columbus, Ohio. Effective January 1.

Purchasing Officers.

J. R. Mneller has been appointed purchasing agent of the Hocking Valley, with office at Columbus, O., to succeed C. B. Duffy, deceased.

S. E. Keillor, formerly with the Duluth, Rainy Lake & Winnipeg, has been appointed storekeeper, with office at Duluth, Minn., of the Duluth, Winnipeg & Pacific, which has leased the D. R. L. & W.

L. B. Wood has been appointed general storekeeper of the Sunset Central Lines of the Southern Pacific, with headquarters at Houston, Tex., succeeding R. L. Price, who at his own request, on account of ill health, has been made storekeeper at Houston.

Special Officers.

Frank Anderson, industrial commissioner of the St. Louis & San Francisco, has been appointed to the newly created position of director of development, with headquarters at St. Louis, and the former office is abolished. The industrial, agricultural and immigration work, heretofore carried on through several departments, will hereafter be under the direct supervision of the director of development.

OBITUARY.

P. Sid Jones, district passenger agent of the Louisville & Nashville, at Birmingham, Ala., died on January 2.

Robert Lee, district passenger agent of the Oregon-Washington Railroad & Navigation Company, with headquarters at Tacoma, Wash., died in that city on December 29.

W. W. Wentz, formerly general superintendent of the Chicago, Rock Island & Pacific at Little Rock, Ark., and who retired from railway service in 1904, died on December 28, at Chicago, aged 56 years.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE CHESTNUT RIDGE is in the market for 1 locomotive.

THE CENTRAL OF BRAZIL is making inquiries for from 10 to 12 locomotives.

THE STEWART IRON COMPANY, Sharon, Pa., is making inquiries for 1 locomotive.

THE RUTLAND has ordered 7 locomotives from the American Locomotive Company.

THE DENVER & SALT LAKE has ordered 2 locomotives from the American Locomotive Company.

THE SOLVAY PROCESS COMPANY has ordered 1 locomotive from the American Locomotive Company.

THE HARRIMAN LINES' order will comprise 50 locomotives from the American Locomotive Company and 208 locomotives from the Baldwin Locomotive Works.

CAR BUILDING.

THE NORFOLK & WESTERN is in the market for 1,250 freight cars.

THE CHICAGO, MILWAUKEE & ST. PAUL is figuring on over 6,000 freight cars.

THE FT. DODGE, DES MOINES & SOUTHERN is in the market for 200 box cars.

THE AMERICAN REFRIGERATOR TRANSIT has ordered 1,000 refrigerator cars from the American Car & Foundry Company.

THE NEW YORK CENTRAL LINES have ordered 1,000 box cars from the American Car & Foundry Company, for the Cleveland, Cincinnati, Chicago & St. Louis.

IRON AND STEEL.

THE CHICAGO, INDIANAPOLIS & LOUISVILLE has ordered 4,000 tons of rails from the United States Steel Corporation.

THE DULUTH, MISSABE & NORTHERN has ordered 22,000 tons of steel from the American Bridge Company for its proposed ore dock at Duluth.

GENERAL CONDITIONS IN STEEL.—Although the volume of orders placed since the first of the year has been characteristic of the holiday period, they have been heavier than expected. It is believed that the Steel Corporation booked about 1,000,000 tons of new business during December, and that the unfilled tonnage for that month will show an increase of about 75,000 tons.

SIGNALING.

The New York, Chicago & St. Louis has ordered from the Western Electric Company apparatus for telephone train despatching, between Fort Wayne and Stony Island, 145 miles, and between Fort Wayne and Bellevue, Ohio, 125 miles.

The Missouri, Kansas & Texas plans during the present year to install automatic block signals on about 100 miles of its lines, as follows: Atoka, Okla., to the Red river, three miles, double track; Red river to Denison, Tex., 4.5 miles, single track; Hillsboro to Granger, Tex., 94 miles. Two mechanical interlocking plants are to be installed; one of 23 functions at Elgin, Tex., crossing of the Houston & Texas Central, and one of 12 functions at West Point, Tex., crossing of the San Antonio & Aransas Pass. An electro-pneumatic interlocking of 29 functions is to be installed at Denison, crossing of the Houston & Texas Central.

GREAT EASTERN RAILWAY, ENGLAND.—New lines and sidings, additional dock lines and a river wall are contemplated at Ipswich by the Great Eastern Railway. Additional capital powers for these and other purposes will also be asked.

Supply Trade News.

Stewart B. McEldowney, superintendent of the Chicago Steel Car Company's plant at Harvey, Ill., died on January 1, at Chicago.

S. W. Midgley, western representative of the Curtain Supply Company, Chicago, has been made western sales manager of that company.

The Hobart-Allfree Company, Chicago, has opened a factory at Chicago where the Freeland and Smyth derailers, switch stands, targets, car replacers, etc., will be assembled and shipped.

The Epping-Carpenter Company, Pittsburgh, Pa., which makes pumping machinery and condensers, has opened a branch office at 728 Monadnock building, Chicago. This office will be in charge of R. E. Burke, who was formerly with the International Steam Pump Company.

J. E. Chisholm has been made a representative of the Universal Flexible Packing Company, Pittsburgh, Pa., with offices in the Old Colony building, Chicago; and George R. Argo has been made representative of the same company, with office in the Third National Bank building, Atlanta, Ga.

William B. Hall has resigned as vice-president and general manager of the Illinois Car & Manufacturing Company, to promote the interests of the Union Railway Equipment Company, of Chicago, which has taken over the patented devices invented by Herman Pries, superintendent of the Haskell & Barker Car Company. Mr. Hall was formerly superintendent of equipment of the Mather Horse & Stock Car Company for 16 years.

Samuel E. Barrett, chairman of the Barrett Manufacturing Company, with office at Chicago, who died at Baltimore on December 29, as was mentioned in the *Railway Age Gazette* of January 3, was born in Massachusetts in 1836. He served through the Civil War as an officer in the Union army, and later came to Chicago and organized the Barrett Manufacturing Company, manufacturers of roofing materials. Mr. Barrett was also a stockholder and a director of several Chicago banks. He retired from active business in 1906.

The officers of the J. G. White Engineering Corporation, New York, the incorporation of which was mentioned in the *Railway Age Gazette* of November 22, page 1012, are as follows: Chairman of the finance committee, J. G. White; president, Gano Dunn; vice-presidents, E. G. Williams, A. S. Crane and H. A. Lardner; secretary, H. S. Collette; and treasurer, R. B. Marchant. During the year ended October 1, 1912, the departments of J. G. White & Company, Inc., which have been organized into the J. G. White Engineering Corporation, were at work on contracts aggregating in cost over $28,000,000, and on appraisals and reports upon properties aggregating over $400,000,000. The officers of the J. G. White Management Corporation, the incorporation of which was mentioned in the *Railway Age Gazette* of November 22, page 1012, are as follows: President, J. H. Pardee; vice-presidents, F. H. Reed and S. L. Selden; secretary and treasurer, T. W. Moffat. The parent organization, J. G. White & Company, Inc., controls the new companies and will continue as an active financing and owning company.

H. F. Ball has opened an office in the Hudson-Terminal building, 30 Church street, New York, as a special consulting engineer. Mr. Ball entered the service of the Pennsylvania Railroad as an apprentice at Altoona, Pa., in 1884. Four years later he entered the drafting room at Altoona and in 1890 was appointed chief draftsman of the car department of the Lake Shore & Michigan Southern. Two years later he was placed in charge of the car shops at Cleveland, as general foreman, and in 1894 was appointed general car inspector. Five years later he was made mechanical engineer of the Lake Shore, which position he held until his promotion to the position of superintendent of motive power in February, 1902. In 1906 he left the Lake Shore to accept the vice-presidency of the American Locomotive Automobile Company; a few months later his jurisdiction was extended over the American Locomotive Company, as vice-president of engineering. This position he resigned a short time ago, as announced in our issue of November 8, 1912. Mr. Ball's

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tenure of office, as vice-president of engineering of the American Locomotive Company, has been co-incident with some of the most important improvements made in locomotive construction, as well as the great increase in power and weight which characterize the present day locomotive. It covered such radical changes in design, as a substitution of the Walschaert for the Stephenson valve gear, the use of superheated for saturated steam, and the successful development of the Mallet locomotive. Mr. Ball was president of the Central Railroad Club in 1900 and of the American Railway Master Mechanics' Association in 1905-6.

TRADE PUBLICATIONS.

LATHE CHUCKS.—The Skinner Chuck Company, New Britain, Conn., has published a new catalog and price list of its independent, universal and combination lathe chucks. Illustrations, brief description and dimension tables are included.

CHICAGO & NORTHWESTERN-UNION PACIFIC.—The department of tours of the Chicago, Union Pacific & Northwestern line has issued an especially attractive booklet describing its winter vacation tours to the Pacific Coast and the Hawaiian Islands.

ELECTRIC DRILLS.—The Chicago Pneumatic Tool Company has published bulletins E-22, E-26 and E-27, illustrating and describing heavy duty electric drills for alternating current; universal electric drills operating on direct or alternating current; and heavy duty electric drills for direct current; respectively.

REFRIGERATION-HEATING-VENTILATION.—The Moore Patent Car Company, St. Paul, Minn., has published an attractive booklet entitled Perishable Products Transported Scientifically and Economically, illustrating and describing in detail the construction of its cars. An interesting table is included showing the comparative tests of the Moore system vs. end ice box cars moving in the same train.

RIVETERS.—The Vulcan Engineering Sales Company, Chicago, has published an attractive catalog of Hanna pneumatic riveters, screen shakers, revolving dumping riddles, mold dryers, etc., made by the Hanna Engineering Works, Chicago. The design and construction of these riveters are described in great detail and their advantages are set forth in a most convincing manner. The entire product and sales of the Hanna company are controlled by the Vulcan Engineering Sales Company.

NEW LINES FOR URUGUAY.—A series of railways are being projected by the Uruguayan government to link up the existing roads and to supply localities not now with means for transportation. The two first railways will extend through the departments of Colonia, Soriano, Durazno, Rocha and Maldonado, with a narrow-gauge railway between Carmelo and Palmira and Dolores and La Laguna. A European syndicate with $15,000,000 capital has offered to co-operate with the government in the construction of these railways.

RAILROAD POLICY IN WESTERN AUSTRALIA.—In the state of Western Australia new railways are designed and constructed on plans which are not submitted to the commissioner of railways who is responsible for their operation and maintenance. This lack of co-operation would not be so bad were it not for the fact that the policy has, for its guiding principle, that the paramount consideration shall be the least first cost. As a consequence these lines are built with steep grades, light rails and ties, insufficient ballast, defective drainage and the omission of the water supply, and the results are small loads, limited speeds, excessive maintenance costs, and haulage of water. Mr. Short, the commissioner, draws attention to this in his report for the year ending June 30 last, and says that 15 miles an hour is the maximum speed for such roads. Trains, consisting partly of tanks of water for the engine can only crawl up the steep grades; in descending them, or on the level, they are prevented from improving their average speed by the frequent stoppages for the permanent way. In the meantime the trainmen are paid excessive overtime, and there is an excessive number of men employed for maintenance, all of which unnecessary expense would be sufficient probably to cover interest many times over on the extra amount which a first-class railway would have cost in comparison with the cheap railway which exists.

Railway Construction.

ALABAMA, TENNESSEE & NORTHERN.—We are informed that this company and the Tombigbee Valley railroad built about 30 miles of new lines in Alabama during 1912, to connect up their lines in Choctaw county between the towns of Ward and Silas.

ASHLAND & WESTERN.—An officer of this company, which operates a line from Custaloga, Ohio, northwest to Ashland, 25 miles, has given a general contract to the West Virginia & Ohio Construction Company, of Ashland, Ohio, for work on an extension building under the name of the Lorain, Ashland & Southern, from Ashland north via Wellington to Lorain. Track has been laid from Lorain south to Wellington 20 miles. There remains a section of 23 miles yet to be built between Wellington and Ashland, and work on this section will be sublet. There will be about 300,000 cu. yds. of earth to be handled and 270,000 yds. of borrow, also 12,000 cu. yds. of concrete to be constructed. The maximum grade southbound will be 26 ft. to the mile, and northbound the ruling grade will be 77 ft. to the mile, and the curvature outside of the terminals will be 2 deg. The company expects to develop a traffic in coal, ore, manufactures and miscellaneous freight.

BRITISH COLUMBIA & WHITE RIVER.—The Canadian parliament has been asked for an extension of time to build from a point in British Columbia on the international boundary at Bear creek, a tributary to the Chilkat river, northwest towards the Alsek river and thence through the Shakwak valley to Lake Kluane, thence along Lake Kluane and via the Donjek valley to the White river, thence to the boundary between the Yukon territory and Alaska between the 62nd and 64th parallels. Barnard & McKeown, Montreal, are solicitors for the applicants.

BUCTOUCHE RAILWAY & TRANSPORTATION COMPANY.—See Moncton & Northumberland Strait.

CALGARY, EDMONTON & FORT MCMURRAY.—Application has been made in Canada for a charter to build lines as follows: From Calgary, Alb., north via Edmonton, passing east of Lac La Biche to Fort McMurray, and following the Athabasca river to Chipewyan, thence west of Slave river and passing through or near Fort Smith to Fort Resolution on Great Slake lake; from Fort Smith southwest to Fort Vermilion, thence southerly on the west side of Peace river to Peace River Landing, and southwest to Dunvegan; from a point on the Red Deer river north of the 52nd parallel to Red Deer. Christie, Greene & Hill, Ottawa, Can., are solicitors for the applicants.

CANEY RAILWAY.—Incorporated in Kentucky with $10,000 capital to build from a point on the Chesapeake & Ohio in Floyd county, Ky., following the middle branch of the Big Sandy river to Beaver Creek, and reaching coal fields in eastern Kentucky. The incorporators include J. Salisbury, M. Flannigan, W. T. Hite, W. W. Brown and W. P. McVay. The headquarters of the company are at Prestonburg.

CLINTON & OKLAHOMA WESTERN.—See Oklahoma Roads.

HURON LAKE SHORE.—Application is being made to the Canadian parliament for incorporation to build from Sarnia, Ont., northeast through the counties of Lambton, Huron, Bruce and Grey, to Meaford. W. B. Converse, Montreal, Que., is solicitor for the applicants.

LAKE ERIE & YOUGHIOGHENY (Electric).—Incorporated in Ohio with $3,000,000 capital to build a line to connect Youngstown, Ohio, with Conneaut. A. W. Jones, J. H. Ruhlman, G. J. Chapman, W. H. Ruhlman and G. M. Brown, all of Youngstown, are interested.

LORAIN, ASHLAND & SOUTHERN.—See Ashland & Western.

MANITOBA-ONTARIO ROADS.—Incorporation has been asked for in Canada to build a railway from Fort William, Ont., northwest via the Lake of the Woods to Winnipeg, with branches to the international boundary between Ontario and Minnesota, and from the main line northerly to the National Transcontinental (Grand Trunk Pacific), also to operate steamships, etc. Lewis & Smellie, Ottawa, Ont., are solicitors for the applicants.

MICHIGAN CENTRAL.—An officer writes that during the year 1912 this company constructed 2.42 miles of third and fourth

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main track in the state of Michigan, which will be used exclusively for freight business. On the Detroit, Delray & Dearborn branch the company built 1.7 miles of second track in Michigan, and has also constructed a double track freight line from that branch to Junction yards at Detroit, 2.46 miles, which is known as the connecting branch. On the Detroit Belt Line 1.37 miles of second track in the city of Detroit was constructed.

MONCTON & NORTHUMBERLAND STRAIT.—The Buctouche Railway & Transportation Company, which was incorporated in Canada in 1910, to build from Buctouche, N. B., north to Richibucto Harbor, and from West Point, P. E. I., east to Coleman, on the Prince Edward Island Railway; also to operate steamers and car ferries, between the two provinces, is applying to change its name as above, and for authority to extend the authorized line from Richibucto harbor to Chatham, N. B., or to Loggieville; also to build a line from Painsec, N. B., to Cape Tormentine. E. G. Evans is general manager, Moncton, N. B.

OKLAHOMA ROADS.—Work is now under way building a four-mile line from Cheyenne, Okla., to a connection with the Clinton & Oklahoma Western. Grading has been finished on about two miles, and it is expected that the line will be open for traffic in February. The chamber of commerce of Cheyenne is back of the project.

SAN PEDRO, LOS ANGELES & SALT LAKE.—An officer writes, regarding the reports that this company will build a low grade line via the Cajon Pass, Cal., that location work is now under way between Riverside and Daggett over the San Bernardino mountains via Cajon Pass. The distance between these two places is 100 miles. It has not yet been determined whether construction work will be started in the near future.

SOUTHERN TRACTION.—An Officer writes that the general contract for constructing and equipping these lines has been given to the Southern Engineering & Construction Company, Dallas, Tex. Work is now under way from Dallas south via Ferris to Corsicana, 55.5 miles, also from Dallas via Lancaster, Waxahachie, Italy, Milford and Hillsboro to Waco, on 97.5 miles. About 30 miles have been finished and are now in operation. (October 25, p. 815.)

SPRINGFIELD & CENTRAL ILLINOIS TRACTION.—According to press reports this company will begin construction work about April. The company was organized in 1910, to build from Springfield, Ill., south via Pawnee, Morrisonville, Hillsboro, Coffeen, Greenville, Carlisle and Centralia; with another line from Greenville west via Alhambra, Edwardsville and Grant City to St. Louis, Mo., and a third line from Coffeen, Ill., southeast via Vandalia, Kinmundy, Louisville and Olney to Mount Carmel. Isaac A. Smith, president and general manager, Security building, St. Louis, Mo. Charles Olson, Beavercreek, Ill., is said to be interested. (February 16, p. 321.)

TOMBIGBEE VALLEY.—See Alabama, Tennessee & Northern.

RAILWAY STRUCTURES.

GALVESTON, TEX.—The Gulf, Colorado & Santa Fe has awarded a contract for the construction of the new union station and general office building to the American Construction Company of Houston. The building will be of steel and concrete construction, six stories in height, and will cost approximately $500,000. It will include a waiting room 62 ft. x 100 ft. The building will have a frontage of 100 ft. and a depth of 125 ft.

HOWELL, IND.—It is reported that the Louisville & Nashville will spend about $200,000 in enlarging its shops at Howell.

MECHANICSVILLE, N. Y.—The Boston & Maine has started work on a new eastbound classification yard and engine facilities consisting of engine house, machine shop, coaling plant, etc. The grading is completed and work on the foundations is under way.

PARSONS, KAN.—The Missouri, Kansas & Texas has awarded a contract to the Gray-Wimmer Construction Company of St. Louis, for the rebuilding of its passenger station.

ROODHOUSE, ILL.—The coaling station of the Chicago & Alton at Roodhouse was destroyed by fire on the night of December 31.

Railway Financial News.

BALTIMORE & OHIO.—A mortgage has been filed in Pennsylvania on the property of the B. & O. in that state to secure an issue of $40,000,000 bonds.

CHICAGO, MILWAUKEE & ST. PAUL.—The *Commercial & Financial Chronicle*, in reply to an inquiry as to the exact legal procedure by which the C. M. & St. P. has taken over the Chicago, Milwaukee & Puget Sound, has received the following from General Counsel Burton Hanson:

"By purchase, the St. Paul company has acquired the fee ownership of the railway lines and property of the Chicago, Milwaukee & Puget Sound Company. The entire capital stock of that company heretofore held by the St. Paul company will continue to be held by the latter as a muniment of title and for the purpose of continuing the corporate existence of the Puget Sound company for such length of time as may be thought advisable, but the lines of railway formerly owned and operated by that company, by the conveyance to the St. Paul company, will be owned and operated by the latter company. As part of the consideration of the purchase, the St. Paul company assumes and agrees to punctually pay, when due and payable, all bonds issued under the first mortgage of the Puget Sound company, as well as all other existing obligations of that company."

CHICAGO & NORTH WESTERN.—The Michigan railroad commission has given its consent to the issue of $10,000,000 equipment trust certificates, the issue of which was approved by the directors some time ago.

OKLAHOMA CENTRAL.—This property, which is in the hands of a receiver, has not as yet been sold under foreclosure, as was stated in the *Railway Age Gazette* of December 27.

TENNESSEE CENTRAL.—On application of S. J. Fordyce, Jr., of St. Louis, vice-president, E. B. Chamberlain, vice-president, and W. K. McAlister, formerly of the supreme court of Tennessee, have been appointed receivers.

UNION PACIFIC.—See editorial comments on page 45.

Attorney General Wickersham has notified the officers of the Union Pacific that he sees no objection to the Union Pacific's receiving the quarterly dividend of 1½ per cent. on its Southern Pacific stock ($126,650,000).

WABASH-PITTSBURGH TERMINAL.—Judge Orr, on January 3, in the federal court, has authorized the sale of the Wabash-Pittsburgh Terminal at the discretion of the special master, W. H. McClung. The upset price is fixed at $6,000,000.

WESTERN MARYLAND.—After a meeting of the board of directors on January 7 it was announced that the regular quarterly dividend of 1 per cent. would be passed. E. D. Adams, chairman of the board, representing the Deutsche Bank, in a statement given out after the meeting, said that the directors had provided during the past year $13,000,000 at a net cost to the company of less than 6 per cent. In part the statement says:

"The Western Maryland system is now in process of transformation and evolution, from a local railway, mainly tributary to and dependent upon the city of Baltimore, to a seaport terminal link in one of the largest railroad lines in the country. Such a transformation necessarily involves large increases in operating expenses, alike (1) in the maintenance accounts by reason of the changes required to be made therein under the Interstate Commerce Commission rules in respect to property abandoned or replaced in the course of improvements, (2) in traffic expenses through expenditures necessarily made in advance to promote traffic for the new line, and (3) in transportation expenses by reason of the innumerable difficulties of carrying on construction and improvement work and current traffic simultaneously. In the present case these difficulties have been augmented by the fact that the betterment of the old line did not proceed in due coordination with the construction of the new line.

"The conditions that now obtain are unquestionably abnormal and temporary. Substantial improvement in operating conditions is not, however, to be anticipated until the betterments of the old line are near completion, which may be expected during the latter part of spring, though it is the opinion of the operating officials that October will be found to have been the period of maximum expense."

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including $2 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$6.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,141 copies were printed; that of those 8,141 copies, 6,687 were mailed to regular subscribers and 348 were provided for counter and news companies' sales; that the total copies printed this year to date were 24,401 copies—an average of 8,133 copies a week.

VOLUME 54. JANUARY 17, 1913. NUMBER 3.

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GENERAL NEWS SECTION 115

AN interesting decision of the Colorado supreme court was noted in last week's issue, in which the court sustained an order of the Colorado Railroad Commission requiring the Colorado & Southern to restore freight and passenger service between Denver and Leadville, Colo., over its narrow gage South Park branch. The company had attempted to close the 21-mile section between Como and Breckenridge during the winter months on account of the expense of operation through a mountainous, sparsely settled country over the 4 per cent. grade over Boreas Pass, 11,400 feet high. It showed during the proceedings in the case that during the winter this line is subject to heavy and continuous snow storms, necessitating a very heavy expense, that in 1911 there was a deficit of nearly $80,000 on the line from Como to Leadville, that its taxes in Summit county amount to $25,000 a year, that the traffic over the line is inconsequential with no prospect of improvement, and that there are less inhabitants along it now than there were ten years ago. On the other hand by the closing of this line the few shippers at Breckenridge were deprived of railway facilities which they had previously enjoyed, freight and passengers being compelled to travel by a very roundabout route over another road in order to reach Denver, and the court held that the law imposes upon the carrier "the duty of furnishing facilities to the public on its entire system, not a part"; that it "cannot be excused from performing its full duty merely because, by ceasing to operate a part of its system, the net returns would be increased." Having once undertaken to serve the public the railway cannot abandon an unprofitable portion of its business without surrendering its charter. In connection with this decision and exposition of the law as it stands as the expression of public policy in this country, it is interesting to note the following paragraph in the recent annual report of the National Railways of Mexico: "One of the considerations weighing in the merger of the companies now forming this company was the suppression of certain lines, principally of the old National Railroad Company and the old Mexican Central Railway Company, which parallel each other, the traffic of the region not being sufficient to sustain both tracks." The report goes on to state that a committee appointed to investigate the matter recommended the abandonment of lines amounting to 288.64 miles and that the necessary steps are now being taken looking to said abandonment. Although some communities must be deprived of railway conveniences by this step, the Department of Communications and Public Works has signified its approval. As the Mexican government holds a controlling interest in the National Railways of Mexico it is interested in the economical operation of the property.

THE space-interval principle as applied in the running of trains is not the severely rigid thing that it is often thought to be. One old railroader says that in his first dim apprehension of the block system, 50 years ago, he conceived of every block section as exactly one mile long. That was the way it was presented in what he had read about its introduction in England. But today we have some railroads divided into blocks of 800 ft., while in other cases trains are kept apart 20 miles. A theorist, considering the problem entirely apart from cost, and studying simplicity only, could easily fall into the error of making every automatic block as short as possible, say 800 ft., and every manual block as long as possible, say 100 miles. The short automatic block would be favored by the absence of track-circuit troubles and by the attractiveness of the idea of increasing the capacity of the road; and the long manual block would please the manager who wished to down the telegraphers' union! A St. Louis correspondent writes on this subject as follows:

I notice that in an editorial in your issue of December 27 you say, in substance, that there are very few railways which are so poor that they could not afford to adopt the block system, if they would make their block sections long. Taking this view of the matter, what would you say to the problem raised by the following situation: a single track line, 80 miles long, without a single intermediate telegraph office and with a time-table showing only one meeting point in this distance. The reader naturally assumes that when you advocate the block system on a line of very light traffic you mean the manual block system; and this implies the employment of operators at the stations. But, surely, you would not think of establishing and maintaining a telegraph office on a desert, where there are no trains to meet and no station business to be done. Theories always have to submit to conditions.

That is a pretty thin line, and no mistake! Forty miles is the longest block section that we have heard of as being actually used. This problem cannot be fairly considered without a fuller knowledge of the conditions; but there are a few fundamentals concerning which there will be no question. It is true that a

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road using the space interval with only two trains a day might be paying a high price for safety. The ultimate argument for the space interval is that it provides for systematic practice in place of loose and unmanageable practice; and it is to be admitted that sometimes we have to pay for "system." Running regular passenger trains is a system that is often very costly; empty seats by the thousand and empty cars by the dozen have to be run daily in order to adhere to a system. Conditions, to a considerable extent, do submit to a theory. But our 80-mile line is not so hopeless, after all. The road surely must have a telegraph or telephone line for its whole length. Since 1850 all enterprising roads have had that much, and since about 1870 both enterprising and unenterprising have had it. The state should require at least that degree of enterprise as a minimum. What do those conductors do when an engine breaks down 40 miles from headquarters? With telephone lines the space-interval principle can be availed of without station attendants. A telephone at that single meeting point, with conductors trained to use it, would enable the despatchers to enforce the space interval. Change these 40-mile block sections to 2-mile sections and we can see this machinery in operation on electric roads today. The reader also will recall an account in the *Railway Age Gazette* some time ago (December 2, 1910, p. 1034) of the use of the electric train staff, without station attendants, on the Delaware, Lackawanna & Western. The block system everywhere! This is the only satisfactory ideal. And it is not so difficult of attainment as we usually think.

THE outlay for passenger terminals in large cities has assumed such vast proportions within recent years, and is increasing so rapidly, that an occasional pause for consideration of the ultimate tendency of the movement may well be worth while. The recently completed Pennsylvania station in New York, the North Western terminal in Chicago, the Northern Central station in Baltimore, the Union station in Memphis and the Harriman lines station in Seattle, not to mention the Grand Central terminal now nearing completion in New York, and the Union station at Kansas City, now half completed, represent a cost of several hundred million dollars. Furthermore, the new stations in prospect for the near future, including the Union station, the Illinois Central station, and the Chicago & Western Indiana station in Chicago, the proposed Union station at St. Paul, the Dallas Union station, the Denver Union station, the Illinois Central station at Memphis, the Harriman lines station at Spokane, plans for all of which are being actively prepared or have been approved, show clearly that the end is by no means in sight. Nor is the movement confined to the larger cities. The terminus of a railway is but one of hundreds of ambitious communities that are continually urging schemes for municipal improvements at the expense of the railways, which seem small in proportion to the large figures which represent railway activities as a whole, but which would amount to an immense total if extended proportionately to other communities. Nor is the sense of proportion a prevailing characteristic of civic ambition. Rivalry between cities and towns becomes an important factor and public sentiment demands that a new station shall not only provide ample facilities for the accommodation of passengers, but shall be constructed in such a way as to be a credit to the community, in accordance with the community's usually exaggerated idea of its own importance. To construct merely an entirely adequate station from the utilitarian standpoint is regarded as an affront, yet communities are not especially grateful to the railways after their demands have been complied with. Because of the semi-public nature of railway services some of these demands are justified. For many others the railways themselves are to blame, because in their efforts to outshine each other they have set examples for demands from other communities which are very difficult to resist. The Grand Central terminal represents an exceptional case. The entire project represents an investment and has been so developed that the rentals from facilities leased to outside parties will absorb the fixed charges. In the case of most of the great passenger terminals, however, there is no expectation that the increased facilities will bring in a commensurate return. Moreover, especially in view of the reduction in passenger fares in many states in recent years these large expenditures for passenger facilities with the resulting fixed charges, impose a very heavy burden on some of the weaker roads, for they are often required to participate in the cost of union stations if they are to secure any part of the competitive business, while the amount of such business they may expect by no means justifies the outlay. Mr. Fritch, in his paper before the Canadian Railway Club, brings out some interesting comparisons between these enormous station expenditures and the passenger earnings of the roads. Of greater significance is his statement that these enormous outlays for passenger stations are being made at the expense of proper freight terminal development. Many shippers have already called attention to this fact in discussions of the freight rate question. It is undoubtedly true that the public would be better served, and that the railways would be in a far better position to effect needed economies in operation if greater attention were given to the development of adequate freight terminal facilities, and less to the establishment of monuments to the ambition of cities and towns or to the vanity of the railways, in the shape of magnificent passenger stations.

THE RAILROAD CLEARING HOUSE.

THE American Railway Clearing House did not prove a success largely because of opposition of railroad accounting officers. In considering the two plans described elsewhere, one for a general clearing house, the other for a number of district clearing houses, this important fact should be given due weight. A joint committee has been appointed representing both financial officers and accounting officers, to consider these plans, and it is hoped that a plan can be worked out which will meet the requirements of a situation that badly needs remedying and at the same time prove acceptable to the accounting officers.

The question of a clearing house for the settlement of balances between railroads in this country is a very important one. It was a problem that E. H. Harriman was deeply interested in up to the time of his death, and the experience with the American Railway Clearing House has shown that despite the difficulty of the problem, nevertheless a clearing house is a feasible undertaking. A possible solution of this problem must not only overcome actual physical difficulties, but also prejudices and predilections. The officer in charge of the accounting department of a railroad is personally responsible to his president and, through him, to the board of directors. It is natural and proper that the ethics of the profession do not permit the shifting of this responsibility. This explains what otherwise might seem a prejudice against permitting any outside voice in the affairs of the accounting department.

There are two plans for a clearing house which have been worked out in detail and which will be considered by the joint committee of accounting and financial officers. These plans provide in the one case for a general clearing house to be established in Chicago or some other city; in the other for 12 or more district clearing houses to be established at financial centers through the country. It is obvious at once that the district clearing house plan will permit of a quicker settlement between local roads than will a general clearing house. This district plan will also give the stronger roads control of the local clearing house in their territory. The accounting officer with financial headquarters at New York will have a feeling that he has under his own thumb, "where he can get at it," the clearing house which settles the bulk of his accounts with other roads. Since, moreover, the great bulk of the settlements between one road and all other roads is between that road and other roads in its own territory, the district clearing house plan will, compared with

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the present method of individual settlements, save a very large amount of transfer of funds from one city to another.

The general clearing house will not be under the control of any one group of roads. Its operations will be simple and complete. The argument has been put forward that the operating costs of the district clearing houses will be less than those of the general clearing house. It is hard to believe this. On the face of it, the clerical labor involved in making between one hundred and two hundred clearing sheets, which will be the aggregate under the district plan, will be very much greater than that involved in making a single comprehensive clearing each month. While the expenses of operation will not be large, probably, in either case, after all the reason for adopting a clearing house plan at all is to eliminate clerical labor and to simplify the settlement of balances. Let us assume that the general clearing house delays the settlement of 90 per cent. of the amount of the balances by a full 30 days. This delay is not cumulative. The total balances under either the general clearing house or district clearing house plan are cleared each month. A road which always has a credit balance will suffer; a road which always has a debtor balance will benefit by this delay; but there are few roads which are always in one class or the other. Under the general clearing house plan three or four roads having connections at New York may settle between each other directly, not submitting these accounts to the clearing house at all. Each road can work out its own problem to its own best advantage while making use of the general clearing house.

Unquestionably the chance for error in making a clearing is much greater where a large number of roads are involved, as would be the case with a general clearing house, than would be the case in each district clearing house. But, after all, banks have found that they can successfully make a clearing between their members each day, and the chances for error in the New York clearing house, for instance, are probably fully as great as would be the case with a general railroad clearing house.

As to the transfer of funds from one city to another, the general clearing house plan provides that local depositories in the different financial centers may be used, and it is hard to see why such a plan as this does not have every advantage, as far as saving of transfer of funds is concerned, that a district clearing house plan has. In either the general clearing house plan or the district clearing house plan it will be necessary to have a working fund, and it should be just as easy for the manager of the clearing house to see that his balances are distributed between the 12 or 15 depositories selected, as it will for each district clearing house manager to have sufficient working capital in his bank to carry out his partial clearances day by day. The advantages of district clearing houses as compared with one general clearing house narrows down to one plausible reason, which is the desire of each member to influence the management of the local clearing house in his own district.

To offset the natural predilection of the accounting officer to have the clearing house "where he can get at it," as provided for in the district clearing house plan, are the advantages of a general clearing house that will be a simple, complete machine without local prejudices and not under the control of any one group of roads. Further than this, it will, or should, accomplish the object, the desire for which has led to the consideration of a clearing house plan, namely, to reduce to a minimum the clerical labor and banking complications of settlement between the eight hundred or more railroads which now settle accounts individually.

Regardless, however, of what plan is eventually adopted, the credit for the fact that a workable plan for a clearing house has been devised and presented to the Society of Railway Financial Officers, and that a joint committee of this society and of the committee of twenty-five of the Association of American Railway Accounting Officers has been appointed to consider this and other plans, is due to the Financial Officers' president, T. H. B. McKnight.

BRIDGE ERECTION BY END LAUNCHING.

THE endwise launching of fully erected bridges of long spans has never gained much favor among American bridge engineers, although the method is more or less common in other countries. This fact cannot be explained by any hesitancy on the part of engineers in this country to move completed structures, for there are numerous examples of daring handling of new and old spans both by floating and skidding, especially of draw spans. The sidewise moving of a span erected on falsework alongside an old bridge is frequently adopted for locations where it is essential that the interruption to traffic in replacing a bridge be kept to the minimum. The most plausible explanation of the disfavor in which end launching is held is found in the wide application of the cantilever method of erection for locations where it is impractical to use falsework. The extent to which the latter method has been developed is illustrated by its use for two double track trusses, 615 ft. 2½ in. long, center to center of end pins, in the Kentucky & Indiana bridge over the Ohio river, described in the *Railway Age Gazette* of January 10, 1913.

In general, end launching is applicable under the same conditions which make cantilever erection necessary; namely, deep water, swift current, extreme variation in tide, sudden freshets or the presence of ice or drift. End launching has two advantages over the cantilever method of erection in that the truss members do not have to be designed for erection stresses and that in locations subject to extremely high winds the danger of erection on shore is much less than over the river channel.

The Monongahela river bridge, having a span of 475 ft., the erection of which is described elsewhere in this issue, is probably the longest and heaviest span ever erected by end launching, although at least four other bridges with spans of 400 ft. or over have been erected in this manner during the last decade.

The Canadian Pacific erected a 415 ft. single track through truss over the French river in 1908 by end projection, the total weight of the span being 1,282 tons. The Tornea Railroad in Finland launched a 410 ft. span weighing 800 tons in 1902, and in replacing the Canadian Pacific bridge over the St. Lawrence river at Lachine, Que., during the summer of 1912, the same method was used in erecting the two channel spans of 408 ft. each. These spans had a weight of 1,365 tons each. The Northern Railway of Costa Rica erected a 400 ft. span over the Reventazon river in 1909 by end launching, the weight of this bridge being only 580 tons. A slightly heavier bridge, although of only 340 ft. span, was erected by the Southern & Western Railway in Queensland, Australia, in 1895.

Three distinct methods of supporting the shore end of the span to be launched have been used. With the Monongahela river bridge two 4-wheel trucks supported this end; similar trucks with 8 wheels each were used on the Southern & Western bridge in Queensland. The more common method, however, seems to be to support the rear end on bearing plates sliding on skidways which usually consist of rails laid on the approach structure or on timber blocking. The Lachine bridge of the Canadian Pacific was supported on six shoes attached to a distributing truss in order to avoid too great concentration of the load on the approach span. In the other bridges mentioned above, two sliding plates were used; in one case the plates were surfaced with brass, and in both cases the sliding rails were oiled or greased to reduce the sliding friction. The bridge in Costa Rica was moved over three sets of stationary rollers mounted on the shore abutment, a temporary pier in the middle of the river and a temporary abutment at the center of the span in its erection position.

In all cases except this Costa Rica bridge the river end of the span was supported by a scow. These scows varied in length from 98 ft. to 200 ft. for the various bridges, and in width from 19 ft. to 37 ft., the general standard being about the same as that described in detail for the Monongahela river bridge. The power for moving the bridges usually consisted of hoisting

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engines located on the shore back of the span in its erection position, the power being applied in most cases to the rear truck or sliding shoe. In the Monongahela river bridge the engines were located on the scow and pulled on lines attached to "dead men" on the river banks. In the bridge erected in Finland, hydraulic presses were used and in the Queensland structure one 10-ton and two 5-ton hand winches furnished the power. Experiments made at the Lachine bridge showed that the sliding friction amounted to about 13 per cent., and the starting friction found in some of the other bridges ranged as high as 20 to 25 per cent. In most cases the moving time was less than the six hours which was consumed in the launching of the Monongahela river bridge. The travel of the Lachine bridge was 12 ft. per min.

The general principle of erecting spans on shore and launching them endwise into position has been adapted to the erection of a number of high viaducts in Europe and South America. One of these over the Sarine river in France was 1,095 ft. long and 249 ft. above the water. The structure consisted of seven spans which were erected consecutively on shore, the first one being pushed entirely across the river. After the projection of the first one it was used as a cantilever during the erection of the first steel tower. When this tower was complete, rollers were placed on its top and the second span was launched from the shore, pushing the first one beyond the erected tower. The second tower was then erected in the same manner and this process was continued for the entire length. This bridge was erected in 1859. A similar viaduct in Chile, consisting of five deck spans 228 ft. long at a height of 328 ft. above the river, was erected in a similar manner, the pier towers in this case being erected from below in advance of the superstructure. The total weight of these five spans was 750 tons, the greatest deflection during erection being 20⅞ in. This bridge was erected in 1890. An even more daring use of this method was the railway bridge over the Danube river near Vienna, where five spans with a total length of 1,312 ft. and a total weight of 2,000 tons were launched complete.

KEEPING A GOOD LOOKOUT.

WHEN a switch light is not burning, a train approaching the switch in the night should be stopped, and the trainmen should relight the lamp; "not slow down, but stop." This is the law and the prophets as laid down by the Indiana Railroad Commissioners, in their circular, noticed last week, page 72. It may be called the law, for those commissioners probably can get the legislature to endorse whatever rule of that kind they may see fit to adopt; and the rule may be very fairly classed as one coming from the prophets, for the reason that in substance it has been common in American railroad practice for two or three generations. The rule has been common, we say; observance of it has not. That is to say, the rule making enginemen responsible for passing a switch that is wrong has been kept in the book when, all the time, it was known both by the officers and the enginemen, that, at innumerable switches situated on sharp curves, and at all switches in times of fog or blinding snow storms, the rule could not be properly observed without a great reduction in the speeds of passenger trains; and in the great majority of cases such reduction was neither ordered nor expected. Moreover, nearly all switch targets are so small that even in the day time the regular observance of a rule like this, by runners of passenger trains, would be a severe and unreasonable strain on their vigilance.

The remedy for this anomalous condition, recognized very slowly, was the introduction of distant signals at all facing-point switches; but the policy of the railroads in this matter was as varied as could be imagined. On double-track lines facing points were got rid of to a considerable extent; on some roads very extensively. The New York Central introduced distant signals, set about 1,000 feet back, several years before it adopted the block system; while, on the other hand, the Lake Shore & Michigan Southern tolerated unprotected facing points long after it began running very fast trains.

All over the country single track lines, with all their switches facing-point for half of the trains, have attempted and still attempt, the impossible combination of speed and safety without providing the distant signal. The advocate of distant signals admits, of course, that the liability that a given switch will be left wrong is extremely small. And the prudent manager, if he believes the expenditure for distant signals unwarranted, aims to keep the schedules of passenger trains slow enough to permit the engineman properly to limit his speed at switches; and it is to the fact that the great majority of managers are disposed to be prudent that we owe our comparative freedom from "open switch" disasters.

The only practicable way in which to carry out the Indiana rule is to provide distant signals everywhere, so that the engineman can always detect the absence of a light before he runs into danger; and without slackening speed. It is strange that this fundamental condition has been so persistently ignored. Without distant signals the best enginemen in the world will find themselves unable to keep up the habit of mind by which they will always do the right thing, except possibly where speeds are always very low. And where a system of automatic block signals takes the place of the distant signal, it is highly desirable that the signals be always located within a moderate distance from the switch, say not more than three or four thousand feet.

To always look at every switch just as soon as it comes in sight is a severe tax on the mental discipline of the engineman, especially where switches are not near together, and traffic is not heavy. On busy lines, where block signals are encountered at short and regular intervals, the engineman forms a habit of constant vigilance; he cannot do otherwise. On thin lines he has varied temptations to laxity, and he cannot keep himself keyed up to the top notch without some aid in the nature of surprise tests. He ought to arrange some kind of a test for himself so that, if possible, he would never make a mistake; but most enginemen do not do this, at least not with sufficient effectiveness, and so the superintendent has to do it; and it is by no means an easy thing to manage. In connection with a new scheme of surprise checking, which has just been adopted on the New York, New Haven & Hartford, Mr. Stone, the chief of the locomotive enginemen's brotherhood, has made a vigorous protest. The New Haven proposes to change switch lights so that they shall show red when they ought to show green, and thus test the alertness of the runners; and Mr. Stone seems to believe that this test will be made under unnecessarily dangerous conditions. Declaring that the making of such tests ought to be made a criminal offense, he says: "No one can measure the effect of such a shock on an engineman as, flying through the night with a fast train, and coming to some curve or obscure place, or running out of a patch of fog into a clear place and see a switch light as 'red as blood' staring him in the face, the headlight shining on a string of cars or on another train, standing on a siding. A man lives years in such seconds and will not get over the effect of it in months." Mr. Stone says that this kind of testing has been done in the West, and was not reasonably managed; and he rightly protests against unnecessary frightening of men on locomotives.

Everyone will sympathize with the view here expressed. But what does Mr. Stone propose instead? Surely, every engineman desires perfect safety. Where a switch can be seen only a short distance ahead, the railroad company is bound, of course, to put in distant signals, or else provide for low speed. But then there is the problem of making up time on other parts of the road to compensate for what is lost by slackening at switches. It is often perfectly feasible to thus make up time; but the whole responsibility for thus varying the speed falls on the engineman; and then there comes in another difficulty, that of getting the runners to do this invariably with good judgment. So we come back to the question of surprise surveillance. Where is the genius of the foot plate who will tell the world the one best

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way to perform this part of the engineman's duty; the perfect vigilance and care which every engineman would like to be credited with? In the management of the fire and the water, and in all the mechanical features of the engineman's work we have everything explained in print, down to the last detail; so that the dullest person, if he can read, may seek the highest perfection. But in the vital matter of keeping a good lookout, the only instruction that is furnished is of the same kind that was in vogue when the Rocket made her first trip. Surely, every reputable engineman means to support his superintendent with consistent loyalty; and he knows that, from the superintendent's standpoint, uniformity of practice is essential. Is there not a way to secure, in this matter of vigilance, a high degree of uniformity and at the same time a high degree of perfection?

NEW BOOKS.

Railroads: Rates and Regulation. By William Z. Ripley, Ph.D. Nathaniel Reps. Professor of Economics in Harvard University. Board cover, 6½ in. x 8¼ in., 659 pages. Longmans, Green & Co., New York. Price, $3.00 net.

The readers of the *Railway Age Gazette* need no introduction to Professor Ripley as a writer on railway economic subjects. He has been a frequent and valued contributor to our columns, and some of the contents of the present volume and the one on "Railroads; Finance and Organization," which is to follow it, have appeared under his signature in this paper. Probably there is more reliable information in this book on the subjects dealt with than in any other that has appeared; and it is presented in a very clear and interesting way. Professor Ripley has been a painstaking student of railway rates and regulation for the last quarter century. He is very familiar with the entire literature of the subject; and he has crowded his book with specific illustrations which will be invaluable to the student.

No class of men have the same opportunity to regard economic questions impartially as have professors in the universities. They also have excellent opportunities to study the statistics and other data bearing on economic problems, and to meditate regarding underlying economic principles. They do not have equal opportunity to study the daily transactions of business at close range. Furthermore, economists are human, and to be human is to have more or less bias. Perhaps the feeling is due to our own environment, but we feel that most professors of economics in this country who discuss railway matters show a bias against the railroads. We think Professor Ripley shows less of it than most of them, largely, no doubt, because he knows more about railways than most of them. But we think he shows some of it. In fact, he seems to concede this; but he adds that "if bias there be, it will in all likelihood be found to favor the welfare of the 'dim inarticulate multitude.' . . . It is this helpless and unorganized general public always in need of an advocate, which, perhaps, most strongly appeals to the academic mind." Bias tends to mislead the judgment; and it is a little hard to understand how that which tends to mislead the judgment can work to the benefit of the "dim inarticulate multitude." The multitude needs advocates; but in a democratic country it needs unbiased instruction even more.

Perhaps Mr. Ripley puts a little too much stress on past faults of railway management and not quite enough on the remarkable reforms that have been introduced in it within the last decade. But this is not unnatural, for few people realize how generally railway managements have cordially welcomed the opportunities that the agitation and regulation of recent years have afforded them to raise their entire business to a higher plane. His book will be a healthy one for railway men to read largely because it does present a point of view different from their own.

In his opening chapter Mr. Ripley gives a concise history of transportation in the United States. He then takes up the theory of railroad rates and in his discussion gives adequate consideration to the two main underlying principles of rate making—the cost of the service and the value of the service. His chapters on rate-making in practice, personal discrimination and local discrimination abound with apt illustrations drawn from numerous sources, especially the decisions of the Interstate Commerce Commission. He believes, as does this paper, that in order to prevent unfair discrimination competing railways ought to be allowed to make reasonable agreements regarding rates and that the Interstate Commerce Commission should be given power to fix minimum as well as maximum rates. His chapter on freight classification is an excellent analysis. He concludes that immediate uniform classification is not desirable, but that steps should be taken to bring about steadily a closer approach to uniformity. He describes favorably the trunk line rate system, which is to a large extent on a distance basis, and this is followed by more or less condemnation of the Southern basing point system and of the transcontinental rate system. Inasmuch as Mr. Ripley contends pretty strongly for the principle that rates ordinarily should be based on distance, and also that the Interstate Commerce Commission should be made practically the final judge of the facts in rate cases, it is not surprising to find that he refers to the decisions of the Supreme Court interpreting the original Intersate Commerce Commission law as "emasculations" of the law, or that he finds a good deal to criticize in the decisions of the Commerce Court, especially that in the intermountain rate case.

Some of his comments on the Commerce Court seem unfair and misleading. For example, he says "The Commerce Court held it to be its proper function as a court of law to review in the broadest way all cases which came before it on appeal." The Commerce Court has not so held. The principles on which it has stated it has based its important decisions seem identical with those laid down by the Circuit Courts and the Supreme Court. The Supreme Court, in the case of Interstate Commerce Commission vs. Illinois Central, 215 U. S. 452, which is often cited as a precedent for narrow court review, indicated that great weight must be given to the commission's findings of fact, but added that the power of the court extended to the determination not only of relevant and pertinent questions of statutory power and of constitutional power and right, but also to the question "whether even although the order be in form within the delegated power, nevertheless it must be treated as if not embraced therein, because the exertion of authority which is questioned has been manifested in such an unreasonable manner as to cause it in truth to be within the elementary rule that the substance and not the shadow determines the validity of the excise of the power." The Commerce Court does not seem to have held that it has any wider jurisdiction than that which the Supreme Court in these cases has indicated that the courts possess. In the case of the A. T. & S. F., et al, vs. I. C. C., et al, for example, the Commerce Court said that in cases where there is substantial conflict in the evidence or testimony on which the finding of the commission is based it would feel bound by the finding unless clearly and palpably against the weight of the testimony. And in the Louisville & Nashville case the Commerce Court said that "not only is the commission vested with a discretion which cannot be disturbed, and which we intend unqualifiedly to respect, but it is entitled to select the testimony which it will believe and rely upon it accordingly as it addresses itself to the discriminating judgment of the commission; but it is not within the authority of the commission to reduce the rates in this or any other case not merely against the weight of the evidence produced to sustain them, but without anything substantial to warrant the conclusions reached or the reasons assigned therefore."

Professor Ripley seems to us to have a tendency to assume that whenever the courts overrule the commission, the courts must be wrong. The legislation under which the commission acts makes it a detective to exercise surveillance over the railways and a prosecuting attorney to prosecute them as well as a judge to judge them; and therefore the chances that it will not be impartial seem much greater than that this will be true as to the

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courts. It may be that as Mr. Ripley and many other economists believe, the Interstate Commerce Commission should by specific statutory provision be made the final judge of the facts in rate cases. But this has not been done; and the courts must construe the law as it is and not as it may be thought it ought to be. If the law is defective or ambiguous, that is not the fault of the courts that construe it but of the congress that passed it. And in many ways the law has been, and is, defective and ambiguous. More fairness and expertness, and less petty politics, in the drafting and administration of laws in this country would reduce very greatly both the work our courts must do and the odium they must incur in performing their duties. It seems to the *Railway Age Gazette* that Professor Ripley's comments on the review of the commission's decisions by the courts constitute a grave defect in an otherwise excellent book.

Following his discussion of recent legislation and of the decisions of the commission and of the courts under it, Professor Ripley has a very interesting chapter on some current transportation matters, such as the conflict between federal and state authority, the control of water carriers and the opening of the Panama Canal. He is a believer in increased federal control, regards with skepticism the agitation for federal development of inland waterways and is optimistic regarding the effect that the Panama Canal will have on commercial and industrial development generally.

How to Invest Money Wisely. By John Moody. Published by the office of John Moody, 35 Nassau street, New York. Flexible leather. 77 pages. Price, $2.

This is a handy little book devoted to the subject of making diversified investments. The subject is covered in a simple, non-technical way that should appeal to the average investor, and the book, beside laying down general principles, contains carefully selected examples that illustrate the author's meaning. There is no attempt to give anything that a thoroughly well informed investor should not already have known, but there are comparatively few investors who have small sums to invest to whom a study of such a book as this will not be of very great value. The book is divided into three parts, the first part describing the principles of making diversified investments; the second describing the principles which should govern investing money with the hope of making not only interest on the investment, but a profit as well, and the third part describing and giving examples of classes of investments.

Supplement to Manual of the American Railway Engineering Association. 129 pages. 6 in. x 9 in. Illustrated. Bound in paper. Published by American Railway Engineering Association, Chicago. Price, $1.

The last complete edition of the Manual of the American Railway Engineering Association was issued in 1911. This supplement contains all revisions and additions adopted at the annual convention held in Chicago last March, and used in connection with the 1911 edition brings it up to date. The manual contains the complete standards of good practice relating to maintenance of way work which have been adopted by the association up to this time, and is a valuable reference book.

The Work of the Bond House. By Lawrence Chamberlain. Published by Moody's Magazine Book Department. 157 pages. Price, $1.35.

Mr. Chamberlain is a bond man with Kountze Brothers, New York, and has written not only a very instructive, but a quite readable little book describing the services to the community that are performed by the American bond house. Mr. Chamberlain describes the work of the soundest of bond houses. The standard that he sets for what an ideal bond house should be is high indeed, but not higher than is the ideal which quite a number of American bond houses aim at. There are three especially instructive chapters on buying municipal bonds, buying railroad bonds and buying corporation bonds. These chapters are particularly interesting at present when the question of whether or not capital is seeking to avoid railroad investments is so often discussed.

Letters to the Editor.

ORDERING AND HANDLING NEW MATERIAL.

St. Paul, Minn., December 19, 1912.

To the Editor of the Railway Age Gazette:

I have read with considerable interest the article on "Efficient Organization for Handling Salvage," published in your issue of December 13, page 1139. During the last ten years there has been a great deal written on handling and disposing of scrap material. It would seem fair to assume that on most roads this subject has been given considerable attention and that they now have adopted systems whereby the greater part of the reclaimable material is saved and the scrap properly disposed of. It is true, no doubt, that there is still room for a very great improvement, which would mean a still larger saving, but it would seem that the time has come when more attention should be given to the new material.

In buying a suit of clothes greater attention is given to getting the best value for the money invested and the care it is to receive than to its disposition after it has served its purpose, and this, to a large extent, should also apply to the store department, meaning a more efficient organization for ordering and handling the new material. If more attention was given to this part of the store department there would be less unused material to consign to the scrap dock that would have been a total less except for its scrap value. It is possible to find castings, bar iron and other large material covered with rust in almost any storehouse, which shows that it has probably been there for years, and if you were to inquire why this material had been ordered the answer would probably be that there was a change in standards, or that it had been ordered by the mechanical department. But is this always the case? Has not some of the over-stock and obsolete material on hand been ordered through a mistake upon someone's part?

I have only mentioned the large material, but if you were to make a careful inspection of all racks, bins and pigeon holes you would find a part of the scrap material in the storehouse instead of on the scrap dock, and this material represents a total loss. In going through the shops have you not also observed a great amount of new material that is scattered around promiscuously and apparently not given any attention, when a place should be provided and proper care taken of it? When a storekeeper or general storekeeper signs a requisition for material, how often does he personally know if that quantity or kind of material is actually required? It is quite true that to a large extent he will depend upon his foreman or section clerk for this information, but what kind of an organization has he for ordering, inspecting and handling this material? What system has been established for educating the man who actually places the order as to the quantity of material that should be ordered and carried? Is this man closely scrutinizing each item before ordering it, and is he thoroughly familiar with the material in his section or department? When the new material is received does he know that it is all right and that it is the best of its kind for the price that has been paid? It may be said that this man is not supposed to be an expert on material. If he is not, who is the man in the store department who is making investigations as to the kind of material that is being purchased, and if it is the kind that will give the best service? What system is there for standardizing material? In this day when there are so many manufacturers of nearly every article, has sufficient attention been given to make sure that this man is not specifying material for which the company will be compelled to pay a certain percentage for its past reputation instead of for its present value?

The ordering, inspecting, handling and accounting of the new material are the main points that are confronting the storekeepers today. For each of these a better system could be established that would result in a very great improvement, and it would seem that there is unlimited opportunity for the store department to make a study of these subjects and outline more perfect systems that will show great savings.

A Reader.

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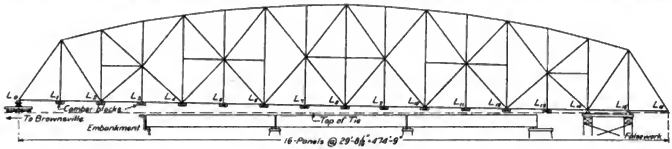
ERECTION OF MONONGAHELA RIVER BRIDGE.

Because of Unfavorable Conditions Long Span Was Erected on Approach and Moved Into Position on Barge and Trucks.

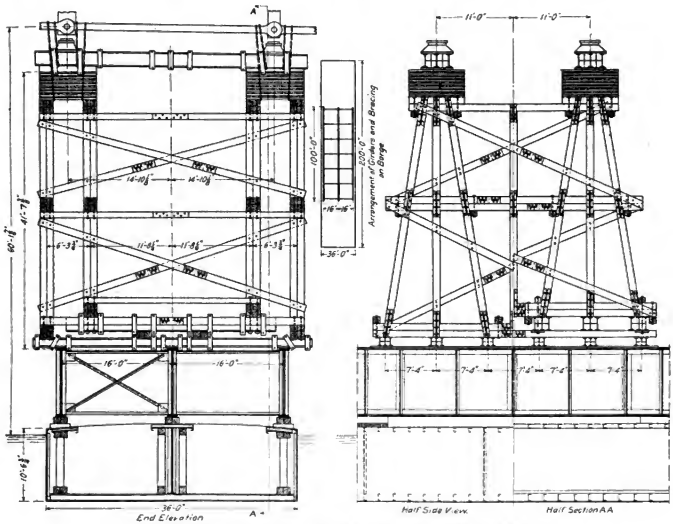
The Monongahela Railroad is now completing an extension into the West Virginia coal fields on which an unusual method was adopted for erecting a through truss bridge across the Monongahela river. The Monongahela Railroad is controlled jointly by the Pittsburgh & Lake Erie and the Pennsylvania and built under the charter of the Buchannon & Northern. This line extends south from the connection with the old line on the east bank of the Monongahela river to a point about three miles north of the state line near New Geneva, where it crosses the river and continues down the west bank to Fairmont, opening



Outline of 475 ft. Truss.

extends from Brownsville, Pa., south to within seven miles of the Pennsylvania-West Virginia state line with numerous branches to the various coal fields. The extension proceeds from the south end of the present line southerly to Fairmont, W. Va., that portion of the road south of the state line being up large areas of coal lands hitherto undeveloped along the entire route.

The crossing of the river is made on a steel structure consisting of three 95 ft. deck plate girder spans on the east end, one pin-connected through truss span 475 ft. long across the channel



Elevations and Sections of False Work Supporting End of Span on Barge.

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and two deck plate girder spans 95 ft. long on the west end. The superstructure was designed for a single track while the stone masonry piers and abutments were built for two tracks, the steel being erected on the line of the north track. The center line of the bridge runs approximately east and west at this point with the east end towards Brownsville.

As this crossing is in the mountains close to the headwaters of the stream and but a short distance below the mouth of the Cheat river, another mountain stream, it is subject to rapid and wide variations in level, rises of 4 to 20 feet in a few hours being comparatively frequent. For this reason, and also because the Monongahela river is a navigable stream, it was not considered advisable to erect the long span on falsework and it became necessary to resort to other methods. It was decided to erect the three deck girder spans on the east end by the ordinary methods and to then erect the truss on these spans and the adjacent embankment with one end of the truss extending over the forward pier into the channel, mount this end on a barge and the opposite end on trucks and move it into final position in one operation.

The channel span was a single track pin-connected through truss 475 ft. long with a maximum height of 75 ft. center to center of chords. It weighed 1,751 tons, and was designed for

Towing Barge Up-Stream with Upper End Supported on Two Smaller Barges.

Cooper's E-50 loading. The trusses were spaced 22 ft. between centers, while the structure was divided into 16 panels each 29 ft. 8¼ in. long.

All steel for this span was unloaded in a material yard at the end of the east approach fill. Previous to its erection the three girder spans on the east end of the bridge were set in place and three additional temporary spans of the same length were erected beside them on the same piers, spaced 23 ft. center to center of girder spans. The truss was then erected on these girder spans, being centered on them, or 11 ft. 6 in. south of its final center line. The fourth panel point from the west end was located over the forward channel pier and all but the three end panels were erected by a traveler in the usual manner. Falsework was then placed in the stream under the two panel points next to the pier and the rest of the structure was erected over the water on this. No falsework was placed under the end panel point, the end post, shoes and bars being placed by booms on the traveler. After the erection of the entire truss was completed, the cantilever portion was reinforced with wire cable diagonals to take care of the reverse shears and the falsework in the stream was removed.

PRELIMINARY ARRANGEMENTS.

While this span was being erected a large steel barge had been designed and built at the Ambridge plant of the American Bridge Company for use in floating the span across the channel. This barge was 200 ft. long, 36 ft. wide and 10 ft. 6½ in. deep. To get it to the bridge site it was necessary to pass it through two locks which were 154 ft. and 164 ft. long, respectively, or considerably shorter than the barge. To get it by these locks the front end of the barge was mounted on two auxiliary wooden scows 50 ft. x 20 ft. and 60 ft. x 20 ft., placed side by side with their long axes parallel to the steel barge. Five bents of falsework of various heights to support the barge in its upraised position were placed on the scows and properly braced. The scows were then sunk and drawn to their proper position under the barge. They were then pumped

View During Record Flood When River Was 29 ft. Above Normal Stage.

out, raising the upper end of the barge about 10 ft. out of the water and it was taken up stream in this position.

While this was being done arrangements were made with the government whereby it built temporary cofferdams a sufficient distance above the upper ends of the locks to permit the closing of the lower gates behind the barge. The permanent head gates and the tail gates were then opened, the barge floated in with its front end projecting over the head walls of the lock, and the tail gates closed. The temporary cofferdam was then broken and the water allowed to flow in, raising the level to that of the upper pool, after which the barge proceeded on its way.

Coincident with this the railway company dredged immediately in front of the two channel piers to permit of sinking

Barge in Mid-Stream Showing Location of Engines and Girders.

the barge under the cantilever end of the span. Also, four "dead men" or anchors each 12 ft. square were placed on the banks as shown on the accompanying drawing.

Upon arrival at the bridge, the barge was anchored near the east channel pier and three 100 ft. plate girders 9 ft. 11½ in. deep were placed lengthwise on it, the girders being spaced 16 ft. center to center of webs and centered both longitudinally and transversely on the barge. These girders were supported on 12 in. x 12 in. timbers 7 ft. 3 in. long, resting on and capped by timbers of the same size, the lower timbers lying horizontally on the channel beams forming the transverse ribs on the bottom of the barge. These girders supported falsework de-

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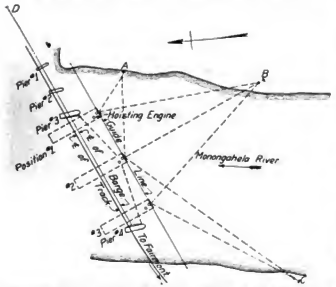
signed to support the second and third panel points on each side of the truss. The falsework was designed for a height from water level to center of pins of the truss of 60 ft. 1¾ in., although a considerable variation from this distance was provided for by blocking at the top to take account of the changes in water level of the stream. The falsework consisted of two three post framed bents under the two trusses, the bents being 22 ft. between centers and 36 ft. long between centers of end



Location of Anchors on Bank for Moving Barge Across the River.

posts. The trestle itself was 37 ft. 7½ in. high from top of girders to bottom of blocking. The weight of the span was transmitted to the falsework through cast shoes under the panel points, each resting on three 24 in. I-beams supported directly on the blocking. Four pumps with boilers were placed on the barge for raising and lowering it while two hoisting engines with drums were placed on the up-stream end to handle the cables leading to the "dead men."

After everything required had been placed on the barge and carefully tested, a time was selected when the stage of the river was approximately that assumed in the design of the staging and the barge was floated to its proper position under the end of the span after having been filled with water until it floated with the lower edge of the deck six inches out of the water. The blocking above the falsework had previously been arranged so that with the barge at its elevation, the cast shoes cleared the lower side of the span about six inches. When in position, the water was pumped from the barge until it rose

End Shoes Supported on Heavy Double Trucks.

two feet out of the water, picking the span up free of the camber blocking. To insure accuracy in raising the barge, markers with large black letters on a white background were placed on each side of the barge at its center with the bottom indicating the proper elevation.

When supporting the end of the span, the load carried by the barge was estimated at 1,360 tons exclusive of the weight of the barge itself, which amounted to 300 tons. This consisted of the reaction of the end of the bridge itself, estimated at 955 tons, the three girders weighing 125 tons, the falsework weighing 230 tons and 50 tons for the engines, pumps and boilers. With the capacity of the pumps estimated at 3,040 gal.

Span Approaching Final Position Before Lowering onto Piers.

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per minute it required one hour and 40 minutes to raise the barge the 18 in. when lifting the span off its supports.

At the time of erection the east end panel point of the span was placed on two trucks under the end posts. Each truck consisted of two four-wheel trucks carrying six 24 in. I-beams on which was placed an American Bridge Company standard turntable center with the top bearing blocks modified to carry the end shoe directly. These two trucks ran on standard gage tracks spaced 22 ft. center to center.

As soon as the span was raised free of the camber blocking and was supported entirely on the trucks and the barge, it was securely tied to the barge by 1½ in. steel cables fastened to the upper chord panel points U-12 on both trusses and to the end posts midway of their length. To prevent lateral movement of the span, similar cables connected the lower panel points L-14 and L-15 to the ends of the barge.

At this point everything was in readiness to move the span across the channel, and while in this condition two very high floods were encountered, in one of which the water rose 26 ft. above the normal stage, and in the other it rose 29 ft. in six hours with the current moving at the rate of 25 miles per hour. In this latter flood the water reached the highest stage on record and it was with difficulty that the barge was prevented from filling with water due to its tilting to one side as the end of the span rose. A wooden watertight bulkhead three feet high was quickly constructed around the barge to prevent the flood waters from entering it. The strain placed on the cables in holding the barge in position made this also a source of great danger while the raising of the end of the span to this elevation changed the distribution of the load upon the supports from what had been calculated and introduced high stresses in certain of the members. Fortunately, the entire equipment withstood the force of the flood successfully, and as the flood subsided the span was lowered on the camber blocking which had in the meantime been raised two feet higher than before. This returning of the span to the camber blocking after it had been lifted free from it is of itself an unusual occurrence in bridge erection, and possibly this is the first time it has been done.

On July 30 the span was finally moved into place. In addition to the two engines on the end of the barge which were connected with the cables to the "dead men" on the shore, a third engine was placed on the span directly above the other two with a line leading back over the center of the bridge to an anchor on the bank to control the movement of the span if either of the other engines became disabled. To insure that the barge moved across the channel in a straight line, a ⅞ in. wire rope guide line was stretched tightly across the river between white post markers. A white line one foot wide was painted across the end of the barge where this line crossed it and it was the duty of the engineer to keep the cable within the limits of this mark. Men were also stationed at each marker on shore as a further check on the accuracy of the movement of the barge across the channel. In moving across the channel, lines *A* and *B*, shown on the accompanying sketch, carried the barge the first half of the distance, but on reaching the center of the channel line *A* was dropped and line *C* was picked up and carried it to the final position. The moving of the span began at nine o'clock in the morning and was concluded about three o'clock in the afternoon, the river being about six feet above the stage estimated and the current six miles per hour.

After being carried across the channel, the span was 11 ft. 6 in. to the south of its final position and about 12 ft. above its final elevation. It was at first planned to deposit this span on blocking on the pier by filling the barge with water and lowering it, remove two feet of blocking on the falsework, raise the barge to take the span off the pier, remove two feet of blocking on the pier and repeat this operation until the span was lowered to the proper level. However, because of the unfavorable river conditions it was thought advisable to free the span entirely from the barge as soon as possible and it was placed on blocking on the pier. Four 500-ton jacks which were coupled together with flexible copper tubing to a header to which was attached a hydraulic pump to operate the four jacks as one unit were placed under the end of the span. This pump was driven by steam and was capable of raising the jacks under load nine inches in five minutes. In this manner this end of the span was lowered to nests of rollers two feet above grade and the span was then drawn to its permanent alinement by block and tackle, moving the span on the rollers. When in its final position, the span was lifted off the rollers by the jacks and was lowered to its final seat.

The work was done under the direction of J. M. Schoonmaker, president, and D. K. Orr, chief engineer of the Monongahela Railroad. J. C. Bland, engineer of bridges of the Pennsylvania Lines West, had general charge of the design and erection. The details of the erection of the structure were planned and carried out by the American Bridge Company, under the direction of H. A. Greene, district erecting manager, and J. L. De Voe, engineer in actual charge of operation.

Barge Arriving at Pier Preparatory to Lowering Span onto Blocking.

ENGLISH GENERAL MANAGER KNIGHTED.—Frank Ree, general manager of the London & Northwestern Railway of England, has been knighted by the king. Sir Frank has been general manager for the past three years, and has been in the service of the road 39 years. He is a member of the Military Railway Council.

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THE PROPOSED RAILROAD CLEARING HOUSE.*

A Joint Committee of the Accounting and Financial Officers Are to Immediately Formulate a Clearing House Plan.

There are four inter-railroad accounts that are now almost universally settled monthly by draft. These are charges for per diem, interline freight charges, interline passenger charges and loss and damage charges. Charges for car repairs are generally, although not always, settled by vouchers. The payments for trackage rights are usually covered by some special arrangement. The amount of money involved in these intercompany accounts is large. On December 31, 1911, the total amount due from other companies, exclusive of advances and loans and rentals covered by lease, to the Pennsylvania Railroad was $6,641,577, and the corresponding total due by the P. R. R. to other companies was $3,933,946.

It is estimated in a study of the subject that W. H. Williams, of the Delaware & Hudson, has made, that the monthly settlements of balances between all roads for interline freight is about $54,290,000, for interline passenger about $9,445,000, for per diem $19,326,000, and for freight claims $586,000.

In addition to the labor involved in determining separately the amount that a company owes each other railroad company with which it has dealings, for per diem, freight charges, passenger charges and loss and damage charges and the amount that each other company owes it on each one of these accounts, there is under present arrangements the necessity for an individual settlement each month on each of these accounts between all roads having dealings with each other. Each one of these settlements is made by draft. The work of determining the amount of the inter-railroad charges and the work of preparing the drafts for amounts due is done by the accounting department. The collection of drafts drawn by a railroad company, and the acceptance and payment of drafts drawn on that company is the work of the treasurer's department.

Under this method there are at least seven entries in the books made between any two roads even if they settle only *balances* on each one of the four accounts mentioned. In case they do not settle balances, but draw drafts as soon as they have figured out what is due them, the number of entries involved may be as many as fourteen. Moreover this involves paying a draft drawn by a road which possibly, at the very time that it is drawing the draft, owes the road on which the draft is drawn more money than it is owed. The situation in the time of money stringency, such as was experienced in 1907, makes a situation that is intolerable. At that time there were probably millions of dollars tied up and lying idle for months at a time, at the very time that each road and each banking community most needed to have available all of the funds that were owed to it.

The expense under this method of settling accounts is impossible to estimate accurately; there are, besides the clerical labor involved, all expenses of collection. It has cost a road as much as $1.25 to collect a $14 per diem charge owed to it. Each company is under the necessity of keeping on hand large working balances ready to meet drafts that may be drawn against it. There is no way of determining when these drafts will be presented, since they come in day by day.

The names of the different railroads with which any one railroad has dealings do not appear on the general ledger of that company; but there is, generally, an auxiliary ledger in which an account is kept with each one of the roads for each one of the four accounts; and, in case of many railroads, there is in addition a balance book compiled from the auxiliary ledger to be used in checking up drafts presented against the company or drafts drawn by the company against other roads.

In England much of the elaborate machinery for determining railroad charges and for the settlement of inter-railroad accounts is done away with by having these charges cleared through a central association. This association has charge of the settlement of accounts for interline tickets and interline freight charges, and has charge of the distribution of equipment as well as the settlement of accounts for the charges for the use of equipment. The work of such a central clearing house in a country where distances are so great as in the United States would be vastly more complicated than in a small country like England. The Committee on Car Efficiency, now the Committee on Relations Between Railroads of the American Railway Association, inaugurated a plan for a clearing house for the settlement of car hire balances as between railroads some years ago. Since July, 1912, however, the plan has been abandoned, but its existence proved at least that a clearing house is practicable.

The maximum number of roads belonging to this clearing house was about 100. The clearing house, however, cleared their accounts with nearly 1,500 railroads and private car lines which were debtors and creditors of the member roads. In 1911, when the clearing house was doing its largest business, there was cleared in one month a total of $4,214,488. This clearing house did not have a large reserve fund, the practice followed being to make drafts on all debtor roads immediately after the first of the month, at the same time forwarding statements of amounts due creditor roads with authority for the draft. The expenses for operation for this clearing house in 1911 averaged about $1,100 per month.

About five years ago the Society of Railway Financial Officers was formed, and later a committee was appointed to consider the question (which had been referred to this society by the railroad presidents) of a general railroad clearing house for the settlement of all balances between companies now settled by draft, and also all other indebtedness as might be agreed on between the roads.

In 1912 this committee made its report to the society, and suggested a plan of organization for a clearing house, which plan was approved by the executive committee of the society and a committee of thirteen was appointed to consider this plan and any others that might be presented and to put a plan in operation.

Since the work of the clearing house would involve the cooperation of both the accounting department and the treasurer's department of each member road, the question has been considered by the Association of American Railway Accounting Officers and a sub-committee of the Committee of Twenty-Five has been appointed to work with the Clearing House Committee of Financial Officers to formulate plans for a clearing house. The plan that has already been considered and approved by the executive committee of the Financial Officers provides for a single general clearing house, and was the work largely of T. H. B. McKnight, treasurer of the Pennsylvania Lines West. In addition to this plan there is up for consideration before the joint committee an alternated plan providing for district clearing houses. The board of directors of the clearing house is to be made up of six accounting officers, six financial officers, and a chairman who is to be *ex officio*, the president of the Society of Railway Financial Officers. The vice-chairman of the board is to be chosen by the board.

The management of the clearing house is to be in the hands of this board of directors. The clearing house is to have a paid secretary, a paid manager and an assistant manager. The manager, assistant manager, whose work will be that of a chief clerk, and certain other clerical help will devote all their time to the work of the clearing house.

* From a forthcoming book on Railroad Accounting by W. C. Hooper, to be published by D. Appleton & Co.

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The general clearing house would be located at Chicago, and it would be necessary to hire offices there. The American Railway Clearing House paid but $450 a year rent, but the rent was low because the A. R. A. furnished the offices. If the entire 813 roads reporting to the Interstate Commerce Commission were to join the clearing house, a suite of offices would be required that would cost possibly $5,000 a year.

Under the district clearing house plan there would be 12 separate clearing houses located at New York, Atlanta, Chicago, Cleveland, Denver, Houston, Montreal, New Orleans, Philadelphia, St. Louis, St. Paul and San Francisco. Each local clearing house would have a local committee of four members each, two financial officers and two accounting officers. There would be a clearing house committee of 24, two from each local clearing house committee, one a financial officer and one an accounting officer. From this clearing house committee there would be elected by letter ballot, each member road having a vote, an executive committee of three, of which one would be president. The members of all committees would serve without pay, and each member of the local committee would in turn act as manager or chairman pro tem of the district clearing house and should draw checks payable to members or the district clearing houses, these checks to be countersigned by one other member of the committee. It is suggested that it might be possible to have a clerk loaned by member roads to each local clearing house. Rents for district clearing houses would not be, of course, anywhere near twelve times as much as the rent for a single central clearing house, but would amount to possibly twice as much, or between $9,000 and $10,000.

The work of the clearing house or district clearing houses is to be confined entirely to the settlement of balances among member roads. The clearing house will have nothing whatsoever to do with the adjustment of these balances. The accounting department of a member road will arrive at the debit and credit balances for per diem, freight, and passenger accounts, and loss and damage claims, in exactly the same way that it now arrives at these figures. The accounting department of a road will then draw up a statement under the general clearing house plan showing what is owed by each member road to its road on consolidated balance for all four accounts, and what the accounting road owes each member road on consolidated balances for all accounts. The form from which this statement is made up in the general clearing house plan is shown as Form A2, and statement itself for this report such as has been suggested, is shown herewith as Form A1. It should be noted that the debit or credit on Form A1 against each other road is a net figure, and is a net for the aggregate of all the accounts which are to be cleared through the clearing house. At the end of the month or at some agreed date this statement is to be sent by each one of the member roads to the clearing house. From this statement the clearing house manager and his assistant will make up a clearing house sheet; such a sheet for 14 roads is shown herewith. On a certain date, say the twenty-fifth of the month following that for which the accounting has been done, the clearing house will col-

Form A 1.

No.....

.....191

THE RAILWAY CLEARING HOUSE:

I report the following debit and credit consolidated adjusted balances on our books at close of.....191.., which are to be settled at next clearing.

.....

Comptroller.

Name of Company.	No.	Net Balance. Debit.	Credit.
Atchison, Topeka & Santa Fe Railway Company	1		
Baltimore & Ohio Railroad Company	2		
Cleveland, Cincinnati, Chicago & St. Louis Ry. Co.	3		
Chesapeake & Ohio Railway Company	4		
Chicago & Alton Railroad Company	5		
Chicago, Rock Island & Pacific Railway Company	6		
Elgin, Joliet & Eastern Railway Company	7		
Louisville & Nashville Railroad Company	8		
New York Central & Hudson River Railroad Company	9		
Norfolk & Western Railway Company	10		
Pennsylvania Company	11		
St. Louis & San Francisco Railroad Company	12		
Southern Railway Company	13		
Wabash Railroad Company	14		
TOTAL			
BALANCE due this Company			

EXPLANATION—This form, in full cap size, to be used by the Accounting Department of each member road (unless Form A2 is adopted instead) to advise the Clearing House of the adjusted balances on its books at the agreed date which are to be settled in the next clearing. To be made on typewriter, and one or more carbons to be retained by the Accounting Department and in connection with Form A2 to form the basis of entries, charging and crediting the Clearing House.

Form A 2 No.....

.....

Statement of Adjusted Balances at.....191.., Consolidated for The Railway Clearing House.

NAME OF COMPANY.		FREIGHT		PASSENGER		PER DIEM		OVERCHARGE, ETC.				CONSOL. BAL. REPORTED TO CLEARING HOUSE.	
		DR.	CR.	DR.	CR.	DR.	CR.	DR.	CR.	DR.	CR.	DR.	CR.
A. T. & S. F. Ry. Co.	1												
Baltimore & Ohio R. R. Co.	2												
C. C. C. & St. L. Ry. Co.	3												
Chesapeake & Ohio Ry. Co.	4												
Chicago & Alton R. R. Co.	5												
C. R. I. & P. Ry. Co.	6												
Elgin, Joliet & Eastern Ry. Co.	7												
Louisville & Nashville R. R. Co.	8												
N. Y. C. & H. R. R. R. Co.	9												
Norfolk & Western Ry. Co.	10												
Pennsylvania Company	11												
St. Louis & San Fran. Ry. Co.	12												
Southern Railway Company	13												
Wabash Railroad Company	14												
Totals													
Balances													

EXPLANATION—This form—full length—to be used in the Accounting Department to consolidate into one balance for reporting to the Clearing House the *balances* in the various accounts named. It may be found best to use this form for the report to the Clearing House, thus saving one blank and giving the Clearing House a little more information to assist it in checking up any discrepancies between the reports of two companies. To be made in typewriting with one or more carbon copies, from one of which, when advice of corrections or correctness has been received from the Clearing House, journal entries may be made charging and crediting the Clearing House as per suggestion above.

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Form G — 14 SECTION A-1

Name of Company.	1 A.T.& S.F.		2 B.&O.		3 C.C.C. & St.L.		4 C.&O.		5 C.B.& Q.		6 C.R.I. & P.		7 E.J.&E.		8 L.S.N.		9 K.Y.C. & T. R.		10 N.&W.		11 Penns.		12 So. Ry.		13 So. Pac.		14 Wabash	
	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit	No.	Credit
A. T. & S. F. Ry. Co.	Debit						1	2,671.44	1	10,602.30					1	675.00	3	2,007.40			1	18,476.19	1	2,643.80			1	119.26
B. & O. R. R. Co.	Debit	2	2,443.18	2			2	2,347.82	2	2,690.43	2	3,023.75									2	8,996.24	2	340.00	2	3,470.27	2	493.76	2	23,561.68
C. C. C. & St. L. Ry. Co.	Debit	3	449.08	3			3	1,234.14	3	1,963.55	3	1,963.55									3	4,073.31	3	3,470.27	3	7,611.46	3		3	20,721.37
C. & O. Ry. Co.	Debit	4	467.23	4	1,234.14	4			4	4,130.26	4	4,431.42	4	199.39	4	4,973.31	4	2,340.18	4	2,340.18	4	2,340.18	4		4	2,340.18	4		4	24,446.29
C. & A. R. R. Co.	Debit	5	4,490.28	5	789.16	5	6,729.43	5			5		5		5	3,224.60	5	4,870.71	5	6,621.42	5	10,640.21	5	6,221.42	5	37,365.35
C. B. I. & P. Ry. Co.	Debit	6	18,471.29	6			6	8,248.72	6		6	4,317.27	6		6	4,987.65	6	1,116.71	6	946.27	6	6,003.21	6		6	5,376.64	6	5,376.64	6	54,772.50
C. & E. I. R. R. Co.	Debit	7	6,400.61	7			7	4,000.38	7		7		7		7	1,306.43	7		7		7		7		7		7		7	11,707.42
L. & N. R. R. Co.	Debit	8	413.09	8	4,930.87	8	1,000.07	8	446.27	8	946.27	8		8		8	17,401.24	8	1,720.43	8		8	1,170.29	8	2,890.43	8		8	29,918.24
N. Y. C. & H. R. R. Co.	Debit	9	18,940.73	9	2,345.67	9	2,635.43	9	1,670.49	9		9	7,420.09	9		9		9	1,740.91	9	896.24	9		9	27,837.86	9		9	65,487.42
N. & W. Ry. Co.	Debit	10	800.60	10	1,430.30	10	11,560.49	10			10	179.54	10	3,746.27	10	7,430.52	10		10		10		10		10	24,125.82			
Penna. Lines	Credit	11	2,448.38	11	1,963.55	11	1,963.55	11	1,000.07	11	1,000.07	11	1,111.43	11	4,420.39	11	9,444.25	11	5,877.21	11	4,980.56	11	2,636.89	11	36,474.94			
So. Ry. & S. F. R. R. Co.	Debit	12	467.48	12			12		12		12		12		12		12		12		12		12		12	4,490.28	12	3,470.27	12	8,427.83
Southern Railway Co.	Debit	13	207.96	12			13	4,890.28	12		12	1,671.43	13	2,432.12	13	980.27	13	4,980.76	13	5,621.29	13		13	2,340.21	13	23,570.99			
Wabash Railroad Co.	Debit	14		14	4,223.21	14	6,241.25	14		14	5,007.41	14	844.71	14		14	1,748.90	14	1,428.91	14		14		14		14	19,494.36			
Total Debits			38,793.25		16,529.52		10,824.69		38,556.14		28,462.90		22,831.98		13,158.72		18,509.82		25,439.79		51,415.91		44,275.83		27,577.36		29,613.18		317,990.15
Total Credits			38,793.25		16,529.52		10,824.69		38,556.14		28,462.90		22,831.98		13,158.72		18,509.82		25,439.79		51,415.91		44,275.83		27,577.36		29,613.18		317,990.15
Balance due Clearing House			16,909.37		23,561.68		20,971.37		31,732.66		32,363.33		34,256.44		29,111.24		13,217.28		27,837.86		24,122.42		20,473.49		13,938.54		23,570.99		15,960.38		317,990.15
Balances due Company			9,713.95		6,431.76		10,947.08		17,222.60		3,907.25		10,000.00		13,824.96		23,256.52		6,207.54		2,293.39		14,254.14		3,638.82		5,683.09		7,721.96		81,301.26
Clearing House Expense Previous Month $1,000	Per		54.62		56.60		43.33		84.83		100.00		80.50		73.91		42.94		74.18		77.63		103.12		44.05		72.05		44.24		1,000.00
Settlement Balances			9,659.33		6,888.36		10,990.41		17,137.83		993.55		12,080.50		13,830.45		23,299.46		6,281.72		7,215.66		14,149.22		3,594.77		5,611.04		7,776.20		1,000.00

In the last line all credit balances to be in black and all debit balances in red.

General Clearing House Sheet.

lect or deposit in banks drafts against roads which show a debit balance and will a few days later send out checks to roads having a credit balance.

In this way the clearing house will accept no responsibility for the correctness of the adjustment as between different roads, that being handled as it now is by the accounting officers of the roads. The clearing house will act as a great automatic machine, which will clear just what has been put into it, no more and no less. In this way each individual member of the clearing house can clear through this institution as much or as little as it desires. It will not be necessary to confine the accounts to be settled through the clearing house to the four mentioned, nor will it be necessary to include all other member roads in the statement sent to the clearing house.

Instead of having an auxiliary ledger with at least four separate accounts with each other road, each member road will have an account only with the clearing house, and for such accounts as it does not wish to settle through the clearing house. The saving in labor cost in the treasurer's office is obvious, as is the saving in collection charges, and the fact that two entries a month will be necessary in the accounting department where in many cases four hundred or more were necessary before, would indicate a very considerable saving in this department.

Journal entries may be made up from the totals of the figures on Form A2 as follows:

Other Companies in Current Freight Accounts.
Other Companies in Current Passenger Traffic Accounts.
Other Companies in Current Car Service Accounts.
Sundry Individuals and Companies in Settlement of Freight Claims.
General Expenses (for one month's proportion of clearing house expenses).
} To Railway Clearing House.

Railway Clearing House to
- Other Companies in Current Freight Accounts.
- Other Companies in Current Passenger Traffic Accounts.
- Other Companies in Current Car Service Accounts.
- Sundry Individuals and Companies in Settlement of Freight Claims.

Under the district clearing house plan each road would forward each month to the district clearing house of which the road is a member a statement covering balances due to and from members of that clearing house, separate statements being shown for each class of settlement made during the month, as, for example, interline freight interline passenger, per diem, etc. Each road will also send each month to each district clearing house of which it is not a member a statement covering the balance due on the reporting road's interline freight, etc., to members of each of the clearing houses of which it is not a member, separate statements being shown for each class of settlement. In addition, each road will send to each district clearing house of which the road is a member a statement covering balances due to and from members of each of the clearing houses of which it is not a member, separate statements being shown for each class of settlement. District clearing houses are to clear between their member roads first and then with each other, a statement being made up by each district clearing house showing balances due to or from each member, separate statements being made for each class of settlement. Each district clearing house is to make a statement showing balances due to or from each member in account with a foreign clearing house, each class of settlement being covered by a separate report.

As soon as a district clearing house receives all of its members' reports for any one class of settlement, it will clear among its own members for this class of settlement. It will clear with other clearing houses as it receives their reports. By clearing first with the local members and for each class of statement as it comes in, the object aimed at is to save time.

Under the general clearing house plan it will be necessary to wait until the statements from all the member roads which are to be included in that particular month's clearings have been

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received. On the other hand, there will be but one large clearing house sheet, while if district clearing houses are adopted there will be a large number of clearing house sheets made out each month by each clearing house. District clearing house sheets would not be large. Since, however, the size of the sheet increases by the square of the number of members, the sheet for a general clearing house would be very large.

The sheet shown herewith is for 14 roads only. A large room would be necessary with a long desk running entirely around the room, permitting a complete longitudinal section of the sheet to be exposed on this desk. It would be a simple matter to cut the clearing sheet into ten sections, showing at one time only ten rows vertically, fastening the ten sections one below the other. We will say now that the Atchison, Topeka & Santa Fe's report came in showing the balances due by the Atchison and to the Atchison in account with each other member road. This report is arranged vertically in two columns as is shown on Form A1. Two clerks could take this report and enter *across* the clearing sheet each credit under the name of each one of the member roads. This would complete line No. 1 all the way across the 150 ft. or so of the clearing sheet. In the meantime other clerks could be at work entering the reports of other roads, three or four men each with an assistant could thus be at work simultaneously in making up the clearing sheet. When the reports from all of the roads had been entered the horizontal lines and the vertical columns could then be footed on an adding machine. If this total made up in

Form D.

THE RAILWAY CLEARING HOUSE.

CHICAGO.....191

.....Comptroller,

.....Company.

Dear Sir:

An error has been found in the footing of your statement to the Clearing House of balances due to and from your Company at.....191 . The debit footing should be $....., the credit footing $....., and the balance due.....your Company to be settled through the Clearing House $..... Please correct your copy of your statement to correspond.

Respectfully,

.....

Manager.

the case of the Atchison from all the debits and credits shown by each one of the *other* roads in account with the Atchison checked with the total debit and total credit, shown by the Atchison on its own record, the work would prove itself automatically. A clerical force of 8 or 10 men would be necessary only for a few days each month and could be hired for night work only. The regular force of the clearing house onght not to exceed seven, including the manager and his assistant.

There are three sorts of mistakes that the general clearing house manager might find in the reports. There might be a mistake in the footing or in entering the net credit or debit balance This kind of a mistake could be corrected by sending the road Form B shown herewith. The second type of mistake would be a difference between the figures shown by one road and those shown by another road for the same balance. For instance the Atchison might show on its report that the Lake Shore & Michigan Southern owed it $250,000, while the Lake Shore's report might show that this company owed the Atchison $200,000. In this case the clearing house would pay the smaller balance on which both reports agree, namely the $200,000, and would notify both roads of the differences in their report (Form C) and this difference could be carried over and adjusted in the next month's clearings. There might also be errors due to the omission of amounts. This would be corrected through the use of Form D.

The general clearing house or the district clearing houses would need some working capital; the amount, however, would be small when compared with the aggregate amounts that are now carried by roads, because of the fact that they do not know when drafts will be presented against them, or from what quarter. It is estimated that if one hundred roads join the clearing house, a working fund of $25,000 would probably be ample for the clearing house needs. Each road on joining the clearing house will be required to subscribe its share of the working fund, the amount to be based on the road's earnings in the previous year. In addition to the expense

Form C.

THE RAILWAY CLEARING HOUSE.

CHICAGO.....191

.....Comptroller,

.....Company,

Dear Sir:

Your statement of....., showing balances due to and by your Company at close of..... shows..... Company as .....$..... That Company reports your Company as.....$.....

Under Rule No..... we clear on the smaller amount and have therefore changed the report of your Company to read to.....of that Company $.....and will settle on that amount. Please make corresponding change in your copy of your report.

Respectfully,

.....

Manager.

of carrying this sum without interest there will be the expenses already mentioned which in the case of the general clearing house will include the salary of the manager, and his assistant and the clerical help necessary in the clearing house. This expense would not be very large, probably $1,000 a month ($10 a month per road) would be an outside figure for a clearing house with a hundred members.

The risks that each road would have to take of other roads defaulting or refusing to honor drafts would not be as large as under the present system. The clearing house can in all probability make an arrangement with one of the large surety com-

Form D.

THE RAILWAY CLEARING HOUSE.

CHICAGO.....191

.....Comptroller,

.....Company,

Dear Sir:

Your statement of balances due to and by your Company at close of business on.....191.., reports due.....Company $..... That Company's statement has to corresponding .....te your Company. Under Rule No....., therefore, we cut out of your statement the amount you show to.....of that Company, to be adjusted between your companies before next clearing day. Please correct your copy of your statement to correspond.

Respectfully,

.....

Manager.

EXPLANATION—Notice of correction to be sent by the Clearing House to the Accounting Department of a member road when its report on Form A1 or A2 contains a charge or credit against another Company, and the report of the other Company on the same form contains no corresponding credit or charge, and the Clearing House is unable to reconcile the difference up to the time for closing the Clearing Sheet.

panies for a blanket bond which would cover any amount defaulted up to say $400,000, such a blanket bond would be very much cheaper than if each road joining the clearing house were required to give a bond for itself. If a road failed to meet a draft drawn against it by the clearing house, the worst that can happen would be a default of one month only, the road could be at once suspended from the clearing house and other member roads notified that they should omit it from future monthly statements. The amount of the default in excess of the amount of that road's deposit for the working fund could then be at once recovered on the bond.

Now as to the matter of distribution of the working fund of

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the general clearing house and of its banking arrangements, banks could be selected in ten or fifteen financial centers over the country and accounts opened by the clearing house in these banks. It would only be necessary for the clearing house manager to use ordinary forethought and judgment in keeping track of what funds he would be required to pay from each one of his banks and to deposit drafts in these banks accordingly. Of course, if necessary, he can transfer in advance to any one of these banks a part of the working funds of the clearing house in case the checks to be drawn on that bank are heavier than can conveniently be met by the deposit of drafts on roads in that territory. For instance, during the cotton season roads in the cotton belt are heavy creditors, and it might be necessary in that case not only to deposit drafts against all roads having debit balances in Houston and New Orleans territory with Houston and New Orleans banks, but also to deposit a part of the clearing house working funds and possibly, also drafts on roads in other territories. The expense of collection in this latter case would be part of the general expenses of the clearing house. In case roads in one section of the country were most of the time in the debtor class it would be necessary to withdraw all of the working fund from the bank in that section and transfer from time to time money from that bank to other depositories.

The general expenses of the clearing house would be charged each month to the member roads on the basis that the total of their debits and credits bore, that month, to the total debits and credits of all roads for that month. Forms E and F show method of advising member roads of the amount of these expenses.

Form E.

THE RAILWAY CLEARING HOUSE.

CHICAGO.....191

.....Comptroller,

.....Company,

.....

Dear Sir:

I enclose herewith statement of operations of the Clearing House for the month of.....191.., showing the total expenses, less interest received, to have been $..... Of this, your Company's proportion, based on the ratio the total of your debit and credit clearings bears to the total debit and credit clearings for that month is.....(Fraction).....or $....., which amount has been added to the balance against your Company in the current settlement as shown by your statement, making the total amount due by you $....., for which draft will be made and collected through bank.

Respectfully,

.....

Enc. Manager.

EXPLANATION—Advice of the Clearing House to the Accounting Department of a debtor road that its report on Form A1 or A2 is correct, giving the amount added to its debit balance for its proportion of expenses of Clearing House for the previous month and the amount of the settled balance for which draft will be made. On receipt of this notice the Accounting Department can make its journal entries and advise Treasurer exactly how much he will have to pay Clearing House.

All employees and officers of the general clearing house would be bonded. Banks acting as depositories of clearing house general funds, would be instructed to honor clearing house checks drawn in favor of railroad companies only. The drafts drawn by the clearing house manager would, of course, be paid by the company on which they were drawn, only in case they were correct, and were drawn to clearing house depositories for account of the clearing house. The amount of expenses could be transferred to the credit of the manager by the board of directors each month for the expenses of the clearing house, and this sum the manager could check out, as required; it would be comparatively small, of course.

There is one objection that was raised by accounting officers, as soon as this general clearing house plan was proposed. Many of the larger roads have certain connections with which they have very large traffic balances each month, and it is a great advantage to have these balances settled very promptly. The objection to the central clearing house was that such balances which are now settled within a comparatively few days after the close of the month could not be settled through the clearing house quite so promptly. The answer to this objection is that there is no reason why companies should put such balances through the central clearing house at all.

If the Erie and the Delaware & Hudson find it of advantage to settle their traffic balances between each other, these balances can simply be left out both by the Erie and by the D. & H. in the statement sent to the clearing house. If half a dozen roads centering at New York desire to have their own clearing houses as between themselves, for certain accounts they can perfectly well do so, leaving out these accounts in the statement sent to the general clearing house. The central clearing house will deal, however, only with member roads and not with other clearing houses.

Form F.

THE RAILWAY CLEARING HOUSE.

CHICAGO.....191

.....Comptroller,

.....Company,

.....

Dear Sir:

I enclose herewith statement of operations of the Clearing House for the month of.....191.., showing the total expenses, less interest received, to have been $..... Of this, your Company's proportion, based on the ratio the total of your debit and credit clearings bears to the total debit and credit clearings for that month, is.....(Fraction).....or $....., which amount has been deducted from the credit balance due your Company in the current settlement, leaving the amount to be paid to it $....., for which check will be sent in a few days.

Respectfully,

.....

Enc. Manager.

EXPLANATION—Advice of Clearing House to the Accounting Department of a creditor road that its report on Form A1 or A2 is correct, giving the amount deducted from its credit balance for its proportion of expenses of Clearing House for the previous month and the amount of the settled balance for which check will be sent. On receipt of this notice the Accounting Department can make its journal entries and advise the Treasurer exactly how much he will receive from the Clearing House.

FUEL ECONOMY ON THE ROCK ISLAND.

BY W. J. TOLLERTON,

General Mechanical Superintendent, Rock Island Lines, Chicago.

The cost of fuel is one of the main operating expenses of a railroad, and is a subject that is being given more consideration by the different roads each year. While several means of one kind or another have been tried with success, the principal manner of effecting savings is in the education of the enginemen in the proper method of handling a locomotive. On the Rock Island Lines the system adopted is along educational lines, which is followed up by district and division officers, under the general supervision of the general mechanical superintendent. A synopsis of the system is as follows:

LOCOMOTIVE FUEL.

The proper handling of locomotives is directly under the supervision of the road foremen of equipment, of whom there are one or more on each division. It is their duty to ride with the engine crews, principally on freight and switch engines, instructing them in the performance of their work. It is the aim to have the one-shovelful system of firing followed entirely. The road foreman furnishes a report to the master mechanic, giving the condition of the various engines ridden and performance of the crew, as well as advising the engine house foreman of any defects which should be repaired. He also furnishes a weekly report to the master mechanic, a copy of which is sent to the general mechanical superintendent, giving a list of the engines ridden, performance of the crew, and other items of interest, together with suggestions as to increasing the efficiency of the service.

The road foremen endeavor to hold at least one meeting a month with the engine crews on each division, at which fuel economy, lubrication and other items which enter into the everyday life of the men are fully discussed. The division superin-

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tendent, master mechanic, trainmaster, chief despatcher and other officials attend these meetings when convenient and talk to the men. A report of these meetings is made to the master mechanic, a copy being sent the general mechanical superintendent. A copy is also sent other road foremen for their information. Boxes have been placed at the larger terminals, in which the enginemen deposit suggestions for consideration at the next meeting. It is also the practice to occasionally appoint one or two committees from the men to prepare a paper on some particular subject to be presented at the next meeting.

Another duty of the road foremen is to examine the firemen on progress examinations, the first year being principally on combustion; the second year on combustion and machinery, and the third year on air.

A monthly report is compiled on each division and posted in the various roundhouses, etc., showing the performance of individual engineers as regards fuel consumption, as follows:

PASSENGER SERVICE.

Rank.	Engineer's Name.	Tons Coal Consumed.	Cost of Coal.	Passenger Car Miles.	Lbs. Coal per Pass. Car Mile.	Three Months' Average.

FREIGHT SERVICE.

Rank.	Engineer's Name.	Tons Coal Consumed.	Cost of Coal.	1,000 Ton Miles.	Lbs. Coal per 1,000 Ton Miles.	Three Months' Average.

SWITCH AND WORK SERVICE.

Rank.	Engineer's Name.	Tons Coal Consumed.	Cost of Coal.	Engine Miles.	Lbs. Coal per Engine Mile.	Three Months' Average.

Six miles are allowed per hour in switch and work train service.

Numerous sub-divisions are made to allow of better comparison of the performance of various engineers; for instance, through service is separated from local service. Separation is also made indicating men above and below the average performance. These reports are made up in the offices of the master mechanics. A copy is placed in the hands of the road foreman for his guidance, as to men who are making a poor performance, and, therefore, apparently most in need of instruction.

A monthly report is also compiled in the office of the general mechanical superintendent, giving the following information for the system during the present month and the corresponding month of the previous year:

Passenger Service.—Tons coal consumed; locomotive mileage; miles run per ton; cost per mile run; passenger car miles; pounds coal per passenger car mile, and cost per passenger car mile.

Freight Service.—Tons coal consumed; locomotive mileage; miles run per ton; cost per mile run; gross freight ton miles; pounds coal per 1,000 ton miles; cost per 1,000 ton miles, and average weight of train (tons).

Total.—Tons coal consumed; locomotive mileage; miles run per ton; cost per mile run, and average cost of coal per ton.

A similar report is prepared covering performance of locomotives using oil as fuel, the gallons of oil used being the basis. The accounting department also issues a monthly report containing somewhat similar information for each district and division in connection with other operating statistics.

The proper drafting of locomotives, which has a large bearing on the economical use of fuel, is directly in the hands of the road foreman, the instructions being that no changes are to be made in the draft appliances of locomotives without the approval of the road foreman or master mechanic.

FIRING UP ENGINES AT TERMINALS.

At points where smoke ordinances are in effect, wood is used for firing up locomotives at terminals; at other points fuel oil and shavings mixed are in use, with good results. The cost of this method of firing up is about one half that of wood. It is the practice to have a meeting of the hostlers and other roundhouse employees, whenever convenient, to interest them in the economies to be effected through doing their work properly.

COAL CHUTES.

The economical handling of fuel at the coal chutes is directly under the supervision of the road master, who is held responsible for their proper operation. The fuel agent, with the cooperation of the district officers, furnishes self-clearing cars to the mechanical chutes and flat bottom cars to the shoveling chutes. A monthly statement is prepared in the general mechanical superintendent's office, showing the cost of handling coal at each chute on the system. This statement compares the cost of labor, the tons handled and the average cost of labor per ton with the same month of the previous year. The cost of supplies is also included in the statement.

The types of coal chutes are divided as follows: Type 1—Ordinary chute, trestle approach, shoveling into pockets necessary. Type 2—Trestle approach, self-dumping cars can be used. Type 3—Belt or conveyer type, self-dumping cars can be used. Type 4—Gravity chute, bucket hoist; self-dumping cars can be used. Miscellaneous—Cranes, buckets, air hoists, etc. A recapitulation is made for divisions and districts.

FUEL FOR STATIONARY PLANTS AND PUMPING STATIONS.

All stationary plants of modern construction are equipped with mechanical stokers and other appliances for burning slack coal, the use of which in the territory traversed by the Rock Island Lines represents a considerable saving over the cost of run-of-mine or lump coal. The balance of the stationary plants have had special grates installed and are now able to burn slack coal with good results, except at some of the northern plants, where, on account of heavy requirements on the boiler, it is necessary to use engine coal during winter months.

Practically all the pump stations use slack coal during the entire year with good results. The use of this grade of fuel has assisted in making a noticeable reduction in the cost of pumping water per year.

AUXILIARY ORGANIZATION.

With a view of effecting further economies in the use of fuel, lubricants and locomotive supplies, an auxiliary department has been organized, in charge of a superintendent of locomotive operation who reports to the general mechanical superintendent, and has jurisdiction over the supervisors of locomotive operation, through the master mechanic.

Supervisors of locomotive operation are appointed for each division, and their entire time will be devoted to effecting economies in the use of the above mentioned supplies, particularly locomotive fuel, through soliciting the co-operation of all employees in their economical use. It will be their duty to instruct engine crews in the proper manner of handling the locomotive at terminals and en route, the proper method of reporting work needed; to instruct hostlers and other employees in regard to loading locomotive tenders; discuss with the district and division officers the condition of the power, in order that its efficiency may be improved, and through instructive methods reduce operating costs and improve the service. The supervisors of locomotive operation do not have jurisdiction over the road foremen of equipment, but are to co-operate with them in order that the greatest results may be obtained.

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NEW YORK REPORT ON CORNING COLLISION.

Discusses Duty of Maintaining Discipline; and the Responsibility of Employees' Unions; Also Use of Steel Cars.

The facts of the rear collision at Corning, N. Y., July 4, last, when 40 persons were killed, are already well known; but the report concerning it issued by the Public Service Commission of the state of New York, Second district, which has just come out, is of special interest by reason of the high qualifications of the men who made it, the impartial character of the recommendations and the broad scope of the investigation; and we reprint extended extracts, substantially verbatim, from a summary given out by the secretary of the commission.

The report discusses the use of steel cars and automatic stops and urges their further study. The commission, however, considers it to be unwise to devote so much attention to the possible protection which might be afforded by steel cars and by automatic appliances that the main lessons of this collision should be lost sight of; and these are, first, that no permanent safety can be expected except through the appreciation by employees, of the importance of their duties and the need of careful attention to every detail of their work; and second, by the railway managers of the necessity of strict discipline and removal of men from the service who fail to meet a reasonable standard of performance of duty in matters involving safety.

The shielding by the faithful majority, or by any part of it, of the careless and inefficient minority from the results of its shortcomings is much to be condemned. It arises from a mistaken sense of loyalty to a fellow workman, and in the end its most disastrous consequences are visited upon the very people whose generosity and good nature are invoked to set it in motion. The reckless engineman is much more likely to kill or maim a fellow employee than he is to harm a passenger. To secure a radical improvement in the absolute prevention of railroad accidents it is the clear duty of organizations of employees, for the protection of themselves as well as the public, to co-operate vigorously and efficiently with the management in the strict enforcement of all rules affecting safety, in the proper punishment of whoever may be guilty of violating those rules, and in the removal from service of all who do not show themselves imbued with a constant desire to place safety above every other consideration. . . . Managers and superintendents should enforce discipline in such matters at any cost, and should never permit any reasonable ground for the charge that their desire for speed is more powerful than their desire for safety.

There should be greater care in the selection of the roundhouse foremen, traveling engineers, and trainmasters. These positions should be made attractive enough to secure good men who are not only competent in the technical side of their work, but who are capable of dealing justly and fearlessly in matters of discipline. The authority of these men should be sustained by the officers above them unless they are proved to be in the wrong, and as long as they do faithful work they should be secure in their positions and be as well protected against arbitrary removal as locomotive enginemen are now protected through the organization of their brotherhood. A high degree of efficiency in these elements appears to have been reached by the railways of England, and it is to be hoped that there is no prohibitive reason why such a condition should not be attained by the railways of this country. There is no doubt that the large majority of railway men perform their duties with great care and efficiency, and have a record to be proud of. The work of enginemen in particular is performed under conditions of stress, of which the general public seems to have a most inadequate appreciation. The mere observation of signals upon high speed trains under varying conditions of light, storm, and fog is a severe strain. The slightest inattention while running at the rate of a mile a minute may result in the missing of a signal. A single error in observation may result in a disastrous accident. The insistent demand of the public for high speed under all circumstances is a keen spur to railroad managers to wink at if not demand high speed under all conditions.

Enginemen are prone to believe that a strict observance of the universal rule that in cases of doubt the course of safety must be adopted imperils their positions and livelihood. Only words of praise should be applied to the general average performance of duty by enginemen. There are, however, in every class of men those who do not average up to the recognized standard of efficiency and faithfulness. . . . More train wrecks are occasioned by such men than by all other causes combined.

The investigation of the Corning accident shows clearly that the primary cause was the entire failure of Engineer William H. Schroeder of the second train to observe signals. The train into which he ran was protected by a full stop signal 250 ft. east of the rear of the train, by a flagman 2,550 ft. east, and by a caution signal nearly 4,500 ft. east. All three signals were disregarded, and Engineer Schroeder appears to have run at full speed into the rear of the train ahead without making any effort to stop.

Schroeder's contention was that the fog was so dense as to make it impossible for him to see signals clearly. The evidence produced shows that the fog had lifted sufficiently to allow the signals to be seen with reasonable clearness, and had it been as dense as Schroeder stated, no excuse has been developed for his running at the rate of 65 miles per hour. No evidence was given to indicate that any pressure was brought to bear upon him to make time with his train under dangerous conditions, or in any way to exceed the limits of safety. Since the accident the railroad company has prohibited the use of intoxicants by its employees, or the use of their time while off duty in a manner that will unfit them for efficient performance of duties. The commission approves of this order, and in securing its enforcement believes that the company is entitled to the full co-operation of the Brotherhood of Locomotive Engineers and associations of trainmen. The actions of Engineer Schroeder should be considered as much an offense against the Brotherhood of Locomotive Engineers, of which he is a member, as they are against the railway and the public.

Flagman Lane had gone back a sufficient distance to give a reasonable warning under the circumstances of this case. He violated the rules by failing to take torpedoes with him, but the testimony indicates that the weather was sufficiently clear to justify him in refraining from the use of torpedoes under the company's rule that they shall not be used in block signal territory except in foggy or stormy weather. The commission remarks that the operating rules should be so amended that the flagman may feel distinctly at liberty to use torpedoes under circumstances appearing to create special danger, but adds: It should be remembered that safety from collision of modern high speed trains is rendered possible only by complete signal systems and by the observance of such signals by engineers. It is certainly well in many situations to use flagmen to supplement the protection given by signals. . . . Trains are, however, frequently run in present high speed railroad practice so closely together and at such high speeds as to make it impossible for a flagman to afford any protection of value under certain limiting conditions. The main reliance must be placed upon the signals and upon their observance by the engineers, and it is possible that the practice in this country may eventually follow that of some of the railroads in England, on which flagging has been abandoned under all ordinary conditions of train service.

The delays to the preceding freight trains and other elements which contributed to this accident, have been considered. These

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conditions, however, are such as must occur frequently in the operation of any great railroad, and the signals and their observance by employees should be such as to afford reasonable safety under these conditions.

The commission has given much thought to the possible improvement of signal systems, especially the overlap and the automatic stop. The full block overlap has received especial attention in connection with preceding accidents; but in this accident the flagman constituted an additional signal, and although the distances were shorter than would be afforded by the full block overlap, there is no reason to believe that such an arrangement would have prevented the accident. The signals were sufficient if ordinary care had been used to observe them.

. . . Unless some satisfactory method can be found to diminish accidents due to carelessness of employees it appears evident that the use of automatic stops must be given much greater consideration than in the past. The perfection of an automatic stop device and experimentation by railroads as to its workings in practical use under the most unfavorable conditions cannot be too strongly urged. . . . But the use of an automatic stop will unavoidably create new dangers against which additional precautions must be devised. Its presence will have a marked tendency to cause a percentage of enginemen to rely upon the stop rather than the observation of signals. No device involving the intricacy and delicate adjustment of an automatic stop will at all times be in perfect working order under the weather conditions prevailing in this country, and an occasional failure is inevitable. If reliance is placed solely upon it, disaster at times must be expected. The problem, when considered in all its bearings, is a most serious one. Collisions are possible on almost every mile of railroad in the United States. If it should prove to be necessary to install automatic stops at each point of possible danger, the expense of installation and maintenance would be enormous, and we believe that the railroad development of the country generally is far from the point at which such a complete installation can be considered. The difficulty of maintaining present safety devices is very great, and the fear of railroad men that the increase of such devices may only change the location of the danger point has a solid foundation. There is an unusual element of danger in a so called safety device which fails to operate. If an air brake fails to work, or a signal shows a false "clear" indication, imminent danger is created from the fact that employees have learned to trust implicitly in these devices, and the speeds of trains and the intervals between them are regulated on the supposition that the automatic devices will work satisfactorily, or that when they fail it will be on the side of safety. There is danger, therefore, that the use of automatic stops may only shift the burden of responsibility from the experienced and skilful engineer, with his many years of training as a fireman, to the signal maintainer, and that much chance for accident may still remain. It should also be considered that the records of this commission show a large number of accidents caused by the defective operation of the emergency brake, especially on long trains. In many cases a lack of uniformity in the action of valves appears to have caused a collision within the train itself, which buckles weak cars and has frequently blocked adjacent tracks with the wreckage thus produced. It is certain that the widespread installation of types of automatic stops which involve the emergency application of the brakes would produce some accidents of this class. We also have in mind the fact that the remarkable record of safety from collisions in English railroad operation is made under the protection of signal systems operated manually and without any automatic checks, such as are afforded by the electric track circuit or the automatic stop.

This collision is the only one involving death of passengers which has occurred in over twelve years on the main line of the Lackawanna railroad under the daily operation of heavy traffic. Other railroads have also attained a high degree of safety. For instance, the Long Island Railroad, whose reports to this commission show a yearly movement of 34,000 passenger trains, has not had an accident involving the death of a passenger in nineteen years.

The report of Supervisor of Equipment Buchanan makes certain recommendations in reference to steel cars, and these recommendations are submitted by the commission for discussion and criticism, with the statement: "We think that they deserve consideration because of the careful personal examination which Mr. Buchanan has made of this and other wrecks."

Steel cars certainly appear to afford additional protection to life in accidents of this character, but there is room for discussion of their value as compared with wooden cars having steel underframes; and an exhaustive examination of this matter is imperatively demanded. The construction of American wooden cars appears to be far superior in safety to the passenger cars used in England or in Europe generally, and the efforts to afford safety and comfort in the car construction of this country as compared with foreign practice is indicated by the great weight of American equipment in proportion to passengers carried. It is shown that in January of this year the passenger cars under construction were about 77 per cent. steel, 16 per cent. wood with steel underframes, and 7 per cent. wood.

The indications are, we think, that the use of steel cars will increase rapidly in this state through the ordinary processes of addition and replacement, and through the necessities of electric operation in tunnels such as those at New York.

The enormous cost which would be required to replace the present equipment of wooden cars in advance of the natural movement in that direction, coupled as it would be more or less with a diversion of funds needed for the prevention of accidents to a purpose that only minimizes the effect of accidents which ought not to have occurred, is an important consideration.

Though an all steel car train may be desirable, and all steel car trains on some roads are run, doubtless for the purpose of adding safety, it is quite another thing to require that a carrier shall not use its steel cars except where all other cars in its train are of that description. Mr. Buchanan's recommendation in that respect is therefore not accepted. We think two, or perhaps three, steel cars at the rear of a train might afford much protection; or even one such car, depending upon the severity of impact in a collision. A single steel car at the head of the train at Westport would probably have prevented the fire which destroyed the wooden cars.

An enormous amount of money has been expended by the railways to diminish the fire risk through the equipment of practically all cars with steam heating appliances, and the use of safe methods of lighting. The separation of the fire in the locomotive from the nearest car by the steel tender, which is at least partly filled with water, is ordinarily a fire protection of great value. The whole subject is one which requires much more careful investigation than has yet been given to it, before any governmental action would be warranted. Our study of the present accident renews the conviction that the question of supreme importance now is how to prevent accidents of this character rather than merely to minimize the effect of such accidents by replacing equipment which is already much heavier, stronger, and more costly than that used in other countries.

TRANSVAAL RAILWAYS.—The commencement of railway construction in the Transvaal dates from the year 1890, when, under the authority of the republican government, a short line was laid at the Rand. On the amalgamation of all the South African government railways, on May 30, 1910, which necessarily followed the political union, the mileage amounted to 7,039, of which 380 miles were on the 2 ft. gage. Since then over 500 miles have been added and about 900 miles are under construction, mostly near completion. On nearly all the South African railways great improvements have been effected, such as easy grades and curves, and in increasing the strength of the permanent way. The total mileage last year amounted to 7,548 miles.

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ELECTRIFICATION OF HEAVY GRADES.

This May Be Found Less Expensive Than Grade Reduction or the Introduction of More Powerful Steam Locomotives.

By C. L. de Muralt, M. Am. Soc. C. E.,
Professor of Electrical Engineering, University of Michigan.

In a previous article published in the *Railway Age Gazette*, October 4, 1912, page 623, it was shown that one of the main advantages of the electric locomotive lies in its great working capacity. Due to this quality it can haul the heaviest trains over the most severe grades at the same speeds as on the level. The working capacity of any given locomotive is dependent on its tractive effort, its boiler power, and its engine power. The first is limited by the weight on drivers, the second by the size of the boiler, and the third by the size of the steam engine or electric motor as the case may be.

It was also shown that the tractive effort and boiler power

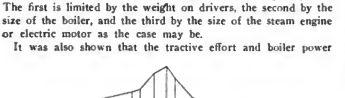

Fig. 1—Profile of Mountain Division of A. B. C. Railway.

limitations may be entirely removed in the case of the electric locomotive, because the boiler is in the far off power house where it can be built as large as necessary, and because, with the great flexibility of the electric drive, it is possible to turn any required number of axles into driving axles and thus make use of any desired weight for tractive purposes. The limitations to engine power are not serious, because, with careful design, it is always possible to make the engine or motor sufficiently strong to slip the wheels. Thus it is seen that sufficient power may be concentrated in an electric locomotive so

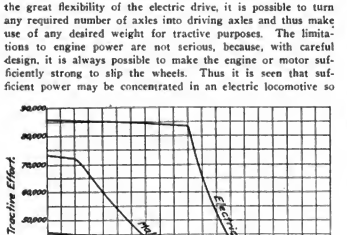

Fig. 2—Tractive Effort Developed by Consolidation, Mallet and Electric Type Locomotives at Various Speeds from 0 to 40 miles per hour.

that any train may be taken up any grade found in railway practice, in the composition in which it arrives at the bottom of the grade. Furthermore, with the proper type of electric motor, this can be done at the same speed at which the train runs on the level. This feature is likely to prove of great value in the case of roads where a severe grade has produced a congestion of traffic.

Let us investigate how electrification compares in such instances with grade reduction or with the use of Mallet locomotives, or with both together. For this purpose we may take the case of a typical western road crossing the Rocky mountains. The profile of the mountain division of this road is represented by Fig. 1. During the past two years this division has handled an average of about 5,400,000 ton-miles daily, of which about 4,300,000 is freight and about 1,100,000 passenger ton-mileage. Freight trains at present show a maximum weight of 950 tons, which is reduced at the bottom of the main grade to about 700 tons, and even with this reduction

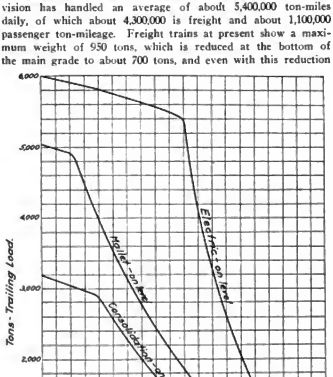

Fig. 3—Trailing Load in Tons Which Can Be Handled by the Different Locomotives on Various Grades.

the speed over the grade is very low. Traffic conditions are becoming more and more congested. In order to increase the daily tonnage capacity of this road it is proposed to raise the present maximum tonnage per train from 950 to 1,100 tons, and to arrange so that this weight of train may be handled unbroken over the entire line at a reasonable speed. To make this possible it is proposed to reduce the ruling grade from 3 per cent. to 2 per cent., and to purchase Mallet compounds for operation on the heavy grade section.

The capital required for these improvements is estimated at $2,100,000, from which may be deducted about $240,000, this being the present value of the 24 consolidation locomotives

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now on the heavy grade section, which would be replaced by the Mallet compounds and could, therefore, be transferred to other divisions. The net cost of the improvement may thus be put down as $1,860,000. By these means it is expected to raise the capacity of the road from 5,400,000 ton-miles to about 10,000,000 ton-miles per day; viz., 8,500,000 freight ton-miles and 1,500,000 passenger ton-miles.

The purpose of this inquiry is to see whether these proposed means offer as great a return on the new capital invested and the same operating advantages as electrification would do. Let us first look at the characteristics of the three types of locomotives involved. The table below gives the most important data with reference to the three engines, and the curves shown in Figs. 2 to 4 give some information concerning their working capacity.

TABLE I.

	Consolidation.	Mallet.	Electric.
Wheel arrangement	2-8-0	2-6-6-2	0-8-8-0
Total weight, lbs.	360,000	500,000	360,000
Weight on drivers, lbs.	194,000	307,000	360,000
Weight per driving axle, lbs.	48,500	51,200	45,000
Total length, ft.	70	84	74
Length of rigid wheel base	15 ft. 8 in.	10 ft.	8 ft. 8 in.
Total heating surface, sq. ft.	3,480	5,770	.....
Tractive effort, lbs.	46,000	73,000	86,000
Coefficient of adhesion, per cent.	23.8	23.8	23.8

Fig. 2 shows the tractive effort developed by each at any speed between zero and 40 miles per hour. Fig. 3 shows the

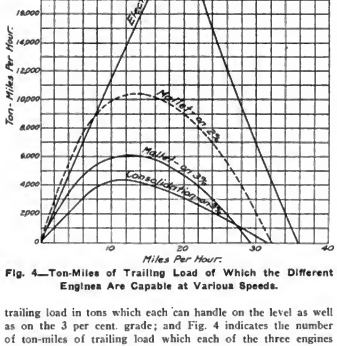

Fig. 4.—Ton-Miles of Trailing Load of Which the Different Engines Are Capable at Various Speeds.

trailing load in tons which each can handle on the level as well as on the 3 per cent. grade; and Fig. 4 indicates the number of ton-miles of trailing load which each of the three engines is capable of handling per hour when running at any speed between zero and 40 miles per hour on the ruling grade.

The principal advantage of the Mallet over the present consolidation lies in the increase of weight on drivers, which produces a corresponding increase in the tractive effort. By referring to Fig. 2 it is seen that the maximum tractive effort of the Mallet is almost 60 per cent. greater than the consolidation. At first glance this would seem to indicate a 60 per cent. increase in traffic capacity, due to the 60 per cent. heavier train which can be handled by the Mallet locomotive. On closer observation it is found, however, that this increased hauling capacity is only securable at low speeds and the ton-miles moved per hour at speeds between 10 and 14 miles per hour, as shown by Fig. 4, are seen to be not proportional to the increase in tractive effort, but only about 35 to 40 per cent. greater for the Mallet than for the consolidation. Table II gives the hauling capacities of the three types of engines on the 3 per cent. grade at speeds of 4, 10 and 20 miles per hour.

TABLE II.

	Consolidation.	Mallet.	Electric.
Trailing tons at 4 miles per hour..	510	880	1,160
Trailing tons at 10 miles per hour..	430	590	1,140
Trailing tons at 20 miles per hour..	150	240	1,100

If we take the most favorable points for each type of locomotive, with reference to actual service capacity, the consolidation is seen to be at its best at about 11 m. p. h., and can then move about 4,400 ton-miles per hour. The Mallet is at its best at about 13 m. p. h., and at that speed is capable of moving 6,100 ton-miles per hour. And the electric locomotive is at its best at about 20 m. p. h., when it can handle about 22,000 ton-miles per hour. At the maximum point the Mallet can therefore haul about 39 per cent. more than the consolidation, and the maximum service capacity of the electric is five times as great as that of the consolidation and 3.6 times that of the Mallet.

The explanation of this tremendous increase lies of course in the fact that the electric locomotive can not only haul a greater tonnage than the Mallet or the consolidation, but it can haul this greater tonnage at a much higher speed. When we consider that, in addition to its larger hauling capacity at high speeds, the electric locomotive is independent of the coal bunker, the water tower, and the roundhouse, and can operate for long periods of time without housing or attention, it will be realized that its actual relative daily service capacity is even larger than is indicated by the above figures for trailing ton-miles capacity.

To handle an 1,100-ton train at a speed of 20 m. p. h. on a 3 per cent. ruling grade is quite feasible with an electric locomotive, as can be seen from the curve in Fig. 3. If the same thing were to be attempted with steam engines, it would take 8 consolidations or 5 Mallets; in other words it appears almost, if not entirely impracticable. However, it was proposed to reduce the grade from 3 per cent. to 2 per cent. for Mallet operation. The trailing load which can be hauled by the Mallet engine on a 2 per cent. grade is indicated in Fig. 3 by the dotted line, and its service capacity on the same grade is similarly represented in Fig. 4.

Fig. 3 shows that an 1,100-ton train may be handled by a Mallet locomotive on the 2 per cent. grade at any speed up to about 7½ m. p. h., and Fig. 4 shows that at that speed the service capacity is about 8,700 ton-miles per hour, or rather more than twice the service capacity of the consolidation on the present 3 per cent. grade. This confirms indirectly the estimate, referred to above, of the expected increase in the capacity of the road from 5,400,000 to about 10,000,000 ton-miles per day due to the grade reduction and use of Mallet locomotives.

The increase in capacity through electrification of the line, without grade reduction, is seen to be considerably greater. The maximum service capacity of the electric engine on the 3 per cent. grade is 22,000 ton-miles per hour. Suppose, for the sake of argument, we take only 75 per cent. of this, or 16,500 ton-miles. We still find the service capacity of the electric engine on the 3 per cent. grade to be about twice as great as that of the Mallet compound on the 2 per cent. grade. Or, putting it another way, if the use of the Mallet engine combined with a grade reduction from 3 per cent. to 2 per cent. will increase the capacity of the road from 5,400,000 to about 10,000,000 ton-miles per day, the use of the electric engine without grade reduction will increase it to about 20,000,000 ton-miles per day.

Now let us look into the financial aspect of the matter. The heavy grade section of the division in question is found to have

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72 miles of main line, 26 miles of second track, and 16 miles of sidings, or a total trackage of 114 miles. A distinctly conservative or ample figure to use is $9,000 per mile of track for a suitable overhead contact line, including the necessary substations, feeders, etc., or $1,026,000 for the 114 miles of track. Suitable electric locomotives of 180 tons each can be bought for about $70,000 each. Eight of them are required, which makes the cost of the locomotives $560,000. The total new investment for electrification may, therefore, be put down as $1,830,000, which includes 15 per cent. for engineering and contingencies. From this should be deducted the same $240,000, corresponding to the present value of the 24 consolidations now on the line, as above in the estimate of the cost of grade reduction and Mallet compounds. The net cost of electrification is thus found to be about $1,590,000, or $270,000 less than the cost of grade reduction plus Mallet compounds. Add to this the fact that there will be a probable annual saving of not less than $50,000, due to difference in maintenance of locomotives, saving in wages to engine men, saving in cost of electricity as compared with cost of coal and saving in cost of water, oil and supplies, and the financial advantages are clearly seen to be with electricity as motive power.

Of course, these are figures applying to a specific case, but the case is rather representative of what is to be found on many of the heavy grade divisions all over the country. It may, therefore, well be said that, in all cases where a heavy grade has produced a traffic congestion, a careful investigation into the merits of electrification will be warranted and it will often be found that electrification will not only be less costly than grade reduction or the purchase of more powerful steam locomotives, or both combined, but electricity will often offer a very much greater increase in traffic capacity than either of those other means or the two means combined.

ANNUAL REPORT OF NEW JERSEY PUBLIC UTILITY COMMISSION.

The Board of Public Utility Commissioners of the state of New Jersey has sent to the governor its third annual report. The report, signed by Robert Williams (president), Thomas J. Hillery and W. M. Daniels, is devoted largely to matters concerning gas companies and telephone lines.

The order issued by the board last year, requiring the railroads terminating on the Hudson river opposite New York City to sell commutation tickets to those New Jersey terminals instead of requiring season ticket passengers to buy to New York City, has been appealed to the Court of Errors and Appeals, and the matter is now under review by that tribunal.

The board has made an extensive investigation of highway grade crossings throughout the state and has classified the crossings according to whether they are dangerous in the first, second, third or fourth degree. All crossings in the state are classed either A, B, C or D. In a number of cases the commission has already recommended the installation of gates, the stationing of flagmen at crossings or changes in surroundings, so as to make the crossings safer. It does not appear that in any case has the commission ordered an automatic audible signal installed. The board reaffirms its views, expressed last year, regarding the abolition of grade crossings, of which there are more than 3,000 in the state. The unreasonableness of requiring the abolition of grade crossings faster than the railroads, especially the poorer roads, can afford the expense, is clearly set forth. The state "will be more than fortunate if by the end of two decades it sees the removal of all the really dangerous crossings." Some of the smaller railroad companies are unable to spend any money at all for this purpose. One road is so poor that the board has reluctantly consented to a discontinuance of daily passenger service during a part of the year. Within the past two years new grade crossings have been forced on certain railroads against their will.

RAILWAY TERMINALS*.

By L. C. FRITCH,
Chief Engineer, Chicago Great Western.

The problem of terminal facilities has become so complex with the marvelous growth of traffic on American railways, that its solution requires the best skill which experience and training can command. It is well known that less attention has been given to the matter of terminals and less provision made for this development than any other branch of the transportation service. There has been a vast development in improvements in alinement and grades, and in rolling stock and equipment, but in the handling of traffic in large terminals practically the same methods are employed that have been the custom since the advent of the railways. Passenger terminal facilities have received far more attention than freight terminal facilities, and it may be said unwisely so. The freight traffic on most railways in America yields the larger proportion of gross revenue and is possibly the only traffic which yields net revenue on many lines. Notwithstanding this, there are many instances where vast sums are, or have been, expended in providing elaborate passenger terminals and only insignificant appropriations made for handling the more important freight traffic. There is a surprising lack of information as to the cost of terminal charges in handling traffic, both freight and passenger. A statement recently made by an executive of a prominent railway system entering Chicago, that the terminal expenses of his line in freight service at Chicago averaged $21 per car, if it is a fact, is an illustration of the enormous cost of handling traffic in large and congested terminals, and points to the necessity of an investigation into what causes such abnormal expense and the application of a remedy. These high costs are largely due to the antiquated facilities and methods employed on most railways in large commercial centers.

The public would be better served and the railways would effect vast economies if greater attention were given and larger appropriations made for the development of adequate freight terminal facilities and less to the establishment of monumental passenger terminals, of which numerous examples might be given. The new passenger terminal facilities of the New York Central in New York City will probably cost $200,000,000 when completed. This sum would build 2,000 miles of double track road at $100,000 per mile. The fixed charges, taxes and depreciation will amount to nearly $20,000,000 per annum, and including operating expenses and maintenance perhaps $3,000,000 per annum more, or a total of $23,000,000. Only two roads are served by these facilities—the New York Central & Hudson River and the New York, New Haven & Hartford. The total annual gross passenger receipts of these two lines are about $55,000,000, but only a portion of this is strictly New York City traffic. Assuming that 50 per cent. of the entire passenger earnings of these two lines accrues on New York City traffic, which seems large, it would amount to $27,500,000, or if the estimate of charges and expenses is correct, the terminal charge at New York City alone is equal to 80 per cent. of the gross passenger receipts.

Another illustration is found in the new passenger terminals of the Pennsylvania Railroad in New York City, estimated to have cost to December 31, 1910, $113,000,000. Assuming the annual fixed charges, taxes and depreciation at 10 per cent., or $11,300,000, and operation and maintenance at $2,000,000, gives a total of $13,300,000. This terminal serves only two lines, the Pennsylvania and the Long Island roads. The annual gross passenger revenue of these two lines is $37,000,000. If 50 per cent. of these earnings accrued from New York City traffic, it would equal $18,500,000. In the case of the Pennsylvania Railroad proportion, 30 per cent. would probably be more nearly correct, and in the case of the Long Island about 75 per cent.

*From an address before the Canadian Railway Club at Montreal on January 14.

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On this basis the earnings accruing in New York City would be about $14,000,000. On the basis of these estimates, the terminal charges are about equal to the entire gross receipts from passenger traffic. The vast sums invested in passenger terminals may be appreciated from the statement that the combined value of the passenger terminals in which the Pennsylvania Railroad is interested in the cities of Washington, Baltimore, Philadelphia and New York, aggregates $178,000,000. This is equal to an average of nearly $800,000 per mile of road for the 223 miles from Washington to New York. Only one of these terminals, the Washington terminal, is a joint terminal. The fixed charges alone on this investment average $40,000 per mile for the line between New York and Washington.

Another illustration may be cited in the case of the Chicago & North Western passenger terminal in Chicago, estimated to have cost about $30,000,000. If fixed charges, taxes and depreciation equal 10 per cent. per annum, or $3,000,000, and operating expenses $500,000, the total annual terminal charges would be $3,500,000. The passenger revenue equals about $18,500,000 per annum, and estimating that 30 per cent. accrues in Chicago traffic, it equals $5,550,000. This would make the terminal charges 65 per cent. of the gross passenger revenue.

The railroads entering Kansas City, Mo., are now constructing a terminal at an estimated cost of $45,000,000, of which about 75 per cent. is devoted to passenger service, and 25 per cent. to freight service. Some of the roads which will use this terminal will pay out more for the use of the facilities than their entire gross receipts from passenger traffic derived from Kansas City.

It must be borne in mind that in all the cases cited the charges cover only terminal expenses, and to these must be added the road expenses and other charges to determine the total cost of handling the traffic. It is assumed that the above statistics are but approximately correct, but they are quoted to emphasize the fact that too much attention has been given to the development of expensive passenger terminals and not enough to freight terminals in our large commercial centers. In the building of most of our modern passenger terminals the desire seems to have been to erect monumental structures where architecture has been the prime consideration, instead of giving first consideration to principles of sound engineering and utility.

The total annual freight revenue of all the railways of the United States is about $2,000,000,000, while the annual passenger revenue is about $750,000,000, or slightly over one-third. The possibilities for economies in handling the vast freight traffic in terminals constitute a field which has been developed to only a very limited extent, largely due to the attention given to the development of passenger terminals, with only limited appropriations for freight terminals. The time has come, however, in many localities where by reason of the marvelous growth of traffic the old facilities are grossly inadequate and the methods employed are such as cannot cope with the demands made by commerce for the prompt handling of the business.

There must be almost a revolution in the processes and methods so long in vogue in handling the vast freight tonnage of a city, for example like Chicago, to meet the growing needs of its commerce. A city of limited area is adequately served by a single freight station for each railroad, but as the city expands and from a few square miles in extent reaches an area of 195 square miles, as in Chicago, the facilities likewise must expand to meet the demands of the traffic.

In my opinion the time will come in all large commercial centers when union freight stations will be established, at any of which freight may be forwarded and received for any point on any line entering the particular city. If union passenger stations are a convenience to the traveling public, then union freight stations are a necessity to the shipping public and the economies possible by such a plan will be incalculable.

If union freight stations are not provided in the near future in our large cities, then in my opinion the railroads will face a demand which will be one of largely added expense to them and that will be store delivery of all less than carload freight, similar to methods now used in some European countries. The establishment of union freight stations at various centers of traffic in large commercial centers, at which freight would be handled for all roads, would result in tremendous saving in teaming freight through city streets, and also in saving in cost of operation of freight stations. It would also conserve large areas in cities by reason of duplication of freight stations where land values are high as against consolidated stations using less area per unit of service. The effect of large areas in the centers of cities occupied by railroads upon the future growth of cities is amply illustrated in the case of Chicago. The area devoted to railroad uses in Chicago practically circumscribes the entire city's business district, making expansion and growth impossible except in one direction and then only along a narrow strip.

There has been a plan just proposed to remedy to some extent the evils of this condition by changing the course of the Chicago river, South Branch, and consolidating the passenger and freight terminals in one general district or area, thus reclaiming for the growth of the city large areas not now available for such purpose. The plan is a commendable one, and is in line with the suggestion made elsewhere that the necessity for properly serving large commercial centers with adequate railway terminals in the future will demand union freight terminal facilities in order to eliminate the economic waste of valuable space now practiced, and also in relieving congestion in city streets due to unnecessary teaming. The difficulties of bringing about such a revolutionary plan are duly appreciated. Various railway corporations own valuable terminal facilities and points of vantage which cannot be readily replaced, but in the best interests of all concerned, especially of the general public, there must be concessions made by some and a result finally secured in the way of economies and improved service which would amply recompense any temporary advantage possessed by a few lines.

It has been my thought that the only practicable means of bringing about the real solution of the railway terminal situation at Chicago would be to merge all the terminal properties of all lines within a given zone into one consolidated terminal company, which would operate all the facilities, rendering equal service to all lines, and by this means subserving the greatest public good. While this may seem a tremendous undertaking at first thought, yet upon analysis, it is perfectly feasible, especially from the fact that all lines terminate at Chicago, consequently only a small portion of the ends of main lines used must necessarily be included in the plan and no line would be affected adversely, as might be the case if through lines existed and these lines were interrupted. The economic possibilities of such a plan from the standpoint of operating efficiency and economy and the great benefit to the public can scarcely be estimated. A preliminary step looking toward such a plan would be the acquisition of all the existing belt lines now operating in the Chicago district, of which there are four or five principal ones. These should all be acquired and owned by all the railroads entering Chicago, giving to all lines equal rights to use in common facilities reaching all facilities and industries located on such belt lines. Some of these belt lines are at present congested with traffic and need extension of facilities, while other belt lines in many cases parallel to the congested lines are little used. Common ownership would make the highest and best use of existing belt lines, rendering the need of extension of facilities on the congested lines unnecessary. Millions of expenditure would thus be saved in addition to the saving in operating all belt lines in common for all lines at actual cost on the basis of use.

PAN AMERICAN RAILWAY IN URUGUAY.—The Pan-American Transcontinental Railway of Uruguay, an American company, has practically completed the line from Durazno to Trinidad.

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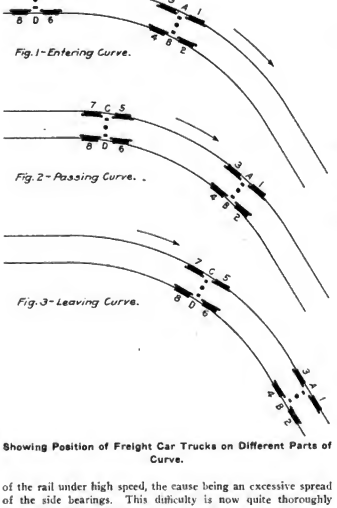
DERAILMENT OF TRUCKS ON CURVES.

A Study of the Action of the Different Wheels of a Car in Entering Upon, Passing Over and Leaving a Curve.

By Arnold Stuckl

The *Railway Age Gazette* has recently published a number of communications on tender derailments. Nothing has been said, however, as to derailments on curves, where cars are in the best possible working condition; nor has anything been said concerning rigid steel equipment, which often leaves the rail at points over which thousands of the older and more flexible cars have passed in safety. Derailments due to the dropping of brake beams, defective material, broken parts, inoperative brakes, worn or sticking details, weak springs, etc., will of course occur to some extent under any conditions, and the remedy in each case of this kind is obvious.

Many of us have seen the inside wheels on curves rise clear



Showing Position of Freight Car Trucks on Different Parts of Curve.

of the rail under high speed, the cause being an excessive spread of the side bearings. This difficulty is now quite thoroughly understood by those who are concerned in the design of cars. The following notes, however, refer more to the frequent derailments on curves which apparently have no specific cause.

The conditions of a car operating over a curve are divided into three distinct periods, viz., entering, passing and leaving the curve. The outer rail on a curve is elevated so that at a certain critical speed the centrifugal force is balanced and the load on all four wheels is equalized. The speed under which this condition takes place will be designated as normal speed. When the car is operating over the curve at the normal speed the load is carried on the center plates and the trucks are free to swivel. If the speed is greater than normal the car will tilt outward, and if it is less than the normal the car will tilt inward. In both of these cases the side bearings toward which the car body tilts assist the center plates in carrying the weight of the car body. This pressure on the side bearings grips the truck and prevents it from swiveling freely.

When the car enters a curve, the front truck being on a partially elevated track and the rear one on a level track, it is subjected to a severe twist, and if the framing is rigid, as it is in the case of most of the high capacity steel equipment, the load is carried by two side bearings diagonally opposite each other. This is not so true of passenger cars because they have two sets of springs in tandem and the body is long and therefore more or less flexible. On freight cars and tenders, however, where the distance between truck centers is comparatively short, this holds true and causes trouble.

ENTERING A CURVE.

If the car frame and springs are sufficiently flexible the load will be equal on all of the wheels when the car enters a curve at normal speed. The truck will therefore be free to swing and wheel 1 (Fig. 1), the only one which hugs the rail, will not be pressed against it very hard and there will be no danger of its climbing the rail. If on the other hand the car frame is rigid the whole load will rest on the side bearings *A* and *D*, thus gripping the trucks and causing a heavy pressure between the wheel flanges and the rails. The only reason that the wheels will not climb in their efforts to swivel the trucks is because of the excessive vertical load which comes on them. None of the other wheels will hug the rail.

When entering a curve at high speed the car will list to the outside, gripping the truck proportionately to the speed, but also holding down wheel 1 with a proportionately greater vertical load. The pressure between the rail and the wheel flanges is, however, increased by an additional item, which unfortunately does not add anything to the load on the wheel—it takes more force to deflect the momentum of the truck. The danger at wheel 1 is therefore greater than when operating at normal speed. If in addition to this condition the car has a rigid frame and the load rests on only two points it is clear that the danger will be still greater, although there will be a heavier vertical load resting on the wheels in question.

If the car enters the curve at a speed lower than the normal it will list inward, gripping the truck at the inside side bearing, causing wheel 1 to hug the rail and resist the swiveling of the truck, which causes a high pressure between the rail and the flange. Under this condition there is very little vertical load on the wheel, and following the path of least resistance the tendency will be to climb the rail. If the car has a rigid frame the vertical load on wheel 1 will be increased and the tendency to climb the rail will thus be largely overcome. In other words, there is less tendency for a car with a rigid frame to be derailed when entering a curve at slow speed than there is with one having a flexible framing. This conclusion is borne out by practice.

PASSING A CURVE.

In passing along a curve at normal speed the conditions on both of the trucks are practically the same, i. e., wheels 1 and 5 hug the rail, while the others do not. As there is no tendency for further swiveling of the truck it makes no difference whether the car frame is rigid or flexible. Under normal speed the loads on all the wheels are the same, and the trucks are free to swivel

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because the body of the car is free from the side bearings. There is therefore little danger from the wheels climbing.

At high speeds the car lists outward, gripping the truck at the side bearings and pressing wheels 1 and 5 hard against the rails. Since there is a heavy vertical load on these wheels there will be no danger of derailment unless other imperfections come into play.

At slow speeds the car will list inward, owing to the elevation of the track and will grip the truck hard, this in turn pressing wheels 1 and 5 hard against the rail. At the same time there is very little if any vertical load to hold these wheels down, and derailments are often caused in this way. One wide awake superintendent of motive power, suspecting this condition, quietly had the speed limit signs taken down in a yard with a number of curves and the trouble was overcome.

LEAVING A CURVE.

On leaving a curve at normal speed wheel 5 only hugs the rail and the trucks are both free to swivel. With a rigid car, however, the load is partly carried on two side bearings diagonally opposite each other, because of the front truck being on level track and the rear one on that part of the track with one rail elevated; but fortunately a fair share of the vertical load comes on wheel 5 and it is prevented from climbing the track.

At high speed the rear truck is gripped by pressure on the side bearing, but the front truck is free. The rear truck will thus derail easier than the front one, and this has been borne out by actual experience in many cases. With a rigid car the relative positions remain about the same with the exception that the diagonal loading adds to the already strained conditions.

In leaving a curve at a slow speed and assuming that the car frame is fairly flexible all of the wheel flanges on the front truck are free of the rail. With a rigid car, however, the diagonal loading will grip the truck and hold it in the same relative position as with the car on the curve. Wheel 2 will hug the inside rail for some time until the track is level enough to relieve the uneven loading. This explains why the inside rail at the end of the curve where double tracks are used are worn for some considerable distance. The rear truck on a flexible car is under the same condition as when the car was passing around the curve and great danger exists because of the trucks being gripped by listing inward and pressing wheel 5 hard against the rail without having a very heavy vertical load on it. With a rigid car, however, these conditions are very much improved.

SUMMARY.

The accompanying table shows the conditions to which each wheel of the truck is subjected under the different situations as above outlined. Under normal conditions there would be no pressure between the wheel flanges and the rail. Under other conditions it would vary in intensity, as noted above, and the letters p, P and **P** are used to denote this pressure, the smallest letter, of course, denoting the least pressure. In the same way the load on the different wheels is designated as O, l, L and **L**, and the danger of the wheel climbing by O, d, D and **D**. As may be seen there are six places where great danger exists of the wheel climbing the rail, and in fact where there is practically nothing to prevent it from so doing. There are also twelve instances where the wheel may climb the rail if it is complicated by other imperfections in the truck or track construction. It is therefore quite evident that the side bearings should be made frictionless to minimize these tendencies.

BURLINGTON ADOPTS NEW TRAIN AUDIT SYSTEM.

The plan of train auditing which has been in force on the Chicago & North Western for the past two years has been adopted by the Chicago, Burlington & Quincy, effective January 1, and is now under consideration by several other western roads. J. E. White, who has been chief train auditor of the North Western since the inception of the system, and who has developed the plan to its present state, will have charge of the work on the Burlington as well. A company called the White Audit System has been formed to handle the system under Mr. White's direction.

The main features of the plan, which is similar to the system generally used in auditing stations, are as follows: Conductors are required to have in their possession at all times checkable evidence of the transportation of every passenger on the train; each train auditor carries a commission of authority signed by the operating vice-president and the general auditor, upon exhibition of which the conductor will permit him to take and examine all forms of transportation in his possession, and the records in connection therewith. The train auditors may board trains at any point, and having made a count of the passengers then on the train, see that all are accounted for. Before leaving the train the auditor fills out his report showing the condition

		High Speed.						Normal Speed.						Slow Speed.					
		Flexible Frame.			Rigid Frame.			Flexible Frame.			Rigid Frame.			Flexible Frame.			Rigid Frame.		
	Wheel.	Pressure against wheel flange due to car gripping truck.	Load on wheel.	Danger of wheel climbing.	Pressure against wheel flange due to car gripping truck.	Load on wheel.	Danger of wheel climbing.	Pressure against wheel flange due to car gripping truck.	Load on wheel.	Danger of wheel climbing.	Pressure against wheel flange due to car gripping truck.	Load on wheel.	Danger of wheel climbing.	Pressure against wheel flange due to car gripping truck.	Load on wheel.	Danger of wheel climbing.	Pressure against wheel flange due to car gripping truck.	Load on wheel.	Danger of wheel climbing.
Entering curve.....	1	P	L	D	**P**	**L**	D	p	l	d	**P**	**L**	D	P	**L**	**D**	P	**L**	D
Entering curve.....	2	O	O	O	O	O	O	O	l	O	O	O	O	O	O	O	O	O	O
Entering curve.....	3	O	L	O	O	**L**	O	O	l	O	O	**L**	O	O	O	O	O	O	O
Entering curve.....	4	O	O	O	O	O	O	O	l	O	O	O	O	O	**L**	O	O	O	O
Entering curve.....	5	O	l	O	O	O	O	O	l	O	O	O	O	O	l	O	O	O	O
Entering curve.....	6	O	l	O	O	O	O	O	l	O	O	**L**	O	O	l	O	O	**L**	O
Entering curve.....	7	O	l	O	O	O	**L**	O	l	O	O	l	O	O	l	O	O	l	O
Entering curve.....	8	O	l	O	O	**L**	O	O	l	O	O	**L**	O	O	l	O	O	**L**	O
Passing curve.....	1	P	L	D	P	L	D	p	l	d	p	l	d	P	O	**D**	P	O	**D**
Passing curve.....	2	O	O	O	O	O	L	O	l	O	O	l	O	O	L	O	O	L	O
Passing curve.....	3	P	L	O	O	L	O	O	l	O	O	l	O	O	L	O	O	L	O
Passing curve.....	4	O	O	O	O	O	L	O	l	O	O	l	d	O	L	O	O	L	O
Passing curve.....	5	P	L	D	P	L	D	p	l	d	p	l	d	P	O	**D**	P	O	**D**
Passing curve.....	6	O	O	O	O	L	O	O	l	O	O	l	O	O	L	O	O	L	O
Passing curve.....	7	O	L	O	O	L	O	O	l	O	O	l	O	O	L	O	O	L	O
Passing curve.....	8	O	O	O	O	L	O	O	l	O	O	l	O	O	L	O	O	L	O
Leaving curve.....	1	O	l	O	O	O	**L**	O	l	O	O	O	O	O	l	O	O	O	O
Leaving curve.....	2	O	l	O	O	O	L	O	l	O	O	**L**	O	O	l	O	O	**L**	O
Leaving curve.....	3	O	l	O	O	O	O	O	l	O	O	O	O	O	l	O	O	O	O
Leaving curve.....	4	O	l	O	O	**L**	O	O	l	O	O	**L**	O	O	l	O	O	**L**	O
Leaving curve.....	5	P	L	D	**P**	L	D	p	l	d	**P**	**L**	D	P	L	**D**	**P**	L	**D**
Leaving curve.....	6	O	O	O	O	L	O	O	l	O	O	**L**	O	O	L	O	O	L	O
Leaving curve.....	7	O	L	O	O	**L**	O	O	l	O	O	**L**	O	O	L	O	O	**L**	O
Leaving curve.....	8	O	O	O	O	L	O	O	l	O	O	L	O	O	L	O	O	L	O

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of the transportation and records, and gives the conductor a copy of it.

Tickets of ordinary issue are treated by the conductor in the usual manner, but for the purpose of assisting the conductors, and as far as possible reducing their work in connection with tickets honored but not taken up, local tickets have been provided, having conductors' train checks, which are to be detached by the conductor for his run, the check detached being accepted by the train auditor as transportation for the passenger. Book tickets, on which the destination is to be written or stamped, and some other forms of local tickets are also provided with train checks to be handled in the same manner as card tickets. Mileage detachments and cash fare receipts are handled as usual. Pass signature slips are required of all holders of annual passes, and of all trip passes which are not taken up by the conductor. The conductor is required to show on a form

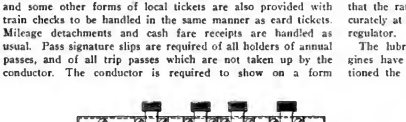
"Transportation honored but not taken up," all tickets not provided with a check to detach, showing the initial point and destination of ticket, form and number. It is not expected that this feature of the plan will add materially to the work required by conductors under previous conditions, in view of the large number of tickets which will be handled only by the first and second conductors. The duties of the train auditor are simple. Being familiar with forms and tickets he is able quickly to ascertain the condition of transportation and whether or not the conductor has his train in proper shape for audit. The check is made absolutely in the open, thereby removing the odium that has frequently been connected with the checking of passenger trains. The White Audit System has in its employ 30 or 40 men, enabling it to make frequent changes on the various roads.

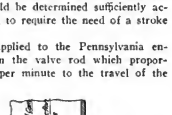
FORCE FEED LUBRICATOR.

A new design of force feed lubricator has been ordered by the Pennsylvania Lines West of Pittsburgh from McCord & Company, Chicago, for 50 consolidation locomotives. The chief improvements are that the sight feed, the bleeder test and the stroke regulator have been eliminated and the design of the driving shaft stuffing boxes has been changed to that shown in the drawing. It was found that with this type of lubricator both the sight feeds and the bleeder tests were not necessary and that the rate of oil supply could be determined sufficiently accurately at the outset so as not to require the need of a stroke regulator.

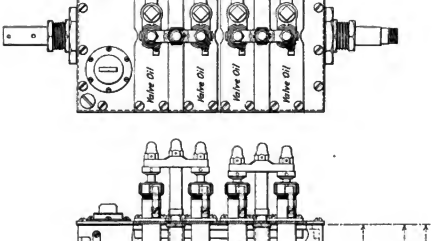
The lubricators previously applied to the Pennsylvania engines have been operated from the valve rod which proportioned the number of strokes per minute to the travel of the valve. The new application has a constant number of strokes per mile, the transformer connecting arm being connected to the link at a point 6 in. above the link support. The other end of this arm is connected to a transformer made up of a ratchet wheel and a system of bevel gears which drives the transmission rod. The transformer may be located on the running board or at any convenient position. The transmission rod has two universal joints and a slip joint to allow for the longitudinal expansion and contraction. Its construction is clearly shown in the drawing.

The two left hand pumps of the lubricator have strokes of 5/8 in., and lubricate the stoker and the air pump. The two right hand pumps have strokes of 3/4 in. and lubricate the steam valves. They are capable of pumping against a pressure of

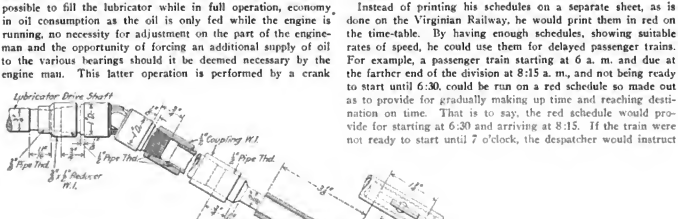




Inside Arrangement of Stuffing Box.


4"
2½"
2½"
4"
4"
4

3,000 lbs. per sq. in. The advantages claimed for this system of lubrication are the positive feed while the engine is working, the elimination of pressure in the oil reservoir which makes it possible to fill the lubricator while in full operation, economy in oil consumption as the oil is only fed while the engine is running, no necessity for adjustment on the part of the engineman and the opportunity of forcing an additional supply of oil to the various bearings should it be deemed necessary by the engine man. This latter operation is performed by a crank



Transmission Connections from Transformer to Lubricator Drive Shaft.

fixed on the end of the pump shaft within easy reach of the engineman.

This system of lubrication has also been used to considerable extent for driving journals, and is unique in this respect in that a pressure in the oil cavity may be maintained sufficiently high to raise the brass from the journal and thus insure a comparatively thick and perfect film of oil throughout the length of the journal. Where axle pressures have become so great it would seem that this system of lubrication would become a necessity; in fact, there are some cases where before it was installed it was impossible to keep the driving bearings from running hot. There are about 200 of these lubricators in service at the present time.

SYMBOL TRAIN SCHEDULES.

This is the title of a patent—No. 1,043,696—that has been granted to E. A. Hardy, of Caliente, Nev., which is a division terminus on the San Pedro, Los Angeles & Salt Lake. Mr. Hardy says that his scheme of schedules is the product of years of experience and has the endorsement of well-known despatchers.

Readers of the *Railway Age Gazette* will recall an account, published in the issue of November 1, last, page 840, describing "contingent schedules" for freight trains, in use on the Virginian Railway; and also an account of another arrangement, with a similar purpose, proposed by G. W. Turner, and described in the issue of December 13, pages 1131 and 1135. Mr. Hardy's scheme is somewhat similar to these. On the Virginian Railway schedules, made out at uniform speed, are prescribed for through freight trains once in four hours throughout the day, in each direction, to be used if needed; and, so far as possible, every through freight train is run on one of these schedules, though they are not a part of the time-table. When no regular train is due and no contingent schedule is due for four hours a train is relieved from the necessity of flagging back, in case of an unusual stop. Mr. Turner's proposition is to have contingent schedules made out at different rates of speed so that the despatcher can use them for extra trains of any kind; and in both of these plans the main object is to relieve the despatcher from the necessity of sending schedules by telegraph, and thus saving his time as well as promoting safety.

Mr. Hardy's principal claim for his arrangement is the saving of time in the despatcher's office and the elimination of chances for error.

Instead of printing his schedules on a separate sheet, as is done on the Virginian Railway, he would print them in red on the time-table. By having enough schedules, showing suitable rates of speed, he could use them for delayed passenger trains. For example, a passenger train starting at 6 a. m. and due at the farther end of the division at 8:15 a. m., and not being ready to start until 6:30, could be run on a red schedule so made out as to provide for gradually making up time and reaching destination on time. That is to say, the red schedule would provide for starting at 6:30 and arriving at 8:15. If the train were not ready to start until 7 o'clock, the despatcher would instruct the conductor and engineman to use that red schedule and run thirty minutes late on it.

The principal rules relative to the symbol schedules are the following:

No train will move under any symbol unless directed by train order. Regular trains moving under symbols will retain their time card rights unless otherwise directed by train order. Extra trains moving under symbols have no right, other than those given them by train order.

No rule of the standard code has to be changed, nor is there any alteration in the standard forms of train orders.

Proposed Railroad for Uruguay.—The plans of the Trans-Uruguay Railway, an American company, have been studied by the Uruguayan government officials and are now ready for final action by the assembly. This road, which extends from the east coast of Uruguay to the northwest corner, with several subsidiary lines, and which also has a port at Atlantica, capable of sheltering the largest ocean vessels, is considered one of the most important propositions ever submitted in Uruguay; and with the very liberal guaranties given, together with the fact that its construction is largely the president's own plan and wish, its success is practically certain.

Construction in Japan.—Work on the Miyazaki section of the Kiushu division is making satisfactory progress. The section from Yoshimatsu, on the main line, to Kobayashi, a distance of 16.74 miles, was opened in September, 1912, and the 30-mile section from Kobayashi to Yamaguchi via Takata-shinden and Miyakonojo is expected to be completed about one year later. The Kagoshima-Sendai section from the present southern terminus of the line via Higashi-ichiki, a distance of 30 miles, will probably be opened to traffic in March, 1914. Both the Miyazaki and Sendai branches will open some new timber and mining country.—*Consular Report.*

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General News.

The Pennsylvania Railroad is to have "first aid" outfits carried in all baggage cars, so that each passenger train will carry two separate outfits, one in the baggage car and one on the locomotive.

Seventeen persons were killed by the explosion of the boilers of the steamboat James T. Staples, at Bladen Springs, Ala., on the Tombigbee river, January 9. Twenty-two persons were injured.

The Richmond, Fredericksburg & Potomac has notified the governor of Virginia that it will no longer contest the claim of the state for taxes which has been in litigation for about ten years. It is said that the amount of back taxes now to be paid will be about $338,000.

The New York, New Haven & Hartford announces that the line between Stamford, Conn., and New Haven, 40 miles, will be ready for electric propulsion by July 1, next. With this extension trains can be hauled by electric locomotives from New Haven to New York, 74 miles.

The Toledo & Ohio Central has replaced its colored male cooks and waiters on dining cars with white women. The new waiters wear white dresses and they are said to be a success. The Toledo & Ohio Central runs cafe dining cars on two trains each way daily between Toledo, Ohio, and Charleston, W. Va.

Swift & Company, the meat packers, have announced to their employees that compensation for accidents and injuries will be paid to the firm's employees everywhere, regardless of state laws. There are fourteen states of the Union and four provinces of Canada where laws of this kind are in force and where Swift & Company compensate employees in accordance with the laws.

The Colorado & Southern is to reopen its line from Como to Breckenridge, in compliance with the order recently made by the state supreme court; but has asked the court for a stay of the order for 30 days, because of the severe weather conditions prevailing in the mountains. An officer says that it is possible the case will be taken to the United States Supreme Court.

The Interstate Commerce Commission has issued a revised rule concerning the inspection of cars containing explosives when transferred from one railroad to another. Cars must be very carefully inspected on the outside, so as to avoid unnecessary opening of the doors. If the contents of a car must be inspected at night electric flashlights should be used, and naked lights are forbidden.

The new governor of Indiana, Samuel M. Ralston, in his inaugural address calls for stricter regulation of the railroads and recommends the passage of a public utilities law. A bill has been introduced in the legislature providing for the abolition of the present state railroad commission and creating instead a public utilities commission, to have extensive powers like those exercised by the commissions of New York and certain other states.

W. A. Garrett, vice-president of the Chicago Great Western, has issued 10,000 copies of a circular addressed to all transportation employees of the road, reprinting the news item published in the *Railway Age Gazette* of January 3, quoting a paper by Mrs. Joseph Severn, on "what 'safety first' means in the home," which won the first prize in the contest conducted by a safety committee on the Oregon Short Line. Employees of the C. G. W. are asked to hand the circulars to the "home folks."

The Senate Committee on Appropriations has reported the bill carrying appropriations for the legislative, executive and judicial branches of the government with an amendment to continue the Commerce Court for the remainder of the fiscal year ending June 30, 1913. The appropriation bill of last winter provided for the court only until March 4. It is believed that the sentiment against the court has largely altered since last winter and that a number of members of the Interstate Commerce Commission are not now opposed to it.

At Sacramento, Cal., January 8, there was unveiled a bronze tablet, at Front and K streets, commemorating the fiftieth anniversary of the beginning of work on the Central Pacific Railroad. The monument stands on the spot where Governor Leland Stanford turned the first shovelful of earth. Dr. David Starr Jordan, president of Stanford University, delivered an address in the presence of a large number of veteran railroad men. Trains on the Southern Pacific everywhere were stopped for five minutes at the time of the unveiling.

In the federal court at Buffalo, N. Y., January 13, the grand jury reported indictments against the New York Central, the Erie, the Lehigh Valley and the Grand Trunk for violations of the interstate commerce law. The Erie, indicted on 51 counts, is charged with failure to collect demurrage on anthracite coal, during 1910, 1911 and 1912 for Williams & Peters, sales agents for the Hillside Coal & Iron Company and the Pennsylvania Coal Company, both companies being owned by the Erie. The Lehigh Valley is charged with leasing a coal yard to the Yates-Lehigh Coal Company for $250 a year when the fair rental would be $1,600 a year. The New York Central is indicted on charges of not collecting demurrage.

A man who robbed the city ticket office of the Buffalo, Rochester & Pittsburgh, at Pittsburgh, Pa., last Saturday, holding up the agent with a revolver, told the agent that he was the same person who had robbed the city ticket office of the Erie, at Cleveland, the day before; and he left at Pittsburgh the keys of the Cleveland office. At Cleveland he told the agent that he was the one who had robbed the office of the same road on Broadway, New York City, near Thirty-third street, on January 3. At Cleveland the robber tied the agent to a chair. At all three places he got considerable sums of money. At Philadelphia on Monday, the 13th, there was a similar robbery of an office of the Lehigh Valley, and the police officers believe the robber's statement is true.

Two officers of the Erie road have been arrested and attachments issued for two others for tearing up 2,000 ft. of the tracks of the Cincinnati, Bluffton & Chicago at Simpson, six miles from Huntington, Ind. A. Burgett and C. J. Rist were held on charges of contempt of court and released on bond. Attachments were issued for T. Mackrell, superintendent of the Chicago division, and J. Burke, of Cleveland, engineer of maintenance of way. The Cincinnati, Bluffton & Chicago extends from Huntington to Portland, Ind., and is being operated under a receivership. About a year ago Erie workmen tore up some of the road's tracks and an injunction was issued forbidding them to interfere with the line, which the Erie asserts was built on its right of way. The C. B. & C. admits using the Erie right of way, but claims that it was justified by contract.

"Safety First" is the title of a display advertisement published by President Mellen, of the New Haven road, last week. Prefacing the statement with the remark that no railroad in the country is fully equipped with No. 20 crossovers and that he has ordered the material for the half million dollar expenditure that will be necessary to comply with the Connecticut commission's order (to establish long crossovers), he says that, beginning probably February 2, the schedules of some of the passenger trains will be lengthened in order to provide for the stops which are necessary at short crossovers under the commission's order. The New Haven recognizes that its main line should be the safest railroad in the United States. The rebuilding and electrification carried on during the past two years have been accomplished with safety. Mr. Mellen asks the newspapers to suspend their criticism until he can make the changes now undertaken, as criticism has possibilities of demoralization in the personnel.

Clerks of the New York, New Haven & Hartford to the number, it is said, of 1,000, have secured an increase of pay. Last week it was said that they were taking a strike vote, but the committee in charge reported Saturday night that a compromise had been reached. The men affected appear to be those in the general offices and at the larger stations. The most important concession which has been made to the men is an increase of 15 cents a day to all now drawing less than $25 a week and establishing the minimum rate per day at $2. All clerks who have been in the service one year get one week's vacation at the end of that year. Those who have served more than two years get 10 days, and all who have worked more than five years will have two weeks each year. On each point the company met

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the man about halfway. The minimum which the clerks asked was $2.25 a day, and they got $2, which is a substantial increase over the present minimum of $1.75. The vacation schedule is practically what was asked. The demand for an eight-hour day was refused, but the other sections of the adjustment are said by the men to be reasonably satisfactory.

Attorney-General Wickersham is to begin civil proceedings under the Sherman anti-trust law against certain anthracite carriers. The suit will be directed against the so-called minor combinations of coal carrying roads and coal companies in the Pennsylvania fields, charges against which were dismissed by the Supreme Court without prejudice in its recent decision because they were held to have been improperly incorporated in the government's original general bill against the "trust." By direction of the Attorney-General, J. C. McReynolds has been studying for several weeks the effect of the Supreme Court's decision upon conditions in the hard coal fields, and he has recommended pursuing the matter further. The combinations referred to are those alleged to have been created in 1898 by the absorption of the New York, Susquehanna & Western by the Erie; in 1901 by the acquisition by the Reading Company, which owned the Philadelphia & Reading Railway and a coal company by a similar name, of the Central of New Jersey with its coal companies; in 1899 by the acquisition by the Erie of the Pennsylvania Coal Company, which is said to have been projecting a new railroad, the Delaware Valley & Kingston.

Electric Railway Statistics for 1912.

Statistics compiled by the *Electric Railway Journal* from official sources show that the mileage of new electrical track built and placed in operation during 1912, including portions of steam railways electrified, was 950.29 miles as compared with 1,191.58 miles in 1911. The total new track for 1912 is the smallest for any year since 1909. The total number of electric railway cars ordered during the year was 6,001, as compared with 4,015 in 1911. The total includes 4,531 city passenger cars, 783 interurban passenger cars and 687 freight and miscellaneous cars.

Unfilled Tonnage of the Steel Corporation.

The report of the United States Steel Corporation shows that on December 31, 1912, the unfilled tonnage was 7,932,164 tons as compared with 7,852,883 tons on November 30, 1912, an increase of 79,281 tons. The unfilled tonnage on October 31, 1912, was 7,594,381 tons; on September 30, 1912, 6,551,507 tons; and on December 31, 1911, 5,084,761 tons. The increase in December was just about what had been expected, so it did not come as a surprise. The unfilled tonnage on December 31, 1912, has been exceeded only three times, namely, March 31, 1907, when there were 8,043,858 tons; on December 31, 1906, when there were 8,489,718 tons; and September 30, 1906, when there were 7,936,884 tons.

Quiet in New England.

The Federal Grand Jury at New York has continued its investigation into the affairs of the New York, New Haven & Hartford, but the daily papers now give this news in two-inch items. Congress has definitely decided to take no action in this matter. The following is from the *Hartford Times:*

"We have read the message of Governor Haines to the Maine Legislature and it is as silent in regard to any popular grievances against the management of railroads in Maine as is the message of Governor Baldwin of Connecticut. We have also noted the message of Governor Fletcher of Vermont and the proceedings of the legislature of that state, and we have failed to discover any evidence of popular hostility to railroad management.

"Here are three of the New England states, therefore, in which the campaign of attack on the New York, New Haven & Hartford railroad and its allied New England lines has no official encouragement. The situation in New Hampshire is practically the same, and throughout the whole of central and western Massachusetts the sentiment of the people is practically unanimous in favor of letting Mr. Mellen go forward to develop the [electric] railway facilities of that state on a broad and generous plan. This plan has now received the official indorsement of a legislative committee which has spent six months in studying the subject.

"Practically the whole outcry against the New Haven road in New England comes from the two cities of Boston and Providence. In Providence there is resentment against the New Haven because it is supposed to have been a party to the stoppage of the Palmer-Providence extension of the Grand Trunk. In Boston the opposition is really confined to a very few people and is largely personal in its nature—that is, it comes from people who find personal profit in engaging in it. This little group of lawyers and politicians who carry on the crusade against New England's railroad interests will presently be exposed in all their littleness and their nakedness, and the consequence of this exposure will be to the advantage of the people of all these six states."

Mileage of Roads Block Signaled.

The table given below, which is made up from that published in our statistical number (December 27, page 1267), shows all railroads, over twenty miles long, appearing in that table, on which the block system is used for 75 per cent. or more of the total length of road used for passenger traffic. A correspondent has called our attention to the fact that in the short table of this kind which was published in our statistical number on page 1238, we did not state that the figures were from a statement made a year ago, and that, therefore, it does not correctly show the situation at the present time. The table now given shows percentages as of January 1, 1913.

Baltimore & Ohio	100	N. Y. Central & H. R.	100
Bessemer & Lake Erie	97	Lake Erie & W.	100
Buffalo, Roch. & Pitts.	100	Lake Shore & M. S.	100
Chesapeake & Ohio	98	Michigan Central	100
Chicago, B. & Quincy	97	Pittsburgh & Lake Erie	97
Chicago, Ind. & Louisville	100	New York, Phila. & N.	83
Chicago, M. & Puget Sound	97	Norfolk & Western	85
Cornwall & Lebanon	100	Pennsylvania—	
Delaware, L. & Western	77	(All east of Pittsburgh)	100
Durham & Southern	100	Pennsylvania Co.	77
Erie	77	Pitts. C. C. & St. L.	80
Chicago & Erie; Columbus & Erie; Erie & Jersey; Genesee River	100	Quincy, Omaha & K. C.	100
		Queen & C—	
		Cincinnati, N. O. & T. P.	100
Grand Trunk	100	Richmond, F. & P.	100
Lehigh Valley	100	St. Louis & S. F.—	
Monongahela	100	Orange & N. W.	100
N. Y. & Long Branch	100	Wabash	96
		Washington Southern	100
		Washington W. P. Co.	100

The reader will understand that in the case of some of the single track lines here shown the companies report that the block system is not used regularly for freight train movements, where no passenger train is involved. As compared with completely signaled roads, these companies may perhaps be said to enjoy in this table a better standing than they are entitled to. On the other hand, some other roads, as, for example, the Southern Pacific and the Union Pacific and their controlled lines, which do not appear in the table at all, have a large mileage of road equipped with automatic signals; but they have also a large mileage of roads carrying a light traffic, not block signaled, which reduces their percentages.

Large Figures.

The New York State Public Service Commission, First District, announces that both of the transportation companies which are to operate the dual system of rapid transit in New York City and contribute to the cost of construction of the new lines, have filed applications for the approval of bond issues needed to finance the project. The Interborough Rapid Transit Company proposes to issue bonds to the amount of $170,000,000. Its petition states that the company has made a contract with J. P. Morgan & Company for the purchase of the entire issue at 93½ and accrued interest. At this rate the company wants permission to issue 5 per cent. bonds, payable in 1966, sufficient to raise $150,797,500. Of this amount the company will use $74,000,000 in cash for its contribution toward the construction of new subways and subway extensions and the purchase of equipment for the same; $16,154,000 to pay for the extension, and $10,800,000 for third-tracking of its elevated lines; $34,668,900 to refund all outstanding bonds; $15,000,000 to pay off outstanding short term notes, and $174,600 to be reserved to pay off outstanding liens on real estate.

The Brooklyn Rapid Transit Company, through the New York Municipal Railway Corporation, which was formed to enter into the proposed contract with the city, desires to issue $100,000,000 of first mortgage 5 per cent. sinking fund gold bonds,

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$65,000,000 to be issued immediately. Of the proceeds the company is to apply $13,500,000 toward the cost of construction of new subways and subway extensions; $1,000,000 to pay for the proposed connection between the Fourth Avenue subway and the Broadway subway at Canal street; $26,000,000 for the purchase of equipment; $6,500,000 for the construction of additional tracks on its elevated railroads; $8,000,000 for the extension of such elevated railroads, and $10,000,000 for the reconstruction of these lines.

The Popular Parcel Post.

The postmaster-general has issued a statement showing that the number of parcel post packages sent through 50 leading post offices during the first week of the new service was nearly two million. As the fifty cities making the reports handle about half the postal business of the United States it is estimated that between 3,000,000 and 4,000,000 parcel post packages were mailed from January 1 to January 7. New York sent 448,000, and Chicago 438,000 packages; Boston, 174,000; Philadelphia, 147,000; St. Louis, 145,000; Jersey City, 60,000; Detroit, 45,000; Baltimore, 42,000; Cincinnati, 37,000, and San Francisco, 35,000.

The statement says that the packages were received, despatched and delivered without confusion or delay. In order to achieve this the postmaster-general was obliged to use practically the entire appropriation of $250,000 allowed by Congress, and he asks for another appropriation of the same amount for the remainder of the current fiscal year.

The volume of packages mailed by the parcel post service continues to increase. Postmaster Edward M. Morgan, of New York City, announced that for the 24 hours beginning with midnight January 7, and ending at midnight January 8, a total of 105,547 packages were mailed in the boroughs of Manhattan and the Bronx, as follows:

At General Post Office	23,940
At Grand Central Station	16,180
At Pennsylvania Terminal	13,932
At branch stations	51,495
Total	105,547
Number of packages insured	2,062
Total number of parcels delivered	21,268
Of which:	
Delivered by carrier	1,711
Delivered by wagon	19,557

The first claim for damage was filed at New York, January 9, for a negative, 10 x 12, which was broken in transit between New York and Chicago. It was valued at $5, but the government had insured it for $50, at a cost of 10 cents.

The Firemen's Demand for Higher Pay.

The efforts of Messrs. Knapp and Neill to find a ground for arbitration between the eastern roads and their firemen, have failed, after a week of conference, and Mr. Carter, the leader of the firemen, announced on Wednesday that they would at once vote on empowering the officers of the brotherhood to order a strike. The railroad stood out for an arbitration board of seven men, while the firemen insisted on following the federal mediation law which provides for a board of three men. Aside from the question of the number of arbitrators, the only reason made public by the firemen to sustain their position is that in an arbitration conducted voluntarily and not under the Act of Congress there is no way to exclude false testimony or to punish perjury.

Surprise Tests on the New Haven.

The New York, New Haven & Hartford has issued a new order in regard to surprise tests of enginemen, and the requirements, as outlined in the order, are printed in the *Locomotive Engineers' Journal*. Mr. Stone, grand chief engineer of the brotherhood, criticises some of these tests as dangerous. He refers particularly to turning switch lights so as to indicate red when an engineman is approaching the switch at high speed. Enginemen in such circumstances, he says, have troubles enough already. The New Haven road requires these tests to be made only where the engineman will have a long view of the switch light; but Mr. Stone says that a road in the west, a few years ago, tried this method and, within a few months, it was found that local officers making such tests selected the worst places that they could find. After two men had been injured by jumping off engines it was discontinued. Mr. Stone calls for national legislation making it a criminal offense to test enginemen in the way described.

Among the things to be done to test men on the New Haven road are the following: Train orders improperly made out; clearance blanks improperly made out; train orders improperly repeated; markers improperly displayed; wrong whistle-signal given to come in; fixed signals clear with red flag in tower; lights removed from signals; blade removed from signal; signal arms half way between stop and clear; train order signals turned to the stop position after the engine has passed; block signal at clear when passed and then changed to stop, while work is being done at the station; and changing of switch light to show red instead of green.

Holiday Travel at Chicago.

The Chicago & North Western has compiled the following figures showing the large amount of passenger traffic handled in and out of the new passenger terminal in Chicago, Friday, December 20, and Saturday, December 21, 1912.

Passengers handled through Terminal, Friday, Dec. 20	51,127
Passengers handled through Terminal, Saturday, Dec. 21	54,489
Friday, Dec. 20, regular sleepers (standard)	44
Friday, Dec. 20, regular sleepers (tourist)	5
Total number of regular sleeping cars	49
Extra sleepers handled (standard)	23
Extra sleepers handled (tourist)	1
Total number of sleepers handled out of Terminal, Friday, Dec. 20	73
Saturday, Dec. 21, regular sleepers (standard)	44
Saturday, Dec. 21, regular sleepers (tourist)	5
Total number of regular sleeping cars	49
Number of extra standard sleepers handled	14
Total number of sleepers handled, Dec. 21	63
Regular number of parlor cars out of Chicago	28
Regular number of parlor cars into Chicago	28
Extra parlor cars into Chicago, Friday, Dec. 20	15

Of these 15 there were 7 from Madison (students) and 4 from Milwaukee.

Proper Basis for Mail Pay.

The present plan of compensation has never worked to the disadvantage of the Government, but has failed to do justice to the railways by reason of infrequent weighing; absence of pay for nearly 40 per cent. of the space occupied as traveling post offices; the performance, without pay, of side and terminal messenger service, and the unjustifiable reduction in pay by the Act of Congress of March 2, 1907, supplemented by Order No. 412 of the Postmaster-General, changing the divisor.

The present law is based upon correct principles, but should be so amended as to provide—

(*a*) For the repeal of the Act of March 2, 1907. Notwithstanding the large increase in every other item connected with the administration of the Post Office Department, the railroads' pay has been singled out as the one element in these operations for concentration of economies. This, too, in the face of the fact that the operating expenses of the railroads have been greatly augmented by the requirements of the law with reference to steel cars, and a general increase in cost characteristic of all business operations.

(*b*) For annual weighings, and a definite and just method for ascertaining daily average weights. The railroads must provide car space and facilities for the maximum weight offered at any time, yet they are paid only for the average weight carried. The Postmaster-General's order covering the divisor has unfairly reduced this average. The parcel post will take from the express service traffic for which the railroad companies now receive compensation transferring it to the mail service; no provision for payment to the railroad companies for the increased tonnage to be handled in mail cars, although such provision was made for the star routes and the city wagon service.

(*c*) For pay for apartment cars on some basis that will compensate for the service. The Postmaster-General has recognized the justice of such a change.

(*d*) For a fair allowance to the railroads for the side and terminal messenger service. The necessity for this is also emphasized by the establishment of the parcel post which will undoubtedly add greatly to the expense of the service.

(*e*) That all rates of pay should be definite and not subject

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to the discretion of the officers of the Post Office Department. Other inequities exist under the present law, but are due to the administrative methods rather than to the law itself.—*Committee on Mail Pay, R. Peters, Chairman.*

Judge Archbald Found Guilty.

Robert W. Archbald, of Scranton, Pa., one of the judges of the United States Commerce Court, and for twenty-nine years a judge in state and federal courts, was, on January 13, found guilty by the United States Senate of "high crimes and misdemeanors"; was stripped of his office and forever disqualified from holding positions of public honor or public trust. This conviction is the result of the trial that has been pending in the Senate several months.

On five of the thirteen charges brought against him by the House of Representatives, Judge Archbald was found guilty. On the first charge the vote was guilty, 68 to 5, and Senators Burnham, Penrose, Oliver, Paynter and Catron were the only members of the Senate who voted to support Archbald. The first five charges were as follows:

First—That Judge Archbald influenced officers of the Erie Railroad, then a litigant in his court, to grant him a favorable option on its share of the Katydid culm dump, near Scranton.

Second—That he attempted to effect a settlement between the Marion Coal Company, of Scranton, and the Delaware, Lackawanna & Western Railroad of a case then pending before the Interstate Commerce Commission on a basis that would have given him a share of the fee earned by George M. Watson, attorney for the Marion Coal Company. On this he was not convicted.

Third—That he attempted to influence the Lehigh Valley Railroad Company to relinquish a lease on "Packer No. 3," near Shenandoah, so that he might lease it on favorable terms from the Girard estate, of Philadelphia. *Convicted.*

Fourth—That Judge Archbald secured from Helm Bruce, attorney of the Louisville & Nashville Railroad, private letters and arguments to sustain an opinion in favor of the railroad in a suit before the Commerce Court. *Convicted.*

Fifth—That Judge Archbald influenced officers of the Philadelphia & Reading Coal and Iron Company to grant a lease on a coal property to Frederick Warnke, for which service Warnke gave him a note for $500. *Convicted.*

On the remaining eight charges the vote was less than two-thirds, and so did not result in conviction. These had to do with trying to influence officers of the Lehigh Valley to buy an interest in coal lands, accepting gifts from litigants and appointing a railroad attorney a jury commissioner.

The President-Elect and the Labor Unions.

Woodrow Wilson, governor of New Jersey, in his annual message to the legislature, delivered this week, again calls attention to the need of abolishing large numbers of grade crossings in the state. Recognizing the great difficulty of meeting the cost of such improvements he says:

"No invariable rule can be laid down which will not lead to all sorts of impossible situations and the eventual interference of the courts. The proper solution of this very difficult matter is to empower the Board of Public Utility Commissioners to order the abolition of such grade crossings in such ways and at such a rate as will adjust their orders to each particular case and set of circumstances."

And the governor again calls for a full-crew law, apparently in disregard of the temperate utterances of the Public Utility Commissioners last year (*Railway Age Gazette*, February 16, p. 275). He says: "Permit me to urge another piece of legislation which seems to me essential both to the safety of travel and to the fair protection of certain classes of railway employees. I refer to the so-called full-crew bill, whose failure to pass the last legislature was so much deplored by all who had noted its introduction and its significance. It is of the highest consequence that railway trains which pass through the state should be manned by adequate crews; and to me, for one, it is a matter of chagrin that they should now carry smaller crews through New Jersey than through Pennsylvania. This is a matter which we cannot afford to neglect. If it cannot be satisfactorily handled in an act, it might also very well be put in the hands of the Public Utility Commissioners by addition to their powers."

Exhibit of the National Railway Appliances Association.

The annual exhibition of the National Railway Appliances Association, in connection with the convention of the American Railway Engineering Association will be held in Chicago, March 15 to 21, inclusive. Both the Coliseum and the First Regiment Armory have been leased to provide for the constantly increasing demand for space, and although it is yet several weeks before the exhibition will be held, most of the space has been allotted.

All railway officials who would be interested in the exhibit will this year receive a special invitation in the form of the association's year book, published this year for the first time, 3,000 copies of which will be distributed among all classes of railway officials.

Following is a partial list of the exhibitors who have reserved space:

Adams & Westlake Co., Chicago.
Ajax Forge Co., Chicago.
American Guard Rail Fastener Co., Philadelphia, Pa.
American Hoist & Derrick Co., Chicago.
American Lock Nut Co., Chicago.
American Railway Signal Co., Cleveland, Ohio.
American Rolling Mill Co., Middletown, Ohio.
American Steel & Wire Co., Chicago.
American Valve & Meter Co., Cincinati, Ohio.
American Vulcanized Fibre Co., Pittsburgh, Pa.
Asphalt Ready Roofing Co., New York.
Associated Manufacturers' Co., Waterloo, Iowa.
Atlas Preservative Co. of America, New York.
Barbey, F. A., Boston, Mass.
Barrett Manufacturing Co., New York.
Beaver Dam Malleable Iron Co., Beaver Dam, Wis.
Blessing, Louis, Jackson, Mich.
Bowser & Co., S. F., Fort Wayne, Ind.
Brach Supply Co., L. S., New York.
Bryant Zinc Co., Chicago.
Bucyrus Co., South Milwaukee, Wis.
Buda Co., Harvey, Ill.
Buyers' Index Co., Chicago.
Cambria Steel Co., Pittsburgh, Pa.
Carey Co., Philip, Cincinnati, Ohio.
Carnegie Steel Co., Pittsburgh, Pa.
Carpenter & Co., Geo. B., Chicago.
Chicago Bridge & Iron Works, Chicago.
Chicago Pneumatic Tool Co., Chicago.
Chicago Railway Equipment Co., Chicago.
Chicago Steel Railway Tie Co., Chicago.
Cleveland Frog & Crossing Co., Cleveland, Ohio.
Clyde Iron Works, Duluth, Minn.
Commercial Acetylene Railway Light & Signal Co., Chicago.
Concrete Steel Co., Chicago.
Conley Frog & Switch Co., Memphis, Tenn.
Cook's Standard Tool Co., Kalamazoo, Mich.
Crerar, Adams & Co., Chicago.
Curtain Supply Co., Chicago.
D. & A. Post Mold Co., Three Rivers, Mich.
Des Moines Bridge & Iron Works, Pittsburgh, Pa.
Detroit Graphite Co., Detroit, Mich.
Detroit Switch Lock Co., Detroit, Mich.
Dickinson, Paul, Inc., Chicago.
Dietzgen Co., Eugene, Chicago.
Dilworth, Porter & Co., Pittsburgh, Pa.
Dixon Crucible Co., Joseph, Chicago.
Drover Co., G., Bridgeport, Conn.
Duplex Metals Co., New York.
E. D. E. Co., Chicago.
Eastern Granite Roofing Co., New York.
Edison, Thomas A., Inc., Orange, N. J.
Edison Storage Battery Co., Orange, N. J.
Electric Storage Battery Co., Chicago.
Fairbanks, Morse & Co., Chicago.
Fairmont Machine Co., Fairmont, Minn.
Federal Signal Co., Albany, N. Y.
Foster, Frank M., Columbus, Ohio.
Franklin Manufacturing Co., Chicago.
General Electric Co., Schenectady, N. Y.
General Railway Signal Co., Chicago.
Hall Switch & Signal Co., Chicago.
Hart Steel Co., Elyria, Ohio.
Hayes Track Appliance Co., Richmond, Ind.
Hobart-Allfree Co., Chicago.
Hubbard & Co., Pittsburgh, Pa.
Indianapolis Switch & Frog Co., Springfield, Ohio.
Inland Steel Co., Chicago.
International Harvester Co. of America, Chicago.
International Steel Tie Co., Cleveland, Ohio.
Iowa Gate Co., Cedar Falls, Iowa.
Johns-Manville Co., H. W., New York.
Jordan Co., O. F., Chicago.
Joyce-Cridland Co., Dayton, Ohio.
Kalamazoo Railway Supply Co., Kalamazoo, Mich.
Kennicott Co., Chicago.
Kerite Insulated Wire & Cable Co., New York.
Keuffel & Esser Co., Chicago.
Keystone Driller Co., Chicago.
Lackawanna Steel Co., Buffalo, N. Y.
Lehon Co., Chicago.
Lidgerwood Manufacturing Co., Chicago.
Lorain Steel Co., Chicago.
Lufkin Rule Co., Saginaw, Mich.
Lupton's Sons Co., David, Philadelphia, Pa.
Lutz-Lockwood Manufacturing Co., Aldene, N. J.
Massey Co., C. F., Chicago.
McFarlane Manufacturing Co., St. Paul, Minn.
McGraw Publishing Co., New York.
MacRae's, The Railway & Supplymen's Mutual Catalog, Chicago.
Morden Frog & Crossing Co., Chicago.
Mudge & Co., Burton W., Chicago.

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M. W. Supply Co., Philadelphia, Pa.
National Carbon Co., Cleveland, Ohio.
National Electric Specialty Co., Toledo, Ohio.
National Lock Washer Co., Chicago.
National Malleable Castings Co., Chicago.
National Surface Guard Co., Chicago.
Nichols & Brother, Geo. P., Chicago.
North Western Construction Co., New York.
Ogle Construction Co., Chicago.
Okonite Co., New York.
O'Malley-Beare Valve Co., Chicago.
Otis Co., Spencer, Chicago.
Otto Gas Engine Works, Philadelphia, Pa.
P. & M. Co., Chicago.
Patterson Co., W., Pittsburgh, Pa.
Pease Co., C. F., Chicago.
Pennsylvania Steel Co., Steelton, Pa.
Pocket List of Railroad Officials, New York.
Potter-Winslow Co., Chicago.
Q. & C. Co., New York.
Rail Joint Co., New York.
Railroad Supply Co., Chicago.
Railway List Co., Chicago.
Railway and Engineering Review, Chicago.
Ramapo Iron Works, Hillburn, N. Y.
Reliance Manufacturing Co., Massillon, Ohio.
Richards-Wilcox Manufacturing Co., Aurora, Ill.
Roberts & Schaefer Co., Chicago.
Sanitary Bank Co., Indianapolis, Ind.
Sellers Manufacturing Co., Chicago.
Signal Accessories Co., New York.
Simmons-Boardman Publishing Co., New York.
Snow Construction Co., T. W., Chicago.
Southern Railway Supply Co., St. Louis, Mo.
Standard Asphalt & Rubber Co., Chicago.
Standard Underground Cable Co., Pittsburgh, Pa.
Stark Rolling Mill Co., Canton, Ohio.
Steel Railway Tie & Appliance Co., Denver, Col.
Templeton, Kenly & Co., Ltd., Chicago.
Titanium Alloy Manufacturing Co., Niagara Falls, N. Y.
Toledo Pipe Threading Machine Co., Toledo, Ohio.
Union Draft Gear Co., Chicago.
Union Iron Works, Hoboken, N. J.
Union Switch & Signal Co., Chicago.
U. S. Wind Engine & Pump Co., Batavia, Ill.
Verona Tool Works, Chicago.
Western Electric Co., Chicago.
Wharton, Jr., & Co., Wm., Inc., Philadelphia, Pa.
Winans Improved Patent Rail Joint Co., Portland, Ore.
Wolfe Brush Co., Pittsburgh, Pa.

Central Railway Club.

The annual meeting of the Central Railway Club was held in Buffalo on Thursday, January 9. At the professional session in the afternoon Arthur Hale presented a paper on Freight Car Tactics. The following officers were elected for the ensuing year: President, W. F. Jones, general storekeeper, New York Central; first vice-president, W. Elmer, jr., superintendent of motive power, Pennsylvania; second vice-president, H. C. Manchester, superintendent of motive power, Delaware, Lackawanna & Western; third vice-president, E. J. Devans, superintendent, Buffalo, Rochester & Pittsburgh. Executive members: E. M. Tewkesbury (So. Buffalo R. R.); George A. Bowman (B. R. & P.); and E. P. Mooney (Ingersoll Rand Company). Secretary-treasurer, H. D. Vought.

During the evening the annual banquet was held at the Hotel Statler. H. H. Vreeland of New York acted as toastmaster, and addresses were made by Arthur Hale, A. J. Grymes, manager marine department of the Erie, and William McClellan, electrical engineer of the New York Public Service Commission, Second district.

Railway Supply Manufacturers Association.

The Railway Supply Manufacturers Association has issued circular No. 1, giving detailed information concerning the exhibit arrangements for the Master Mechanics and Master Car Builders' conventions, which will be held at Atlantic City, N. J., next June. The exhibits will again be on Young's Million Dollar Pier, and 87,361 sq. ft. of exhibit space has been provided, an increase of 5,597 sq. ft. The price of space is 40 cents per sq. ft., as usual. Space will be assigned on February 11, 1913, at the office of the secretary, J. D. Conway, Oliver building, Pittsburgh, Pa.

International Refrigeration Exposition.

Arrangements have been perfected for the holding of an exposition of refrigeration in connection with the third annual International Congress of Refrigeration in September, at Chicago. The exposition will be held in the amphitheater at Forty-second and Halsted streets, and will include exhibits of the various devices pertaining to refrigeration, as well as refrigerator cars and refrigerating machinery.

Railway Business Association.

Announcement has been made that it has been decided to hold the annual dinner of the Railway Business Association in the second week in December instead of in the third week, as was done last year, because some of the members and guests, especially from the West, found it difficult to attend the dinner in New York and get home in time for Christmas.

Cleveland Engineering Society.

At the meeting of the Cleveland Engineering Society, held on January 14, James L. Stuart, constructing engineer, Pittsburgh, Pa., presented a paper on Business Methods in Construction Work.

Railway Club of Pittsburgh.

At the regular monthly meeting of the Railway Club of Pittsburgh, to be held January 24, W. M. Prall, superintendent of car service, Pennsylvania Lines West, will present a paper on Terminal Service.

Kansas Engineering Society.

The annual meeting of the Kansas Engineering Society will be held January 21-22, at Topeka, Kan. T. J. Strickler, Topeka, is secretary.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRICAL RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 13 Park Row, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Convention, January 21-23, Chicago.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

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CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—F. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May, 1913, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, Chicago & North Western, Escanaba, Mich. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES' ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C. M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, a second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—C. S. Butterfield, Lee's Summit, Mo. Next meeting, August 14-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Telec. Engrs.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La. Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—E. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1797, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The railways operating between Kansas City and Denver have reduced their time freight schedules between the two cities from 72 to 48 hours.

The Baltimore & Ohio has notified the State Railroad Commission of Pennsylvania that it will no longer contest the order of the commission, issued December 3, 1910, requiring the road to charge no higher fare from points east of Connellsville to points west of that place than the aggregate of the fares to and from Connellsville.

A joint committee, representing the industrial traffic managers of the Business Men's League of St. Louis, and the Local Freight Agents' Association of St. Louis and East St. Louis, has issued a joint circular urging all shippers to exercise greater care in the marking of freight, and containing several rules, the observance of which would tend to prevent loss and damage claims and delays to freight.

The Merchants Association of New York City announces the usual reduction in fares for merchants coming to New York to make their spring purchases. The rates, full fare one way and half fare the other, apply at trunk line points more than 100 miles from New York City, and the dates are January 18 to 21, inclusive; February 15 to 18; March 1 to 4; March 15 to 18. The return trip must be made within fifteen days.

The increase of single-trip and round-trip suburban fares on the Illinois Central in Chicago on January 1 has elicited protests from several business men's associations in districts along the line who have held a mass meeting, addressed a petition to the management asking a restoration of the old rates, and filed a complaint with the Illinois Railroad and Warehouse Commission. In their newspaper interviews the protestants speak as if all of the suburban rates had been advanced, whereas there has been no change in commutation rates for 10-ride and 25-ride tickets, nor for monthly tickets.

The Alabama-New Orleans Transportation Company is working on plans for the operation of a line of self-propelled steel barges from the Warrior river coal fields in Alabama to the Warrior and Alabama rivers, Mobile bay, Mississippi sound and the Lake Borgne canal to the Mississippi river and New Orleans. It is proposed to carry coal, principally, on the going trips and general cargo on the return trips. The company has recently installed a ship-building plant at Violet, La., for the construction of its own barges, and this work is now under way. It is also preparing extensive land and water terminals at a cost of about $500,000 for the handling of coal, both by water and rail and in storage.

Citrus fruit shippers of southern California at a meeting with the traffic officers of the Southern Pacific, Atchison, Topeka & Santa Fe, and San Pedro, Los Angeles & Salt Lake, last week asked the railways to come to their assistance, in view of the destruction of a large part of the crops by cold weather, by making an emergency reduction in rates on fruit shipments to the east and north at once, in order that a portion of the crop, which is only slightly damaged, may be sent to market for what it will bring. There are now blanket rates applying to practically all points east of the Rocky mountains of $1.15 per 100 lbs. on oranges and $1 on lemons. Some of the shippers asked for a reduction as great as 50 per cent. The railway men took the position that the part of the crop that escaped the frost could stand the present rates, and that the portion that has been damaged should not be shipped at any price, except under special conditions.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on Relations Between Railroads of the American Railway Association, in presenting the statistical bulletin No. 135, giving a summary of car surpluses and shortages by groups, from September 27, 1911, to December 31, 1912, says: The total surplus on December 31, 1912, was 50,659 cars; on December 14, 1912, 26,614; on December 20, 1911, 88,646 cars. Compared with the preceding period; there is an increase in the total surplus of 24,045 cars, of which 7,365

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is in box, 1,100 in flat, 10,221 in coal and 5,359 in miscellaneous cars. The increase in box car surplus is general throughout the country, except in group 6 (Iowa, Illinois, Wisconsin and Minnesota). The increase in flat car surplus prevails throughout the country, except in groups 9 (Texas, Louisiana and New Mexico), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona). It will be noted that there is an increase in coal car surplus in every group. Doubtless the observance of the holiday season by the miners has contributed to this. The increase in miscellaneous car surplus prevails throughout the country, except in groups 7 (Montana, Wyoming, Nebraska and the Dakotas), and 9 (as above).

The total shortage on December 31, 1912, was 33,601 cars; on December 14, 1912, 61,006 cars; on December 20, 1911, 11,832 the total surplus of 37,987 cars, of which 10,407 is in box, 1,928 in flat, 18,586 in coal and 7,066 in miscellaneous. There is an increase in the total shortage of 21,769 cars, of which 14,431 is in box, 2,489 in flat, 3,267 in coal and 1,582 in miscellaneous.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report and totals for the country for the corresponding dates for previous years; and the diagram shows the total bi-weekly surpluses and shortages from 1907 to 1912.

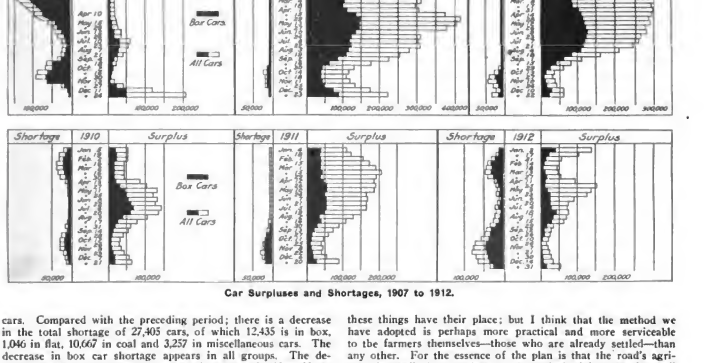
E. B. Thomas to the Farmers.

There are many ways in which railroads aid agricultural work. Some of them run special instruction trains and hold exhibitions; others issue numerous pamphlets; others attract settlers. All

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses—Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages—Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—December 31, 1912	7	331	545	83	333	1,292	313	131	158	40	642
" 2.— " 31, 1912	30	755	50	2,065	132	2,999	619	6	1,250	0	1,875
" 3.— " 31, 1912	30	837	339	4,264	927	6,369	5,958	30	2,519	528	9,035
" 4.— " 31, 1912	11	1,793	128	763	1,177	3,861	985	1,096	182	0	2,263
" 5.— " 31, 1912	27	326	21	1,013	855	2,215	3,020	1,059	100	78	4,257
" 6.— " 31, 1912	30	834	569	1,858	2,533	5,794	6,118	313	480	724	7,635
" 7.— " 31, 1912	5	67	163	124	398	742	456	0	20	48	524
" 8.— " 31, 1912	18	1,369	356	3,223	2,136	7,084	807	50	0	75	932
" 9.— " 31, 1912	14	2,572	† 173	335	607	3,667	0	4	0	18	22
" 10.— " 31, 1912	22	3,570	1,175	2,518	7,010	14,273	809	32	27	402	1,270
" 11.— " 31, 1912	6	624	562	0	577	1,763	5,011	30	0	105	5,146
Total, December 31, 1912	200	13,078	4,081	16,823	16,677	50,659	24,096	2,751	4,736	2,018	33,601
" January 3, 1912	167	26,145	9,004	64,719	32,448	142,316	5,953	104	88	233	6,378
" January 4, 1911	161	39,361	8,626	34,483	27,962	110,432	1,064	987	160	1,297	3,508
" January 5, 1910	154	20,830	8,451	10,204	12,815	52,309	7,304	344	4,906	1,339	13,893
" January 6, 1909	156	146,255	25,283	117,686	43,695	333,019	170	202	120	14	506

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1912.

cars. Compared with the preceding period; there is a decrease in the total shortage of 27,405 cars, of which 12,435 is in box, 1,046 in flat, 10,667 in coal and 3,257 in miscellaneous cars. The decrease in box car shortage appears in all groups. The decrease in flat car shortage is shown in groups 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 4 (the Virginias and Carolinas), 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 9, 10 (as above), and 11 (Canadian Lines). The decrease in coal car shortage is general, except in group 7 (as above). The decrease in miscellaneous car shortage prevails throughout the country except in groups 7 and 9 (as above).

Compared with the same date of 1911; there is a decrease in these things have their place; but I think that the method we have adopted is perhaps more practical and more serviceable to the farmers themselves—those who are already settled—than any other. For the essence of the plan is that the road's agriculturist shall give practical not theoretical advice; that he shall become acquainted with the particular problem of the particular man, and point out just what should be done and what should not be done in special cases.

In the section traversed by the Lehigh Valley is located much of the best land to be found anywhere in the United States. You all know how far some of the apples which are grown in the east surpass the far-famed western product. It does seem a pity that here in New York and Pennsylvania, so near the

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large cities which constitute such insatiable markets, there is so much land that is either not cultivated in the most remunerative manner or not cultivated at all.

Any fair-minded man, from a very brief examination of rate schedules, will conclude that the proportion of the market price of agricultural products that goes into the freight rate is far from too large; transportation is the only article having a relation to the cost of living that has not advanced in price. The farmers frequently complain that they get far too small a price for their milk, considering what it is sold for in New York. The railroad company gets 32 cents for transporting a can of 40 quarts from the most distant zone, 190 miles or more from New York City. Some of our milk is shipped from as far as 400 miles from the city. The railroad rate of 4/5 of a cent a quart I hardly think that anybody can justly call an exorbitant rate, especially when the character of the service is considered —the refrigeration, the collecting at the various milk stations, the quality of the equipment necessary, and the fast schedule upon which milk trains are operated. These rates have not been increased in over fifteen years. Hence they could not have been a factor in the increased retail price of milk. The point I wish to make is that, if the cost of food products has become unduly high, it is not because the railroad or the farmer is getting too much out of it.

I suggest that you think seriously of a plan that has been proposed, for farmers to co-operate and establish storage plants where they can keep their products at a time of over-supply. I know, of course, that there will be some to remind us that there were not enough cars last autumn to ship the vegetables to market, and it is true that a scarcity of cars was felt. But it is absolutely impossible for enough cars to be kept in service to meet such a situation as the one I mention.

In the quality of railroad service, naturally, the farmer is vitally interested. On no railroad is the service perfect. In this world things never are. But, speaking for the Lehigh Valley, I can say that the management makes a sincere effort to give just as good service as possible to the farmers. Traffic is handled more safely and rapidly now than ever before. But that is not to say that we are standing still, content with things as they are.

The rapid development of the railroad industry has been attended by many changes calculated to excite not only unjust but even just criticism. In a new country, under new conditions, and without experience of the past as a guide, there has been developed a system of transportation such as the world had never dreamed of. To say that such a vast industry could have been developed, with the multitude of minds and the millions of capital which it required, without some individuals having seized upon the opportunity to increase their own fortunes, would be to say that human nature had changed. No enterprise of this magnitude in the history of the world has ever been conceived and carried on without individual benefit to its promoters. To say that it could have been done in the development of the railroads is to insist that the men who were engaged in it are fit only for that place where the only method of transportation is wings and the sound of the whistle is replaced by the music of harps. . . .—*E. B. Thomas, President of the Lehigh Valley, before the Farmers' Institute at Towanda, Pa., January* 11.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended from January 1 to May 1, an item in a supplement to Hosmer's tariff, which provides that the joint through class rates named in the tariff will not apply between Missouri river points, Mississippi river crossings and certain stations on the St. Louis, Iron Mountain & Southern between St. Louis, Mo., and Memphis, Tenn., and that the combination of locals will apply in lieu thereof. Taking Kansas City, Mo., as a representative point of origin, and Williamsville, Mo., as a representative destination, the cancellation of existing rates would result in an advance of 28 cents on first class with corresponding advances on the lower classes.

The commission has suspended from January 7 until May 7 certain items in supplement to the tariff of M. P. Washburn, which advance rates for the transportation of ground iron ore, in carloads, from Chattanooga, Tenn., and certain other points to New York, Boston, Mass., and certain other points. The present tariff provides a rate of $3.79 per gross ton from Chattanooga to Boston, all rail, and a rate of $3.57 per gross ton from Chattanooga to New York, all rail. The items which have been suspended advance the rates to $6.60 per gross ton to Boston and $5.95 per gross ton to New York, making an advance of $2.81 per gross ton to Boston and $2.38 per gross ton to New York.

The commission has suspended from January 5 until May 5 items in a supplement to Emerson's tariff, which change the rates on classes and commodities from New Orleans, and points in that vicinity, to Rock Falls and Sterling, Ill. Up to the present time Chicago rates have been applicable to this traffic. The suspended items provide for application of the Dubuque, Ia., basis of rates on traffic from New Orleans to Sterling and Rock Falls, which change would result in an advance of 5 cents per 100 lbs. on the first and second classes, no change on the third and fourth classes, an advance of 3 cents on fifth class and 4 cents on sixth class, an advance of 5 cents per 100 lbs. on sugar in carloads, and similar advances on other commodities.

The commission has suspended from December 31, until April 30, certain tariff schedules which eliminate through rates for the transportation of lumber from points in British Columbia and Alberta, Canada, and Oregon, Washington and other states to eastern points via Denver, Pullman and Pueblo, Colo., in connection with the Atchison, Topeka & Santa Fe; Chicago, Burlington & Quincy; Chicago, Rock Island & Pacific; and Missouri Pacific, and provide for application of combination rates, leaving through rates in effect on shipments moving over the Oregon-Washington Railroad & Navigation Company and the Oregon Short Line to eastern points only via the Union Pacific. The present rate from Portland, Oregon, to Chicago via the Colorado gateways is 65 cents and the proposed rate is 89 cents, an advance of 24 cents. The present rate from Portland to New York is 85 cents, and the proposed rate is $1.08½, an advance of 23½ cents.

Salt Rates Not Advanced.

In re investigation and suspension of advances in rates by carriers for the transportation of salt from Kansas points to stations located on the Wichita Falls & Northwestern in the state of Oklahoma. Opinion by Chairman Prouty:

The effect of the tariff under suspension is to cancel joint rates on salt from the salt fields of Kansas to points in Oklahoma on the Wichita Falls & Northwestern, thereby advancing rates when shipped by these routes from 5 cents to 10 cents per 100 lbs. The commission found that as the carriers did not justify the proposed advances, the advances are unjust and unreasonable and that the present through route should be maintained. (25 I. C. C., 610.)

Minimum Weight and Car Sizes.

Riverside Mills v. Georgia Railroad et al. Opinion by the commission:

Charges collected for the transportation of two shipments of cotton-factory sweepings from Augusta, Ga., to Lockland, Ohio, were found to have been unreasonable. Reparation was awarded.

Carload minimum weights should be established with reference to the loading capacity of the car. If carriers desire to protect themselves from unduly low charges per car, they should do so by regulating the rate, and not by prescribing minimum weights which can only be loaded in cars of unusual size.

It is incumbent upon carriers to furnish cars that will ordinarily contain the minimum weight which they have established, or to publish a rule that will provide for charging shippers on that basis, when unable to furnish such cars. (25 I. C. C., 434.)

Complaint Dismissed.

Manufacturers & Merchants' Association of New Albany, Ind., et al. v. Aberdeen & Asheboro et al. Opinion by Commissioner Clements:

The petitions for modification and extension of the original order in this case (24 I. C. C., 331), mentioned in the *Railway Age Gazette* of July 26, 1912, page 179, filed by the complainants, and for setting aside of the original order, filed by the defendants, were denied as to all contentions of both parties, except as to complainants' request for reconsideration of question of reparation. (25 I. C. C., 116.)

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REVENUES AND EXPENSES OF RAILWAYS.

FIVE MONTHS OF FISCAL YEAR, 1913—(CONTINUED FROM P. 79).

Name of road.	Average mileage operated during period.	Operating revenues			Maintenance		Operating expenses			Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.				
Illinois Central	4,763	$18,035,144	$5,946,082	$27,126,850	$4,853,020	$6,059,356	$570,147	$10,287,114	$641,292	$21,611,329	$5,515,521	—$52,246	$1,187,750	$4,674,525	$779,052
Indiana Harbor Belt	105	.....	.....	1,305,226	147,319	434,582	13,449	530,227	30,092	878,763	426,463	15,217	27,800	414,378	14,079
Lake Erie & Western	806	2,098,673	415,907	2,655,631	373,518	434,582	62,639	938,556	55,885	1,864,980	790,651	.....	102,553	688,098	114,261
Lake Shore & Michigan Southern	1,873	16,067,935	5,552,266	24,218,142	3,023,269	3,292,627	621,280	11,179,247	1,157,847	14,980,263	9,268,068	117,696	730,000	8,853,756	733,540
Lehigh & Hudson River	97	720,846	22,986	761,886	118,458	107,227	6,333	255,573	20,567	508,158	253,728	.....	20,000	233,728	11,238
Long Island	399	1,561,439	3,639,359	5,475,368	668,846	545,688	82,037	2,114,901	107,835	3,519,287	1,956,081	345,510	282,250	2,019,341	246,358
Louisiana & Arkansas	255	533,191	105,742	684,749	112,814	107,294	11,350	270,024	24,344	436,672	248,077	.....	20,000	206,898	41,179
Louisiana Ry. & Navigation	311	617,268	134,096	809,499	105,428	91,090	29,228	302,331	30,152	396,429	314,070	.....	27,500	286,570	68,776
Louisville & Nashville	4,723	17,837,042	5,593,341	24,852,096	4,427,873	4,279,294	521,384	7,870,053	534,768	17,633,376	7,192,813	—12,435	764,266	6,416,112	—611,437
Louisville, Henderson & St. Louis	200	378,169	176,240	634,995	148,768	71,499	22,647	192,378	15,116	450,360	84,635	1,262	15,000	70,897	—67,261
Maine Central	1,049	2,973,532	1,267,407	5,044,319	910,922	647,835	58,439	1,745,286	120,296	3,483,278	1,561,041	9,247	214,444	1,355,844	79,872
Michigan Central	1,817	9,212,452	3,334,046	14,042,127	1,791,728	2,047,2	412,059	4,824,1	232,917	9,856,913	4,816,614	22,979	720,000	4,269,593	—199,853
Midland Valley	373	451,446	210,489	696,982	169,732	103,512	12,772	214,383	37,755	528,128	168,853	1,679	27,339	142,693	14,169
Minneapolis & St. Louis	1,242	3,534,584	1,134,340	4,911,406	1,000,290	566,586	119,504	1,194,504	82,166	3,142,281	1,769,125	—162	153,125	1,615,838	24,408
Minneapolis, St Paul & Sault Ste. Marie	3,976	10,427,252	3,097,691	14,232,338	1,575,130	1,546,810	270,085	3,989,496	258,344	7,639,965	6,592,473	102,738	756,699	5,938,512	1,402,343
Missouri, Kansas & Texas	3,819	9,765,632	4,067,209	14,653,794	1,988,926	1,824,911	306,193	4,858,562	400,866	9,379,317	5,273,467	—22,942	528,801	4,719,724	1,579,794
Missouri Pacific	3,929	9,457,963	3,234,258	12,753,526	2,099,105	2,249,126	301,216	5,043,667	344,890	10,033,026	2,758,562	—14,483	456,950	2,287,095	1,364,438
Mobile & Ohio	1,114	4,166,841	651,993	5,103,044	694,372	959,915	185,933	1,782,513	153,607	3,685,530	1,419,514	—6,843	149,295	1,263,376	—19,991
Nashville & Decatur	65	156,722	.....	176,227	29,613	23,123	1,775	82,227	9,887	146,551	29,676	.....	11,000	18,676	16,398
Nashville, Chattanooga & St. Louis	1,231	3,788,626	1,356,267	5,522,901	828,087	1,036,010	195,106	2,044,479	136,291	4,223,975	1,298,926	—2,241	127,080	1,168,685	5,064
New York Central	165	553,239	78,773	650,395	79,866	22,062	1,874	132,535	17,528	303,870	346,525	.....	30,746	315,979	30,304
New Orleans & North Eastern	196	1,141,276	1,143,241	2,443,144	167,133	196,562	49,326	595,009	60,023	1,120,452	352,796	244	63,500	289,540	111,367
New Orleans Great Northern	283	483,762	154,427	693,903	111,013	92,342	12,193	299,934	33,878	449,360	244,460	—350	9,050	235,041	4,808
New Orleans, Mobile & Chicago	327	890,462	156,747	1,130,476	176,666	162,166	16,792	352,622	32,167	675,840	363,836	—391	20,775	342,470	71,693
New York Central & Hudson River	3,593	28,876,382	15,375,236	46,759,635	6,839,336	8,916,094	940,972	16,615,401	1,108,157	34,420,363	14,899,072	207,699	2,656,811	12,349,960	105,694
New York, Chicago & St. Louis	529	4,468,901	747,571	5,413,914	619,303	625,568	153,330	2,121,489	82,662	3,764,292	1,209,642	—6,921	180,000	1,522,721	166,138
New York, New Haven & Hartford	2,291	9,457,963	12,834,258	12,753,526	2,099,105	2,249,126	301,216	5,043,667	344,890	10,033,026	2,758,562	—14,483	456,950	2,287,095	1,364,438
New York, Philadelphia & Norfolk	2	1,230,369	229,261	1,581,810	130,016	270,960	20,428	653,214	62,728	1,137,886	443,924	.....	58,500	385,424	57,677
Norfolk & Western	2,010	15,812,700	2,239,272	18,227,426	2,531,915	3,367,166	276,069	5,260,790	341,479	11,777,810	6,294,616	—15,598	600,000	5,678,028	498,288
Norfolk Southern	561	857,041	357,518	1,334,189	249,740	174,290	34,290	410,724	31,911	899,903	434,286	—7,249	30,000	397,035	42,273
Northern Central	423	4,236,276	1,097,494	5,954,634	678,411	1,034,267	176,009	2,595,993	127,236	4,816,286	1,176,548	4,309	238,994	942,763	108,278
Northern Pacific	6,733	20,506,644	4,691,103	28,361,966	4,102,857	3,564,499	510,187	8,564,499	417,706	18,966,836	14,395,130	206,271	1,359,167	13,046,229	1,442,136
Pacific Coast Co.	1,764	2,405,288	2,311,991	6,727,768	971,107	1,000,769	341,895	2,395,532	207,391	5,016,693	1,711,075	1,050	31,657	1,678,468	14,063
Pennsylvania R. R. & Nav. Co.	5,310	52,782,824	32,911,413	87,726,206	13,091,184	630,082	219,647	2,782,117	227,729	5,060,764	3,509,634	—14,291	452,910	2,842,433	281,260
Pennsylvania Southern Texas	479	937,468	276,870	1,345,139	227,756	157,344	30,972	311,152	30,266	757,293	427,793	.....	25,000	402,793	189,963
Pere Marquette	1,751	5,955,930	1,381,676	10,149,890	1,573,617	1,946,401	419,213	3,553,072	483,336	9,975,639	10,174,251	—14,355	1,188,101	8,971,795	1,629,357
Philadelphia & Reading	1,015	12,393,406	3,744,529	21,575,911	3,063,345	3,458,792	552,565	7,626,829	1,714,574	14,410,619	23,173,423	—310,103	3,026,397	19,837,061	2,233,505
Pittsburgh & Lake Erie	273	4,651,481	1,305,467	9,312,500	1,429,709	1,516,219	124,913	3,592,302	216,080	6,913,723	2,200,777	.....	273,645	1,926,172	1,435,991
Pittsburgh, Shawmut & Northern	278	1,435,760	255,713	1,813,142	274,000	170,844	29,760	734,007	54,413	1,263,024	550,118	—1,497	36,000	512,615	64,808
Pittsburgh, Lisbon & Western	1,467	13,863,085	3,636,255	19,163,154	2,979,768	3,489,249	358,463	6,564,165	346,874	13,738,519	5,724,735	—3,756	710,454	5,010,525	473,736
Pittsburgh, Lisbon & Western	228	618,054	59,131	761,834	163,458	166,999	5,681	231,179	19,110	526,635	234,693	.....	7,942	226,751	39,643
Pittsburg & Shawmut	72	672,811	.....	694,014	114,727	79,986	153	179,827	351	374,827	319,187	35,887	40,000	243,934	164,455
Pittsburg, Shawmut & Northern	368	891,672	193,342	1,165,737	192,294	310,405	43,725	627,953	31,625	1,205,102	490,655	.....	67,045	423,610	4,082
Rutland	3,186	19,811,270	2,276,176	24,676,327	3,727,445	2,265,685	265,424	4,491,064	240,000	10,041,611	4,632,186	—25,511	1,473,925	3,133,400	741,100
Rutland	96	2,764,232	662,342	3,582,965	416,827	575,997	138,846	953,518	127,248	2,062,436	1,520,529	—3,784	120,290	1,396,455	122,744
Seaboard Air Line	2,712	8,139,992	1,190,576	10,143,845	1,627,901	58,765	6,210	167,933	10,384	311,195	153,151	.....	12,000	141,151	16,147
Southern	7,036	35,576,646	7,041,472	49,030,534	3,241,015	4,701,537	852,568	13,434,760	1,174,290	19,672,169	9,464,472	19,235	1,071,710	8,411,997	405,886
Southern Pacific	281	203,747	152,181	492,830	138,533	42,260	12,134	109,648	19,768	412,343	80,427	.....	33,608	46,669	—56,302
Southern Pacific	1	565	1,351	2,016	1,180	1,182	1,182	1,182	1,182	5,910	2,345,572	.....	9,437	276,136	164,185
Southern Pacific Co.	8,317	36,542,953	13,884,761	43,316,759	4,237,162	3,506,073	847,903	11,154,335	1,046,672	22,792,115	20,416,644	216,804	1,140,103	19,317,045	2,254,159
Southern Pacific Co.	3,566	1,404,138	781,416	2,262,753	242,350	191,911	41,367	538,897	67,231	1,027,346	1,285,407	3,486	267,000	1,013,893	39,850
Southern Ry. & Nav. Co.	271	1,462,142	170,404	1,713,103	315,574	71,200	14,385	352,792	25,833	1,000,784	185,012	.....	11,112	173,900	18,904
Southern Ry. & Steamship Co.	344	.....	1,423	1,291,701	193,274	73,339	4,571	452,469	36,958	761,111	530,590	58,880	143,500	445,970	124,197
Southern Ry. in Georgia	458	1,151,027	486,502	1,746,462	260,677	303,544	37,293	667,332	55,981	1,454,367	292,095	2,090	67,338	331,647	—17,012
Texas & Pacific	1,865	5,518,609	1,992,552	8,060,027	1,113,461	1,268,809	166,587	3,452,018	229,962	6,230,837	1,729,190	6,722	254,467	1,481,445	—99,765
Tennessee Central	413	2,052,393	599,514	2,902,300	349,538	427,153	34,406	786,661	45,458	1,653,419	848,881	—3,598	101,032	744,256	36,915
Texas & Pacific	1,851	5,456,609	1,969,136	7,733,909	1,083,725	1,249,238	153,246	3,377,976	46,446	1,710,774	5,723,275	.....	74,000	449,275	13,042
Texas & New Orleans	463	1,037,170	262,980	1,346,468	203,369	150,473	50,241	538,333	58,405	1,090,921	345,647	.....	20,925	324,722	100,164
Toledo & Ohio Central	3,574	17,371,069	4,932,671	24,233,858	2,479,186	2,854,742	433,561	5,971,798	534,291	11,993,518	12,330,340	—1,032	904,476	11,424,832	1,258,900
Toledo, Peoria & Western	241	584,077	172,301	776,872	157,559	.....	26,110	13,438	96,942	613,990	162,882	.....	26,255	582,755	90,539
Union Pacific	31	.....	.....	2,755,293	150,701	419,034	604	709,441	14,841	1,294,621	957,382	9,655	28,250	938,987	82,954
Union Pacific System	8,7	3,393,292	1,668,257	4,944,460	667,424	867,353	128,641	1,215,937	91,611	3,470,966	1,473,494	.....	150,280	1,323,214	444,035
Utah	511	432,494	276,784	715,475	151,904	124,072	16,197	208,774	25,211	533,658	181,817	—1,777	29,500	152,540	30,296
Virginia & Southern	474	2,028,953	131,036	2,270,911	300,436	476,171	27,133	558,461	42,698	1,325,901	895,010	31,061	87,900	838,173	80,939
Wabash	2,355	7,660,346	2,275,314	9,941,839	1,429,114	454,145	75,008	1,369,721	63,502	2,701,495	1,140,344	—19,668	112,565	1,008,111	252,835
Wabash Pittsburg Term.	1,324	3,100,736	1,116,553	4,539,462	907,132	640,314	77,231	1,225,981	136,386	3,487,044	1,052,418	—157	185,000	867,261	58,857

Average mileage operated during previous period—[illegible]103; [illegible]1,776; [illegible]4,705; [illegible]1,180; [illegible]1,805; [illegible]3,770; [illegible]3,398; [illegible]3,916; [illegible]1,255; [illegible]404; [illegible]3,591; [illegible]562; [illegible]2,005; [illegible]472; [illegible]6,019; [illegible]1,689; [illegible]296; [illegible]1,416; [illegible]3,978; [illegible]213; [illegible]240; [illegible]3,814; [illegible]842; [illegible]7,089; [illegible]6,184; [illegible]551; [illegible]35; [illegible]3,506.—Indicates Deficits. Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1912.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses — Maintenance			Operating expenses			Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total. inc. misc.	Way and structures.	Of equipment.	Total.	Traffic.	Transportation.	General.	Total.				
Alabama Great Southern	309	$311,756	$165,670	$486,279	$53,753	$92,225	$152,764	$12,764	$141,418	$9,869	$310,079	$146,250	—$498	$14,562	$131,190	$15,043
Atlanta & West Point	93	54,260	40,258	105,432	11,382	19,404	32,241	3,246	54,386	4,995	75,406	30,024	43	7,244	22,723	2,810
Baltimore & Ohio Chicago Terminal	77	.....	2,018	160,854	33,899	16,678	779	76,925	4,611	132,892	27,962	824	19,115	9,671	4,964
Belt Ry. Co. of Chicago	21	.....	.....	269,372	19,190	40,117	465	121,556	5,676	186,213	83,158	.....	8,138	75,020	—13,107
Central Vermont	411	227,172	83,840	339,637	32,014	58,201	8,064	177,639	8,276	284,194	55,443	135	12,209	43,378	8,350
Chicago & Erie	270	$25,235	$8,459	425,060	75,856	96,555	21,064	238,295	11,753	443,523	—18,463	—1,080	13,334	—32,877	—94,696
Chicago, Indianapolis & Louisville	617	401,241	132,142	586,531	81,364	71,407	18,121	226,610	13,746	411,288	175,243	.....	22,640	154,603	42,293
Chicago, Terre Haute & Southeastern	351	158,614	17,031	190,219	25,986	31,964	3,143	78,453	8,242	121,788	68,431	—187	10,000	58,244	—2,708
Cincinnati, Hamilton & Dayton	1,015	718,719	127,986	945,754	112,647	142,295	19,134	391,408	22,614	688,098	257,656	.....	38,443	219,213	37,745
Cincinnati, New Orleans & Texas Pacific	337	699,198	149,856	941,706	86,267	215,398	22,344	402,216	19,192	596,927	344,781	.....	20,000	324,780	269,810
Detroit & Toledo Shore Line	79	102,079	.....	102,448	9,216	6,278	1,218	29,276	2,399	48,387	54,061	.....	4,830	49,231	3,096
Duluth, South Shore & Atlantic	627[1]	169,335	81,959	264,766	54,264	33,953	11,920	111,699	19,360	231,196	33,590	—137	18,000	15,727	—33,047
Erie	1,988[2]	2,575,491	744,544	4,215,643	545,439	823,902	93,493	1,565,301	95,241	3,123,814	1,592,319	—9,031	155,235	1,430,453	118,928
International & Great Northern	1,190	887,649	226,309	1,184,546	159,942	150,449	26,171	464,977	40,107	841,746	342,800	—1,658	30,000	311,142	—129,371
Kanawha & Michigan	177[3]	233,164	30,855	270,405	39,440	62,276	2,426	75,092	6,652	185,896	84,509	—11	8,749	75,759	—4,058
Kansas City Southern	827	728,310	140,078	959,329	103,444	105,715	25,759	301,867	22,664	569,449	389,880	.....	35,842	354,038	78,309
Lehigh Valley	1,453[4]	3,261,111	361,592	3,744,264	531,731	544,063	81,156	1,309,442	63,591	2,451,008	1,293,256	—8,343	117,500	1,175,133	89,123
Louisiana Western	298	127,523	59,376	196,250	25,075	38,860	6,714	57,621	4,327	132,537	63,713	1,128	7,228	57,613	5,962
Morgan's La. & Tex. R. & S. S. Co.	404	381,447	95,626	497,643	50,945	65,172	12,917	158,031	8,369	343,832	153,809	—722	17,999	137,088	—21,314
New Orleans, Texas & Mexico	277[5]	142,417	17,474	169,863	23,169	6,922	2,701	84,003	6,217	103,012	66,851	.....	4,505	62,346	17,887
New York, Ontario & Western	566	589,670	89,824	715,144	90,947	109,920	9,318	283,905	13,751	507,841	207,303	—4,725	18,167	184,411	46,898
New York, Susquehanna & Western	155[6]	164,226	45,817	240,327	27,231	28,771	2,592	108,071	5,065	171,640	68,687	3,897	14,673	57,911	—36,025
Northwestern Pacific	401[7]	134,324	130,204	286,843	36,838	37,346	4,572	109,764	12,727	201,747	84,898	.....	12,879	72,019	15,950
Peoria & Eastern	352	233,760	39,729	313,909	26,713	71,033	4,782	114,267	5,574	222,519	91,390	.....	14,900	77,490	26,192
Richmond, Fredericksburg & Potomac	89[8]	122,968	73,978	228,380	31,397	29,076	2,632	83,622	7,931	154,658	73,722	.....	805	73,117	10,621
St. Joseph & Grand Island	319	79,074	29,590	120,459	28,802	17,932	4,802	55,289	5,237	112,562	7,897	—1,133	6,396	368	13,354
St. Louis & San Francisco	4,742[9]	2,770,154	574,273	3,961,638	569,622	538,190	76,872	1,315,576	99,475	2,595,535	1,366,103	.....	137,148	1,224,753	78,631
St. Louis, Brownsville & Mexico	510	153,102	74,268	242,756	38,530	35,889	6,449	115,760	9,439	204,267	38,489	.....	5,000	33,390	—20,189
St. Louis Merchants' Bridge Terminal	9	.....	360	182,462	10,068	9,340	699	98,736	1,494	139,362	43,100	.....	6,100	36,799	17,605
St. Louis Southwestern of Texas	703	319,663	106,002	456,272	95,902	88,775	11,810	165,693	19,978	382,156	74,614	59	10,380	64,323	—56,536
Southern Pacific, Los Angeles & Salt Lake	1,135[10]	608,310	221,691	893,139	89,940	145,294	31,257	291,433	19,276	577,652	315,487	—1,448	24,011	289,000	—47,491
Seaboard	3,070[11]	1,488,498	380,623	2,081,381	292,482	289,574	61,928	748,426	62,604	1,443,014	638,367	—2,011	81,000	553,356	28,457
Tuscola, Peoria & Western	248	65,217	29,850	111,598	18,742	24,187	727	44,254	3,293	93,295	18,303	.....	4,000	13,503	2,418
Ulster & Delaware	129	58,434	16,850	80,432	8,775	11,606	1,094	37,906	2,456	60,937	19,495	183	3,300	—18,738	—3,081
Virginia & Southwestern	240	132,327	13,486	154,861	23,182	33,797	1,812	42,169	3,735	104,686	50,175	.....	5,500	44,675	5,494
Wabash	2,315	1,954,213	593,903	2,742,209	359,616	440,457	86,324	1,115,504	65,991	2,111,844	630,228	—7,979	71,655	551,594	102,317
Washington Southern	36	39,107	37,019	104,515	16,773	12,360	1,164	40,213	3,087	73,797	30,718	.....	4,000	26,677	—209
Western Maryland	543	530,423	66,997	640,128	86,146	90,422	14,828	265,889	11,407	468,742	171,386	.....	20,000	151,386	—30,391
Western Pacific	937	450,275	94,468	568,284	78,239	42,862	28,358	213,409	24,548	385,916	174,368	—1,165	23,064	152,129	19,489
Western Ry. of Alabama	338	93,167	48,141	176,098	20,978	21,407	6,062	35,159	5,719	89,325	39,365	.....	6,500	32,240	3,925
Wheeling & Lake Erie	459[12]	632,375	44,698	714,826	91,737	136,448	8,355	228,101	12,008	476,669	238,157	1,313	31,581	207,939	14,858

FIVE MONTHS OF FISCAL YEAR, 1913.

Alabama Great Southern	309	$1,415,215	$554,040	$2,150,596	$256,907	$445,067	$692,905	$668,986	$47,003	$1,480,668	$669,928	—$2,132	$71,542	$596,254	$47,640
Atlanta & West Point	93	266,141	215,596	531,789	69,365	93,976	26,396	170,693	25,081	385,711	146,078	724	30,053	116,799	—5,741
Baltimore & Ohio Chicago Terminal	77	.....	11,169	807,637	123,979	109,300	3,578	376,879	22,195	597,938	209,729	4,528	95,376	118,681	52,394
Belt Ry. Co. of Chicago	21	.....	.....	1,376,277	96,376	168,607	2,549	530,559	29,098	827,204	549,073	.....	37,246	473,579	31,769
Central Vermont	411	1,156,000	563,391	1,962,012	232,083	288,749	43,822	873,765	40,088	1,478,507	383,510	1,897	61,000	324,407	—77,265
Chicago & Erie	270	1,863,873	333,262	2,405,123	459,121	491,560	103,756	1,164,598	54,389	2,273,624	131,499	—5,889	65,351	60,259	—217,144
Chicago, Indianapolis & Louisville	617	2,015,856	770,061	3,073,227	439,468	326,394	90,458	1,095,496	74,880	2,026,696	996,581	.....	116,233	880,348	7,736
Chicago, Terre Haute & Southeastern	351	739,716	93,219	844,665	153,468	163,817	15,013	256,811	38,174	627,281	217,484	—1,039	50,000	166,465	—53,772
Cincinnati, Hamilton & Dayton	1,015	3,468,230	762,999	4,718,936	533,752	767,210	100,127	1,796,128	95,852	3,295,189	1,423,747	.....	176,927	1,246,720	67,597
Cincinnati, New Orleans & Texas Pacific	337	3,231,343	780,958	4,223,278	465,183	860,441	113,352	1,765,211	95,246	2,771,183	1,451,968	—1,251	141,000	1,309,717	—98,084
Detroit & Toledo Shore Line	79	534,373	.....	536,530	88,081	30,973	5,811	145,533	11,731	282,129	254,401	.....	23,430	230,971	21,421
Duluth, South Shore & Atlantic	627[1]	943,477	462,577	1,476,942	338,238	163,683	51,366	540,703	59,987	1,153,977	322,965	5,539	90,000	238,504	—133,261
Erie	1,988[2]	17,653,514	4,342,740	23,760,238	2,918,509	3,946,585	474,161	7,463,240	427,720	15,230,215	8,530,523	6,839	721,309	7,816,053	653,183
International & Great Northern	1,160	3,981,388	1,200,018	5,483,845	667,620	664,969	129,603	1,989,536	161,864	3,613,591	1,870,254	—10,823	150,000	1,709,431	
Kanawha & Michigan	177[3]	1,164,103	171,505	1,466,721	199,847	247,688	11,327	400,627	31,677	891,166	575,555	—97	45,647	529,811	—26,501
Kansas City Southern	827	3,399,123	742,525	4,593,763	454,830	597,421	128,512	1,428,512	156,446	2,765,721	1,828,042	.....	179,210	1,648,832	398,407
Lehigh Valley	1,453[4]	16,178,836	2,278,296	19,081,854	2,616,090	3,040,185	411,229	5,712,500	319,831	12,099,835	6,981,489	—49,999	587,000	6,343,950	1,642,310

Average mileage operated during previous period—[1] 623; [2] 1,995; [3] 176; [4] 1,431; [5] 264; [6] 152; [7] 404; [8] 83; [9] 4,732; [10] 1,113; [11] 3,054; [12] 457. —Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

FIVE MONTHS OF FISCAL YEAR, 1913—(CONTINUED).

Name of road	Average mileage operated during period.	Operating revenues			Operating expenses				Net operating income (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) compared with last year.
		Freight.	Passengers.	Total.	Maintenance of way, struc. inc. misc. structures.	Maintenance of equipment.	Traffic.	Trans-portation.	General.	Total.				
Louisiana Western	208	$607,962	$272,131	$926,476	$94,666	$154,875	$34,587	$278,319	$36,942	$589,409	$337,067	$2,689	$84,943	$300,823	$93,953
Louisville, Henderson & St. L. Co.	229	1,480,047	901,116	2,631,404	330,503	443,111	63,381	1,077,260	74,648	1,990,913	640,491	91,184	91,184	197,308	—127,910
Louisville, Hen. & St. Louis	773	3,489,039	963,415	4,651,804	524,158	643,211	227,286	2,140,000	317,049	3,851,705	800,099	94,182	94,182	705,917	—157,313
New York, Ontario & Western	396	3,137,897	987,125	4,341,130	561,502	611,600	58,215	1,476,990	89,896	2,798,203	1,542,927	—6,301	96,833	1,434,793	297,404
Northern Central	1,166	7,357,357	3,081,215	10,643,570	1,467,332	1,615,975	1,615,975	3,615,975	1,615,975	8,315,257	2,328,313	—1,615,975	712,338	1,615,975	1,615,975
Northwestern Pacific	4017	2,731,005	959,760	1,721,218	235,784	187,458	18,684	584,516	64,462	1,090,958	710,260	.....	62,895	648,865	—87,799
Peoria & Eastern	312	1,152,339	333,409	1,527,756	196,865	276,629	22,866	546,062	28,502	1,070,918	536,889	.....	33,200	453,860	132,363
Pittsburgh, Fort Wayne & Toledo	119	1,013,428	144,484	1,249,048	148,934	182,230	24,439	307,767	36,839	700,187	548,861	.....	31,974	516,887	—51,598
Richmond, Fredericksb. & Potomac	119	361,543	242,264	649,516	81,731	98,720	14,109	107,767	16,829	319,157	141,969	.....	10,251	130,718	—31,988
St. Louis & San Francisco	4,742*	11,751,965	4,839,365	16,871,301	2,564,438	2,453,950	397,986	6,467,418	518,816	12,313,658	6,337,873	.....	854,381	5,703,412	363,414
St. Louis, Brownsville & Mexico	510	727,270	273,367	1,196,274	195,468	130,202	24,709	529,330	45,760	925,478	260,796	.....	22,540	233,296	—72,447
St. Louis Southwestern of Texas	703	1,551,614	535,499	2,316,695	360,833	404,836	80,486	801,993	93,213	1,672,365	487,249	—991	51,800	434,249	—25,235
San Antonio, Los Angeles & Salt Lake	1,020*	6,443,199	2,009,094	9,453,924	1,336,723	1,372,096	310,693	3,431,096	386,340	6,786,465	2,581,309	—12,845	485,000	2,083,464	1,014,638
Toledo, Peoria & Western	248	344,617	221,660	603,053	94,592	109,442	12,668	210,041	12,408	455,491	149,562	.....	24,000	125,562	—35,550
Ulster & Delaware	120	806,740	228,476	1,562,585	77,263	84,025	7,499	214,300	12,164	395,311	167,274	104	16,300	171,078	—32,383
Union Pacific System	8,170	39,643,247	12,797,191	57,722,974	7,707,063	8,142,705	1,442,409	17,144,000	1,761,104	36,197,281	21,525,693	.....	1,999,000	19,526,693	1,999,000
Wabash	2,515	9,644,513	3,381,591	14,707,231	1,959,599	2,147,384	431,132	5,003,135	220,315	10,761,565	3,945,246	—21,533	352,776	3,566,127	417,240
Washington Southern	36	197,065	184,588	500,345	69,292	57,899	3,548	191,467	14,052	336,815	161,530	.....	16,733	144,797	7,440
Western Maryland	542	2,151,262	488,162	3,197,068	425,502	439,268	79,379	1,264,920	60,454	2,269,228	927,945	—11,119	100,000	727,948	—255,010
Western Pacific	1,132	2,790,519	1,135,141	4,197,787	557,104	1,014,660	147,264	1,664,000	75,713	3,458,741	739,046	—1,041	100,000	638,005	—118,518
Western Ry. of Alabama	133	290,519	235,851	590,633	99,094	105,894	28,220	183,359	27,412	443,679	154,804	.....	12,500	131,355	—18,758
Wheeling & Lake Erie	1,139	2,536,301	911,606	3,761,557	467,278	615,668	42,231	1,107,041	67,252	2,240,827	1,423,030	13,607	154,136	1,109,341	1,241,453

* Average mileage operated during previous period.—† 264; ‡ 352; § 466; ‖ 583; ¶ 4,232; ** 1,112; †† 3,054; ‡‡ 457. — Indicates Deficits, Losses and Decreases.

Reparation Awarded.

Switzer Lumber Company v. Kansas City Southern Railway Company. Opinion by the commission:

The commission found that the rate of 18 cents per 100 lbs. for the transportation of lumber in carloads from Stables, La., to Ashdown, Ark., was unreasonable to the extent that it exceeded 10 cents. (25 I. C. C., 611.)

Arabol Manufacturing Company v. South Brooklyn Railway Company et al.

The commission found that the joint rates for the transportation of seventeen carloads of sizing from Bedford, N. Y., via Weehawken, N. J., to Carthage and other New York points were unreasonable to the extent that they exceeded the aggregate of the intermediate rates. (25 I. C. C., 429.)

In re investigation and suspension of advances in class and commodity rates by carriers operating between stations in the states of Missouri, Kansas and Nebraska.

Rates between points on the Joplin branch of the Missouri Pacific and points upon its Northern and Virginia branches may be constructed by combination in the same manner as from points upon its line between Kansas City and St. Louis. The order of suspension was vacated. (25 I. C. C., 401.)

STATE COMMISSIONS.

The New York State Public Service Commission, Second District, has consented to the discontinuance of passenger stations at six places on the Greenwich & Johnsonville. The company has found that there is no further need for passenger service at these stations because the people now travel by the Hudson Valley electric road.

The railway commissioners of Canada have issued a circular directing that engines running tender first, except suburban tank engines, equipped with pilot on tender, shall not exceed a speed of 20 miles an hour. The board has been impressed with the number of injuries to enginemen (in some cases fatal) apparently due to engines being run tender first at excessive speed.

The New York State Public Service Commission, First district (New York City), has sent to the legislature its annual report. The report is made up largely of an account of the doings of the commission in relation to rapid transit, which includes a list of the contractors who are doing the new work now under way, with information about the contracts. On the subject of grade crossings, of which there are 477 in Greater New York, the commission explains the reasons for its request for large appropriations from the state treasury. The companies operating surface railways in the city have introduced many additional gates and have taken other measures for protection, and the number of persons killed and injured has been diminished during the past five years, as shown by the following statement of the total numbers killed each year, namely: 1908, 21; 1909, 23; 1910, 16; 1911, 30; 1912, 10.

The annual report of the Indiana railroad commission, following the usual statistics, contains a recommendation for legislation to prevent trespassing on railway tracks by providing for a penalty to be imposed on persons who use the tracks as a thoroughfare. The commission also recommends legislation making it a misdemeanor for persons to pass under or over railway gates at highway crossings when the gates are down. The report shows that during the year 1912, 447 persons were killed on the steam and electric railways of the state and that there were 7,249 casualties altogether. The commission classifies 2/5 of the deaths as preventable and 4,103 of the casualties as preventable. The report states that when the signaling now ordered by the commission is installed, 64 per cent. of the steam railway mileage in the state will be equipped with block signals. Automatic block signals have been installed on 1,313 miles since the enforcement of the block signal law and manual block signals have been installed on 1,393 miles.

Massachusetts Commission's Views.

The Massachusetts Railroad Commission in its annual report considers the status of the New York, New Haven & Hartford, in the light of recent public discussions concerning the re-

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lations of the company to the state and to the road's patrons. Unlike former utterances of the Massachusetts commission this chapter is made up of statements which are couched in such general terms that they may be called vague. The substance of this long deliverance is all contained in the following seven paragraphs extracted by the *Boston Journal:*

"The people of this state have a right to demand railroad facilities commensurate with the profitable character of the business in this territory."

"It is the consensus of intelligent opinion that the system has already exceeded the proper limits of combination, and that unless it proceeds to voluntarily divest itself of some of the properties now held there is but little doubt that some other effectual means will be found for accomplishing that result."

"Indifference on the part of the railroad companies to the legitimate transportation needs of the communities which they serve, may imperil the continuance of the present relationship under which the companies are permitted to exercise functions of a public character."

"The New York, New Haven & Hartford Railroad as a result of excessive expenditure . . . in transactions outside the functions of a steam railroad has adopted economies in operation which have resulted in serious inconvenience to shippers and the general public."

"In so far as the present conditions can be attributed to the operation of the policy of monopoly, the results have been such as to cause a growing distrust in the wisdom of that policy."

"It seems imperative that some action be taken by the public authorities . . . to assert a more effective control over this railroad system, and to secure from it the proper performance of the obligation it has voluntarily assumed."

"There is a widespread feeling that this railroad system has become so large and is made up of so many heterogeneous elements that it is difficult to operate it efficiently under single control."

COURT NEWS.

The Pennsylvania Supreme Court has ordered a reargument of the case of the Pennsylvania vs. the State Railroad Commission, on the question of jurisdiction to determine the constitutionality of the full crew act. The reargument is to discuss the point whether the court or the commission alone can enforce the provisions of the act.

The federal court at Portland, Ore., has issued an injunction on the application of the Oregon-Washington Railroad & Navigation Company, restraining the enforcement of an act recently passed by the state legislature, limiting the hours of service for trainmen to fourteen hours a day. The court held that the state has no authority to enforce such an act, because it is in conflict with the federal statute.

The Atchison, Topeka & Santa Fe, St. Louis & San Francisco and Chicago, Rock Island & Pacific have filed bills in the federal court at Topeka, asking an injunction to prevent the enforcement of a rate law passed by the legislature of Kansas in 1905, which establishes maximum rates for the transportation of crude oil and its products. The provisions of the law have never been put into effect, but the complaints charge that it is now proposed to enforce it.

Following the decision in the case of the government against the coal carrying railroads of Ohio, reported in the *Railway Age Gazette*, January 3, page 35, the United States Circuit Court at Columbus has ordered the railroads interested to sell their stock in the Sunday Creek Coal Company. The order also says that the joint ownership of the Kanawha & Michigan by the Lake Shore & Michigan Southern and the Chesapeake & Ohio must be terminated.

The Butler County Railroad, a line in western Pennsylvania, and the Louisiana & Pacific, both classed as "tap lines," have petitioned the Commerce Court for an injunction restraining the Interstate Commerce Commission from enforcing its orders of May 14 and October 30, 1912, in which tap lines are excluded from the privilege of joining in through freight rates, on the ground that they are not common carriers. The petitions aver that the Interstate Commerce Commission has no authority to issue orders of the kind complained of.

Railway Officers.

Executive, Financial and Legal Officers.

A. E. Macdonald has been appointed general claim agent of the Canadian Northern and the Duluth, Winnipeg & Pacific.

M. K. King has been elected vice-president of the Canton Railroad, with headquarters at Baltimore, Md., succeeding J. Wm. Middendorf, resigned.

John F. Auch, whose election as vice-president and freight traffic manager of the Philadelphia & Reading, with headquarters at Philadelphia, Pa., has been announced in these columns, was born on March 18, 1858, in Pennsylvania. He began railway work in October, 1875, as night operator on the Philadelphia & Reading at West Spring Mills, Pa., and in 1879 was appointed station agent at Chalfont. In 1885 he was made chief clerk to the division freight agent of the Philadelphia & Atlantic City, now a part of the Reading system, with office at Philadelphia. From 1886 to 1888 he was division freight agent at the same place, and then was appointed traveling freight agent of the Atlantic City Railroad and the New York division of the Philadelphia & Reading. In 1889 he was appointed chief clerk to the general freight agent, and in April, 1891, was made division freight agent at Harrisburg. Three years later, he was promoted to assistant general freight agent at Philadelphia, remaining in that position for 14 years, until his appointment as general freight agent on May 1, 1908. He was promoted to assistant freight traffic manager on November 1, 1909, and on December 27, of the same year, was made freight traffic manager, which position he held at the time of his recent election as vice-president and freight traffic manager of the same road, as above noted.

J. F. Auch.

Operating Officers.

E. M. Wrenne has been appointed assistant superintendent of the Nashville, Chattanooga & St. Louis.

J. W. Anderson has been appointed an assistant superintendent of the Oregon-Washington Railroad & Navigation Company, with headquarters at La Grande, Oregon.

W. H. DeFrance, heretofore general superintendent of the Louisiana Southern, has been appointed assistant general manager of the Alabama-New Orleans Transportation Company, with headquarters at New Orleans, La.

John E. Epler, general bonus supervisor of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan., has been appointed acting assistant general manager of the Chicago & Eastern Illinois, with headquarters at Chicago.

J. W. Knightlinger, trainmaster of the Southern Pacific at Roseville, Cal., has been appointed assistant superintendent of the Louisiana Western and Morgan's Louisiana & Texas Railroad & Steamship, with headquarters at New Orleans, La.

R. R. Beasley has been appointed superintendent of The Direct Navigation Company, a subsidiary company of the Sunset-Central Lines of the Southern Pacific Company, with headquarters at Houston, Tex., succeeding Thomas L. Morse, retired.

F. M. Nowell, superintendent of the Scranton division of the Delaware, Lackawanna & Western, at Scranton, Pa., has been appointed trainmaster, with headquarters at Scranton, and

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H. J. Mullaghy, trainmaster, has been transferred from Scranton, to Binghamton, N. Y.

D. J. Hackett has been appointed superintendent of the Canada division of the Michigan Central, with office at St. Thomas, Ont., snceeeding F. W. Cowley, acting superintendent, who has been appointed trainmaster, succeeding J. S. Graney, acting trainmaster, assigned to other duties.

Frank E. Nicoles, division superintendent of the Chicago, St. Paul, Minneapolis & Omaha at St. James, Minn., has been appointed superintendent of the Eastern division, with headquarters at Eau Claire, Wis., succeeding T. W. Kennedy, who has been assigned to duties in the general manager's office at St. Paul, Minn.

W. H. Coppage has been appointed superintendent of the Louisiana Railway & Navigation Company, with headquarters at Shreveport, La., succeding A. G. Abell, resigned. H. L. Graham, trainmaster of the Eastern division, has been transferred to the Western division, with headquarters at Shreveport, and A. P. Maguire has been appointed trainmaster of the Eastern division, with headquarters at Baton Rouge.

Frank Johnston Kron, whose appointment as superintendent of the Logansport division of the Pennsylvania Lines West of Pittsburgh, with headquarters at Logansport, Ind., has been announced in these columns, was born August 29, 1869, at Kittanning, Pa. He began railway work December 5, 1888, on the Eastern division of the Pennsylvania Lines West of Pittsburgh at Pittsburgh, Pa., and on January 1, 1900, was transferred to the Erie & Ashtabula division at New Castle, Pa. He was made trainmaster on that division August 15, 1902, and April 10, 1905, was promoted to superintendent of the Marietta division at Cambridge, Ohio, where he remained until March 1, 1910, when he was transferred to the superintendency of the Louisville division at Louisville, Ky., which position he held at the time of his recent appointment, as noted above.

Henry Oliver Dunkle, who has been appointed general manager of the Erie lines west of Buffalo and Salamanca, with headquarters at Cleveland, Ohio, was born at Pittsburgh, Pa., and was educated in the high schools. He began railway work in 1879 with the Baltimore & Ohio as an operator, and was later a train despatcher on the same road. From 1882 to 1889 he was consecutively train despatcher, chief despatcher and trainmaster on the Pittsburgh & Western, now a part of the Baltimore & Ohio. In 1890 he was appointed snperintendent of transportation of the South Carolina, now a part of the Southern, at Charleston, S. C. From 1892 to 1895 he was trainmaster and chief despatcher of the Baltimore & Ohio at Akron, Ohio, and from 1895 to 1903 was superintendent of the Pittsburgh & Western at Pittsburgh, Pa. He went to the Erie in May, 1903, as superintendent of the Meadville division, and the following January was appointed general superintendent of the same road at Cleveland, Ohio, which position he held at the time of his recent appointment as general manager of the lines west, as above noted.

H. O. Dunkle.

Frederick McQ. Falck, whose appointment as superintendent of the Atlantic City Railroad, with headquarters at Camden, N. J., has been announced in these columns, was born on July 5, 1874, at Atlanta, Ga. He was educated in the Elmira, N. Y., schools and at Cornell University, and began railway work on June 1, 1898, as assistant supervisor on the Philadelphia & Reading, at Shamokin, Pa. From May, 1900, to December, 1901, he was supervisor at the same place, and then was transferred in the same capacity, first to Philadelphia and later to Trenton, N. J. In May, 1903, he was appointed division engineer on the Shamokin division, with headquarters at Tamaqua, Pa., and was transferred in the same capacity in June, 1905, to the Reading division, remaining in that position until his appointment as assistant superintendent of the Wilmington & Columbia division in March, 1910. He was promoted to superintendent of the same division the following October, which position he held at the time of his recent appointment as superintendent of the Atlantic City Railroad, as above noted.

Alfred M. Schoyer, who on January 1, became general manager of the Vandalia, with headquarters at St. Louis, Mo., as already noted in these columns, was born at Allegheny City, Pa., November 1, 1859. His entire railway service has been with the Pennsylvania Lines West of Pittsburgh, with which company he began work in 1872 as messenger. He was successively until 1892, telegraph operator, train despatcher and chief train despatcher on the Eastern division of the Pennsylvania Company. He was then appointed superintendent of telegraph of the Pennsylvania Lines West of Pittsburgh, which position he held until November 1, 1899, when he was made superintendent of the Eastern division of the Pennsylvania Company, with office at Allegheny, Pa.

A. M. Schoyer.

Mr. Schoyer became general superintendent of the Northwest System, with headquarters at Pittsburgh, Pa., on January 1, 1902, which position he held when he was appointed general manager of the Vandalia, as mentioned above. From 1893 to 1899 he was superintendent of telegraph of the Vandalia as well as of the Pennsylvania Lines West of Pittsburgh.

D. Crombie, assistant to vice-president of the Grand Trunk at Montreal, Que., has been appointed general superintendent of transportation. C. G. Bowker, joint superintendent at St. Thomas, Ont., has been appointed general superintendent, Eastern lines, including Montreal division (Districts 1, 2, 3, 4), Montreal terminals, Belleville division (Districts 5, 6, 7, 8, 9, 10), and Ottawa division (Districts 30, 31, 32). H. E. Whittenberger, superintendent at Toronto, has been appointed general superintendent, Ontario lines, including, Toronto terminals, Barrie division (Districts 11, 12, 14), Hamilton division (Districts 13, 16, 17, 19), London division (Districts 17, 18, 20, 21, 24), St. Thomas division (Districts 18, 19), and Stratford divisions (Districts 15, 22, 23). U. E. Gillen, superintendent at Montreal, has been appointed general superintendent Western lines, including Districts 25, 26, 27, 28, 29 and P. O. & N. Railway. W. H. Farrell, assistant superintendent of the Eastern division at Montreal, Que., has been appointed superintendent of freight service. Frederick Price, superintendent of car service at Montreal, Que., has been appointed superintendent of passenger service, and his former position has been abolished.

Alvie R. Merrick, whose appointment as general superintendent of the Western Maryland, with headquarters at Baltimore, Md., has been announced in these columns, was born on December 9, 1874, at Port Austin, Mich., and was educated in the grammar school at Bad Axe, Mich. He began railway work on June 1, 1891, as a passenger brakeman on the Saginaw, Tuscola & Huron, now a part of the Pere Marquette, and five years later went to the Chicago & Grand Trunk, now a part of the Grand Trunk. In 1899 he returned to the service of the Saginaw, Tuscola & Huron as freight conductor, and in 1901 was made passenger conductor. He was appointed trainmaster on the Toledo division of the Pere Marquette in March, 1902, and later served in the same capacity, first on the Lndington divi-

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sion and then on the Chicago division, until he was made superintendent of the Saginaw district of the same road in March, 1904. When the Pere Marquette was re-districted in December, 1911, he remained at Saginaw in charge of the Saginaw division, comprising the Toledo-Ludington and S. T. & H. divisions. When the territory was again re-districted in May, 1912, he was put in charge of the Saginaw-Ionia S. T. & H. division, and now becomes general superintendent of the Western Maryland, as above noted.

H. E. Newcomet, whose appointment as superintendent of the Louisville division of the Pennsylvania Lines West of Pittsburgh, has been announced in these columns, was born April 27, 1874, at Philadelphia, Pa. He was graduated from the University of Pennsylvania in 1894, and began railway work in February, 1856, as assistant on engineer corps of the Pennsylvania Lines West of Pittsburgh. From 1898 to 1899, he was an assistant engineer of the Cleveland & Pittsburgh division, and was then for two years an assistant engineer on the Cincinnati division. In 1901 he was promoted to division engineer of the Indianapolis & Vincennes division, remaining with that division until 1903, when he was transferred to the Cincinnati division as division engineer. Two years later he became division engineer of the Erie & Ashtabula division, and in 1906 he was appointed division engineer of the Cleveland & Pittsburgh division, which position he held when he was advanced to the superintendency of the Louisville division, with headquarters at Louisville, Ky., as above noted. Mr. Newcomet has been continuously in the service of the Pennsylvania Lines West of Pittsburgh since February, 1856.

H. E. Newcomet.

L. J. Ferritor, whose appointment as superintendent of the Scranton division of the Delaware, Lackawanna & Western, with headquarters at Scranton, Pa., has been announced in these columns, was born in 1865 at Athens, Ohio, and began railway work as a telegraph operator on the St. Louis, Kansas City & Northern, and was later traveling agent and operator in the trainmaster's office of the Omaha division of the Wabash, St. Louis & Pacific, now a part of the Wabash. In 1890 he was appointed train despatcher, and from 1885 to July, 1896, was chief despatcher of the same division. He went to the Grand Trunk in July, 1896, as trainmaster of the Middle division at Stratford, Ont., and from 1898 to May, 1899, was assistant superintendent of the same division at London, Ont. From May, 1899, to February, 1904, he was joint superintendent of the Southern division of the Grand Trunk and the Buffalo division of the Wabash at St. Thomas, Ont., and from February, 1904, to August, 1905, was superintendent of the Eastern division of the Wabash at Peru, Ind. He was appointed superintendent of the Middle division of the same road in August, 1905, with headquarters at Decatur, Ill. In 1910 he became superintendent of the Northern and Southern divisions of the Chicago & Alton, and resigned from that position in October, 1912.

L. J. Ferritor.

Traffic Officers.

M. K. Butler has been appointed traveling freight and passenger agent of the Georgia & Florida, with headquarters at Moultrie, Ga.

Archibald Fries has been appointed general freight agent of the Sharpsville Railroad, with office at Pittsburgh, Pa., succeeding D. G. Gray, resigned.

H. W. Askew, commercial agent of the New Orleans, Mobile & Chicago, has been appointed division freight agent, with headquarters at New Orleans, La.

George A. Lee has been appointed assistant general passenger agent of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at Minneapolis, Minn.

C. Frank O'Hara has been appointed traveling agent of the Chicago, St. Paul, Minneapolis & Omaha, with office at Duluth, Minn., succeeding O. C. Scherer, promoted.

W. A. Huckstep has been appointed soliciting freight agent of the Georgia Southern & Florida, with office at St. Louis, Mo. succeeding C. N. McNulty resigned to accept service with another company.

The title of Warren Brown is changed from southeastern freight and passenger agent to that of general agent of the El Paso & Southwestern system and the Morenci Southern Railway, with headquarters at Memphis, Tenn.

H. C. Conley, division freight agent of the St. Louis & San Francisco, at Oklahoma City, Okla., has been appointed assistant general freight agent, with headquarters in that city. S. M. Childs has been appointed district passenger agent, with office at Indianapolis, Ind.

F. A. Miller, general passenger agent of the Chicago, Milwaukee & St. Paul, has been appointed passenger traffic manager, with headquarters at Chicago, and H. E. Pierpont, general freight agent, has been appointed freight traffic manager, with headquarters at Chicago.

J. L. Cox, assistant general freight agent of the Southern Railway in Mississippi, at Columbus, Miss., is now assistant general freight and passenger agent, having succeeded to the duties of Harvey E. Jones, Jr., assistant general passenger agent, resigned to become general agent in the passenger department at Mobile, Ala., of the Mobile & Ohio, and N. V. Hutchinson, traveling freight agent at Columbus, Miss., is now traveling freight and passenger agent.

W. H. Parnell, traveling passenger agent of the Southern, at Norfolk, Va., has been appointed district passenger agent, with office at Houston, Tex., succeeding F. R. McMillin, promoted to chief advertising clerk, with office at Washington, D. C. J. D. Ruden, traveling passenger agent, at Atlanta, Ga., has been transferred to Norfolk, succeeding Mr. Parnell, and Edward E. Barry has been appointed traveling passenger agent at Atlanta, succeeding Mr. Ruden.

H. R. Lewis, who has been appointed general freight agent of the Baltimore & Ohio, with office at Baltimore, Md., was born on March 25, 1872, at Mattoon, Ill., and entered the service of the Baltimore & Ohio in August, 1896, as a clerk in the freight tariff department. He was promoted to chief rate clerk of the general freight department on March 1, 1898, and became chief clerk of that office on February 1, 1907. In April, 1912, he was appointed division freight agent at Baltimore, which position he held at the time of his recent promotion as general freight agent of the same road.

W. N. Hill, freight soliciting agent of the Southern, at Atlanta, Ga., has been appointed commercial agent, with office at Dallas, Tex., succeeding William Humphries, transferred. R. P. Kinbrough, freight soliciting agent at Atlanta, succeeds Mr. Hill. J. H. King succeeds Mr. Kinbrough. Emerson Lucas, freight soliciting agent at Nashville, Tenn., has been appointed commercial agent, with office at Washington, D. C., succeeding

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M. M. Emmert, promoted. H. W. Watson, traveling freight agent at Nashville, succeeds Mr. Lucas, and J. C. Hext, freight soliciting agent at Savannah, Ga., succeeds Mr. Watson.

W. R. Askew, whose appointment as division freight agent of the Baltimore & Ohio, with office at Baltimore, Md., has been announced in these columns, was born on November 20, 1873, at Baltimore, and began railway work in January, 1888, as a messenger in the freight offices of the Baltimore & Ohio, at Camden Station, Baltimore. He then held various positions in the general freight department, until he became a rate clerk in September, 1899, and was promoted to chief rate clerk on February 1, 1907. In April, 1912, he was made chief clerk of the freight department, and now becomes division freight agent of the same road.

The industrial department of the Baltimore & Ohio has been extended over the Cincinnati, Hamilton & Dayton, and now includes all lines of the Baltimore & Ohio system. Harry O. Hartzell, industrial agent at Pittsburgh, Pa., has been appointed assistant general industrial agent, with headquarters at Baltimore, Md., and he will have charge of the activities of the department over all lines. Howard L. Gallcher, traveling freight agent at Columbus, Ohio, succeeds Mr. Hartzell, at Pittsburgh, and the authority of H. A. Treudley, industrial agent at Cincinnati, has been extended over the C. H. & D. lines. Mr. Hartzell was born in Baltimore, Md., on August 11, 1875, and after attending the public schools and Baltimore City College began railway work as a messenger and junior clerk in the offices of the Western Maryland. In December, 1895, he went to the Baltimore & Ohio as private secretary to the assistant general freight agent, and in September, 1898, was made contracting freight agent, becoming traveling freight agent, at Baltimore, in May, 1905. He was appointed assistant chief clerk of the general freight department on February 1, 1907, of the same road, and was promoted to industrial agent at Pittsburgh in November, 1910.

Engineering and Rolling Stock Officers.

N. A. Alquist has been appointed general car inspector of the Missouri, Kansas & Texas, with office at Parsons, Kan.

H. C. Van Buskirk has tendered his resignation as superintendent of motive power and car department of the Colorado & Southern, owing to ill health.

S. U. Rhymer, signal supervisor of the Chicago & Alton, has been appointed general signal inspector, a newly created position, with headquarters at Bloomington, Ill.

J. H. Tinker, master mechanic of the Chicago & Eastern Illinois, at Danville, Ill., has been appointed acting superintendent of motive power, succeeding S. T. Park, effective February 1.

A. M. Lupfer has been appointed chief engineer of the Spokane, Portland & Seattle, the Oregon Trunk and the Spokane & Inland Empire, with headquarters at Portland, Oregon, succeeding R. Budd, resigned to accept service with another company.

The motive power department of the Baltimore & Ohio System has been reorganized. The present superintendent of motive power, who report to the general superintendents, now have the titles of division superintendents of motive power. A superintendent of motive power has been appointed for each general manager's territory, reporting to these officers at Baltimore and at Cincinnati on operation and maintenance and to the general superintendent of motive power on standards and shop methods. A. P. Prendergast, superintendent of motive power at Cincinnati, Ohio, has been transferred to Baltimore, Md., reporting to General Manager C. W. Galloway, and M. J. McCarthy, assistant superintendent of motive power of the Cleveland, Cincinnati, Chicago & St. Louis at Beech Grove, Ind., has been appointed superintendent of motive power of the Baltimore & Ohio Southwestern and the Cincinnati, Hamilton & Dayton, with headquarters at Cincinnati, reporting to General Manager W. C. Loree.

W. R. Hillary, division engineer of the Pennsylvania Lines west of Pittsburgh, Northwest System, has been appointed supervising engineer of the Central System, with headquarters at Toledo, Ohio. M. P. Tucker, Jr., has been appointed division engineer of the Akron division, Central System, with office at Akron, in place of R. C. Harris, promoted. A. C. Watson has been appointed division engineer of the Zanesville division, Central System, with headquarters at Zanesville, Ohio, to succeed Mr. Tucker. Jos. A. Rothrock has been appointed assistant division engineer of the Zanesville division, with office at Zanesville, in place of E. H. Kersting, transferred. R. C. Miller has been appointed division engineer of the Toledo division, Central System, with office at Toledo, Ohio, succeeding G. R. Barry, transferred. R. R. Metheany, Jr., has been appointed division engineer of the Marietta division, Central System, with headquarters at Cambridge, Ohio, to succeed S. W. Hodgin, transferred.

William Thomas Dobyns, whose appointment as engineer of maintenance of way of the Southern Railway, with headquarters at Greensboro, N. C., has been announced in these columns, was born on March 26, 1867, at Floyd, Va. He began railway work on August 27, 1886, as a section laborer on the East Tennessee, Virginia & Georgia, now a part of the Southern Railway. Two years later he was made foreman, remaining in that position for five years, when he was appointed track supervisor on the Southern Railway. He remained in that position until 1898, and was then made roadmaster on the Atlanta, Knoxville & Northern, now a part of the Louisville & Nashville. In January, 1903, he became roadmaster on the Virginia & Southwestern, at Bristol, Tenn., which position he held at the time of his appointment on December 1, 1912, as engineer of maintenance of way of the Northern district of the Southern Railway.

W. T. Dobyns.

Purchasing Officers.

J. E. Mahaney, general storekeeper of the Oregon-Washington Railroad & Navigation Company, with office at Albian, Oregon, has been appointed purchasing agent of the Spokane, Portland & Seattle, the Oregon Trunk, the Oregon Electric and the United Railways, with headquarters at Portland, Oregon, to succeed F. A. Bushnell, resigned to accept service with another company.

Special Officers.

C. M. Haines has been appointed traveling immigration agent of the Gould Lines, with headquarters at Ft. Worth, Tex., succeeding Will L. Sargent, resigned. He will represent the St. Louis, Iron Mountain & Southern, the Texas & Pacific and the International & Great Northern. Heretofore Mr. Haines has been connected with the Agricultural and Mechanical College of Texas.

OBITUARY.

Frank H. Laey, the commercial agent of the Atlanta & West Point, at New Orleans, La., died on January 10, at that place at the age of 67.

J. M. Ellison, passenger agent of the Denver & Rio Grande at Colorado Springs, Colo., died in that city on January 6, aged 70 years. He had been in the service of the Denver & Rio Grande for 34 years.

Samuel D. Coykendall, president of the Ulster & Delaware, died on January 14, at his home in Kingston, N. Y. He was born at Wantage, N. J., in 1837, and with his father-in-law, Thomas Cornell, formed the towing business now known as the Cornell Steamboat Company. He became president of the Ulster & Delaware in 1895.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE ST. LOUIS SOUTHWESTERN is said to be considering the purchase of 20 locomotives. This item has not been confirmed.

THE NEW YORK, NEW HAVEN & HARTFORD has ordered 50 Pacific type locomotives and 25 switching locomotives from the American Locomotive Company.

THE DULUTH & IRON RANGE has placed an order for a number of locomotives which includes 2 mikado locomotives from the Lima Locomotive Corporation.

THE OAHU RAILWAY & LAND COMPANY, Honolulu, Hawaii, has ordered two consolidation locomotives from the American Locomotive Company. The dimensions of the cylinders will be 15 in. x 20 in., the diameter of the driving wheels will be 38 in., and the total weight in working order will be 102,000 lbs.

THE HARRIMAN LINES have ordered 189 locomotives and 25 additional tenders from the Baldwin Locomotive Works and 57 locomotives from the American Locomotive Company. The order from the Baldwin Locomotive Works comprises 99 passenger mikado locomotives, 30 freight mikado locomotives, 55 switching locomotives and 5 Mallet (2-8-8-2) locomotives. The order from the American Locomotive Company comprises 49 Pacific type locomotives and 8 ten-wheel locomotives. The allotment of these locomotives will be as follows: Union Pacific, 40 locomotives from the Baldwin Locomotive Works and 10 locomotives from the American Locomotive Company; Southern Pacific, 51 locomotives from the Baldwin Locomotive Works and 14 locomotives from the American Locomotive Company; Oregon-Washington Railroad & Navigation Company, 16 locomotives from the Baldwin Locomotive Works and 6 locomotives from the American Locomotive Company; Oregon Short Line, 15 locomotives from the Baldwin Locomotive Works and 5 locomotives from the American Locomotive Company; Sunset Central Lines, 37 locomotives and 25 additional tenders from the Baldwin Locomotive Works, and 12 locomotives from the American Locomotive Company; Chicago & Alton, 30 locomotives from the Baldwin Locomotive Works and 10 locomotives from the American Locomotive Company.

CAR BUILDING.

THE ILLINOIS CENTRAL is in the market for 60 passenger cars.

THE CHICAGO, ROCK ISLAND & PACIFIC is in the market for 50 passenger cars.

THE SOUTHERN RAILWAY is in the market for 200 box cars and 200 coal cars.

THE CAROLINA, CLINCHFIELD & OHIO is making inquiries for from 500 to 2,000 freight cars.

THE PITTSBURGH & LAKE ERIE has ordered 500 coke cars from the Pressed Steel Car Company.

THE NATIONAL RAILWAYS OF MEXICO have ordered 30 tank cars from the Pressed Steel Car Company.

THE TOLEDO & OHIO CENTRAL has ordered 1,000 general service cars from the Ralston Steel Car Company.

THE LOUISVILLE & NASHVILLE is said to have ordered 2,000 hopper cars from the Pressed Steel Car Company, and 500 hopper cars from the Mount Vernon Car & Manufacturing Company. This item has not been confirmed.

IRON AND STEEL.

GENERAL CONDITIONS IN STEEL.—Although steel orders in the aggregate are smaller than they were in the corresponding period of December there has been a very large amount of steel for delivery in the third quarter of this year contracted for. The mills are operating at almost full capacity and it will be difficult for them to increase their output beyond the present level. The consensus of opinion is that steel prices will be held around current quotations for the next six months, unless conditions are disturbed through unfavorable political developments.

Supply Trade News.

The Church-Davidson Company, Chicago, has been appointed general time inspector for the Pere Marquette and the Copper Range.

The name of the Chicago Tie & Timber Treating Company, of Waukegan, Ill., has been changed to the Chicago Creosoting Company.

J. W. Johnson, manager of the Chicago office of the General Electric Company, Schenectady, N. Y., died in Chicago, January 14, at the age of 62.

The Pennsylvania Equipment Company, Philadelphia, Pa., is in the market for a second-hand, 15-ton capacity Browning locomotive crane.

J. R. McKee, O. D. Young and Anson W. Burchard, all of New York, have been elected vice-presidents of the General Electric Company, Schenectady, N. Y.

Holders of certificates of deposit for preferred and common stock of the Allis-Chalmers Company, Milwaukee, Wis., are called upon to pay on or before January 15, the third instalment of the stockholders' assessment as arranged under the reorganization plan. On each share of preferred stock $6 is due, and on each share of common stock $3 is due.

Fred Gardner, for several years railroad representative for J. T. Ryerson & Son, Chicago, resigned on January 1, and is now representing the Jacobs-Shupert Firebox Company, Oxweld Railroad Service Company, Burden Iron Company, Boss Nut Company, and other railroad specialties, with office at 339 Railway Exchange building, Chicago.

The Terry Steam Turbine Company, Hartford, Conn., has sold several Terry forced draft sets for Taylor stokers operating in various plants of the New York, New Haven & Hartford, and has also received a duplicate order for forced draft sets for the Zylonite plant at the Housac tunnel. This latter will have a capacity of 40,000 cu. ft. per minute.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., among recent orders has received the following: 27 equipments of No. 308 motors and type A B control for the Long Island Railroad for interurban service; and one quadruple equipment and type H L control for use on an electric locomotive for the Oakland, Antioch & Eastern.

Joseph P. Ord, formerly a vice-president of the General Electric Company, Schenectady, N. Y., died in New York on January 9, at the age of 60. Mr. Ord graduated from Yale University in 1873, and was subsequently admitted to the bar. After serving in the accounting department of the West Shore, Mr. Ord went to the General Electric Company, where he was largely instrumental in building up the business of that concern.

The United States Air Brake Corporation, Brisbane building, Buffalo, N. Y., was incorporated in New York, October 10, 1912, with $1,000,000 capital to make its new Q-R (quick release) locomotive air brake equipment, and also to make all kinds of unpatented air brake parts, giving special attention to air brake hose and hose connections. The officers of the company are as follows: President, Edward H. Eddy; vice-president, F. H. Dukesmith, and secretary-treasurer, Jacob Dilcher. See also notice under Trade Publications.

James F. Whiteford, bonus supervisor of the Atchison, Topeka & Santa Fe, with office at Topeka, Kan., has resigned to become counseling engineer for Suffern & Son, in particular charge of their engineering work in Europe, with headquarters in London, England. Mr. Whiteford was born in 1876, and received his early education in the public schools of Illinois, and continued his education through correspondence. He entered railroad service as machinist apprentice with the Chicago, Burlington & Quincy in 1892, and remained for several years as general machinist, gang foreman and engine house foreman at various shops on that road. Later he went to the Union Pacific and served as gang foreman, erecting foreman and general foreman of the locomotive repair shop at Omaha, and chief inspector of mechanical equipment. In 1905 he became

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associated with Harrington Emerson and H. W. Jacobs in the installation of the betterment work on the Atchison, Topeka & Santa Fe, having entire supervision of this work in the roundhouse department. During this time he materially assisted in the development of the efficiency system of wage payment. Since 1908 he has had general supervision of the betterment work on various grand divisions of the Santa Fe, including assignments of special investigations on betterment work.

The United States Steel Corporation has made public its wage increase plan which provides for an increase of $12,000,000 a year. The statement issued by Chairman Elbert H. Gary is as follows: "In accordance with the recent announcement made by the chairman respecting an advance in wages, many of the subsidiary companies of the Steel Corporation have made up their schedules, which together aggregate an increase in wages of about $1,000,000 per month, commencing about February 1. These benefits largely apply to the workmen receiving the lowest daily wages. Some of the mining companies are not included, for the reason that wages have been heretofore adjusted by those companies and are now above the average." The increase in wages is in line with the policy adopted by E. H. Gary and the management of the corporation to advance wages when conditions justified such action. Chairman Gary has always advocated fair and reasonable wages for the workmen of the Steel Corporation, and it is due largely to the position taken by him that the corporation has experienced no labor difficulties to speak of since the great strike shortly after the corporation's organization. Certain shareholders, at times, have made the claim that the employees were receiving more than their proportion of the corporation's income, but the policy pursued seems to have been a wise one in so far as the establishment of harmonious relations between employer and employee is concerned. The employees of the Steel Corporation last year received the highest average wage since the organization of the company. The average amounted to $819, compared with $800 in 1910, $776 in 1909, $729 in 1908, $765 in 1907, $729 in 1906, $711 in 1905, $677 in 1904, $720 in 1903 and $717 in 1902. The advance of $1,000,000 monthly just announced amounts to an increase of approximately 8.5 per cent to the men benefiting. Wages in 1911 aggregated a total of $161,419,000. The advance just made probably brings the average wage to around $865 per year per man. The advance, of course, means that the corporation has added $12,000,000 per year to its expenses. Including the present advance the Steel Corporation is paying to its employees close to $35,000,000 more per year than would have been the case if wages had continued since organization without change. The increase in wages, expenditures for profit sharing, pensions, welfare work, etc., increased taxes, the advance in expenses in general and lower steel prices explain why the Steel Corporation is making less money than at the time of organization in the face of the fact that capacity within that period has been practically doubled.—*Taken from the Wall Street Journal.*

TRADE PUBLICATIONS.

PNEUMATIC TOOLS.—The Chicago Pneumatic Tool Company has issued bulletin 34-F, containing a mechanical description of the design and construction of class G Chicago pneumatic compressors.

AIR BRAKES.—The United States Air Brake Corporation, Brisbane building, Buffalo, N. Y., has published bulletin No. 1 on its new Q-R locomotive air brake equipment. This equipment is designed to permit of alternate control of locomotive and car brakes to avoid the severe shock caused by the slack in long trains, and particularly to save the engine tires from becoming overheated or flattened. The booklet describes clearly and concisely the advantages of this brake equipment, its operation and construction.

WEIGHT OF RAILS ON AFRICAN RAILWAYS.—At first 45-lb. rails were used in Africa; on the introduction of steel, however, the same section was retained, but the weight was 46½ lbs., and this remained the standard weight of rails for many years. Later on, 60-lb. rails were substituted, and now, on the more important lines of the railways in Africa 80-lb. rails are being adopted.

Railway Construction.

ALBERTA INTERURBAN.—The Canadian Minister of Railways has approved the route map for a line from Calgary, Alta., to Cochrane, 45 miles. The residents of Calgary voted to grant the company a right of way into the city for 25 years.

ALTON, ST. LOUIS & CAIRO (Electric).—According to press reports this company, which was organized early in 1909 to build from Alton, Ill., south through Madison, St. Clair, Monroe, Randolph, Jackson and Union counties to Cairo, in Alexander county, about 130 miles, with a branch to Waterloo and Columbia, in Monroe county, will build the line in 50-mile sections. It is understood that the first work to be carried out will be on the section from East St. Louis. T. N. Chase is president, and W. R. Borders is vice-president. The headquarters of the company are in the Navarre building, St. Louis, Mo.

CANADIAN PACIFIC.—The Minister of Railways has approved route maps of revision of route on second track work between Calgary, Alta., and Vancouver, B. C., as follows: West of Calgary, 21 miles; Ross Peak to Mill Creek, B. C., 20 miles; Chase to Salmon Arm, B. C., 25 miles.

Application is being made to the Dominion parliament for authority to build a line from the Toronto-Sudbury line between Bolton Junction and Palgrave, Ont., through Peel and Halton counties to a junction with the Toronto-Windsor line near Campbellville.

The Dominion parliament has been asked to authorize the building of a line from south of Forsythe street, Hochelago ward, Montreal, Que., northerly to a junction with the Canadian Pacific line near L'Epiphanie.

CHESAPEAKE & OHIO.—The Piny River & Paint Creek has been opened for business on the Hinton division from Beckley Junction, W. Va., to Cranberry, six miles, and the Loup Creek branch of the Hinton division has been extended from Price Hill Junction, W. Va., to Mount Hope, one mile.

CHICAGO AND NORTH WESTERN.—On the Galena division a new branch has been opened for business from Churchill, Ill., to Seatonville, six miles.

CINCINNATI, LICKING RIVER & VIRGINIA.—According to press reports this company, which was incorporated last year, is making surveys from Cincinnati, Ohio, south, and through Magoffin, Johnson, Floyd, Knott and Letcher counties, Ky., in the eastern Kentucky coal field. As soon as surveys are finished construction work will be started. It is said that capital to finance the project has been secured. The plans call for building via Jenkins, thence through the Cumberland mountains at Pound Gap to Wise, Va. J. B. Walker, president; P. G. Stuart, vice-president, Winchester, Ky., and F. C. Buskirk, secretary and treasurer.

LIBERTY & CALLICOON.—The New York Public Service Commission, Second district, has granted this company a certificate of public convenience and necessity. The plans call for building from a point near the New York, Ontario & Western, in Liberty, N. Y., to Jeffersonville, via Loomis, White Sulphur Springs and Youngsville, in Sullivan county, about 14 miles. The commission has authorized the company to issue capital stock to the amount of $200,000 and bonds for $250,000. The proceeds are to be used for the construction of the line, and the charter provides that it may be operated either by steam or electric power.

MISSISSIPPI ROADS.—An officer of the Finkbine Lumber Company, with headquarters at Wiggins, Miss., writes that the company is building an 8½-mile logging line.

MISSOURI, KANSAS & TEXAS.—Announcement is made that this company will spend over $2,000,000 during the present year for improvements and general betterments in Texas. The main line will be rehallasted and the present rails on 170 miles will be replaced with those of 85-lb. section. Many side tracks, team tracks and passing tracks will be built. The banks are to be widened and the drainage improved. The plans include new trestles and culverts, and several water and fuel stations. A number of stations and inspection houses are to be put up.

NORFOLK & WESTERN.—The Williamson & Pond Creek has been opened for business from Williamson, W. Va., to Pond

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Creek, five miles, to Morocoal, Ky., 10.7 miles, and to McVeigh, 11.8 miles.

OREGON SHORT LINE.—The Teton branch of the Montana division has been opened for business from Ashton, Idaho, on the Yellowstone branch southeast to Driggs, 37.2 miles.

PENNSYLVANIA RAILROAD.—Work on the Allegheny Valley has been authorized to include three double-track tunnels, ranging in length from 2,500 to 3,500 ft., and costing about $1,500,000. The improvements will eliminate three sharp curves and shorten the distance between Oil City, Pa., and Pittsburgh 14 miles.

PHILADELPHIA & READING.—An officer writes that contracts have been let for laying additional tracks to Charles F. King, Pottsville, Pa., for a westbound track between Yardley, Pa., and Woodbourne, 3¾ miles, and to P. F. Brendlinger, Philadelphia, Pa., for a westbound track between Skillman, N. J., and Hopewell, 2½ miles, and an eastbound track between Stoutsburg and Hopewell, 2 miles.

RIO GRANDE VALLEY TRACTION.—A contract has been given to the Stone & Webster Engineering Corporation, of Boston, Mass., it is said, to build from El Paso, Tex., down the valley of the Rio Grande to Ysleta. (August 9, p. 271.)

ST. LOUIS, BROWNSVILLE & MEXICO.—The Austwell branch has been opened for business from Heyser, Tex., south to Austwell, 17.5 miles.

SAN ANTONIO, FREDERICKSBURG & NORTHERN.—Incorporated in Texas with $30,000 capital and headquarters at Fredericksburg and at San Antonio. The plans call for building from a point on the Kerrville branch of the San Antonio & Aransas Pass, about four miles northwest of Waring in Kendall county, Tex., north to Fredericksburg in Gillespie county, about 25 miles. R. A. Love, F. Crane, R. L. Cunningham, J. H. Haile and E. D. Campbell are directors. F. Richards is chief engineer.

TENNESSEE, KENTUCKY & NORTHERN.—An officer of this company, which operates a line from Algood, Tenn., north to Livingston, 19 miles, writes that contracts are to be let about April 1, to build extensions as follows: From Livingston north to Stearns, Ky., and from Algood south to Sparta. The maximum grade will be 1½ per cent., and maximum curvature 5 deg. The company expects to develop a traffic in forest products, coal and merchandise. (December 27, p. 1288.)

TEXAS ROADS ELECTRIC.—Residents of Smithville, Tex., are back of a project to build an interurban line between Smithville and Austin, about 50 miles, and between Smithville and Rockport, about 140 miles. Eastern capitalists are said to be interested in the project.

RAILWAY STRUCTURES.

INDIANAPOLIS, IND.—Plans are being prepared for improvements in the union station, to cost approximately $1,20,000, on which work will be begun shortly.

MAYBROOK, N. Y.—The Central New England improvements to engine facilities, consisting of roundhouse, power house, machine shop and coaling plant, are about completed, and the roundhouse is in operation. The company is also constructing a new eastbound classification yard.

SAN ANTONIO, TEX.—Plans are being prepared by the International & Great Northern for a new 14-stall roundhouse and machine shops.

SCOTT CITY, KAN.—The Scott City Northern recently completed improvements which were begun last September. The work included widening of cuts and banks and replacing tile and timber drainage openings with concrete structures. New buildings have been put up at Scott City, including a two-stall engine house, a freight house, a storehouse and a blacksmith shop.

WESTCHESTER, N. Y.—Work is well under way on an eastbound classification yard, and improvements to provide additional transfer facilities for the New York, New Haven & Hartford, at Westchester, New York City.

YOAKUM, TEX.—The San Antonio & Aransas Pass is erecting three additional buildings at its shops at this point, 50 x 150 ft., 28 x 100 ft., and 50 x 80 ft.

Railway Financial News.

ATLANTA, BIRMINGHAM & ATLANTIC.—Clark, Dodge & Co. and White, Weld & Co., both of New York, are offering an additional $500,000 receiver's 5 per cent. certificates of July 1, 1912-July 1, 1913, at 99½, yielding over 6 per cent. interest on the investment. There is a total of $5,000,000 receiver's certificates authorized, of which, including those now offered, there are $4,700,000 outstanding. These certificates are secured by a first lien on the 329 miles of main track and on the terminal properties in Atlanta, Ga., and Birmingham, Ala.

BALTIMORE & OHIO.—The directors have authorized an issue of $63,250,000 4½ per cent. convertible bonds of March 1, 1913-1933. The bonds are convertible any time up to 1923 into common stock at $110. Stockholders are offered the privilege of subscribing at 95½ to the new bonds to the extent of 30 per cent. of their holdings. The entire issue has been underwritten by Kuhn, Loeb & Co. and Speyer & Co., both of New York.

Robert Garrett has been elected a director, succeeding Samuel Rea, resigned.

CHICAGO, MILWAUKEE & ST. PAUL.—The office of chairman of the board, which was held by Roswell Miller until his recent death, has been abolished.

CHICAGO, PEORIA & ST. LOUIS RAILROAD.—This company has taken over the property of the old Railway company, and the receivers have been discharged.

CHICAGO & WESTERN INDIANA.—J. P. Morgan & Co., the First National Bank and the National City Bank, all of New York, are offering the unsold portion of $10,000,000 3-year 5 per cent. mortgage notes of the Chicago & Western Indiana at par.

DENVER, NORTHWESTERN & PACIFIC.—Newman Erb is quoted as saying that the foreclosure sale of the property will take place within 60 days.

ILLINOIS CENTRAL.—Kuhn, Loeb & Co., New York, have bought $8,000,000 4½ per cent. equipment trust certificates, maturing semi-annually from August 1, 1913, to February 1, 1923.

KANSAS CITY TERMINAL RAILWAY.—J. P. Morgan & Co., New York; Lee, Higginson & Co., Boston, and the Illinois Trust & Savings Bank, Chicago, are offering $4,000,000 first mortgage 4 per cent. bonds of 1960-1960 at 95. This is part of a total $10,000,000 first mortgage bonds recently issued by the company, of which the $6,000,000 not offered in this country have been sold in England and Europe.

MAINE CENTRAL.—Stockholders have voted to increase the capital stock from $15,000,000 to $25,000,000, and stockholders are offered the privilege of subscribing for new stock at par to the extent of two-thirds of their present holdings.

MINNEAPOLIS & ST. LOUIS.—This company has made arrangements with Speyer & Company, New York, for the retirement of $1,000,000 of the $4,000,000 5 per cent. secured notes maturing February 1, 1913, and for the refinancing of $3,000,000 of these notes through the issue of $3,000,000 new 6 per cent. notes. Holders of the old notes wishing to take new notes will receive $15 in cash per $1,000 note.

NORFOLK & WESTERN.—Samuel Rea has resigned as a director.

NORTHERN CENTRAL.—Waldo Newcomer and Phillip A. Small have been elected directors, succeeding Samuel Rea, resigned, and A. L. Snowden, deceased.

SOUTHERN PACIFIC.—Otto H. Kahn, Mortimer L. Schiff, Frank A. Vanderlip, Charles A. Peabody, Robert W. Goelet, Marvin Hughitt, Robert S. Lovett and E. J. Spence have resigned, and James N. Wallace, J. N. Jarvie, Cornelius N. Bliss, E. P. Swenson, Clarence H. Kelsey, J. Horace Harding, W. P. Bliss and George H. Leighton have been elected directors in their stead.

UNION PACIFIC.—It is said that the dissolution plan for the Union Pacific-Southern Pacific will be ready for presentation to the new attorney general, who goes into office March 4.

WHEELING & LAKE ERIE.—The receiver has sold $2,000,000 5 per cent. equipment trust obligations and $840,000 6 per cent. 2-year receiver's certificates.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

E. A. SIMMONS, *President.*
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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$4.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 10,225 copies were printed; that of those 10,228 copies, 8,771 were mailed to regular subscribers and 348 were provided for counter and news companies' sales; that the total copies printed this year to date were 34,686 copies—an average of 8,667 copies a week.

VOLUME 54. JANUARY 24, 1913. NUMBER 4.

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FOR many years the railways adjusted their passenger rates to accord with varying conditions of transportation. Then many of the state legislatures reduced the prevailing rate from three to two cents a mile, frequently explaining such action on the ground that a single flat rate is preferable to "discriminating" rates. Since that time the railways naturally have refrained from making many new rates less than two cents a mile, but suburban commutation fares to and from large cities have been retained in most cases at the old figures, the density of such traffic of course justifying a lower rate than the average. On January 1 the Illinois Central advanced its suburban fares in Chicago for single-ride tickets to the two-cent-a-mile basis prescribed by the state legislature, without disturbing the low commutation rates for 10-ride and 25-ride and monthly tickets, which are used by all regular patrons of the suburban service, for the purpose of inducing a larger sale of the commutation tickets, and thereby reducing congestion at its ticket windows. The advance does not affect those who are dependent upon the road for their daily transportation to and from their work, and who make up the bulk of the traffic, but falls upon the occasional passenger for whom nearly empty trains are run throughout the day. In this case the usual complaint of the suburbanite has been magnified by several local business men's associations, and aldermen up for re-election, into charges such as that the advance is a menace to the real estate business and that it is discrimination against the territory served by the Illinois Central, and especially against those who cannot afford to buy ten rides all at once. Therefore, the corporation counsel has submitted an opinion that the city council has the power to regulate the suburban fares of steam roads within the city limits, and the local transportation committee has appointed a committee to investigate the entire subject of suburban rates with a view to reducing them by ordinance. Railway regulation by a federal government and at the same time by the various state governments is sufficiently complicated now. To add regulation of rates by city councils would seem to be an entirely unnecessary complication.

THE collision at Irvington (Indianapolis), Ind., November 13, caused the death of eleven passengers and four employees, and on account of it officers and directors, as well as trainmen, were indicted on criminal charges and are now under bonds. The salient facts of this case are already well known; but the report of Chief Inspector H. W. Belnap, of the Interstate Commerce Commission, dated December 31, and made public this week, is an illuminating rehearsal of important collateral facts which are of particular interest. The disaster affords one more striking illustration of the acts or omissions of a half dozen men converging on a single point and causing a disaster which any one of the half dozen, if he had done his best to make things safe, would have prevented. The names of the men on the train are given in the report, but the derelictions or mistakes of officers, though shown, are not connected with any particular person. We note the main elements of the cause of the collision in the order in which they are given by Mr. Belnap: *(1) The manual block system is in use, but for the protection only of following movements. (2) The freight (eastbound) had been delayed about an hour by being stalled on a grade of 1 per cent. It had to double a short hill. (3) The engineman of the freight on backing into the side track sounded the whistle to call in the head brakeman and had the fireman cover the headlight, before the switch had been set straight. (4) The engineman got down on the ground and started to close the switch himself, but before he got to it he met Brakeman Gross (who had been east to protect the train) coming in, and Gross, on being asked, said that the switch was closed. The rear brakeman, having been sent by the conductor, came up just then, asked the same question and received the same answer. The conductor had gone back to the station some 2,000 ft. back of the engine. (5) The switch had not been closed and its light was not burning. (6) Gross

*Mr. Belnap's closing paragraphs, embracing his conclusions, are given in another column.

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said that as he was coming in he "saw a light near the switch and supposed some one was closing it"; the headlight being covered he assumed that everything was all right. He walked around the switchstand, but did not observe it carefully nor look at the rails. He was carrying a red and a white lantern and the light was not very good. (7) The passenger engine was working steam when it entered the side track. (8) The switch lamp was designed to burn 8 days (192 hours) and was usually attended to twice a week. It was burning at 5 p. m., 10 hours before the collision; but in that 10 hours three trains had reported it not burning. It had plenty of oil. (9) The rule (104A) puts on the engineman the duty of seeing that the switch is set straight in a case like this. (10) The conductor and both brakemen had had occasion to turn this switch, but none of them lighted it. (11) The rule requiring an imperfect fixed signal to be taken as a stop signal specifically includes switches among fixed signals; but the superintendent of the division said that the rule had not been "interpreted" to cover switch lights, and trains were not expected to stop because of the absence of such a light. Therefore, says Mr. Belnap, the engineman of the passenger train was following the customary practice. (12) Failures of switch lights are frequent. (13) Sixteen trains had had to double this hill in two months; coal was reported poor. (14) The engineman had just been promoted and had made only six trips as a runner. (15) The head brakeman (Gross) had been in the service only 19 days; he had had two months' experience elsewhere as switchman (yard brakeman). (16) The fireman was making his first trip over the road but had had 11 months' experience elsewhere. The engineman had been helping in the care of the fire. (17) The city of Indianapolis imposes a speed limit of 30 miles an hour, but this limit is not observed at this place. (18) The passenger engine had had an electric headlight, but it had been off two months for repairs.—As we have said above, this is an illustrative case, of a striking character. Railroad officers will need no assistance in drawing the moral.

At the meeting of the New York Railroad Club, held on the evening of January 17, a paper was presented advocating the use of an electrically controlled air brake for steam railway service. While, both in the paper and the discussion which followed, special emphasis was placed on the greater rapidity of application that can be obtained at the rear of a long train, by means of such a control, the advantages to be gained were not considered to be those of decreasing the distance run in making the stop, but in the reduction of the shock incident to the present method of brake application, because of the greater uniformity in the retardation of all of the cars of the train. Even at high speeds the percentage of reduction, in stopping distances, would not be great in an emergency application; but it is in service work that the advantages will be the most pronounced, because under present conditions the difference in time of brake application on the front and rear cars increases with the length of the train. The first advantage to be gained would, therefore, lie in the elimination of rough stops. Then, as shocks are decreased, so would be the tendency of the wheels to slide flat. The discussion was directed more particularly to passenger train work, and the subject was reviewed from the operating and mechanical points of view; the application of the electrically controlled brakes to the cars of the subway and Westchester lines was elaborated on especially in the case of the latter, where 200 per cent. braking pressures are used. And finally the use of such a brake on freight trains was advocated on the ground that there would be a great reduction in shock, and consequently in damage to cars and lading, if the time of application of brakes to the last car of a 100-car train were to be cut down to a simultaneous application to all of the cars from the present required time of 6 or 7 seconds. While no instances were cited of the application of this electric control to steam railway work, it was evident, from the attitude of all who took part in the discussion, that the improvement would be welcomed as a means of obviating some of the present annoyances incident to the use of the air brake.

SOFT ANSWERS TO HARD QUESTIONS.

"A SOFT answer turneth away wrath." This is the title or the main theme of a circular issued by a western road and recently quoted in the newspapers, calling on trainmen and other employees to more carefully heed the rule requiring them to be uniformly courteous in their intercourse with passengers. With the noticeable accession of religion in railroad circles which seems to have taken place lately, this and other quotations from holy writ are increasingly popular. This, no doubt, is a good thing; for it is always salutary to go back frequently to the fundamentals, and the Bible is a good place in which to find rock-bottom truth.

But only a little observation is necessary to remind the superintendent (if he has overlooked the fact) that the passenger brakeman—the man whom we always have in mind when we talk about courtesy to passengers—has a very difficult task, and that mere softness will not enable him to get very far in his efforts to give wholly satisfactory service. In other words, a hundred—or even 20—passengers will in the course of a day ask him a variety of perplexing questions which a college education would not enable him to answer rightly; and if he is going to make a success of carrying out the superintendent's ideal he has got to engage in a perpetual study. It is the fashion nowadays to tell the station agent that he is the representative of the company in all things; and so far as courteous attention to passengers is concerned the brakeman is as much so as the agent; and both of them do, indeed, encounter people all the time whose simple questions about trains or fares or facilities are supplemented by criticisms, expressed or clearly implied, which impugn the general policy of the company as incisively and as comprehensively as anything ever published in Washington by Lawyer Brandeis or any other hired critic seeking to incriminate a whole board of directors.

In short, the brakeman has to frame answers which the general manager himself can frame with only partial success, and has need for a diplomatic mind like that of the secretary of state. He needs to consult not only Proverbs 15:1 but to bear in mind that the superintendent, if he had thought so far, would have quoted also 15:2—"The tongue of the wise uttereth knowledge aright." The company expects every employee to be not only gentle, but wise. A trainman—or even a conductor who gets $200 a month—may speak very amiably, yet leave passengers unsatisfied because of his lack of knowledge; knowledge of simple facts which he might have acquired by a little study. A passenger is not entitled to be informed about branch line or stage line connections a thousand miles away, or about prices of meals on steamboats in the Danube or the Amazon river; but a conductor can greatly promote the popularity of his road by being posted on all these small details throughout his own vicinity.

Another bit of Scripture that the superintendent needs to remember is found in the 13th verse of that chapter—"A glad heart maketh a cheerful countenance." And nothing else makes it with complete success. Nowadays we tell the employee to stand up for the company (when it is criticised). But this implies that he himself likes the company. If he is dissatisfied with his pay, or his boss, or his surroundings, he will make a sorry job of trying to answer critics. Moreover, if he is 90 per cent. satisfied—and if, on being questioned at headquarters, he professes, carelessly, to be 100 per cent. satisfied—that remaining 10 per cent. of dissatisfaction will be sufficient to neutralize most of the superintendent's exhortations, unless the man has been made to reflect on the subject and systematize his thoughts.

To make all employees so well pleased with the company

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and its policy that they will habitually praise it may seem to be a pretty large task; but will any one deny that this is an important feature in the campaign to promote politeness? Assuming that most employees who deal with passengers are fairly well satisfied with their lot there is still a considerable task to insure that they will act on this feeling habitually and will not let their words and their attitude be influenced by some grievance about a minor matter or by the unfriendly spirit of some fellow employee.

And there is still another verse in that fifteenth chapter of Proverbs which the brakeman may notice if he reads the chapter: It speaks of "the revenues of the wicked." The feeling that the capitalist gets more than a just share of the profits, and, therefore, should be classed as "wicked," is not found exclusively among the farmers in the back towns; it exists among railway employees. Frequently a labor-leader takes it as the text for a speech, and there are employees who, if they were to read this verse as referring to railway revenues, would see nothing inappropriate in the use of the word "wicked." Not that there are many such. Those who actually formulate ideas of enmity to the company are probably very few. But the root idea is common, without doubt, and to counteract its influence demands very much more than the occasional promulgation of a circular.

But, assuming that an employee has a good opinion of the company, that good opinion needs training and cultivation. If he is going to advertise the road's virtues, he needs to know about its weaknesses also, and how properly to estimate both good and bad features. The public knows—or thinks it knows—the bad ones, and the public's feeling cannot be ignored. After meeting a few criticisms which he knows to be justified, or even partly justified, the untrained trainman, finding difficulty in defending a part of his road's policy, when he has to admit that other parts are indefensible, relapses into the very common state of mind which simply evades the issue. He tells passengers, in substance, that it's none of his business to answer their questions. The general passenger agent himself, unless his road is one of those referred to by Mr. Thomas, where whistles have been superseded by harps, has to make some apologies and explanations when he confronts passengers face to face; and it is futile to expect trainmen and station men to praise the road as the G. P. A. would like to have them do it, unless he instructs them in his methods.

It is highly desirable that all employees who deal with passengers (or freight customers) be intelligent, polite and discreet. It is obvious that to make them so the company should do everything practicable in the way of instruction. Even were all employees well gifted in this respect at the outset it would still be desirable to have systematic instruction for the purpose of promoting uniformity. Why should not the traveling passenger agents give station men and trainmen courses of lectures? Would that be giving too much importance to a secondary matter? We think not. Politeness is, indeed, secondary to safety, and it may be said that we have not yet completed the education of our employees in that primary feature; but in practice the men are required to secure to passengers *both* safety and comfort; and two sides of a man can be cultivated simultaneously. The traveling men make it their business to show people the good qualities of the road and, where necessary, to explain those which are not good. If they are successful they ought to be able to talk instructively to those who have not had time to study the art of advertising so thoroughly.

The typical employee—the passenger trainman—is entitled to all the instruction in diplomacy that the company can reasonably give to him, for many of the questions that confront him have to be looked at from at least four sides: the wishes of the passenger, the actual rights or needs of the passenger, the wishes (instructions) of the company and the actual rights of the company. And usually he must decide quickly. Take the typical case of a passenger in a crowded car who cannot find a seat. He wants a seat, right there, at once. He may have no right to one, for the company may have done its best to provide an adequate supply, only to be thwarted by uncontrollable circumstances. Or, there may be a seat three cars in the rear and the trainman has got to decide whether he ought to go and find that seat or send the passenger alone. Sending the passenger implies the need of an apology for having to inconvenience him. The trainman has a duty to apologize for a lack that he himself is not responsible for. Or, perhaps, he knows that some trainmaster or other officer would have put on another car had he not been dull or careless. Trainmen usually do not know how to defend the company in cases like that. Still less do they know how to get out of the matter gracefully if they know that the superintendent habitually demands too strict "economy" in the use of cars. If a trainman tries to escape an unpleasant duty in such a case by referring passengers to the conductor he may be doing worse than to use his own imperfect talents, for the conductor, though he have twice the ability of the trainman, may just then have ten times as many perplexities.

Again, take the case of the passenger who unexpectedly finds that he must wait an hour or two for a delayed train. It may be that the company should be defended, or excused; or it may be that it deserves censure. The passenger, if an experienced traveler, possibly may know some of the causes of delays better than does the station-employee who has to deal with him. It is a difficult situation, yet it may be one of the best of opportunities to influence the public in the right direction, if only the right thing be said.

Giving soft answers is a great art!

REPORT OF THE FEDERAL BOILER INSPECTOR.

THE first annual report of the chief inspector of locomotive boilers has been presented to the Interstate Commerce Commission, and incorporated in its twenty-sixth annual report to Congress. The information included, and the manner in which it is presented is hardly as fair to the railroads as it might be. This has been shown by many of the abstracts and quotations taken from it by the press. In the first place, in connection with the statement that the law requires that the railroads file rules and instructions for the inspection of locomotive boilers, it says, "notwithstanding this notice only 170 out of an approximate 2,200 carriers complied therewith." This would seem to indicate that the railroads deliberately disregarded the law, whereas as a matter of fact, and it is recorded in the minutes of one of the hearings before the Interstate Commerce Commission, this was done so that a uniform set of rules could be established to the mutual benefit of the government and the railroads.

Under the heading of "Accidents resulting from the failure of locomotive boilers and their appurtenances," are classified the numbers and kinds of such accidents. Although these pertain to the boiler of the locomotive they were not all "failures" in the true sense of the word. An analysis of these causes shows that about 90 per cent. of the deaths were due to low water in the boiler, which is a man failure, rather than one of design, and although the crown sheet failures are classified as to the contributory defects, the fact remains that low water was the prime and only cause of such explosions. Aside from explosions, 759 other accidents are listed, resulting in 10 killed and 796 injured. These are listed under items which do not contribute to boiler structural weakness, but are of the class of mechanical defects that are inherent in all branches of human endeavor, in which perfection cannot be obtained. This, of course, is not and should not be urged as an excuse, and every endeavor should be made to reduce the number and results of preventable accidents.

There was no comparison made of the number of accidents with previous years to show the effect of the government inspection, and in fact it would be almost impossible to obtain information on all the items mentioned in the report. There were some figures, however, presented at one of the hearings

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on the number of shell and firebox explosions during the years 1905 to 1909, which compares with the present figures as follows:

	Number—		Killed—		Injured—	
	Av. for 1911-12.	Av. for 1905-9.	Av. for 1911-12.	Av. for 1905-9.	Av. for 1911-12.	Av. for 1905-9.
Shell Explosions....	3	3.1	27	6.1	41	4.7
Firebox Explosions..	94	51.3	54	26.5	168	30

The figures for 1905-9 are the average per year and to be strictly comparable they should be increased in proportion to the number of locomotives, which was 43,787, as against 62,074 reported in 1911-12.

There is no clue to the extent of any of the damages or injuries. There were 243 defective squirt hose and connections which resulted in 245 injuries. This one item is nearly one-third of the preventable accidents. Burst water glasses is the next largest similar item, being 165 in number, resulting in one killed and 168 injured.

Another point which may be easily misunderstood is that of the defects. From the reading of the report it would seem that railroads had been grossly negligent, for out of 74,234 engines inspected, 48,768 were reported defective. Since the object of the law is to promote safety this statement could be interpreted that so many engines were unsafe for use. Analysis again shows that most of these defects were of a nature that in no way impaired the safety of the boiler. Again, in a large number of cases the engines were inspected just after completing a trip and before an opportunity had occurred for them to be repaired by the terminal mechanics. If all such defects were eliminated, and those engines were reported that were actually in service, or ready to go into service, the total number of defects would have been greatly reduced.

An attempt has been made to classify the number of defects found on each road, which as coming from a government inspector would lead one to consider it as being strictly accurate; but under staybolts broken we find that one of the largest roads in the country had only 25 reported from a total of 3,621 locomotives owned, which from the face of it to a practical man is wholly absurd, for there is no question, and, with the present construction of boilers, no getting away from breaking a large number of staybolts. While this statement may be correct in that only 25 were found broken, it would lead one to believe that the inspection had been carried on at a time most fair to the road. As against this we have 1,745 staybolts broken on a road owning 1,236 engines. From this it would seem that most any number of defects could be found if the engines were inspected at a time when the roads themselves did not have them in actual service, and acknowledged that they were out of repair.

It is also stated that 3,377 locomotives were ordered out of service, but the statement is not made that anyone of these 3,377 was found in actual service. Here again is another point for misinterpretation. The fact that only five of these cases were appealed to the chief inspectors shows that the railways realized the condition of the locomotives, and in many cases might not have used them until they were placed in proper condition. Considerable more comprehensive information as to the correct status of the locomotives in this country could have been given had the chief inspector confined his report to the violations, or intended violations of the law. As the defect report stands it is a very incomplete report of the total number of defects that all the locomotives in this country may have during one year of their existence.

While it is unfortunate that the report is such as to admit of misinterpretation, there are, on the other hand, reasons for congratulation on the work of the chief inspector of locomotive boilers for the first year of this new department. It would be impossible to organize and develop the work of such a department without some mistakes being made and that as few misunderstandings have occurred in putting the regulations into effect speaks well for chief inspector of locomotive boilers and the co-operation between his department and the railways generally.

Letters to the Editor.

GOVERNMENT OPERATION OF RAILROADS.

EASTERN RAILWAY OF NEW MEXICO;
AMARILLO, TEXAS, JANUARY 15, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The suggestion of Mr. L. C. Fritch that the government take over the Union Pacific or the Southern Pacific, to use in demonstrating proper railway regulation, with the proposal to appoint members of the Senate from states through which the road runs, and the Interstate Commerce Commissioners, as directors, presumably with Franklin K. Lane as president, is very interesting.

Then, following the recent precedents set by Indiana and by New England, if the patrons of these government roads wish to reach the men high up, in case of accidents, we may expect to see them indict the president and the directors on criminal charges.

Perhaps, if politicians see their perilous position of responsibility for mistakes of subordinates government regulation may not be so popular. Possibly, however, they might claim immunity under the law that you cannot sue the king.

AVERY TURNER.

SALES OF INTERNATIONAL SIGNAL STOCK.

NEW YORK, JANUARY 14, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In a recent issue you published a letter from Mr. Ray, chief engineer of the Delaware, Lackawanna & Western, that might lead your readers to infer that this company was trying to sell stock to the public, and such an impression would do us a very grave injustice.

The facts are these; more than six years ago, our own stockholders set aside a reserve fund of $200,000 of treasury stock, and not until our inventions had been so perfected as to be "approved for test" by the Block Signal and Train Control Board was any offering of it ever made, and then only to our own stockholders.

At the annual meeting in September, every stockholder present joined in signing and issuing a statement to those unable to attend the meeting, urging each of them to subscribe for their pro-rata of this reserved treasury stock as soon as possible; and this appeal was mailed to each stockholder with the report of the annual meeting.

This was just as legitimate—to urge them to hurry up their subscriptions—as would be any other lawful act authorized by a meeting of the stockholders.

None of this treasury stock has ever been offered to the general public; nor have we allowed one line of advertising or descriptive matter to be published regarding our automatic train stop. Had we been "stock jobbers," such an article would have brought us hundreds of buyers, but we refused offers of reputable papers; nor will we allow any advertising until our train stop has been thoroughly tested and proved successful.

Our bulletin No. 16 was mailed only to stockholders of this company, and *not* to "railroad employees" (unless they were also stockholders), nor to the general public. As we construe it, the bulletin sets forth very clearly that the installation of the Lackawanna is purely for testing purposes, and its success or failure has no binding action of any kind on that railroad, and we certainly do not agree with any opinion that it was misleading. Mr. Ray's letter does not mention the fact that his road asked for and received from us a signed agreement fixing the prices at which future equipment could be bought from us in case our apparatus was desired by it.

Only treasury stock, and not personal stock, was offered for subscription. Every cent of the proceeds from its sale goes directly into the company treasury for a working capital, and not into the pocket of any individual. And this treasury stock

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is offered only to present stockholders, who have been kept informed of company conditions by the various bulletins; and the bulletin specifically states that the subscriptions are being solicited for the very purpose of making this testing installation and supervising the tests. The inventor has been for years an associate member of the Railway Signal Association, and we have the very highest of bank, trust company, and business references. We invite the fullest investigation of both ourselves and our automatic train stop.

THE INTERNATIONAL SIGNAL COMPANY,
Jean F. Webb, President.

CONTINGENT SCHEDULES ON THE VIRGINIAN.

NORFOLK, Va., January 13, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

G. W. Turner, in the December 13 number of the *Railway Age Gazette*, takes exception to a statement made in the article on our contingent schedules to the effect that a flagman has served no useful purpose unless he has actually stopped or warned a train which otherwise would have come into collision with the train he is protecting. As to this, the only point that may be discussed is, whether the flagman should go out (provided he is furnished reliable and authorized means of so determining) when there is no train to be stopped. The Virginian contingent schedule gives the men in charge of a train this authorized information which, with respect to following trains, is equal to an absolute block; and without doubt there exist on certain portions of every railroad conditions of train movement where this system of moving extra trains could be utilized to advantage.

We are making no argument against the flagman going back to protect the rear of his train. The only claim is that there should be no greater need, under certain conditions, for such protection, than there is for sending a flagman ahead, under practically the same conditions, to protect the head end of his train.

The only agencies (with the exception of the staff), so far as I know, which are depended upon for moving trains against each other on single track are time schedules and train orders, with the red flag as an auxiliary when a train fails to clear. Block signals are regarded as aids, but for well known reasons are seldom depended on as absolute protection for either the front or rear of a train.

Now, if a time schedule is regarded as paramount, and the red flag auxiliary protection for the front of a train, by what process of reasoning is it determined that the red flag becomes paramount and the time schedule worthless for the protection of the rear of a train, where an oversight is much less certain to result in a collision? Why is it thought that men may be depended upon to avoid numerous opposing trains, but not the one following train with which they might become involved by our schedules?

Is it not possible that it is due to the obsession of fixed opinion, proceeding from continuous habit of thought in one direction? I can say for the Virginian Railway that when protection is required, our men protect more promptly and in much better form than they did under the old conditions; and in view of the fact that trainmen have knowledge of following as well as of opposing trains we consider our plan is in complete harmony with the "safety first" proposition.

Referring to the example given where trains running late on contingent schedules 30 and 31 are used to illustrate a condition where it is claimed that failure to deliver a meeting order to C. S. No. 31 would result in opportunity for collision, I will say that failure of delivery of the order to either or both trains, whether on time or late, and regardless of where the order is placed or where the trains are directed to meet, could not possibly result in collision, except by the most palpable oversight and direct violation of the rules. This is due to the fact that until a meeting point is provided by train order, the two trains are clearing each other. If C. S. No. 30 received the order and C. S. No. 31 did not; C. S. No. 30 would proceed to the meeting point stipulated in the order, while C. S. No. 31 would continue to clear the time of C. S. No. 30, thus giving no opportunity for collision.

The presumed difficulty about starting the wrecker on short notice on account of trains not protecting rear is more imaginary than real. It is no more difficult to get notice of the wrecker to trains of the same direction than to trains of the opposite direction. The same line of reasoning might be used as argument that trains from the opposite direction ought not to be run at all. As a matter of fact the schedules might, under certain conditions, be of considerable assistance in getting the wrecker started against opposing trains.

As to the small road proposition, an examination of published statistics, which are available to everyone, will disclose a several times greater density of traffic on the Virginian Railway than on any one of the larger systems mentioned by Mr. Turner.

The speed schedule plan submitted by Mr. Turner does not, from my point of view, work out to a successful conclusion. I doubt whether everyone will agree that the matter of figuring out the numerous run late schedules would be as simple a process as represented. That, however, is only a matter of opinion, and my criticisms will be confined to what I consider to be defects of the system.

In all of the examples of orders submitted by Mr. Turner, the westbound trains are given right over all eastbound extras and in order No. 5 right is given over all trains; copies of the orders to be placed at Pablo or distant terminal for trains not yet in existence and at intermediate points for trains already in existence. In view of the fact that the eastbound trains then on the road would not be clearing the schedules of the westbound trains until advised of their existence and there being no restriction placed upon westbound trains except the schedules, it would be impossible, without danger of collision, to start a westbound train from Farley until the notification order has been signed for and actually delivered to all of the trains over which right is given. To simply place the order would not be sufficient; actual delivery must be effected.

It is apparently the intention to run trains on high speed schedules and slow speed schedules indiscriminately, according to class of traffic and the time they are ready to start. To start a high speed train behind a slow speed train without giving notice to the slow would be unsafe and in violation of the rules. It would, therefore, be necessary before starting a train on a high speed schedule from Farley to place copies of a notification order to all slow speed trains of the same direction then on the road; and such orders would have to be actually signed for and delivered before the train could be moved from Farley. Additional provision would have to be made for work trains. Under the circumstances how would it be possible to start trains "on a moment's notice," as is claimed?

Suppose a train about to leave Pablo receives a copy of order No. 5, how are the men receiving the order to determine whether engine 400 is running eight hours late on schedule A of yesterday (in which event it would be already overdue) or the schedule of today or of tomorrow? If I am right in assuming that no time limit is placed on the rights conferred by the order, I should say that the only safe conclusion would be that the train is already overdue and the opposing train would not be justified in leaving Pablo.

I may not have a correct understanding of all of the details in connection with the proposed speed schedule plan, but the objections I have mentioned would, if sustained, appear to me to be sufficient to seriously impair its usefulness as a system.

A. T. WOODRUFF,
Train Rules Examiner, Virginian Railway.

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CANADA'S MOST SUCCESSFUL RAILWAY YEAR.

A Detailed Study Showing the Growth of Mileage, Facilities, Traffic and Earnings During the Year Ended June 30, 1912.

By J. L. Payne,
Comptroller of Statistics, Ottawa.

During the year ended June 30, 1912, the railways of Canada built 142.53 miles of second track and 599.39 miles of yard track and sidings. This may not seem like much construction work, and it will probably be regarded as an odd way to begin an article which is intended to present a picture of the most prosperous year in the history of Canadian railway interests. But, properly appraised, these additions mean a great deal, and the singling out of such facts will not appear at all peculiar to modern railway men. Moreover, they imply other conditions equally satisfactory. Additional second track and more facilities for the expeditious handling of traffic are today the outstanding needs presented by the general transportation problem of this continent. The manager of every large railway is in despair over this matter; and his perplexity is intensified by the self-reproach that such a situation could have been saved by foresight and faith. Land which could have been had at a moderate figure forty, twenty, or even ten years ago, is now held at a prohibitive price. Real estate is advancing rapidly in Canada, too; but it may still be acquired at relatively low cost, and optimistic, perspicacious railway men are getting hold of it for sidings and terminals. In doing this they are slightly anticipating their needs; but they are showing sound judgment. Railway expansion in Canada is proceeding at an unprecedented rate, and the day is near at hand when this elbow room at terminals, and these longer and more numerous sidings will justify themselves in net earnings.

It is worth while to give the particulars which are lacking in the foregoing paragraph. The addition of 142.53 miles of second track brought the total up to 1,752.49. Again this may seem a small matter; but that mileage was equal to 6.5 per cent. of the total first track mileage of the Dominion, and was 86 miles more than were added in 1911. Six years ago there were but 1,067 miles of second track in Canada, or 4.7 per cent. Of yard track and sidings there were 4,092 miles in 1907, and 6,149 in 1912. This increase was from the ratio of 18.2 per cent. to 23.0 per cent. of first track mileage. While single track mileage increased 19 per cent. in six years, second track increased 64 per cent., and yard track and sidings 50 per cent. This was good business, and its real significance will be better understood when it is pointed out that in 1910—which is the last year for which official figures for comparison are available at the moment—yard track and sidings in the United States had increased but 30 per cent. during five years. In other words, it is the rate at which Canada is coming that gives these figures special value. And this matter of relative progress will be found to be the conspicuous feature in all aspects of Canada's railway advancement in 1912.

There is another feature of railway administration in Canada which is distinctly on the side of betterment. During the past four years the expenditure on maintenance of way and structures has represented an average of 21.50 per cent. of the total operating expenses. This has been better by 2 per cent. than the railways of the United States have averaged during the same period, and it reflects a disposition to secure efficiency. The upkeep of equipment has also been equal to over 20 per cent. of operating expenses, and that percentage is understood to demonstrate sound railway management the world over; but it falls below the United States average. In the light of what has been done in this regard in Canada in the past, it points to safe policy. In 1907 the outlay on way and structures was $930.30 per mile of line; in 1912 it was $1,179.11. The total expenditure for maintenance of equipment in 1907 was $965.01 per mile; in 1912 it was $1,115.41. This is also below United States figures; but the ratio of increase has been greater on the Canadian side of the line. The point which these facts emphasize is, that the railways of the Dominion are not fattening immediate net earnings by neglecting either roadbed or equipment, in which they are merely true to the best traditions of prudence. They are living up to the highest standards in all that makes for the economical handling of traffic.

First track mileage was increased by 1,330 miles during the year, bringing the total up to 26,727. In no preceding year had such a large addition taken place. Eighty-three per cent. of the new mileage put in operation was in the western provinces, and, with avidious appetite, they are crying out for more. As a matter of fact, 1,623 additional miles of line were in actual operation in 1912, and 1,738 had been completed; but officially these 3,361 miles were regarded as being under construction. Had they been taken into the count, the operating mileage of Canada would have reached 30,088, or a larger total than that of Great Britain. There were altogether in the official sense 8,826 miles under construction on June 30, 1912; but the definition of that term would not be strained if it were said that more than 10,000 miles were actually in process of being built. "Under construction" applies to work lying all the way between the exploratory survey and the opening of the road for traffic. It might be observed, however, that, while the preponderance of this prospective mileage is in the West, slightly over 40 per cent. of it is located in the East. Turning again to the relative idea, it is encouraging to Canadians to realize that, measured by population, they are building railways at twice the rate of their progressive neighbors to the south. They are still maintaining the unique position of having the highest mileage per capita of any country in the world, yet see room for further growth in the fact that by the territorial test they are at the very foot of the list.

Without any qualification, it may be said that the Canadian people are at this juncture concerned more in securing two things than anything else—markets and transportation facilities. To get these they have not only made very considerable sacrifices; but, with perfect cheerfulness, are prepared to make still larger drafts upon the public treasury and the national credit. The burdens arising out of what has already been done to aid railway construction are represented in cash subsidies of $208,-072,074, contributed by the Dominion government, by the provincial governments and by municipalities; in land grants aggregating 56,052,055 acres, and by guarantees aggregating $245,-070,045. For 1912 the increase in cash subventions over 1911 amounted to $5,892,818, in land of 6,000,000 acres and in guarantees of $96,733,688. The government is also constructing the eastern division of the Grand Trunk Pacific at a cost which the minister of finance announced in parliament would probably reach $243,000,000. An expenditure of $117,000,000 has already taken place. These items added together make $696,142,119, without placing any money value on the land grants. It is impossible to say what the latter are worth; but the holdings of the Canadian Pacific and the Canadian Northern in the West would realize not less than $150,000,000 at prevailing prices. During the past year railway lands averaged $13.70 per acre, and the sum received from sales amounted to $18,200,000. The Canadian Pacific had an average of $15.99 for 669,639 acres; but received $40.25 per acre for 3,270 acres of irrigated land. The Canadian Northern averaged $15.17 per acre, as compared with $12 in 1911. Guarantees have been the popular form of

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aid during recent years, and governments of the western provinces have assumed obligations in that regard beyond $150,000,000. In the majority of instances the guarantee is of both principal and interest for a long term of years. In the case of the Grand Trunk Pacific, the Dominion government not only guarantees the interest on bonds, but makes up the difference between the sale price and par.

Canadian railways hauled 89,444,331 tons of freight in 1912, or 9,560,049 more than in 1911. This was the largest increase in any year. There were also 41,124,181 passengers carried during the year—a gain of 4,025,463 over the preceding year. This larger volume of traffic created a heavy tax on equipment and, in the autumn months, the movement of the western harvest was marked by considerable congestion. Nevertheless, the conditions in that regard were much better than in 1911. This was due in part to more rolling stock, but chiefly to better organization. The additions to equipment in 1912 embraced 265 locomotives, 13,700 freight cars and 433 passenger cars. The demand for new freight cars has been far beyond the capacity of domestic industries, and during the year orders were placed in the United States for over 14,000 units. The total equipment orders of the Canadian Pacific during the past year had a money value of $48,000,000, which is said to have been double the amount ever given within such a period by any railway in America. These orders included 467 locomotives, 26,653 box cars, 94 stockers, 25 diners, 57 tourist cars and a great deal of other rolling stock. The available supply of cars in the Dominion for freight service reached a total of 140,918 on June 30 last, and on that date the official statistics show a material increase in carrying capacity. For example, in 1907 there were but 9,790 cars of the 80,000 lbs. class in Canada; in 1912 there were 21,951. Of the 100,000 lbs. class, the number during the same period had grown from 3,448 to 7,135.

There was a betterment in passenger density over 1911 of 6.291, and passenger miles increased by 304,282,712. Gross earnings per passenger train mile were $1.390, as compared with $1.263 five years ago. Per freight train mile the advance was from $2.069 in 1907 to $2.494 in 1912—equal to 20 per cent. Per mile of line, the number of passengers carried was 1,539—a gain of 79 over the preceding year. A comparative summary of these and other statistical data is as follows:

	1911.	1912.
Number of passengers	37,097,718	41,124,181
Passengers carried one mile	2,605,968,924	2,910,251,636
Passengers one mile per mile of line	102,597	108,888
Passengers per mile of line	1,460	1,539
Average passenger journey—miles	70	71
Passengers per train	60	62
Earnings, passenger service	$58,317,998	$65,048,187
Average receipts per passenger	$1.360	$1.375
Average per passenger per mile—cents	1.944	1.943

There was a gain in 1912 of 3,509,712,232 ton miles over 1911, while freight density was increased by 99,947. The average revenue per ton per mile declined from .777 in 1911 to .757 in 1912, which scarcely gives support to the persistent complaint that freight rates are being advanced. As indicating the activity in freight movement during the year, loaded cars had a mileage of 1,102,719,543, as compared with 946,946,917 in 1911. There was an appreciable betterment in the average load of both cars and trains, and in the number of cars per train, while the length of haul went up by 18 miles. The following summary of facts for 1911 and 1912 will give a concise view of the freight situation:

	1911.	1912.
Tons hauled	79,884,282	89,444,331
Tons hauled one mile	16,048,478,295	19,558,190,527
Tons, one mile per mile of line	631,829	731,776
Average haul, miles	200	218
Average tons per train	305	325
Average cars per train	18.03	18.19
Average tons per car	16.91	17.87
Average per ton per mile—cent	.777	.757

One or two things occurred during the year which emphasizes the part played by transportation facilities in the economic life of nations and communities. Canada is essentially an agricultural country, with large live stock and dairy interests, and yet in 1912 she imported several million pounds of mutton from Australia, and several million pounds of butter from New Zealand. It would have been impossible to go farther for such products. It cost, however, half as much to bring a pound of mutton from the Antipodes to the Pacific coast as it did to deliver it from the butcher shop in Vancouver to the home of the consumer. That is to say, this mutton was brought from Sydney to Vancouver at a freight cost of slightly over two cents a pound; and the special committee which investigated the meat problem at Washington declared that it cost four cents per pound to maintain a delivery service between the retailer and his customers. The New Zealand butter was brought to Vancouver by steamer, and thence by rail as far east as Montreal, where it sold at 40 cents per pound to consumers. The freight cost by water and land was less than four cents per pound. That this was not a mere spasm in trade, is demonstrated by the fact that this winter millions of pounds of New Zealand butter will be delivered in Canada under contract. A more striking illustration of what transportation facilities do could not well be found. It demonstrates very clearly that the producer and his market are not separated by miles, as is popularly assumed, but by freight charges. One should not say: "New Zealand is 10,800 miles from Montreal"; but rather, "New Zealand is 3.8 cents per pound from Montreal." If either the butter or the mutton had been produced 150 miles away from Ottawa, and it could not have been moved by either steamer or railway, the cost of hauling that distance would have been greater than it actually was from New Zealand or Australia.

The record gross earnings of $219,403,753 were the inevitable result of increased traffic. A betterment of over 16 per cent in total revenue for 1912 suggests material expansion in production and marketing. Freight yielded over 75 per cent. of the year's gain, although, as has been said, the ton-mile rate was lower than 1911. This gain was chiefly in the hauling of 3,500,000 more tons of agricultural products, and 2,750,000 more tons of manufactures—indicating a larger harvest and greater industrial activity in the Dominion. There were further earnings of $21,221,775 from outside operations, with a balance to the good of $5,888,157. These operations were principally in the conduct of steamship business and hotels; for it must be borne in mind that Canadian railways are getting to be large owners and operators of steamers. The Canadian Pacific alone has a fleet of 70 vessels, of which 16 are on the Atlantic, and 3 on the Pacific. The remainder are in service along the Pacific coast, on the Great Lakes and on the lakes and rivers of British Columbia. The Canadian Northern has two large steamers on the Atlantic, and the Grand Trunk Pacific has two on the Pacific coast. It is obvious that railway traffic in an exporting and importing country like Canada must create business on the ocean; and railway owners of Canada seem disposed to control things at both ends. Railway hotels are also multiplying, and would seem to be profitable. The Canadian Pacific has made the largest investment in this regard; but both the Grand Trunk and Canadian Northern are following the tempting example set. Earnings from express business have increased by 61.5 per cent. in five years. All the leading railways carry on a service of that nature, first paying themselves liberal rates for "express privileges," and then declaring attractive dividends from what is left over. They also earn millions out of their telegraphs, which are spread over the whole country, and some of them control large electric railway interests. Whatever else may be said, it must be admitted that these railway hotels, steamers, and express and telegraph services are the best in the country. The railways conduct such interests with splendid skill.

Gross railway earnings in 1912 showed an increase of $30,670,259 over the preceding year. Thirty years ago the total earnings were less than this increase. These gross earnings equalled $8,209 per mile of road, as compared with $6,397 five years ago. In 11 years the aggregate earnings per mile have

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more than doubled. Revenue came from the following sources in 1911 and 1912:

	1911.	1912.
Passengers	$50,566,894	$56,543,664
Mails	1,869,414	1,914,720
Express	4,674,135	5,294,868
Baggage, parlor cars, etc.	1,207,555	1,285,413
Freight	126,570,534	149,961,140
Station and train privileges	826,252	1,086,687
Telegraph, rents etc.	3,018,710	3,307,739
Total	$188,733,494	$219,403,753

It will be observed that while there were substantial increases in all the divisions, passengers and freight scored heavily. Per ton, gross earnings from freight rose from $1.561 in 1911 to $1.655 in 1912. In this regard the gain in five years has been equal to over 12 per cent., which is largely accounted for by the hauling of a larger volume of high class commodities, as was pointed out in a preceding paragraph.

Operating expenses in 1912 were equal to 68.7 per cent. of gross earnings, and amounted to $150,726,540. In this connection there was exhibited a further rise in the cost of running a train one mile. That cost has almost doubled since 1899. It was then 77.9 cents; it is now $1.493. An analysis of items making up the total expenses of operation reveals a persistent advance in the cost of fuel and labor. The conditions in regard to employees would seem to be the same on both sides of the line. The unions co-ordinate and the process of leverage is identical. Just where the upward movement will stop nobody seems to know. Operating cost in 1912 amounted to $5,639 per mile of line.

It would take up a good deal of space to deal comprehensively with the financial position of Canadian railways. The salient facts alone can be given place. The official statistics show a capitalization in 1912 of $1,588,937,526, of which $770,459,351 was represented in stocks and $818,478,175 in bonds. This liability would be equal to $89,454 per mile of line if the whole sum were divided by the mileage given in a preceding paragraph; but neither the divisor nor the dividend would in that case be correct. After deducting from capital figures duplication and dead liability, and excluding the mileage of government owned lines, the true quotient in the calculation is $50,832 per mile. That is a relatively low figure. It is slightly below the actual cost per mile of government owned lines in Canada. It is well secured. Against it stands a steadily swelling volume of gross and net earnings. The former have increased by 128 per cent. in ten years, and the latter by 141 per cent. Dividends have gone up from a total of $12,760,435 in 1907 to $31,164,791 in 1912. The dividend payments of the past year were equal to 4.05 per cent. on the entire stock liability—good or bad, alive or dead. The railway bonds, in so far as they are a real liability—that is, when duplication has been eliminated—are gilt edge. Both principal and interest are safe. Thirty per cent. of them are backed by government guarantees. The capital liability of Canadian railways is growing at the rate of about $100,000,000 a year, and in this growth the United States has both a direct and indirect interest. To the extent of nearly $100,000,000 it has been created by American ownership on the northern side of the boundary, and Americans are the holders of an enormous volume of Canadian railway stocks and bonds. The indirect interest arises from the fact that every mile of railway built in Canada means a call upon American producers for more or less of the equipment and operating necessaries. For example, the United States supplies 95 per cent. of the lubricating and signal oil used by Canadian railways.

Canada, by every proper test, is going ahead rapidly. In many parts, particularly in the West, the activity is spoken of as "a boom." Whether or not the term applies depends wholly upon the point of view. Certainly real estate is selling at high figures in the more promising centers. But what has created these centers? The railways in every case. And, while the railways have primarily brought about this new scale of values in real estate—real estate which yesterday was worth but a few dollars an acre for farming purposes—the foundation of what is taking place in the West is the rising tide of immigration. Now, as in the past, and as it always will be, the so-called value of land is vested in the people on the spot. As people gather in communities the rise in land values is merely an expression of permanency, and that permanency cannot exist without transportation facilities; which is another way of saying that Canada's boom must be reflected in railway expansion. The ground work of development has been laid; for history is sure to repeat itself in the sense that what happened in the American West between 1860 and 1890 will happen in the Canadian West between now and 1930. An established flow of population creates accretive power; and in the case of Canada that power rests on the fact that free farming lands will be a thing of the past when the public domain of the West is taken up.

The part which Americans are taking in the peopling and development of the Canadian West, and of Canada generally, is quite important. Hundreds of thousands have crossed the line during the past six or eight years to take up farming land, and many others have come over to share in the money making chances which arise in new and rapidly growing communities. Upwards of 1,500 miles of railway are now being operated in Canada, representing a capital outlay of $100,000,000, which are mere extensions of American systems. Millions of tons of freight move annually across that imaginary line called the international boundary. It is very much an imaginary line so far as the railways are concerned; for trains move backward and forward over it with the same freedom they cross state lines. Canadian railway corporations own thousands of miles of line in the United States. Reports to Ottawa are made on precisely the same forms, and governed by the same classifications, on which reports are made to Washington. For railway purposes the line is unrecognizable; but it is there, and the fact that it will remain there need not in any sense hamper the growth of international transportation interests. Those interests will and must increase. The flag is scarcely an element in the matter, from a sentiment. Trade follows the ship and the railway. Canada is the second best customer of the United States, and the United States is Canada's second best customer. The prosperity of Canada means more business for the United States, whether that prosperity is demonstrated in additional railway mileage, in swelling population or in larger production. Hence, the story of Canada's best and most encouraging railway year must be a matter of genuine, and not entirely unselfish satisfaction to those who live south of the forty-ninth parallel.

Reference to accidents can hardly be avoided. In 1912, Canadian railways killed 568 persons and injured 3,780. Of the killed, 47 were passengers. One passenger in every 872,855 was killed, which was an abnormal ratio. One passenger in every 84,792 was injured, which reflected a very bad year in respect of casualties of that class. A study of accidents to employees over a period of years, reveals the somewhat surprising fact that relatively the same number suffer injuries every year from practically the same causes. That is to say, in proportion to numbers there are about the same number killed and injured every year from say jumping on or off trains, from coupling or from other avoidable causes. It might be supposed, the number of accidents would have more or less direct relation to train mileage, as representing the measure of risk; but such a law cannot be found in an analysis of casualty statistics. Accidents at highway crossings were numerous in 1912, notwithstanding the steady elimination of grade crossings and the installation of many warning devices. The high proportion of trespassers killed tells the story of fatal haste at city crossings when the protective gates are down. The killing of 235 trespassers in other ways rather shows that Canadian railways will soon learn to sympathize with American roads in the matter of the tramp nuisance.

The number of employees reached 155,901 in 1912—an increase of 14,677 over 1911. The additions were equal to 31 per 100 miles of line, and brought the total up to 583. The salaries and wages bill for the year was $94,237,623, including outside oper-

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ations; but making a deduction of $6,937,984 on that account, the total for comparison with other years was $87,299,639. This was $12,685,901 higher than the figures for 1911, and the total was equal to 58 per cent. of operating expenses. On the basis of the statistical family, it has been estimated that one person in six gets a livelihood, directly and indirectly, out of the operation of railways in Canada. The calculation would not have to be strained to bring the ratio up to one in five. As an example of the indirect interest, it is probable that the supplying of 15,000,000 ties in 1912, at a total cost of $6,500,000, represented an income of $700 for 9,285 persons; or the livelihood of 46,000 souls on the statistical basis. Incidentally, it might be observed that the cost of ties has more than doubled in fifteen years, and the use of treated sleepers has commenced as a matter of economy. The average cost per tie in 1912 was 44.7 cents.

Looking back over what has been written, it will be observed that Canadian railways in 1912 made entirely new, and in some respects surprising, records in practically every statistical aspect. The additions to mileage of first track, second track, and yard track and sidings, the increase in traffic, the additions to equipment, the gains in all the earning divisions, the multiplication of employees, and the betterments in trainload and efficiency tests in general were the largest in the history of the Dominion.

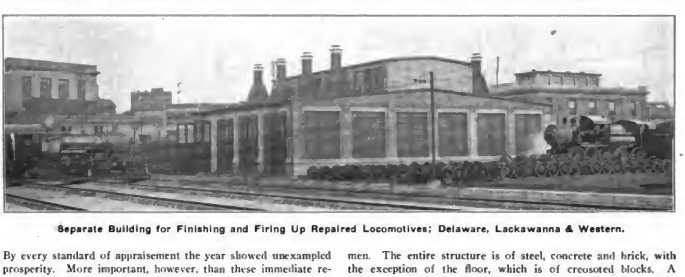
By every standard of appraisement the year showed unexampled prosperity. More important, however, than these immediate results, is the warranted assumption that an era of extraordinary expansion in railway interests has begun. The railway people are keenly alive to their trackage and equipment needs in view of swelling immigration and the rapid development of the western provinces. They are adding to their transportation facilities on a scale which mirrors their optimism, and yet, build as quickly as they may, it is not probable that they will be able to get ahead of their needs. Traffic keeps up with new mileage. This is a situation which represents the fruition of long-cherished hopes; but Canada does not close her eyes to the fact that in this growth the United States has a genuine interest. It does not mean rivalry. It means, as has been said, larger business on both sides of the line.

There is one further feature of the Canadian railway situation which calls for a closing observation. No matter what expansion may take place or how many new lines may be built, the tendency to centralization seems likely to continue. The smaller roads will be absorbed by the larger. During the past year this process has been actively in operation. The annual report of the Canadian Pacific to its shareholders is largely taken up with the story of absorption. There are some who profess to see danger in this; but there will always be another side to the matter. Whatever else may be true, the change of control carries with it development and efficiency. Strength succeeds weakness. In the last analysis transportation facilities are bettered.

A FIRING-UP HOUSE FOR REPAIRED LOCOMOTIVES.

Where there is an engine house located conveniently in relation to a large repair shop, the locomotives are generally placed in it for firing-up after the erecting shop work is completed and preparatory to the trial trip. While this avoids the inconvenience of smoke and dirt in the erecting shop, it frequently interferes with work in the engine house, particularly if the latter be located at a busy terminal. In some cases this has been avoided by providing a special shop, or running shed, for the purpose.

The Delaware, Lackawanna & Western has just completed what is termed a "firing-up" house in connection with the locomotive repair shop at Scranton, Pa. This building is located directly across the transfer table from the main machine and erecting shop, and is used for housing the locomotives while the tenders are coupled on and made ready for service and while they are being fired-up, and also for making the running repairs reported by the engineer after the trial trip. It is 85 ft. long and 70 ft. wide, and has four tracks, each having a 50 ft. pit of concrete construction. It is heated by steam, is piped throughout for hot water, etc., and is lighted by electricity, with extension lights for the convenience of the work-



Separate Building for Finishing and Firing Up Repaired Locomotives; Delaware, Lackawanna & Western.

men. The entire structure is of steel, concrete and brick, with the exception of the floor, which is of creosoted blocks. A large monitor extends across the center, and smoke jacks of steel and concrete have been installed at both ends of each pit, so that locomotives may be either headed or backed in. We are indebted to H. C. Manchester, superintendent of motive power and equipment, for this information.

RAILWAYS IN NATAL.—In Natal a small beginning was made in 1860 on the 4 ft. 8½ in. gage, altered subsequently to the Cape gage (3 ft. 6 in.). The main line leading to Johannesburg, a very heavy one, was opened in 1895. When the line reaches the Transvaal, it attains a level of over 5,000 ft. This main line has several branches, and the total mileage at the date when the railways were taken over by the union, two and a half years ago, was 998 miles.

RAILROAD DEVELOPMENT IN URUGUAY.—For the first time in its history the earnings of the Central Uruguay Railway for the past year exceeded $1,000,000. The extensions to the northeast have been completed to the city of Melo, not far from the border of Brazil. The Eastern Railway has opened the line to Maldonado, with a corresponding increase in its business. Work has been begun on the Midland Railway, between Tres Arboles and Piedra Sola, and applications for concessions have been made for new railway lines between Melo and Acegua and from Salto to Rivera.

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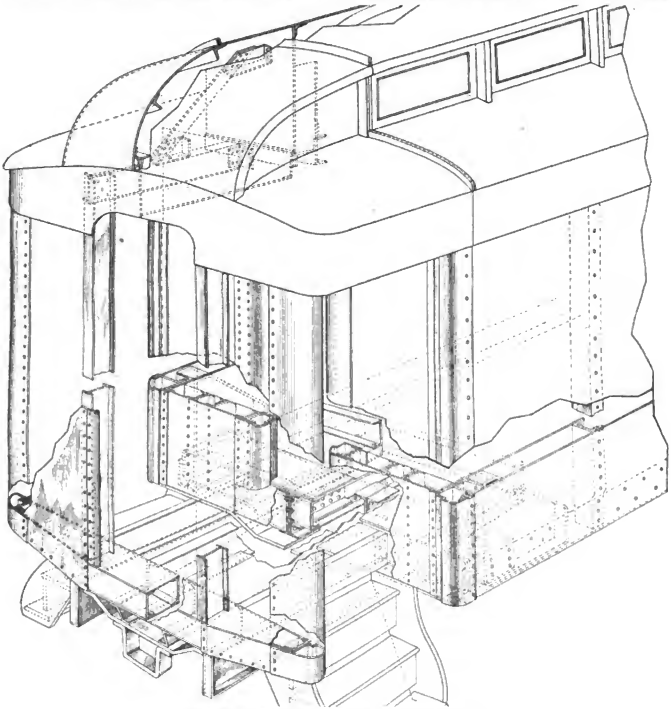
A COLLAPSIBLE PLATFORM AND VESTIBULE.

The Barney & Smith Car Company, Dayton, Ohio, has recently applied for letters patent on an interesting innovation in the construction of vestibules and platforms for passenger cars. This has for its chief purpose the protection of the ends of the car body in collisions and wrecks.

The device includes the entire platform and vestibule, from the end of the car body to the nose piece of the platform, and is so constructed that in case of a shock more severe than encountered in ordinary service, the platform and vestibule will collapse or crush, forming a cushion space of nearly 8 ft. between two cars, before the car bodies come together. In an eight car train this would amount to about 50 ft. of cushion construction, planned to absorb the shock and damage before the car bodies containing the passengers could be seriously disturbed.

This is accomplished by stopping the center sills at the end of the car body proper and fastening platform extensions to them. The connection between the extensions and the center sills is made of such strength that the rivets will shear when the car receives a shock more severe than the maximum service shock. The steps, vestibule doors and hood will of course collapse when the rivets shear on the sill extensions, and these will further tend to absorb the energy of the shock.



Collapsible Platform and Vestibule on an All-Steel Car.

One illustration shows a car of steel construction throughout, while the other shows one with the collapsible extension made of wood. This wood construction may be used with all-steel, all-wood or composite car bodies. It will be noted that the end of the car body is designed for great strength, by

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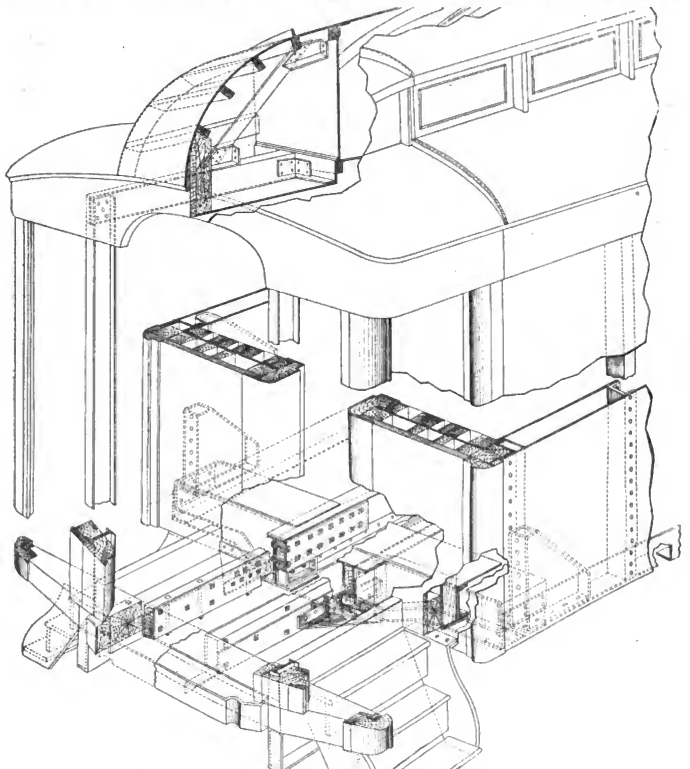
using a number of heavy steel sections to form the door posts, corner and intermediate posts, and that the intermediate posts have been further reinforced by angles riveted to the inside. These angles in practice would be about 4 ft. 6 in. long, as it is claimed that in case of the cars attempting to telescope the point of greatest shock is never greater than 18 in. or 20 in. above the floor line. The entire end of the car body proper is covered by a heavy steel plate, extending from the upper part of the roof to the bottom of the end sill. This is to further strengthen the end of the car, hold the end posts in proper position and prevent parts of the vestibule from piercing the end of the car. This end plate, which is made in pieces securely riveted together, is also so designed and fastened to the roof members that in case of collision, if the shock were not wholly absorbed by the collapsible platform, the entire end of the car roof would be pulled downward, forming a protection by forcing the next car or locomotive to be thrown upward and over in place of going through the end of the car.



Steel Car Equipped With a Wooden Collapsible Platform and Vestibule.

The entire platform, vestibule, hood and sill extensions are a unit, detachable and separate from the car body proper, and

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can be applied, if necessary, after the car is built. In case of collision it is presumed that these parts would be the only ones greatly damaged and could, therefore, be removed and replaced at a minimum cost and delay.

As may be seen from the drawings, extra heavy steel beams are used for vestibule center posts. These beams are securely fastened above and below, the idea being that should one of the cars attempt to ride over the other the beams, if they were hit about the line of the nose piece, would be of sufficient strength to cause the rivets in the sill extensions to shear off. In order to further prevent one car riding the other there has been designed an anti-climbing device. This consists of pressed steel shapes placed below the nose piece, and forming a part of the detachable vestibule. The ends of the car proper are further strengthened at the side by pressed steel triangular shaped pieces with flanges at the edge. These extend to a height of about 30 in., and serve to protect the end of the car should it get a cornering blow and also to reinforce the side and end.

The illustration showing the collapsible vestibule and platform of wood construction shows an auxiliary wood end outside the steel end. This has been designed to serve as a cushion to further prevent the end of the car body from giving way in case of a wreck. This illustration shows two walls, the end of the car proper, reinforced with wood, and the wall of the vestibule, which rests directly against the car end. The shock absorbing qualities of the wood are utilized to advantage in this design. In general, the entire device is based on protecting the car bodies from damage and destruction, thereby saving the lives of the passengers.

TRAIN ACCIDENTS IN DECEMBER.[1]

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of December, 1912:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
†3.	Penn.	Dresden, O.	re.	P. & P.	11	8
6.	West. Md.	Pen Mar Park	bc.	F. & F.	5	2
15.	Balt. & O., S. W.	Lexington, Ind.	bc.	F. & F.	2	0
26.	Lehigh Valley	Lehigh Gap	re.	F. & F.	1	0

Derailments.

Date.	Road.	Place	Cause of Derailm't.	Kind of Train.	Kil'd.	Inj'd.
1.	Cin., H. & Dayton	Hamilton	boiler	F.	1	1
1.	New York Cent.	Hoffman's	journal	P.	0	1
6.	Lehigh Valley	Jenkins Junc.	acc. obst.	F.	1	0
11.	C., C., C. & St. L.	Sanford, Ind.	d. switch	P.	1	32
12.	Balt. & Ohio	Glencoe	runaway	F.	0	6
24.	Central Ga.	Americus	d. track.	P.	0	25
24.	St. Louis I. M.	Hot Springs	exc. speed	P.	0	16
30.	St. Louis & S. F.	Memphis	b. rail	P.	0	28

As a result of the collision near Dresden, Ohio, on the 3d, nine passengers and two employees died, and three employees and five passengers were injured. This accident was reported in the *Railway Age Gazette* of December 6. The cause of the collision was failure of the flagman to get back a sufficient distance to stop the second train.

The trains in collision at Pen Mar Park, Pa., on the 6th, were a train of empty passenger cars eastbound and a freight train westbound. Both engines and many cars were wrecked. Four trainmen and a trespasser were killed and two trainmen were injured. The cause of the collision was improper handling of train orders on the part of the train despatcher and two conductors.

[1]Abbreviations and marks used in Accident List:

re, Rear collision——be, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Fr., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

The freight trains in collision at Lexington, Ind., on the night of the 15th, were No. 99 and No. 94 of the C. C. C. & St. L., which company uses the B. & O. S. W. tracks at this point. Both engines were damaged and two tramps were killed. The trains were to meet at Lexington. The collision was due to No. 94 coming in at uncontrollable speed, the "air failing to hold."

The trains in collision at Lehigh Gap, Pa., on the morning of the 26th were eastbound freights. One brakeman was killed. Four cars took fire and were burnt up. The collision was due to excessive speed under a caution signal, the train passing a home signal set against it.

In the derailment of a double headed freight train by a boiler explosion, near Hamilton, Ohio, on the night of the 1st, the engineman was killed and the fireman was injured. The explosion of the boiler of the second engine threw the leading engine and cars of the train off the track and 12 of these cars were wrecked. The cause of the explosion was low water.

The train derailed at Hoffman's, N. Y., on the 1st, was westbound passenger No. 45, running at full speed. Of the 200 passengers on the train, nearly all were shaken, but the cook of the dining car is the only person reported injured. The cause of the derailmept was the breaking of a journal of the rear truck of the tender, and it is said that the train ran about a mile after the truck had dropped so as to drag on the rails, being finally thrown off at a switch.

The train derailed at Jenkins Junction, Pa., on the morning of the 6th, was a westbound freight, and the engine was overturned. The cause of the derailment was a car from an eastbound train which had jumped the track and fouled the westbound line. The engineman was killed.

In the derailment of a passenger train at Sanford, Ind., on the 11th, three employees were injured, one fatally, and 30 passengers were injured, none severely. The cause of the derailment was a switch out of adjustment; but it was protected by an automatic block signal, which signal was disregarded.

The train derailed near Glencoe, Pa., on the morning of the 12th, was a heavy freight descending a steep grade. The train consisted of two engines and 42 cars of coal, and the derailment was due to the train becoming uncontrollable; and one of the engines was overturned at a curve. Six trainmen were injured, two of them fatally.

The train derailed near Americus, Ga., on the 24th, was westbound passenger No. 9, known as the Seminole Limited. Four passenger cars left the track, but none of them was overturned. Twenty-four passengers and one trainman were injured. The cause of the derailment was irregular track, following very heavy rains.

In the derailment of a passenger train near Hot Springs, Ark., on the 24th, the engine and five cars were overturned. Fifteen passengers and one trainman were injured. The cause of the derailment is believed to have been excessive speed on a six-degree curve, combined with a tender truck which was too rigid.

The derailment near Memphis, Tenn., on the 30th, was due to a broken rail. One passenger car fell into a river; 28 passengers were injured.

Electric Car Accidents.—Of the accidents reported in the newspapers as occurring on electric railroads in the United States in the month of December, only two appear to have been attended with fatal results. At Ashtabula, Ohio, on the 10th, a street car was struck by a freight train on a crossing and eight passengers were killed. On the 28th, at Cincinnati, a street car was derailed on the Central bridge over the Ohio river and fell 40 ft. to the ground below. Nine persons were injured, two probably fatally. On the same day near Annapolis, Md., on the Washington, Baltimore & Annapolis, a collision between a passenger car and a freight train wrecked the passenger car; and five men were injured, all of them were trainmen.

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FREIGHT CAR TACTICS OR REGULATIONS.*

"There Is No One Freight Car Question; There Are At Least Sixteen." Tactics Are Needed to Govern Rather Than Rules.

By Arthur Hale.

I have selected the title of Freight Car Tactics not from its military significance, but because tactics are usually broader than rules and are planned to meet variable conditions; they are employed with a good deal of discretion. The point I want to make is that in handling freight cars, especially between railway systems, you are handling them under varying conditions, and the people who handle them ought to have more or less discretion. Or, what would be better, the rules must be made in such a varied way that they will work properly under varied conditions. I have here a list of sixteen such conditions. There are a great many more under which freight cars may be interchanged between railways, and under which they may not be interchanged, when possibly they ought to be interchanged.

The first great variation is in the situation of a freight car on what is called an originating railroad and its situation on a distributing road—the difference between the delivery of a loaded car by an originating railroad to a distributing road, and the return of the empty car from the distributing road to the originating road. This is probably the most striking variation, but it is not the only one of importance. The situation is entirely different today, when there is a car shortage, from the situation six months ago, when there was a car surplus. So far there are two pairs of situations: the situation on the originating road and on the distributing road; the situation in period of car surplus and a car shortage; and that makes four combinations. There is also a difference when a car is on a railway that is well equipped and in good condition from the situation when it is on a railroad in a state of congestion. There are two more situations. Multiply them and you have eight.

And there is, furthermore, a difference of condition with a freight car which is what has been called a legal-tender car—a car like a box car, which is good for a load anywhere in the country—and a car of special design, such as a refrigerator car which is no special good unless you want to ship something which is to be protected from heat or from cold. It is no good to have refrigeration in a car if you are going to ship hay in it or merchandise. Sometimes it is rather had to have the refrigerating arrangements in. Between the special car on the one side and the legal-tender car on the other, the most important difference is that out of the legal-tender car we expect to get 80 per cent. or 90 per cent. of loaded mileage, whereas out of the special car we expect to get little more than 50 per cent. The coal car is usually returned empty. The legal-tender car is one that can be loaded almost anywhere and which is now running a large percentage of its mileage under load—a situation which we want to preserve in this country. If you admit those as two more we have sixteen general situations to be considered. There are a lot more. But the point is that there is no one freight-car question. There are at least sixteen and probably more. And a set of rules that governs such a variety of questions is or should be more a set of tactics than a set of laws.

One great difficulty about these car questions is that when two railway men get talking about it, one may be talking about one question and the other about another. When a railway man thinks of the car question today he very probably thinks of the special cars which he wants to load tomorrow, and he thinks that the rules ought to be framed so as to take him out of his present difficulty. Take the officer of an originating railway, of a railway that originates more freight than it receives—supposing it to be a coal railway, and most coal railways are originating railways—you will find that he is thinking about his coal cars and in discussing the car question will feel that the important thing is that his coal cars be returned to him promptly in a period of car shortage. That is about the only phase of the car question he considers, and he will be for a set of rules that will secure that, without thinking at all of the box car, of the time of car surplus, or of the question whether railways may or may not be congested. So that one present difficulty and one past difficulty in our trying to make rules or tactics to cover this car question has been that we have been dealing with a lot of men who have been looking at the subject from varying points of view.

Let me insist a little on this division of railways, between originating and distributing roads. Of course every railway originates some freight and every railway distributes some freight to the consignees on its line. But very few railways receive exactly as much as they deliver. And railways will line up on this car question quite broadly, as originating railways who are always loading a majority of cars away, and distributing railways, to whom a majority of loaded cars are coming. The problem as between two such roads, today, if there were no other problem, would be very simple. You would only have to make a rule which would put a proper incentive on the return of the empty car from the distributing road to the originating road. And that is about all that they have done in Europe, for instance. They have been so successful in putting on very stiff penalties to secure the immediate return of an empty car from the distributing road to the originating road, that they have succeeded in getting the empty mileage of their cars in interchange up to 50 per cent. That is to say, they do not do much to load their cars back because the penalty is so very high against loading them wrong.

That penalty is a continuous penalty. In England, for instance, suppose I am loading my car to your road. It goes 100 miles on your road. You are allowed three or four days for that movement and pay a mileage for it. After the three or four days that are allowed, you pay three shillings a day—that is, 75 cents a day for a car that will hold but 10 tons. You pay that 75 cents a day until the car comes back to my lines, no matter what happens to it. If you use it in your own business it is three shillings a day. If you divert it to another road it is three shillings a day. The penalty is so severe that the English railways never think of loading a car back unless they happen to have a load at the particular station at which it is unloaded. They do not have any freight car tactics. They have freight car laws, and the cars come back. But, I believe they have a great many more cars than they ought to have and a great many more cars in proportion than we have.

I agree that in times of car shortage the English practice is not so bad, but in times of car surplus there is not so much difference between an originating and a distributing road. When there is a surplus of cars the empties come back and there are plenty of cars everywhere. But the minute there begins a shortage of cars then the distributing road which is accustomed to filling all the orders of all its consignees always keeps on doing so and uses the foreign cars with which to fill those orders. That means that the proportion of cars on the distributing road increases, and it holds more than a hundred per cent. of the number of cars it owns. Of course, there is the same increase in orders for cars on the originating road, but the originating road has not got so many cars because the distributing road is holding them. And the more orders there are for cars in gen-

*Mr. Hale prepared a paper on Freight Car Tactics for presentation before the Central Railway Club at its annual meeting on January 9, 1913. At that meeting, however, he departed from the printed paper in order to secure a more logical presentation, and has very kindly furnished us with the revised notes from which this article is extracted.

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eral the fewer cars there are upon the originating road. That is the argument of the car owner in the condition that now prevails. That argument has been thought out and worked out into these very drastic plans that they have in England, and in France, and it has led to the very prompt return of the car and a corresponding unnecessary multiplication of equipment.

But when you turn the thing around, when you come to a period of car surplus, then you find the situation is entirely changed, because then in order to earn per diem on its car the originating road will be grievously tempted to return the foreign car empty to the distributing road and to force its own loaded cars upon the distributing road, and the distributing road cannot avoid that burden. The distributing road then is paying more per diem than it really should. And when you get to the situation which I think was reached some years ago, when railways were loading cars against each other—were returning foreign cars empty and loading their own cars—you get a doubling of empty mileage that is most unfortunate, because it is an additional expense that happens when the roads are making least money.

I will not undertake to go through all the other variations, but I will lay some stress on the situation on a road in a state of congestion. I have heard it said that when there is a car shortage the more engines you have the less cars you will have, and there is a good deal in that. Because if you have a lot of engines you are probably not congested. If you are not congested you will move your cars promptly to the delivery points; you will get rid of your cars, and the roads which are congested or which are not in as good shape as you, will not be able to return them to you. I have seen that happen on divisions of a single railroad. I have seen a division that had its power in good shape simply run out of cars while a division whose power had run down got so congested that more power had to be given it to get the cars away. The same thing happens as between railways. There are railways not so very far from Buffalo which have been congested with great and unfortunate regularity in the last few winters, and the result of the congestion has been that every road has been delivering more cars to them than it received. They seem to have used their power solely in taking cars off the interchange tracks. The amount they have been paying out in per diem for cars which have been standing around and not moving has been simply tremendous.

This variation in the car question is very much the same between the divisions of one railroad, between the stations on one division, or between the industries at one station—very much the same as it is between the railways in the United States. The man in charge of the distribution of cars on a large railway has to take all these variations into account. He considers whether there is a car shortage or a car surplus; he considers whether his divisions are congested or not; he considers which of his divisions are originating and which are distributing, and he considers whether the particular cars are cars which should go back empty or cars which should be loaded back. The man in charge of distribution on the large railroad takes all these things into consideration every day and issues orders every day or every hour to get the best possible results out of his cars. If you should ask him to write down the rules under which all those cars will move he would be at a considerable disadvantage. He would say: "Why, I want a little time for that. I should want to look over my correspondence and see what I have done." He has many of his rules in his head; he has some of them written down; where they are general they are written down, but a great many of them are not general. You cannot get the best use out of your equipment on a railroad by putting it all down on paper and telling your men to follow general instructions. You have to follow it up. You have to have reports, in the first place, to know the situation. You cannot step into an office and distribute cars unless you have got a hundred men all over the road telling you where the cars are. That is the first thing you have got to have. And when you do get the reports, while you have as many general instructions out as you can, yet there has got to be something different done every day to keep the cars moving properly. It is just the same on a division with a car distributor. He depends largely on his reports; he has some general instructions out, but he has to send out a great many individual instructions to get anything like good movement out of his cars.

Now what is the moving power on the railways we have been discussing? What is the moving power really that pushes through those orders and gets results? It is discipline. The only reason why the superintendent of a division is able to get empty cars moved from the place where they are not needed to the place where they are needed is the discipline of his division. People know that they have got to do what they are told, and they go ahead and do it without asking questions or they know the reason why. It is the same with a large railway. The general superintendent or the general superintendent of transportation orders so many empties from one division to another, and they go or he knows the reason why. Here we have on these railways this variable situation met in a variable way and backed up by discipline and with results.

Now you come to the arrangements between the railways. It is just as important that the cars be properly distributed between the railways as it is between divisions on a railway. It is more important from some points of view. But there is no possibility of such a thing as discipline—and you come to the American Railway Association, you come to our committees and you say, "Gentlemen, please make us some rules under which these cars will be properly distributed between the railways." Now don't you think that is a little hard? We have found it very hard and we have not been very successful. But we have done some things, we are going to do more, and I hope we shall be able to do the right thing. If we do not, why, the Interstate Commerce Commission probably will, or they will try to.

The first thing that we did was to get away from charging cars. We used to do that a long time ago. And that was rather worse than nothing, for this reason: that it was a direct penalty on the return of the empty car. In the old days before 1902, when mileage was paid on cars you could hold an empty foreign car on your siding for an indefinite period and did not have to pay anything. But the minute you moved it a hundred miles toward home you had to give the owner 60 cents. Now, why should you fine yourself for returning an empty car? And a great many people did not do it. But we got hold of that question and after a number of failures the per-diem system went into effect. In 1902 we began to charge the munificent sum of 20 cents a day for the use of cars. That, of course, was not enough. It was gradually increased. It went into effect just after a period of car shortage. You never can do anything in this matter, however, until you have a period of car shortage. And there was such a period in 1901 and 1902 which enabled us to get the per-diem rules through. That gave us 20 cents a day, gradually increased until we came to the great car shortage of 1906, and then the rate was pushed up to 50 cents. At the time there was an investigation by the Interstate Commerce Commission and that investigation waked up a good many railroad men, as well as others, who had not thought much about the question. The rate was put up to 50 cents, although after the panic of 1907 it was thought advisable to drop it. There was that recognition by the railways of the difference of situations between a car shortage and a car surplus, a recognition which has not always obtained since then, but which I think will be finally recognized.

During that big car shortage we did get the rate up. But more than that we initiated the series of reports which are necessary for the carrying out of any set of rules that approach tactics. It was in 1907 and under the pressure of that great car shortage that the American Railway Association started the reports of car shortages and car surpluses which have been in effect ever since. We have finished out the sixth year. It also initiated the monthly bulletins which give the performance of the cars, which show for each railway the number of miles the car

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is run, the number of ton-miles the car is carried, the number of dollars the car has earned per day, and they further show—and this is possibly of more importance—they show which railways are using more cars than they own and which railways are using less cars than they own. If a railway shows that it has on its line only 80 per cent. of the cars that it owns, as certain originating roads do nowadays, that railway ought to be helped; and if a railway shows that it is using, say 20 per cent. more cars than it owns, that is a railway that ought to do something or perhaps ought to be helped, but in a different way from the road which has lost the use of its cars.

Those reports have been published regularly and form about the only information we have on the subject. They have been supplemented in the last month by a semi-monthly location sheet or car-balance sheet which is made by every railway to the Interstate Commerce Commission and of which a copy is sent to the American Railway Association as well. These reports do not seem like much, but I think they have had a good effect. It is true we have had a serious car shortage this last fall, but I think it would have been a great deal worse if we had not had every two weeks the figures showing what the car shortages were, and if the railways had not been able by looking at these figures to see that a car shortage was infallibly coming. The railways ordered a good many cars this last year, something over 212,000. I do not think they would have ordered them if it had not been that the reports of the American Railway Association were showing week by week that the surplus of cars was dropping down and the shortages were beginning earlier than usual. Of course, it may be that they ordered more cars and not enough locomotives. That is another question. But they certainly ordered more cars and before they really felt the grip of the car shortage.

The railways have done one other thing, and this is in the direction of the tactics of which I spoke. They have appointed what is known as the Commission on Car Service. It is formed of three members of the executive committee of the American Railway Association, and to that commission any railway can go and say, "another railway has injured me by detaining my cars and by misusing my cars, and I wish my wrong righted." The commission has the power of fining the railways at fault an unlimited amount. In fact, the only limit made is a minimum rate of $2.00 per misuse. That commission has been in existence for only about two months, but four railways have appeared before it and those four railways have made forty-seven different complaints. It was quite in the power of the commission to examine the records of the railways at fault and assign summary punishment to them, but it has not done that as yet. It has tried to handle matters in a broad way and rectify the situation rather than handle the matter technically. The first thing the commission noticed was that every one of these complaints was in regard to coal cars. There was not one complaint as to box cars. The commission has managed to get certain coal cars home, by its own individual efforts, but the first general and the first important result of the work of the commission was the signing in Chicago, by the presidents of the Chicago roads, of what we call the Chicago declaration, under which the Chicago roads have agreed to give a preference to the handling of empty coal cars. It was a recognition by the Chicago roads that they had a public duty before them; it was their duty to see that the coal mines were kept running and that there would be plenty of coal this year. The coal mines have been kept running and there is plenty of coal. That was done within a couple of weeks after the first case was brought to the commission and after the commission had had a chance to look into the matter in a broad way. That had such a good effect in the vicinity of Chicago; it had such a good effect on the coal lines of Indiana and Illinois that the commission has now asked the presidents of all the railways in the United States to sign a similar declaration, with the idea of meeting the first want, which is a prompt handling of the cars which can carry coal. The presidents are very generally signing the declaration.

The record of the commission so far has not been the record of a judge; it has not assessed all the penalties it could; its record is the record of an administrator. Or, if I can come back to the subject of my talk, the record of a tactician. It has been taking a particular case and has been applying a particular remedy.

I hope people will remember that the car question is not one question but a great many questions; that its answer is not one answer but there are a great many answers to be given to the separate questions; and I hope people will realize that in the handling of cars, even between railways, we need more than a set of cold rules, laws and penalties; we need possibly strategy —but that seems a large word. I feel we need a certain amount of tactics.

WEIGHING METHODS ON THE ST. LOUIS & SAN FRANCISCO.

E. D. Levy, assistant general manager of the St. Louis & San Francisco, was one of the railway witnesses at a hearing before the Interstate Commerce Commission at New Orleans on December 17, in its general investigation of methods and practices in the weighing of carload freight. The following abstract from Mr. Levy's statement to the commission contains an interesting description of some of the methods employed by the St. Louis & San Francisco in the effort to obtain the greatest possible accuracy in the weighing of freight, as well as similar views of a practical railway official on deficiencies in the present weighing practices.

Our standard track scale is a 50-ft., four section, extra heavy pattern, 150-ton scale with type registering beam. We have 16 of these in actual operation—all installed during the year 1911. We expect to install six more of these during the year (1912). Our scale pits are being constructed with waterproof membrane. The decks are supported by ties and are also water and dust proof. The live rails are supported by cast stands, which rest on steel construction. This overcomes the trouble of water and dirt on the platform changing the balance of the scale. We have a total of 66 track scales on the Frisco as follows:

19—	150-ton	50 ft.
1—	80-ton	44 ft.
1—	82-ton	42 ft.
41—	80-ton	40 ft.
2—	80-ton	38 ft.
1—	60-ton	40 ft.
1—	60-ton	36 ft.

All weighmasters are sworn under the rules of the Western Railway Weighing Association or Southern Weighing and Inspection Bureau. We have 34 weighmasters carried on association payrolls; and others are carried on our own rolls. All weighmasters are instructed to see that cars are properly spotted, cut at one end, that the beam is allowed to balance naturally, that the scale is in good working order, and that full information called for on all scale tickets is secured in all cases. This information consists of date weighed, gross, tare and net weights, the weather condition, the amount of refuse, ice in tanks, racks, blocking, dunnage, stakes, temporary fixtures, grain doors, etc., the capacity of car and signature of weighmaster.

All scales are equipped with type-registering beams and our rules provide that in all cases cars should be weighed by the weighmaster without the waybills being before him; the waybills are retained in the agent's office, or in the yard office. The cars are placed on the scales and the weighmaster registers a ticket in the type-registering beam, and sends it to the yard office where it is applied to the waybill, or if it is a check weight, and confirms the weight as provided in our tariff, it is filed. By using the type-registering manifold scale tickets and type-registering beams errors in transposing figures are eliminated, also errors in reading beams.

Our tariffs provide that all cars originating on this line, or

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received from connections, which do not bear authorized weighing association track scale stamp, or agreement of such association, should be track scaled en route, and at certain places, namely, St. Louis, Kansas City, Harvard, Chaffee, Ft. Smith, Yale, Springfield, Hugo and Jasper. We check weigh shipments of lumber to check against our track scale weights at other points, and track scale weights of other roads, and at certain other points we check weigh shipments of coal for special reasons. Where the difference between the first track scale weight and the second track scale weight does not exceed 1,000 lbs., the weight is not changed and the waybill is indorsed with a rubber stamp reading, "Check weighed OK."

A report of every car check weighed is made to my office, where we maintain a weighing bureau, consisting of a chief, two clerks and a force of four traveling scale inspectors having tool cars; they have, in addition, steel test cars, two weighing about 45,000 lbs., and two weighing 70,000 lbs., and having a wheel base of slightly less than 10 ft., so they can test each section of our modern four section track scales. The bureau in my office checks the weight differences obtained on our track scales, makes an investigation, and very often is able to locate the error, and in that way cause our weighing service to be maintained at a high standard. The weighing or any other branch of the service that is not supervised and checked will soon deteriorate.

The force of scale inspectors is kept constantly busy inspecting and testing scales and supervising the installation of new scales. We test our scales with our own inspectors on an average of once in sixty days, and the weighing bureau checks to see that all scales are given periodical inspection. When the inspectors make a test of a scale they send in a report on a prescribed form, and all matters requiring attention are given prompt handling. Superficial inspection is given the scales each morning when the weighmaster comes on duty—he sees that the platform is swept off, and that it is free from bind, and that the scale beam is in proper balance.

As a remedy to improve present conditions we suggest that shippers of all commodities be required to show on bills of lading or shipping tickets the actual or estimated weight of commodity to be shipped, and if estimated the basis for the estimate shown on face of bill of lading or dray ticket; in case of lumber, whether dry, half dry or green, and the estimated weight per foot, age and dimensions. The railroad should then weigh the freight at the first track scale and if the weight comes within the variation of tolerance prescribed, then the weight given by the shipper should be accepted.

In check weighing carload shipments, we make no correction when the weights agree within 1,000 lbs. If in weighing, it is found there is a variation of more than 1,000 lbs., or whatever variation is prescribed, the shipment should be again weighed on the scales carefully, and the scales carefully balanced, and if the shipment passes another scale en route it should be billed to be weighed on that scale. If a second weight confirms the shipper's weight it should be allowed to stand. If it confirms the first track scale weight it should stand.

In the event of a variation between shipper's weight and railroad weight, the agent should be charged with the duty of convincing the consignee of the actual weight, if the consignee is not willing to accept railroad weight before the property leaves his possession. In other words, hold an ante-mortem investigation instead of a post-mortem investigation. Under present practices when an overcharge claim is received on lumber, for instance, the lumber is out of existence, it is the part of some building or may be in the roof or sides of box cars; the car in which the shipment was transported may be thousands of miles away. There is no chance to prove the weight of lumber or correctness of the tare weight of the car. If the car is located, the tare produced would not conclusively prove the tare weight a year ago, especially in cases where the amount of overcharge was not great. Under this plan agents could secure from the superintendent authority to bill car empty to the first track scale for light weight if there is no scale at destination. Under the plan proposed the agent would have a number of ways of arriving at the actual weight. He could call upon the consignee to produce his invoice; he could call upon disinterested lumbermen to pass upon the degree of dryness, and in extreme cases he could go so far as to measure part of the lumber and find out how much it weighed per foot. At points where association inspectors are located they could be called upon to do this. Agents should be authorized to determine and agree with consignee upon actual weight, in the same manner as we now require our agents to handle claims for visible loss and damage, i. e., either deliver the freight in good order and secure receipt, or arrive at the correct amount of damage and pay the consignees in full settlement of claim. This has been found more satisfactory than the post mortem settlements. Under this plan if the railroad weights are sustained the consignee must pay all expense, including demurrage if any; if the shipper's weight is sustained the railroad pays it.

We firmly believe that track scales and other scales used by railroads and shippers for determining the weight of freight carried in interstate commerce will never be the proper machinery for producing those weights until the Interstate Commerce Commission or some other competent governmental authority assumes a direct supervision over them. As far as this railroad is concerned, and I believe the same applies to all other railroads, we do not want to assess freight charges on any more freight than is actually transported, but we do want to assess charges on every pound that is transported; the great majority of shippers and receivers of freight, want to pay lawful charges on every pound of freight shipped, but no more.

There are two sides to the weighing proposition; one is the weighing machinery and the other the human agency performing the weighing. There are also two sides to the complaints on the weights of freight transported by the carriers; one is the overcharge against shippers, and the other is the undercharges for which the carriers suffer. If a railroad clerk or weighmaster produces a weight in excess of the actual weight he does not personally profit, but if a shipper or receiver of freight can return an incorrect weight less than the actual amount transported he profits individually. I know the large majority of shippers and receivers of freight are honest, but in the administration of weights we find that the dishonest man is as much a factor we have to contend with as the incorrect weighing machinery and careless weighmasters.

We also find that shippers have inferior weighing machinery and through ignorance think that it is correct. This same thing might be said of some railroads, all of which leads back to the theory that we will not have correct weights until the Interstate Commerce Commission, or some other competent governmental authority, assumes jurisdiction not only over weighing machinery, but over the people who perform the weighing.

We feel that it is not only desirable, but necessary that the commission should prescribe certain standards with reference to scales, specify certain foundation construction, weight of the different parts of track scales, also wagon scales, hopper and platform scales; that the commission should have a force of competent inspectors to see, after promulgating their specifications and rules, that they are complied with, and should order out of commission those scales not meeting the specifications and not competent to produce good results. Such a course might cause this railroad, and a number of others, to spend a large sum of money to bring the weighing machinery up to proper standard. If that be true, then we should spend the money and would do it. As a matter of fact there would be no loss to the carrier, because experience has demonstrated that where we put in modern track scales our weights are so superior that in a short time the cost of the scale is paid for.

There are a great many inferior scales on the market. The

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scale manufacturers will sell the purchaser any kind of a scale he wants. They will sell a good scale if the purchaser is willing to pay for it; if not, they will sell him one that will "fit his pocketbook." These scales are often badly installed, the method of installation may absolutely prevent a scale from giving satisfactory service. There is no one to inspect and pass on these scales at the present time.

POSTAL CAR LIGHTING.

The specification for the lighting of full postal cars, as approved by the postmaster-general, has been issued by the Special Committee on Relations of Railway Operation to Legislation in bulletin No. 44, with an explanation of the various points considered. The lighting system is to be either electricity or gas with provision for emergency lighting, as specified later. The fixtures, wiring, equipment, etc., are to be according to the railway's standard practice. Each electrically lighted car equipped for axle generator or head-end system of lighting shall be equipped with storage battery of sufficient capacity to furnish for 12 hours the intensity of illumination specified hereinafter without any charging whatever of the battery during this period. Each car using gas or straight storage electricity as the primary system of lighting shall be equipped with storage capacity sufficient to furnish light for 36 hours at the intensity of the illumination specified hereinafter.

Location of Light Units.—The light units for illuminating the bag rack and storage portions of the car shall be located on the center line of the postal apartment. Direct lighting units shall be located at such uniform height that the shadow of the paper boxes is not cast on any bag rack label, nor higher than approximately 3 in. above the back rod of rack. In no case shall any light unit (except oil lamps, the lowest point of which may be 6 ft. 9 in. from the floor) be mounted at a height of less than 7 ft., measured from the floor to the lowest point of the light unit (spacing between adjacent units in the bag rack portion of the car shall not exceed 8 ft. 6 in. in case of any direct system of lighting, nor 14 ft. in case of any indirect system).

Light units for illumination of the letter cases shall be mounted at the same height from the floor as the units in the body of the car, and as far from the front of the face of the letter case as possible, without the body of the distributor throwing any shadow on his work. In standard construction, where the letter case table is 17 in. wide, the above distance is 20 in. Where the car construction does not permit the above distance to be employed, a lesser distance, but not less than 16 in. may be employed. Separation between adjacent letter case units shall be such as to provide an illumination intensity at all points within the requirements hereinafter specified.

If an indirect lighting system be employed, the provisions of the above paragraph will be waived. In such case, the only requirements imposed for location of units of letter cases are those involved in providing for sufficient vertical and horizontal illumination intensities to meet the provisions of these specifications as hereinafter stated, all units in the car burning. For the purpose of these specifications an indirect system is here defined as any system in which at least 85 per cent. of the horizontal illumination on the 46-in. plane of utilization is received, either directly or indirectly, by reflection of the light from the deck of the car.

In the case of incandescent electric or mantle gas lamps, the design of light unit, except letter case units, shall be such that no portion of the bare lamp filament or the bare mantle is visible to the eye when the unit is observed at an angle of 70 deg. or greater from the nadir. (In general, light units are preferred which emit no light or only a small amount of light between the angles of 50 deg. and 100 deg. from the nadir.) The control of the lights in the postal apartment shall be independent of any other lights in the car, and the letter case units shall be controlled independently of any other light units in the postal apartment.

Initial Illumination Values.—All horizontal illumination values shall be taken on a plane 46 in. above the floor line. Vertical illumination values shall be taken on the vertical plane on the face of letter case as specified below. New lighting installations shall be such as to give initial illumination values in foot candles within the following limits:

Location.	Minimum.	Maximum.
Bag-rack portion:		
Center of car, horizontal	4.70	10.00
Mouth of bags, illumination measured 18 in. from side of car, horizontal	2.50	10.00
Letter cases:		
Over table, horizontal	4.70	16.00
Face of case, vertical	2.08	16.00
Storage portion, not behind obstruction, horizontal, measured not less than 18 in. from side or end of car	2.50	10.00

Illumination requirements at letter cases as above specified shall be entirely fulfilled by letter case units, other units in the car not burning; but letter case units may be considered as contributing to the specified illumination values for the body of the car.

If globes or reflectors of opal glass, rough crystal glass, prismatic glass, or aluminized metal, and those giving similar results (excluding heavy density opal with glazed reflecting surface, mirror glass, porcelain enameled metal and those giving similar results) be employed, the minimum values specified in the above table may be reduced 20 per cent. and the maximum values increased 20 per cent.

Above illumination values are based on an allowance of 40 per cent. for depreciation in service. Less efficient maintenance must be compensated for by increased initial installation.

If an indirect lighting system be employed, the minimum and maximum values in the above table may be respectively decreased and increased 40 per cent. in the bag rack and storage portions of the car, and 25 per cent. at the letter case locations specified in the above table.

Service Illumination Values.—While the car is in active service the lighting installation shall be maintained at all times to give illumination values (in foot-candles) not less than the following minimum values:

Location.	Minimum.
Bag-rack portion:	
Center of car, horizontal	2.80
Mouth of bags, illumination measured 18 in. from side of car, horizontal	1.50
Letter cases:	
Over table, horizontal	2.80
Face of case, vertical	1.25
Storage portion, not behind obstructions, horizontal, measured not less than 18 in. from sides or ends of car	1.50

Illumination requirements at letter cases as above specified shall be entirely fulfilled by letter case units, other units in the car not burning; but letter case units may be considered as contributing to the specified illumination values for the body of the car.

If globes or reflectors of opal glass, rough crystal glass, prismatic glass, aluminized metal, and those giving similar results (excluding heavy density opal with glazed reflecting surface, mirrored glass, porcelain enameled metal, and those giving similar results) be employed, the minimum values specified in the above table may be reduced 20 per cent.

If an indirect lighting system be employed the minimum values in the above table may be decreased 40 per cent. in the bag rack and storage portions of the car, and 25 per cent. at the letter case locations specified in the above table.

A light failure is defined as the condition where for a period exceeding 30 minutes the primary lighting system fails to give sufficient illumination to permit distribution of mail matter to be continued. It will be considered that whenever the lamp

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voltage falls below 80 per cent. of the normal operating lamp voltage such a condition of light failure has been reached.

A car movement is defined as the use of a postal car by a crew of postal clerks over the length of their run in one direction. Where a car covers more than the run of one erew, each separate run shall be considered a car movement.

The percentage of failure of the lighting system is defined as the ratio of the total number of failures to the total number of car movements of each primary system of lighting (gas and electrically lighted cars to be considered separately) on each railway system. The determination of percentage of failure shall be based on the operating performance of each car for the preceding twelve months period. Only such failures as are promptly reported by the railway mail service to the operating railroad shall be considered in computing the percentage of failure.

Emergency Lighting.—If the percentage of failure of the primary system of electric or gas lighting does not exceed 1 per cent., candle lamps will be accepted as a suitable emergency light. If the percentage of failure of the primary system of gas or electric lighting exceeds 1 per cent. and is not greater than 4 per cent., an emergency system of suitable oil lamps, gas or electric lights, maintained by independent storage capacity, may be required. Such emergency system must provide illumination values not less than 50 per cent. of the minimum operating illumination values specified above for the primary system, with the exception of letter cases and center line of car through bag rack portion where the illumination shall not be less than 60 per cent. If the percentage of failure of the primary system of electric or gas lighting exceeds 4 per cent., a new installation or a second complete primary system of lighting will be required on cars so failing.

ANNUAL REPORT OF THE NEW YORK PUBLIC SERVICE COMMISSION, SECOND DISTRICT.

The sixth annual report of the New York State Public Service Commission, Second district, shows 924 corporations, municipalities, and individuals engaged in serving the public in some capacity, under the jurisdiction of the commission. Of these, 183 are steam railroad corporations, 125 are street railroad corporations, 7 express companies, 1 sleeping car company, 301 electrical corporations, 73 manufactured gas corporations, 58 natural gas corporations, 29 acetylene gas corporations, 18 gasolene gas corporations, 126 telephone corporations, and 8 telegraph and cable companies. The steam railroads have 8,458 miles of main line and the electric railroads have 1,909 miles. The total capitalization of the corporations under the jurisdiction of the commission is $4,822,222,727.

During the year 1912 the commission handled 2,853 applications and complaints, being the greatest number for any year since it came into existence. In 1908 there were 1,606, and in 1911 there were 2,321. The commission devoted 288 days to public hearings, during which days 504 separate hearings were given. During the year the commission authorized the issuance of stocks to the amount of $30,602,055, and bonds to the amount of $96,817,446; a total of $127,419,505. Every mile of steam railroad track in the state has been personally inspected by representatives of the commission, the total main line, sidings and yards equalling 17,816 miles of track. The inspections made last year indicate a higher plane of maintenance than has existed heretofore in the history of the state. The development of new and better appliances which are being adopted not only by the larger railroads, but by the smaller ones when renewals become necessary, is adding safety and facility to transportation.

The rail situation indicates steady improvement with respect to weight. The use of treated ties with tie plates and screw spikes is rapidly increasing on many of the principal roads. The extension of the automatic signal system has been continued on the New York Central, the Buffalo, Rochester & Pittsburgh and on branches of the Delaware, Lackawanna & Western.

No railroad fires of any importance in the forest preserve have been caused by locomotives since the order of the commission of April 1, 1909, requiring oil-burning engines.

The commission has made extensive investigations into street railway service in the cities of Buffalo, Rochester, Yonkers and Newburgh, and important and substantial improvements are to follow each of these investigations.

The commission recommends to the legislature the re-passage of the law vetoed by the governor last year without specific reasons therefor, empowering the commission to suspend increases in railroad rates pending investigation as to the reasonableness of such advances. The commission feels that the best time to investigate increases in rates is when the increases are proposed to be made. The best time for the carrier to justify increases is when the reasons or causes underlying the action are fresh in the minds of railway officers.

Recommendation is made that the Public Service Commission's Law be amended, authorizing the commission to protect shippers in cases where the agent of a railroad quotes an erroneous rate. In such cases the carrier should be liable to a forfeiture of $250 to the state. The forfeiture provision is held to be necessary to prevent future lax methods.

Attention is also called to the fact that it is possible for telephone corporations to organize with a property value less than $10,000 and begin business without any reference to the commission, thereby defeating one of the real purposes of the supervision of telephone corporations. Further, no means is provided for ascertaining whether or not a certain corporation was originally within the jurisdiction of the commission or whether since its formation, in the natural process of its development, it has grown so as to have an investment in the business in excess of $10,000.

VICTORIAN GOVERNMENT RAILWAYS.—The lines owned and operated by the state of Victoria, Australia, includes 3,622 miles of steam railway, all of 5 ft. 3 in. gage, except 122 miles of 2 ft. 6 in. gage, and an electric line 5¼ miles in length. The railway also operates the state coal mines at Wonthaggi, producing about 200,000 tons of coal per year. The gross revenue of the railway in the fiscal year ended June 30, 1911, amounted to $23,827,406, while the working expenses were $14,558,977, leaving a net revenue of $9,268,429, or 4.31 per cent. on a capital account of $215,005,737.

WESTERN AUSTRALIA RAILWAYS.—The Western Australia Government Railways have cost about $60,000,000 and extend to about 2,300 miles. The first line was commenced in 1871 by a private company, and was followed by a line to the north of the settled districts from Geraldton to the copper districts of Northampton. Construction has since proceeded rapidly, the main feature of the northern system being an inland line from that port. The goldfield line from Fremantle through Perth to Laverton, and a southern line from Northam near Perth on the latter line to Albany, was subsequently made, and all the southwest corner of the state has now been fairly filled up with a network of lines. The cost has been about $26,425 per mile, the country generally being easy. The gage is 3 ft. 6 in. The chief difficulties encountered have been in connection with the water supply. There were, at the date of the last report, over 350 miles under construction, including an isolated line in the north of the state, 114 miles long, from Port Hedland to Marble Barr. There are 507 miles of new lines authorized. The Midland Railway, 277 miles long, connecting the northern and southern systems, is owned by a private company. The Western Australian railways are at present entirely isolated from all the other Australian systems.

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Maintenance of Way Section.

THE protest raised by Dr. Von Schrenck in his paper before the Wood Preservers' Association against the improper treatment of timber under the stress of urgent requirements, or at the direction of the party for whom the work is being done, may well be given serious consideration. While directed primarily at the conditions existing at plants doing work by contract, it also applies to those plants owned and operated directly by the railways. Those in charge of these plants owe it to their clients or employers to fully explain the injurious effects which will follow a deviation from the best accepted practice and to discourage this wherever possible, for the premature removal of such ties from the track will be remembered and charged against the plant long after the special instructions have been forgotten.

THE ninth annual convention of the American Wood Preservers' Association, held this week in Chicago, reflected the exceedingly promising condition of the association and its remarkable growth during the last two years. It was organized at St. Louis in 1904, when 24 men met at the Transportation building on the World's Fair grounds and perfected plans for a permanent organization. The first regular meeting was held at St. Charles hotel, New Orleans, on January 17, 1905. Following this the annual meetings were held in Chicago, in 1906; Memphis, Tenn., in 1907; Kansas City, Mo., in 1908, and at Chicago annually since that time. The membership list has grown to a total of 157, a net gain of 53, or over 50 per cent, more than that of last year. Twenty-nine railways are now represented by 45 members, the rest of the membership representing commercial treating plants, lumber companies and other manufacturing concerns. This membership is scattered over 29 states and four foreign countries. As the larger portion of the treated timber is consumed by the railways, the importance of this rapidly growing association to the railways can be readily realized.

THE severe climatic conditions encountered in most parts of the country at this season of the year introduce a special class of problems affecting nearly all branches of construction and maintenance of way work. The next contest will be on "Winter Methods" and will relate to the handling of these special problems. Contributions describing methods, new or not generally in use, for overcoming any of the many difficulties encountered in the prosecution of construction or repair work, or in the routine maintenance work of keeping the tracks, water stations and other facilities in service, will be eligible. The unusually severe conditions encountered last winter are still fresh in the minds of all and the methods used then, as well as those developed this winter, will be of interest if they depart from common practice. Prizes of $25 and $15 will be paid for the first and second best papers received, while all others accepted and published will be paid for at our space rates. All contributions should be sent to the Civil Engineering Editor of the *Railway Age Gazette*, Transportation building, Chicago, and must be received by February 25.

THE judges of the contest on "The Storing and Handling of Maintenance of Way Material," who were H. M. Eicholtz, division superintendent, Chicago & North Western; A. F. Blaess, assistant engineer maintenance of way, Illinois Central, and C. G. Delo, engineer maintenance of way, Chicago Great Western, awarded the first prize to A. S. Markley, master carpenter, Chicago & Eastern Illinois, Danville, Ill., and the second prize to E. K. Coggins, chief clerk to roadmaster, Southern, Knoxville, Tenn. Five other papers were received from A. Palm, roadmaster, Central California Traction Company, Sacramento, Cal.; M. Ganley, roadmaster, Atchison, Topeka & Santa Fe, Argentine, Kan.; M. Riney, foreman bridges and buildings, Chicago & North Western, Baraboo, Wis.; R. O. Gillies, roadmaster's clerk, St. Louis & San Francisco, Ft. Scott, Kan., and Joseph J. Morgan, New York Central & Hudson River, Kingston, N. Y., all of which are published in abstract in this issue. The economical handling of material is an important one for maintenance of way officers to consider, and it is well worth their attention, as it offers opportunities for large savings or waste, depending on the way the work is performed. While more elaborate than the average modern installation, the Pittsburgh & Lake Erie storehouse at McKees Rocks, described elsewhere in this issue, is typical of the results of a careful study of this problem. The papers presented have far from exhausted the subject and we invite further contributions describing more particularly definite methods and installations, and the results which have been secured by their use.

ENGINEERS in charge of timber preservation may not all agree with Mr. Weiss in his comparison of zinc chloride and coal tar creosote for preserving cross ties, presented before the convention of the American Wood Preservers' Association this week, and abstracted elsewhere in this issue. Mr. Weiss finds six points of superiority for creosote, namely; it does not leach, it does not weaken the ties, it does not corrode the spikes, it does not cause leakage of signaling currents, its penetration can be readily tested, and it is somewhat cheaper on the basis of assumptions made in the paper as to the life of treated ties. On the other hand, he found five points in which creosote is not as desirable as zinc chloride, namely; it evaporates from the ties, it does not penetrate the wood as easily as zinc chloride, its composition is far from uniform, it is combustible and it is more difficult to handle. In the matter of toxicity the paper shows the two preservatives to be about equal. If the factors enumerated are of equal importance, there would seem to be cause for a careful study before deciding that either process is the more desirable and some question might be raised as to whether the rapid increase in the use of creosote during recent years and the lack of growth in zinc chloride treatment has resulted from such study or from other influences. The advocates of zinc treatment maintain that some of the poor showings made by zinc-treated ties in the early days of wood preservation can now be directly traced to poor timber or improper operation of the plant, rather than to any inferiority of the process. The fact that the Baltimore & Ohio is now building a new plant for treating ties with zinc chloride and that a large western road, which discarded the zinc process a few years ago, is reported to be considering its readoption, indicate that some timber treating engineers have reached the conclusion that the comparisons of the two preservatives are not all in favor of creosote.

THE specifications for Portland cement, published elsewhere in this issue, differ in several important respects from existing specifications, the most prominent of which are those adopted by the joint committee of the American Society of Civil Engineers, American Society for Testing Materials, American Institute of Architects, Engineer Department of U. S. Army, Association of Portland Cement Manufacturers, and the American Railway Engineering Association. The Lackawanna specifications are based upon an extended study, both in the field and laboratory, extending over the past two years. One conclusion reached as the result of this study was that a large part of the difficulty encountered with cement can be traced to the presence of the coarser particles. As a result, these new specifications require that 95 per cent. of the cement by weight shall pass through a number 100 sieve as compared with 92 per cent. in the specifications referred to, and 80 per cent. through a number 200 sieve instead of 75. Largely because of

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this increased fineness it was possible to require a higher tensile strength. Instead of the required strength of 175 lbs. for neat cement after 24 hours, 200 lbs. is required, the other figures for neat cement remaining as in the earlier specifications. In the 1; 3 mixture the strength in the seven day test is raised from 200 to 250 lbs., and in the 28 day test from 275 to 375 lbs. Another important deviation is in the substitution of the auto clave test for the more common boiling test. The investigation showed that many samples which would pass the boiling test would not pass this auto clave test, and it is believed that the latter will reject many samples which pass the boiling test, and in that way will remove a large portion of the cement which would ultimately cause failures if placed in structures. While this test may be regarded by some manufacturers as unnecessarily severe, in view of the extent to which this road is going into this class of construction, and the size of the structures which it is building, it is better for it to reject several worthy cements than to allow one poor cement to pass. The results of the enforcement of this specification will be followed with much interest by engineers in general.

THE systems in general use for the handling of maintenance of way material vary so widely on the different roads that it is not to be expected that all the ideas advanced in the papers received in the contest on The Storing and Handling of Material will receive the unanimous approval of all our readers. The handling of this material is now passing through a process of development and on certain roads considerable attention is being given to a study of the comparative advantages of the different methods, for each of the systems possesses certain advantages, as well as disadvantages. The handling of material and of scrap is, however, not being given the amount of general attention which its importance would appear to justify. The extent to which the maintenance department should maintain its own storehouse and handle its stock, as compared with the handling of it directly by the store department, is a much argued question with merit on both sides. It is interesting to note that on several roads where the maintenance of way department has studied this subject carefully, the material is being handled directly by that department. This practice is, however, not in general use. The amount of emergency and reserve material to be held out along the line by the smaller gangs also varies widely, although there is a strong tendency now to reduce this to the minimum and to concentrate a moderate amount at some central point. With the train service now existing on most lines, the emergency material can thus be concentrated and greatly reduced in amount without running much chance of incurring delays. The reduction in the number of standards, especially for rail and track fastenings, is also being closely watched as another means of reducing the amount of capital tied up in reserve material. The practice of handling scrap varies widely, although the supply department in most cases handles it, sorting and classifying it for sale. On some roads the maintenance of way and mechanical departments collect and sort their own scrap, turning it over to the purchasing department for sale. The method of collecting the scrap itself is subject to some variations in practice. One reader says that it is the practice on his road to run scrap cars whenever there is a sufficient amount of material to warrant it. Other roads run their supply and scrap cars at stated times, so that those concerned may know when to expect it and can plan accordingly.

THE USE OF SLOW ORDERS AND FLAGS.

NOT long ago we received a letter from a railway officer interested in fuel economy protesting vigorously against the frequent use of slow orders by maintenance forces on the ground that every time a train was forced to materially reduce speed, or to stop, it required a consumption of from 500 to 1,500 lbs. more coal than would otherwise have been required. Laudable as the agitation for fuel economy is, and much as we desire to promote this, it would seem that this criticism borders on dangerous ground. As similar remarks have been heard on other occasions, it is well to consider what they involve.

The ideal conditions are, of course, that the track shall at all times be safe for trains at full speeds. However, this condition is more to be hoped for than realized even on the best maintained roads. There are certain sources of delays which can be avoided by the expenditure of a sufficient amount of money, among which can be placed much of the bridge renewal and track improvement work. There are other causes of delays which are unavoidable with the present methods of railroading. Among these are broken rails, washouts, storms, and certain classes of bridge erection.

The problem of reducing or eliminating the delays referred to in the first class is essentially an economic one, depending on the amount of money a road is justified in spending to eliminate a certain amount of delay to traffic. On the main line of the Pennsylvania between Philadelphia and New York, the time which the maintenance forces are allowed to hold a track is limited to 12 min. In such a place the cost of doing work increases very greatly, for the time lost by a gang because of traffic conditions may far exceed that spent in working, but is justified by the very heavy traffic which must be kept moving. A careful check, made a few days ago, of the time of a gang engaged in putting in a floor system for a large bridge which was being rebuilt under traffic, showed that this gang was able to work only about 2½ hours daily. Delays such as these run into money the same as do the coal bills referred to above. These lines of heavy traffic density are, however, not typical of the conditions existing on the average railroad in this country and the frequent use of the slow order becomes economical.

From their very nature, the second class of delays, the unavoidable slow orders, are a necessity as a measure of safety to compensate for the weakening of the track structure either during alterations or repairs, or from other causes. While the number of accidents due to neglect to put out slow orders or flags where the conditions are known are small and reflect to the credit of the maintenance men as a body, their supervisors and superior officers cannot do other than insist upon the use of such precautionary measures whenever there is a possibility of accident due to weakened conditions, and these men should know that they have the support of their operating officers whenever such an order or flag is put out. While engineers will seldom intentionally run by a stop flag, on many roads they will regularly exceed the limits set on slow orders, forcing the supervisors and foremen to set these limits lower than would otherwise be necessary.

Closely associated with the use of the slow order is the use of the flag for absolute stop. This is especially important at this season of the year when broken rails are most prevalent. Many section gangs are reduced during the winter months to two or three men, and in such cases they can do little else than flag until assistance arrives, when a broken rail is discovered, or the track suddenly becomes unsafe. All foremen engaged in maintenance work must not only be impressed with the importance of flagging, but also with the sending of flags out a sufficient distance to fully protect all trains. It is only a few weeks since the engine and forward car of a fast passenger train on the main line of an important road ran off the track at a point where a broken rail was being taken out because of a "short flag." With the large and increasing proportion of foreigners employed in many of the gangs today, it becomes doubly important for the foremen to fully realize the necessity of proper flagging and their superiors can well emphasize this.

In a departmental organization it is natural that the transportation officer will be interested in the continual movement of trains without delay. He is, therefore, apt to criticise the foreman who stops or slows down trains without ascertaining all the facts in the case. He must be careful with his criticism for this censure from a superior officer may cause a foreman to take a chance the next time. It is far better to cause a delay than an accident.

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Letters to the Editor.

LIGHT VERSUS HEAVY TREATMENT OF TIMBER.

CLEVELAND, Ohio, December 13, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

On page 748 of your issue of October 18 there appeared an article by E. A. Sterling on "The Development and Status of the Wood Preserving Industry in America," in which he gives a summary of the various processes or treating methods now in use in this country. He divides the different kinds of treatment into three classes: high artificial pressure processes, atmospheric pressure processes and low artificial pressure processes. Each of these is again sub-divided between "full-cell" and "empty-cell." This classification is, in my opinion, incomplete and indefinite. In the first place, he omits to mention in his summary the "boiling in oil process," which is used to a considerable extent in Oregon and Washington. Again, he does not describe how "full-cell" and "empty-cell" treatment is secured or performed with "low artificial pressure processes" as he does for all the others mentioned in his schedule, nor does he make clear what he means by "high artificial pressure" and "low artificial pressure." Is it not true that the pressure in the impregnating cylinders may be anywhere from one pound to 250 pounds? Therefore, where is the distinction between the two processes?

If there is any, when and by whom was the dividing line established? In regard to the so-called "full-cell" and "empty-cell" processes, I desire to repeat here what I have often expressed, that there can be no such distinction between different treating processes. These so-called "empty-cell" processes are nothing more than "partial dose" processes, injecting only a limited quantity of creosote oil into the timber.

I would summarize the methods in use in this country at present, as follows:

ARTIFICIAL PRESSURE PROCESSES.

Full Dose.—Impregnation done in closed cylinders. Preservatives injected into the wood to total refusal, after the wood is put into a receptive condition by air seasoning, or boiling in steam or oil. Preservatives mostly used are creosote oil, zinc chloride, crude oil and other chemicals and solutions. Penetration and diffusion as thorough as the condition of the wood and process of treatment will admit.

Partial Dose.—Impregnation done in closed cylinders. Duration and amount of pressure regulated so as to inject a limited quantity of preservative into the wood, creosote being the only preservative used in this process. Penetration usually scant except in sapwood and the variation in the absorption in individual ties is very large.

ATMOSPHERIC PRESSURE PROCESSES.

Light Dose.—Impregnation done in open tanks. Preservative usually creosote oil, crude oil or carbolineum. Quantity absorbed depending upon the temperature and nature of the solution, character and condition of the wood. Treatment only superficial.

The Lowry and Rueping processes come within the category of "partial dose" artificial pressure processes.

Mr. Sterling states that the present tendencies are towards lighter impregnation with creosote and that no less than 16 plants use a light impregnation creosote process. While not specifically so stated, the impression left on my mind after reading this article, and I think on that of most readers, is that it is economical to treat ties with a partial dose of creosote. I do not believe these light doses are economical, and feel sure that some railway companies treating their ties in this manner are making a great mistake. Treating railway ties with light doses of creosote oil has been shown by experience to be a very unwise thing to do. For motives of economy some of the French railways undertook to reduce the quantity of oil injected into their ties, from full dose to partial dose, and met with unfavorable results. Why should we not profit by past experience and treat ties to refusal, instead of repeating these mistakes?

In France, where the creosoting of ties is an old industry, heavy treatment has been the rule, forcing into the timber all of the creosote that it would take. In England, also, the creosoting of ties is an old industry, but, on the average a somewhat smaller quantity of creosote per unit volume of timber has been used than was common in France. In comparisons of the practical results obtained in the two countries it has always been reported that the life obtained from creosoted ties in France was longer than in England, purely and simply because of the larger amount of material used per unit of the treated timber. If the long-standing results of experience in these countries have been correctly represented, and if any significance attaches to them, we fail to see the logic in much of the supposedly experimental work that has been done in this country. If the life of the timber depends upon the amount of preservative injected, as long-time experience seems to teach, then skimping the material might be expected to result as skimping usually does in other engineering work, no matter under what name or disguise the art is practiced. The old adage, "Anything worth doing at all is worth doing well," is eminently fitting in the treatment of ties and timber.

W. F. GOLTRA.

GAGE OF AFRICAN RAILWAYS.—The first railway in South Africa was a short line, constructed by a company, from Cape Town to Wellington, with a branch to Wynberg, amounting in all to about 63 miles in length. It was begun in 1859, and opened in 1863, and was taken over by the government in 1873. This line was on a gage of 4 ft. 8½ in. When, however, the Cape Colony decided to embark on a policy of railway extension, the question arose whether a narrower gage would not be more suitable to the requirements of the country. The decision in 1869 to construct many extensions in India on the 3 ft. 1 in. gage no doubt influenced the Cape government in the adoption of a somewhat similar gage. This decision praetically settled the question for nearly the whole of Africa. Thus, when the political union of South Africa was accomplished, the physical union, through uniformity of railway gage, had been already attained. The gage fixed on was 3 ft. 6 in., and the Cape Town to Wellington line having been converted, construction was pushed forward from three ports—Cape Town, Port Elizabeth and East London.

QUEENSLAND RAILWAYS.—The first section of the railways was opened in 1865 from Ipswich to Granchester, the government in this case being the first builders. The 3 ft. 6 in. gage was adopted. The principles guiding extension in Queensland were different from those of the older states, the general scheme being to run lines inland, more or less parallel to each other, from the several ports of Brisbane, Rockhampton, Townsville, Cairns, Cooktown, and Normanton, reaching, respectively, Cunnamulla, Longreach, Clencurry, Charleston, Laura, and Croydon. A line in a southerly direction from Towoomba to Wallangarra forms the main line connecting with that from Sydney. A short line direct from Brisbane to the border at Tweed Heads will in the future form a second main line to Sydney when the North Coast Railway of New South Wales is completed. There have been considerable engineering difficulties in the construction of some of the Queensland railways, especially on the Cairns line, 48 miles of which cost about $140,000 per mile. The total mileage reached 3,868 at the date of the last report. Over 1,605 miles were under construction, and 618 were authorized, and in addition there are 215 miles of private railway lines. The government lines in Queensland have cost an average of $35,270 per mile.

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NOTES ON STAKING OUT TRACK CONNECTIONS.

Solutions of Maintenance Engineering Problems Which Avoid Errors Resulting from the Use of Field Book Methods.

By W. H. Wilms,
Assistant Engineer, Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis, Ind.

The ordinary field book is of slight value to the engineer engaged in maintenance work in the solution of track problems. None of the problems presented in such books have been solved with a view to practical application. Following the methods outlined in these books, it is not uncommon, for instance, to see new sidings staked with the initial curve tangent to the center of the track from which the turnout leads, although a little study will show that the curve is not necessarily tangent to the frog, and unless it is tangent, an elbow must be thrown in the curve, or a piece of tangent introduced, depending on whether the curve beyond the frog is of less or greater degree than the curve back of the frog. In either case, the siding presents a bad appearance and in case of an extremely sharp curve and close quarters, the engineer would probably find the siding could not be operated until relocated. The only field book that has attempted to treat track problems with a view to practical application by means of a so-called "reference curve" makes such problems really more complicated than they are. In the following notes only such problems as commonly occur in practice are given, leaving it to the ingenuity of the engineer to modify these methods to meet his particular requirements in more complicated cases. While no claim to originality is made in the solution of these problems, it is believed a number of them will be new to not a few engineers.

SWITCH LEADS.

From both the operating and maintenance standpoints the installation of turnouts leading from curves is to be avoided whenever practicable. When the installation of a turnout on the outside of a curve is unavoidable, the switch leads should be made straight wherever it is possible to do so, as the benefits

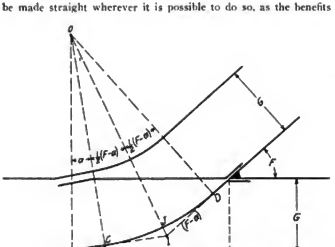


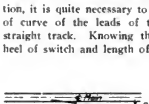
Fig. 1.

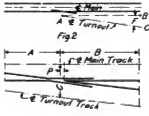
in safer operation and decreased maintenance of the switch by using straight leads are very pronounced. Often a slight change of alinement or the substitution of a different size frog will readily effect this.

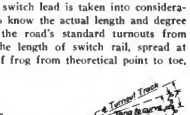
Of equal importance is the reduction to a minimum of the curvature in the leads of a turnout on the inside of a curve. This also can often be effected by slight changes in alinement and the substitution of a higher frog number.

Also, for similar reasons, the alinement of the turnout track immediately beyond the frog is of importance. Where a curve is necessary it should, if possible, be of the same degree as the curvature in the lead; otherwise there results the objectionable feature of a change in curvature in a very bad place, which not only looks bad but is apt to be a constant source of trouble in operation and maintenance. This is especially true where the curvature is sharp and connections close.

In order to obtain a solution to such problems as the above where the alinement of the switch lead is taken into consideration, it is quite necessary to know the actual length and degree of curve of the leads of the road's standard turnouts from straight track. Knowing the length of switch rail, spread at heel of switch and length of frog from theoretical point to toe,







No.	Angle	A	B	C	D	p	Lead

Fig. 4.

the length and curvature of the lead are readily obtained from the following formulas:

(From Manual of Am. Ry. Eng. Assoc.)

F = Frog Angle
W = Length of Wing Rail of Frog
S = Length of Switch Rail
H = HeelDistance of Frog
G = Gage of Track
R = Radius of Center Line of Lead Curve
a = Switch Angle

$$\text{Lead Dist. AB (Fig. 1)} = (S - W)\frac{\sin \tfrac{1}{2}(F - a)}{\sin \tfrac{1}{2}(F + a)} + G \times \cot \tfrac{1}{2}(F + a)$$

$$\text{Radius of Lead Curve} = \frac{G - H - W \times \sin F}{\cos a - \cos F} - \frac{G}{2}$$

Having once computed this data from the road's standard frog numbers, the engineer should place it in his field book for future reference.

SIGNIFICANCE OF STAKES.

Due to the fact that many track foremen and supervisors have to work to stakes set by many different engineers, some of whom make it a practice to set stakes indicating the location of a frog on the rail line at the theoretical point and others who set such stakes on the center line of track opposite the actual point, costly mistakes sometimes result. To avoid such trouble, it is a good plan to have some definite system of marking and setting stakes, and after the tracks have been staked out to go over the layout with the track foreman and explain to him the significance of the stakes, so that when track laying begins there will be no chance for mistake or confusion. In most cases it is unnecessary to take into consideration the difference between the theoretical and actual points in the location of a frog. There are a few cases, however, where a failure to observe this difference would result seriously. For example, in the location of the frogs of a No. 10 crossover between parallel straight tracks, 13 ft. center to center, where the track is straight between frogs, the distance from theoretical to actual point of a No. 10 frog with a ¼-in. point is 5 in. Now, if stakes are set for theoretical

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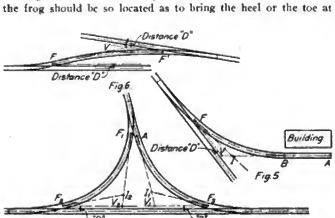
points and the foreman sets the actual point of frogs to these stakes—a thing he is very likely to do unless the significance of the stakes has been explained to him—there will result a total error in the position of the two frogs of 10 in., resulting in a gage of only 4 ft. 7½ in. in the straight track between the frogs. This is no hypothetical case, but along with other mistakes of its kind is almost of constant occurrence with young and inexperienced engineers. To avoid such trouble, stakes marking position of frog should be set for actual point and plainly marked to that effect. When the location of a frog in the existing track is not definitely fixed by conditions, the point of the frog should be so located as to bring the heel or the toe at



a rail joint. If this is done, only one rail cutting is necessary, and no short rails are required.

GRAPHICAL SOLUTION OF TRACK PROBLEMS.

A great many track problems can be readily solved by graphical methods. With careful and accurate drafting on a large scale—say 10 or 20 ft. to the inch—many complicated problems are readily solved with all the accuracy usually required in track work. In a great many problems a solution can be easily and quickly effected by making a few trials in the field. In such cases it has been the writer's practice to carry with him in the field a few curve templets, scale, triangle and drawing paper, and by locating the critical or determining points and plotting them to scale, he has generally been able to decrease the number of trials necessary for a solution to one or two.

In staking out tracks to and around existing structures the young and inexperienced engineer may not appreciate the importance of proper clearance and many a track has been staked and afterward built 6 in. to a foot or more too close to an existing structure.

GENERAL METHODS.

The ordinary method of locating turnouts where the position of the frog in the main or body track is not a critical feature is as follows: Set up the instrument at *A* (Fig. 2), this point being in the center line of the turnout track opposite the point of the frog. Foresight is taken on point *B* gage distance from the center line of main or body track, with the vernier set at minus the frog angle so that when the reading is turned to zero the line of sight is in the center line *A-C* of the turnout track. If, now, the turnout track is to proceed on a curved alinement, deflections may be turned either right or left and the curve located. A stake set back a distance from *A* equal to the length of the lead locates the switch point and the track foreman lines the curve between the heel of the switch and the toe of the frog, either by eye or by using a series of ordinates from the main track rail. If the main or body track is curved (Fig. 3), a backsight *D* and a foresight *B* are set, making the distance *A-D* equal the distance *A-B*. The angle between the line *A-B* and the line *D-A* extended is bisected to obtain a line parallel to the tangent to the main track rail at the point of frog and the frog angle *F* is then turned off from this tangent line. The work of locating the turnout track is thus done with one set up of the instrument, entirely independent of any theoretical assumption regarding the curve in the lead.

To make the curve (if any) in the turnout track tangent at the heel of the frog instead of at the point, which many would consider better practice, it is only necessary to have a table as in Fig. 4, and using the offset *D*, proceed as before.

In locating close connections between tracks and sharply curved branch tracks running into or along buildings where the exact position of the frog is a critical feature of the work, this position may usually be obtained as follows: Let *A-B* (Fig. 5) be the center line of a branch track whose position for the distance *A-B* is determined by the building. Extend line *A-B* towards the main track to point *V* at distance *D* from the center line of the main track. Measure the angle *V* and the distance *VB*. Let *I* be the point of intersection of the line *AV* with the line *FI*, angle *IFV* being the frog angle. Now the criterion for the minimum degree of curvature in the curve *FB* is that the point of intersection *I* shall be equally distant from the points *F* and *B*. This makes the curve *FB* a simple circular curve. To solve the problem, let $FI = IB = T$ and let measured distance $BV = M$.

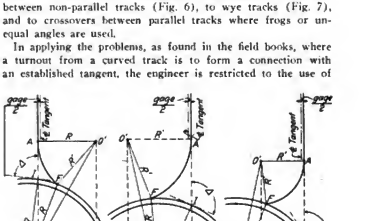
Then $VI = M - T$; and in triangle *FIV* we have:

Angle I = angle V + angle F, and

$$\frac{T}{\text{Sin } V} = \frac{M - T}{\text{Sin } F},$$

from which the tangent distance T may be obtained. After thus solving triangle *FIV*, first for T, then for distance *FV*, the frog may be located by measurement from the established point *V*. This method of treatment is applicable to crossovers between non-parallel tracks (Fig. 6), to wye tracks (Fig. 7), and to crossovers between parallel tracks where frogs or unequal angles are used.

In applying the problems, as found in the field books, where a turnout from a curved track is to form a connection with an established tangent, the engineer is restricted to the use of



[Case 1. Curves in Opposite Directions. Δ less than 90°.]

[Case 2a. Curves in Opposite Directions. Δ greater than 90°, R cos Δ greater than R cos Δ.]

[Case 2b. Curves in Opposite Directions. Δ greater than 90°, R cos Δ less than R cos Δ.]

but one curve, the degree of which is that of the theoretical curve of the turnout, which equals the degree of curve of turnout from a straight track, plus or minus the degree of the curve of the track from which the turnout springs. The use of this one curve will rarely prove desirable on account of its being either too sharp or too flat.

Four general cases of the problem present themselves, as shown in the illustrations, Figs. 8, 9, 10, 11, 12, 13. The necessary field work in each case consists in measuring the angle between the center line of tangent and the tangent to the center line of the curve at the point of intersection; or better yet, the angle between a line offset one-half the gage from the center line of the tangent and the rail which will pass through the frog, as the latter will simplify the problem, and the radius of the

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rail is determined simultaneously by measuring the middle ordinates for one or more chords.

Having the angle of intersection, as described above, the radius of the curved track, and the angle of the frog to be used, and having selected a radius for the connecting curve, the essentials of the location are the distance between the point of intersection and the point of the frog, the central angle of the connecting curve and the distance between the point of intersection and the *B. C.* of connecting curve.

The following solutions offer ready and accurate methods of obtaining the above-named points:

In Figs. 8, 9, 10, 11, 12 and 13 let *CA* represent a line offset one-half the gage from the center line of tangent, which is to be connected with the gage line of the rail of the curved track by means of a frog having an angle of *F* and a curve whose radius is *R*. *O* and O^1 are the centers, *I* the point of intersection wher the angle Δ has been measured, and the other notations are as shown in the diagrams. The rail opposite the frog and the switch rails are not shown as they have no bearing on the problem. Required to determine the angle *I O F*. Then measure on the curve:

Arc F I = R × angle I O F in minutes × a constant (= 0.00029089).
Or chord F I = 2R × sin ½ I O F.

The distance OO^1 is determined by solving the triangle OFO^1 of which the angle *F* and its including sides *R* and R^1 are known. This also determines the angles FO^1O and FOO^1.

In cases 1 and 3, Figs. 8 and 11, O B = B C + O C = R^1 + R cos Δ
In cases 2a and 4a, Figs. 9 and 12, O B = B C − O C = R^1 − R cos Δ
In cases 2b and 4b, Figs. 10 and 13, O B = O C − B C = R cos Δ − R^1.

It should then be noted that when *O B* is computed to be greater than $O\ O^1$, impossible conditions have been imposed; the radius of the connecting curve has been taken too large.

Having determined the angle $O^1\ O\ B$ from the right triangle $O\ B\ O^1$, in which *O B* and $O\ O^1$ are known, the angle *I O F* is found as follows:

In cases 1 and 2a, I O F = Δ — (F O O^1 + O^1 O B).
In cases 3 and 4a, I O F = 180° — (Δ + F O O^1 + O^1 O B).
In case 4b, I O F = O^1 O B — (F O O^1 + Δ).
In case 2b, I O F = Δ — (180° — O^1 O B + F O O^1).
In cases 1 and 2a, A O^1 F = O^1 O B — F O O.
In cases 3 and 4a, A O^1 F = F O^1 O — O^1 O B.
In case 4b, A O^1 F = F O^1 O — (180° — O^1 O B).
In case 2b, A O^1 F = 180° — (O^1 O B + F O O).

To determine the distance AI:

In cases 1 and 2, A I = A C − I C = O^1 B − I C,
= O^1 O sin O^1 O B — R sin Δ.
In cases 3 and 4, A I = I C − A C = R sin Δ − O^1 O sin O^1 O B.

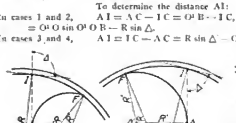

Fig 11. [Case 3. Curves in Same Direction, Δ greater than 90°.]

Fig 12. [Case 4a. Curves in Same Direction, Δ less than 90°. R^1 greater than R cos Δ.]

Fig 13. [Case 4b. Curves in Same Direction. Δ less than 90°. R^1 less than R cos Δ.]

The engineer should be careful to add or subtract one-half the gage to the center line radii, as the case may require. The point *A* which is the *B. C.* of the connecting curve, and the point *F*, which is the theoretical point of frog *P. T.* of the connecting curve can now be readily fixed in the field and the entire connection staked out.

While the writer realizes that it is better practice to place the frog end of the connecting curve at the heel of the frog, to impose that condition in the above problem would complicate it beyond measure. In inserting 10 or 15 ft. frogs in a curved track, the trackmen cannot help slightly changing the original alinement of the track at that point, and energy spent in making a closer solution than that outlined above will surely be wasted.

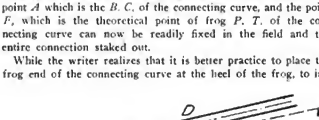

Fig 14.

METHOD OF OBTAINING STRAIGHT LEADS.

Theoretically, a turnout leading off the outside of a curve, the degree of which is equal to that for the turnout from straight track will have a straight lead. Practically, however, the lead will not be straight, but curved to a greater or less extent. This is due to the fact that switch rails and frogs are straight and not curved as is generally assumed. When it is possible to do so, it is desirable from both the operating and maintenance standpoints to obtain absolutely straight leads. To obtain straight leads in turnouts leading off the outside of a curve where the main curve is also being staked at the same time, the following method will prove effective. (See Fig. 14.)

Fig 15.

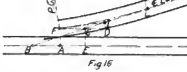

Fig 16

After staking out the main curve *ABC* to *B*, the point decided upon for the location of the frog, set up the instrument at *D*, this point being in the center of the turnout track opposite the point of frog. The frog angle is now turned off from a line through *D* parallel to the tangent to the curve at *B*, and the point *S* is located a distance equal to the length of the switch lead from point *D*. The instrument is now set up at *S*, and the main curve is continued from the line *DS*, or switch lead, after which the alinement of the turnout beyond the frog can be proceeded with.

Where conditions permit, it is desirable to have the alinement of crossovers between frog points straight. In the case of crossovers between parallel curved tracks, it is not generally possible to meet this requirement using standard frog numbers, a special frog being necessary in such cases. The writer has known of a number of instances where this requirement of straight track between the frogs of a crossover was of sufficient importance to justify the ordering of the special frog necessary; frog points being comparatively close together in most crossover work.

LADDER TRACKS.

In order to obtain the maximum car capacity of the body tracks connected to a ladder track, the angle of the ladder track should be made the greatest possible under the conditions.

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The criterion for maximum ladder angle is given by the formula (see Fig. 15):

$$\text{Sine of maximum ladder angle} = \frac{\text{Distance between switch points } K}{\text{Distance center to center of body tracks.}}$$

In order that road engines may operate over the ladder track it is desirable that the curve beyond the main track frog be made as light as possible. In a number of extensive ladder layouts the writer has used two and three degree curves in such places with very good effect. The method of staking out such ladder tracks is as follows.

After locating the position of the main track frog the point of intersection of the center line of the ladder track with the center line of the main track, *B*, is found by measuring off the distance *AB*. The instrument is set up at *B*, the ladder angle turned off and the frog points along the ladder located by measuring the computed distances from *B*. At the same time the points of intersection of the center line of various body tracks with the center line of the ladder track are located by measuring the distance *DC*, *FE*, etc., from the frog points. The curve beyond the main track frog is now located. The instrument is then set up at the points *C*, *E*, etc., and the body tracks staked out by foresight established at the opposite ends of these tracks by measuring over the respective track centers of each track from the main track. The curves connecting the various body tracks to the ladder track being very short, it is sufficient to locate only their middle and end points.

To compute the distance AB (Fig. 16), let
T = Tangent Distance of Curve FL
ICD = Ladder Track Angle
Then
DI = T sin F
FD = T cos F
CD = DI cot ICD
FC = FD—CD
AB = BE—AE
= gage × cot ICD—FC.

While the writer believes that the above method of laying out ladder tracks represents the best practice, there are a number of engineers who prefer to make the ladder angle equal to the angle of the frog to be used in the ladder track, thus making the ladder track frogs line up straight with the body tracks. The central angle of the curve beyond the main track frog is then simply the difference between the angles of the main and ladder track frogs. However, the writer sees no justification in sacrificing valuable ground space and consequent car capacity for the little, if any, advantage that is gained by eliminating the slight curve beyond the ladder track frogs. Those who favor this method claim that by the elimination of this curve in the body tracks, switching operations are rendered more safe by reason of the better views afforded trainmen. However, the writer believes this apparent advantage is more imaginary than real.

ERIE ANNUAL TRACK INSPECTION.

The annual track inspection of the Erie has recently been completed and the awards have just been announced. These awards are based largely on the results of records made by the track inspection car described in the *Railway Age Gazette* of June 21, 1912, these records showing the location and number of low joints, lurches and irregularities in the surface of the track. The question of the amount of money expended on the various sections and subdivisions is also carefully considered. Those sections and subdivisions are selected which appear to have sufficient merit to warrant consideration for the prizes, and are carefully studied with reference to their locations from a physical standpoint, the amount of traffic carried, general condition of the right-of-way, structures and other conditions that in any way affect the awarding of prizes. The study of conditions, taken in connection with the amount of money spent for the work performed and the record of the inspection car, form the basis for the awarding of the prizes.

The first prize of $200 for supervisor on main line was awarded to W. L. Madill, Binghamton, N. Y., and the second prize to C. Joyce, supervisor at Paterson, N. J. The first prize of $200 for supervisors on branch lines was awarded to T. Beam, at Shops, Pa., and the second prize of $100 to W. E. Stenson, Wayland, N. Y. In addition, 23 prizes ranging from $125 to $25 were awarded to section foremen having the best and second best sections on various subdivisions.

ANNUAL TRACK INSPECTION OF THE NEW YORK CENTRAL.

The report of the annual track inspection on the New York Central & Hudson River for 1912 was recently issued. The track of each supervisor and each section foreman is graded. No prizes are awarded to the supervisors, but the foreman receiving the highest rating on each main line subdivision receives a premium of $3 a month, while the foreman having the best section on each main line division, except the electric division, receives an additional premium of $2 a month. On branch lines the foreman having the best track on each subdivision receives a premium of $2 a month, while a premium of $3 a month is awarded to the foreman having good yard sections. The object of this premium system is to reward the foreman for individual efforts during the year rather than for the appearance of their section on the day of the inspection. For this reason certain sections receiving high marks were excluded in the awarding of premiums because of extra gang work, or new construction, or because the foreman had been in charge of the section for only a short time. Supervisor A. M. Clough of subdivision 23 on the Western division at Batavia, N. Y., received the highest rating, while Supervisor C. E. Doty of subdivision A of the electric division at New York received second highest rating. Section Foreman Michael Burke of subdivision 23 on the Western division received the highest individual rating for a main line section. Premiums were awarded to 34 main line section foremen, to nine foremen of branch line sections and to 10 foremen in charge of yard sections.

ABSTRACT OF ENGINEERING ARTICLES SINCE DECEMBER 20, 1912.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since December 20, 1912:

An editorial commenting on the possibility of a better utilization of existing freight terminals was published in the issue of January 3, page 2.

The Hopatcong-Slateford Cut-off. The second article written by C. W. Simpson, resident engineer of the Delaware, Lackawanna & Western, covering the work on the recently completed Lackawanna cut-off, describes the unusually heavy bridge work, including two of the largest concrete railway bridges ever built in this country. The detailed description of these bridges, as well as of other concrete structures on this cut-off, was published in the issue of January 3, page 9.

An editorial comment on the very large rail orders which have been placed for the coming year was published in the issue of January 10, page 46.

Tonnage Ratings on New and Old Lines. A letter by Paul M. La Bach explaining some features of this question brought out in the discussion of a former article by him appeared in the issue of January 10, page 50.

Mechanical Transference at Freight Terminals. An abstract of a paper by H. McL. Harding, read before the Western Railway Club, giving the essential principles which a successful system of mechanical transference must fulfil and the extent to which various types comply with these essentials, was published in the issue of January 10, page 51.

Two Conflicting Theories of Valuation. An article by Halbert P. Gillette, takes the ground that valuation must be based on market value or on the amount of the investment, but that it should never be based on a combination of the two. Mr. Gillette's article appeared in the issue of January 10, page 55.

Erection of Kentucky & Indiana Bridge. The erection of the super-

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structure of the Kentucky & Indiana bridge over the Ohio river at Louisville, Ky., involved some unusual features, the principal one being the erection by cantilever method of two 620 ft. simple trusses weighing 4,400 tons each. An unusual method of making the closure in the bottom chord of these trusses had to be adopted and the use of jacks for raising adjacent spans to secure closure was also unique. An illustrated description of this work was published in the issue of January 10, page 57.

Erection of Monongahela River Bridge. On account of the rapid and wide variations in the level of the Monongahela river, and the necessity for keeping the stream open to navigation, it was decided to erect a 475 ft. single track truss over the main channel, carrying the extension of the Monongahela Railroad, by end launching after the span was completely erected on shore. The details of the barges carrying the river end of the span, the trucks carrying the shore end and other interesting features of this work are described and illustrated in the issue of January 17, page 93.

An editorial on bridge erection by end launching which reviews the use of this method in other countries and comments on the fact that it has not been used in this country, appeared in the issue of January 17, page 91.

Electrification of Heavy Grades. An article by C. L. de Muralt discussing the problem of main line electrification and expressing the opinion that in some cases this may be found less expensive than grade reduction or the introduction of more powerful steam locomotives appeared in the issue of January 17, page 107.

Railway Terminals. An abstract of an address before the Canadian Railway Club by L. C. Fritch, chief engineer, Chicago Great Western, including some interesting data as to the cost of passenger terminals and a clear analysis of the economic features of such expenditure appeared in the issue of January 17, page 109. An editorial comment on this paper was published in the same issue, page 90.

NEW DELAWARE, LACKAWANNA & WESTERN SPECIFICATIONS FOR PORTLAND CEMENT.

The Delaware, Lackawanna & Western has probably gone into concrete construction to a greater extent than any other railway in this country. No other road has built any structures approaching the Paulins Kill viaduct and the Delaware river bridge on the Hopatcong-Slateford cut-off, described in the *Railway Age Gazette* of January 3, either in general dimensions or in quantities of materials used. These structures will be exceeded in size by two structures on the new cut-off being built north of Scranton on the same road, the larger of which, the Tuckhannon viaduct, will require over 150,000 cu. yds. of concrete. Concrete is being extensively used on this road, not only in bridges, but for station buildings, signal towers, fence posts, and many other purposes. For this reason it is not surprising that the officers in charge have gone into this subject thoroughly, and therefore the following specifications for Portland cement are of much interest.

SPECIFICATIONS FOR PORTLAND CEMENT.

Definition.—The cement shall be the product obtained by finely pulverizing clinker produced by calcining to incipient fusion, an intimate mixture of properly proportioned argillaceous and calcareous substances, with only such additions subsequent to calcining as may be necessary to control certain properties. Such additions shall not exceed 3 per cent., by weight, of the calcined product.

Specific Gravity.—The specific gravity of the cement shall not be less than 3.10.

Fineness.—Ninety-five per cent. of the cement, by weight, shall pass through the No. 100 sieve, and 80 per cent. of the cement, by weight, shall pass through the No. 200 sieve.

Time of Setting.—The cement shall not acquire its initial set in less than one hour and must have acquired its final set within ten hours.

Soundness—Force Autoclave Test.—Three neat briquettes to be made up in the usual manner and allowed to remain in the damp closet for 24 hours. At the expiration of that time, the briquettes are to be removed from the molds and placed in the autoclave, sufficient water being added to partly or wholly cover the briquettes. The autoclave is then closed, the burners being of sufficient size to raise the pressure to 295 lbs. in not more than one hour. The pressure of 295 lbs. shall be maintained for one hour longer, or a total time of two hours. The pressure is then to be gradually released and the briquettes taken out and placed in the moist closet, where they shall be allowed to remain for one hour. At the end of that time they are to be broken in the standard cement testing machine in the usual manner. The average tensile strength of the three briquettes taken from the autoclave must show a tensile strength of not less than 500 lbs. per sq. in. They must also show an increase of not less than 25 per cent. over the average tensile strength of three briquettes broken at the end of 24 hours. A bar of neat cement, 6 in. long by 1 in. square, shall be made up at the same time the briquettes are made; this expansion bar to remain in the moist closet for 24 hours and to be removed along with the briquettes and tested with the briquettes in the autoclave, as indicated above. After one hour in the moist closet, this expansion bar shall not show an expansion greater than one-half of 1 per cent.

Tensile Strength.—The minimum requirements for tensile strength for briquettes 1 in. square in section shall be within the following:

NEAT CEMENT:

24 hours in moist air	200 lbs.
7 days (1 day in moist air, 6 days in water)	500 lbs.
28 days (1 day in moist air, 27 days in water)	600 lbs.

ONE PART CEMENT, THREE PARTS SAND.

7 days (1 day in moist air, 6 days in water)	250 lbs.
28 days (1 day in moist air, 27 days in water)	375 lbs.

The average of the tensile strengths developed at each age by the briquettes in any set made from one sample is to be considered the tensile strength of the sample at that age. Any results that are manifestly faulty will not be included. The sand briquettes will be thoroughly tamped in the molds by using an iron die to fit inside the sand briquette mold, this die to be struck a number of blows with a wooden mallet.

Composition.—In the finished cement, the following limits shall not be exceeded:

	Per Cent.
Loss on ignition for 20 minutes	4
Insoluble residue	1
Sulphuric anhydride (SO_3)	1.75
Magnesia (MgO)	4

Insoluble Residue.—The insoluble residue shall be determined on a one-gram sample which is digested on the steam bath in hydrochloric acid of approximately 1.035 specific gravity until the cement is dissolved. The residue is filtered, washed with hot water, and the filter paper contents digested on the steam bath in a 5 per cent. solution of sodium carbonate. The residue is then filtered, washed with hot water, then with hydrochloric acid, approximately of 1.035 specific gravity, and finally with hot water, then ignited and weighed. The quantity so obtained is insoluble residue.

Inspection.—All cement which is used by the above named company, or any contractors doing work for the company, must be sampled at the mill. The inspector will take a sample from each and every car and properly seal the cars with the company's seals. In no case must cement be shipped from any mill without the company's inspector being present. Should it be necessary at any time to ship cement without inspection at the mill, but which inspection will be made at point of destination, the shipper must so notify the chemist and engineer of tests, and receive special orders from him for the shipping of the cement. The inspector must have access to all parts of the mill, either day or night, when any contract is being filled for the company. The shipper must furnish the office of the chemist and engineer of tests with analysis and physical tests showing results obtained upon the bin from which shipments are made. Samples taken from every car will be sent to the laboratory for further test and inspection. Any sample which fails to meet any or all of the above requirements will be condemned and returned to the shipper, who must pay freight charges in both directions. Samples of cement obtained from cars which continue to show a lower result at the end of the 28-day sand test than is shown in the 7-day sand test will be sufficient cause for the canceling of any contract which at that time may be in force.

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THE STORING AND HANDLING OF MATERIAL.

Seven Contributions to the Contest Which Discuss Various Phases of This Problem in the Maintenance Department.

FIRST PRIZE: ADVANTAGES OF DERRICKS FOR HANDLING MATERIAL.

By A. S. Markley,

Master Carpenter, Chicago & Eastern Illinois, Danville, Ill.

The necessity for handling large quantities of material of various kinds required in maintenance of way work has given rise to the development of steam derrick cars for the economical handling of such material, especially timber and piling. We have in such service a dismantled Bay City pile driver converted into a derrick car. It is equipped with a 7 in. x 10 in. double cylinder engine, shaft driven, with a double drum and its own power mast of standard clearance with a 36 ft. boom of 10 tons capacity at 20 ft. radius. This derrick is equipped with a standard engine tank and pilot car and is self propelling, being able to move five loaded cars on a level track.

With this machine we have been able to reduce the cost of

Hand Derrick Car for Lifting Heavy Timbers.

loading and unloading lumber in large quantities to 25 to 35 cents per M. We can unload and load piling, separating it into the various lengths, for 0.5 cents per lineal ft. With the old method of rolling it on and off cars and switching cars by hand to distribute the material to the various piles it cost $1 to $1.75 per M. board ft. for lumber, and 5 to 15 cents per lineal ft. for piling. One big advantage of this car is that we are enabled to do our own switching of cars placed on the bridge yard track, eliminating all delays due to waiting for switch engines.

We are also using the car for loading and unloading material of all kinds on the main line where traffic is not too heavy and there is no side track near the work. When a sufficiently large amount of material is to be unloaded to justify it, a temporary track is put in, eliminating delay to trains and at the same time delivering the material at the time it is needed. We frequently bring such material out on the main line with this car, advising the despatcher of our intention beforehand, and protecting against all trains by flagging with regular bridge men. After 43 years' experience I find that bridge men are fully as capable of protecting the derrick car on the main line as regular trainmen are. I have yet to learn of an accident resulting from a failure of bridge men to properly flag trains.

As this derrick will run eight miles an hour it can readily get out of the way of traffic. On branch lines where trains are few it is possible for it to run 10 or 15 miles pulling the bridge equipment with it and saving considerable time. An engineer and two men can load and unload material with it and it is never necessary to use over four men besides the engineer.

Our yard is so arranged that all material is piled as nearly as possible in the order in which it is used; stringers, caps, piles and guard rails are placed in adjoining piles in this order so that all material usually needed at one time can be loaded together, eliminating the moving of cars as much as possible. The tracks are of sufficient length to allow the unloading of material at both sides of one track. Empties are stored on an adjoining track, while obsolete bridge material is stored alongside it.

We also use a hand derrick for handling timber along the main track in the field. Five men can handle material with this derrick; ordinarily it would require 10 men or more without it. It will readily pick up and carry three hard pine stringers packed 32 ft. long. This derrick, shown in the photograph, is built on an ordinary push car and is provided with a crab on a concave drum which fleets itself in hoisting or lowering timber. A chain extends from the car to the rail with a clutch to prevent the car from overturning. This entire derrick, exclusive of the car, did not cost over $20.

SECOND PRIZE: THE STORING AND HANDLING OF ROADWAY MATERIAL.

By E. K. Coggins,

Chief Clerk to Roadmaster, Southern Railway, Knoxville, Tenn.

Each superintendent should have a storehouse centrally located on his division, preferably at headquarters, for the handling of roadway material. This storehouse should be within trucking distance of the freight house and should be of sufficient size to allow ample floor space so that the different kinds of material can be kept in special piles. Shelves, racks, bins and lockers should be provided in which to keep the smaller articles such as light hardware, etc., while a separate room should be provided for the storage of cement, lime, plaster and similar material. Platforms around the building will furnish ample space for heavy and bulky material such as frogs, switches, guard rails and roadway signs and will also allow room for the storage of building material such as brick, roofing slate and tile. In connection with this platform there should be a shed in which dry and dressed lumber and other material which should be protected from the weather can be stored.

A scrap and lumber yard should be located as near this storehouse as conditions will allow, this yard to have a track through the center with sufficient room on either side for assembling, assorting and separating the different classes of rail and roadway scrap that are accumulated on the line and which must be consolidated for shipment on sale orders. Bridge material such as girders, I-beams, trestle timbers and all other surplus heavy rough building material can be received, stored and distributed from this point to the best advantage.

The work of handling the heavy material can, of course, be

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done more economically and satisfactorily if proper facilities are arranged for. A rail loader and a car equipped with a hoist or derrick should at least be available at all times. The local section forces should not be required to furnish the labor to handle this material. A better way is to organize a small force with a good foreman for this work, and any spare time can always be spent in assisting the track men. A handy man familiar with the different classes of material should be placed in charge of the storehouse. Such a man would be kept busy receiving and forwarding shipments, checking invoices and keeping the proper records of all transactions.

It is necessary for each track supervisor to have a place at his headquarters where he can store a small stock of emergency material, tools and supplies. The handiest and best location in nearly, if not all cases, is found at the rear of the freight depot where small local shipments can be handled with the least expense and trouble and can be gotten out on the line quickly in case of emergency.

Each section should be provided with a good tool house in which to care for the material furnished for repairs. The importance of this does not seem to be realized as section gangs on many roads are provided with nothing more than a 3 ft. x 6 ft. tool box in which to store supplies. Any experienced foreman will vouch for the statement that enough is lost in a short time in broken shovels, track gages and other light tools, which are piled in a box with heavy track jacks and claw bars, to build a standard tool house. A greater loss, however, can be checked up in such items as track bolts, frog, switch and signal repair parts that are piled behind and under the tool boxes. These are neglected for a short time and soon become so rusty, that they cannot be used and are placed in scrap and a new supply furnished, a portion of which is likely to reach the same destination at an early date. Time as well as material is lost from this cause. A crew will wait 10 or 15 min. for one of their number to replace the contents of the box, thrown out in search for a cotter key, chisel or some other small article. At times the hand car is covered with snow and must be cleaned off. Perhaps a fire will have to be made to thaw out the bearings before it will "roll," and it is often necessary for all "hands" to walk and push the car, which would not have happened had it been sheltered in the tool house and protected from the storm.

Shipping material and tools in small local shipments to the different sections has always been found unsatisfactory. As a rule train crews do not like to stop at a way station for a keg of spikes, and if they have only a small amount of company material for that station they will carry it by. Switches are hard for trainmen to handle and a great many switch points are thrown from the cars and broken. A much better plan is to run a material and supply car over the division once each month at a stated time, which the section men can meet to draw their supplies. The roadmaster or supervisor should accompany this car and issue only the amounts required. Old tools can be exchanged for repaired ones and any surplus can be taken up and distributed to other points where needed or returned to the storehouse. At the same time two or more cars, if necessary, should be carried for the purpose of picking up all mechanical and roadway scrap that section forces have gathered during the month, which should be piled at their headquarters ready for loading.

HANDLING MAINTENANCE MATERIAL ON THE SANTA FE.

By M. Ganley,

Roadmaster, Atchison, Topeka & Santa Fe, Argentine, Kan.

All track ties are piled, on receipt, as close to the place where they are going to be used as possible and are than protected from fire and high water. Where high water must be considered, due consideration should be given to the location, as it is cheaper to handle ties a second time to get them where they are to be used than to send a force of men to move them hurriedly in case of high water.

Where bolts are not to be used for some time they should be stored at stations and kept under cover to protect them from the water. Switch material is handled in the store department yard where each different class of material is piled in separate piles in proper order, with switch point fastenings, for instance, at one end of the row, and switch points, guard rails and fittings in proper order, the frogs being at the far end of the row. Bolts are stored with the section of rail that they fit. With such an arrangement it is almost impossible even for foreigners to make a mistake and get the wrong kind of material. Switch material is shipped to the store department and unloaded by track forces who charge the labor to the store department. This department carries the stock of material while the track department keeps the yard in shape.

Our yard is not large enough to warrant the installation of any labor saving devices and the main economy is gained by close co-operation between the store and track departments. The roadmaster makes a monthly check of material on hand with the storekeeper and then gives him an idea of what material will be required the coming month and how to order it to take care of the needs. Also, as material is accumulated on the division from time to time which is of no value to the track department, it is loaded and turned over to the store department to send to some other division where it may be needed. By this co-operation between the two departments the accumulation of a large amount of dead stock at different points is prevented and the material charge is reduced accordingly.

SMALL MATERIAL YARDS.

By M. Risey,

Foreman, Bridges and Buildings, Chicago & North Western, Baraboo, Wis.

We have adopted the following method of handling our bridge material on the Madison division, storing it at four different points. Where possible we block up old bridge stringers to about the level of the floor of a car and pile stringers and caps on this. Our season's supply of material comes in between March 1 and June 1, usually badly mixed in flat, gondola and box cars. It is unloaded by a gang of three or four men and is held at these points to be sent out as required by the district bridge foremen. The cost for unloading the material averages about 70 cents per thousand board feet. It usually costs about 40 cents per thousand board feet to load it again as it is usually loaded on flat cars. A distinct saving is thus made in the cost of handling the material and it is also easier to keep the weeds and grass away from the timber. Air spaces are provided between each layer of material by using small 1 in. x 4 in. boards between the adjacent timbers.

When material is desired for bridge renewal it is handled by the pile driver crew, as our yards are not large enough to warrant the use of a derrick. At two of these yards we hold emergency material including piling, stringers, caps and ties sufficient for a ten span pile bridge. If this material is not called for during the season it is used for temporary bridge work and is replaced with new material.

HANDLING MATERIAL IN SMALL YARDS.

By A. Palm,

Roadmaster, Central California Traction Co., Sacramento, Cal.

The cost of handling material by hand is practically the same per pound or per foot in small yards as in large ones. While planning to install machinery to reduce this cost of handling in large yards, it is always well to consider that some provision should be made to reduce the cost in the smaller yards as well. The following notes refer particularly to methods for reducing the cost of handling material in yards where the installation of machinery on a large scale is out of the question.

A small hand derrick on an "A" frame can be used to handle frogs and other cumbersome material. With it a couple of

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men can load and unload such material with ease and safety, while the cost is low in comparison with what it is when such material is handled by hand. I have in mind a device similar to the American rail loader, with a cylinder operating by air pressure with a switch tank and air compressor mounted on the floor of the car. A gasoline engine similar to that used on hand cars is installed on this car to drive the compressor and to propel the car. The wheels should be without flanges to allow the car to be moved from one place to another by laying a few planks in front of it for a runway. With a machine of this type three or four men could load or unload and store as much material in a given time as 12 or 14 men could do by "main strength and awkwardness." It would probably reduce the cost of handling material at least 60 per cent.

The machine could be easily loaded on a flat car and taken out on the road to load or unload rails, distribute new rails and concrete pipe, etc. As the wheels would be without flanges it would propel itself from one car to another after loading or unloading the car ahead of the machine. It could be kept in use almost constantly and would save its cost several times during the first year.

HANDLING SUPPLIES THROUGH THE STORE DEPARTMENT.

By R. Q. GILLIES,

St. Louis & San Francisco, Fort Scott, Kan.

It does not seem to me advisable for railways to maintain material yards for the storage of surplus material as it is better and quicker to ship the material directly to the point where it is to be used. On large railways the material is standardized as far as possible and the store department should carry it in stock to be shipped when ordered. The cost of loading this material at the storehouse, together with the cost of unloading at a material yard, loading it again for shipment where needed and unloading it at destination is expensive. A large portion of this cost can be avoided by eliminating the second handling.

We have recently received instructions to do away with material yards. It is now the practice to order both cross and switch ties for the year sent to one point, usually the road-master's headquarters, where they are held on cars until a statement is furnished showing the contents of the car. The cars are then rebilled to the points where the ties are required. The statement of contents is generally received before the car reaches the division. In addition to saving money by eliminating the rehandling, we also avoid having excess surplus material on hand. By having the section foremen render a monthly report showing the material on hand, received by shipment, received from tracks repaired or taken up, material used or shipped and material on hand at the end of the month, we know just what stock we have on hand. In case of an emergency we can go through these reports and instruct the foremen on a section having the required amount of material on hand to ship it to the point needed.

All scrap rail is held at a central point ready to ship on sales orders. Four scrap cars go over the subdivision on local trains, two cars each way, whenever there is sufficient scrap on hand to warrant it. All foremen are notified to meet the train and load what scrap they have. When the two locals meet, the one that is going toward the station where the scrap is held for orders takes all the cars to that station. When the cars reach this point the section force sorts the scrap, placing the mechanical scrap on one car and the track scrap on another and billing them to the general storehouse. Scrap rail is sorted from the miscellaneous scrap and is held in a convenient place for a sales order. This material is also picked over by the mechanical department, and material fit for further use is removed before the cars are sent to the general storehouse. On one such inspection recently $1,000 worth of good material was culled from the scrap cars.

SYSTEMATIC CLASSIFICATION OF MATERIAL.

By JOSEPH J. MORGAN,

New York Central & Hudson River, Kingston, N. Y.

One of the greatest difficulties in the shipment of material is the failure of the foremen to explicitly state what they require. Frequently the storekeeper is doubtful as to just what material the foreman refers to on his requisition. This results either in delay in shipping the material or in the wrong material being shipped, and in either case requires additional labor. This condition can be improved on, if not entirely eliminated, by having all items of material carried in stock listed and classified as to size, weight, etc., in alphabetical order, each item being numbered. This list should be printed on heavy cardboard in heavy type. Each foreman should be furnished with one of these lists and instructed to place it in the tool house or some other convenient place for reference in ordering material. On some roads foremen are supplied with perforated order books arranged so that in making out orders two copies are made, one being kept by the foreman for record. With a few additions such a book would do very well. A column should be added with a heading, "Item number per classified list." In this column reference should be made by the foreman to the classified list giving the item numbers of the articles desired as shown on the list. This system might prove somewhat difficult for the foremen to grasp at first, but after they became familiar with the item numbers this trouble would vanish.

In handling staple material, such as bolts and spikes, which are usually received in large quantities, they should not be unloaded when received at headquarters, as is the general rule, but arrangements should be made to have the car or cars placed in way freights and a sufficient supply unloaded by each section gang to take care of their needs, thus eliminating to a large extent the numerous requests from foremen and the rehandling of this material. Of course there would undoubtedly be exceptions to this program on account of the delays in releasing cars in some locations. The proper handling of material for special work should also receive careful attention, and a little foresight in this connection would do away with much extra labor. When material is to be used in connection with a special piece of work, the requisition should state that it should be shipped directly to the work.

SOUTHERN PACIFIC'S MANUFACTURE OF TRACK FASTENINGS.

For a number of years the Southern Pacific has been converting all forms of scrap iron into tie plates, angle bars, spikes and other track fastenings. Owing to the gradual consolidation of many lines having different patterns and weights of rail, a large number of different kinds of fastenings have been required from time to time. Most of these have been wanted in small numbers and could not be bought economically in the open market as they were no longer being rolled. Also the market for the constantly increasing stock of scrap iron is limited in the western states, and it was decided to use this material for the manufacture of these special fastenings which could not be readily bought. Accordingly arrangements were made to convert this scrap material into these special patterns of fastenings and the necessary equipment was installed in the Sacramento shops. The output varies greatly with the demand and with the amount of scrap available, but practically all the scrap is now utilized for this purpose. About 1,700,000 tie plates are made each year in addition to angle bars and other fastenings. While no definite figures of the savings can be arrived at, because these figures are dependent on the assumed prices with which the various departments are credited for the scrap received at the mill, it is known that there is a fair profit in actual cash besides the convenience of being able to secure these special fastenings when needed.

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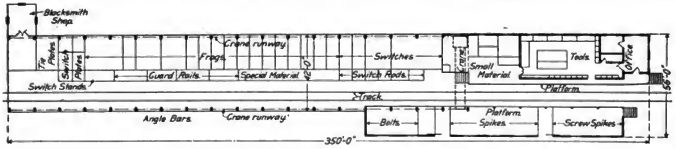
HANDLING TRACK MATERIAL ON THE PITTSBURGH & LAKE ERIE.

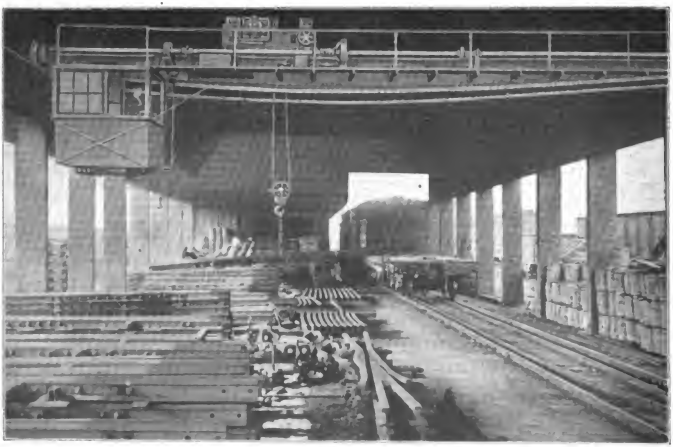
Much attention has been paid to the storing and handling of track material on the Pittsburgh & Lake Erie, a prominent result of which is the maintenance of way storehouse at McKees Rocks, Pa. At this storehouse all the track material required on the division between Pittsburgh and Youngstown, Ohio, comprising three supervisors' districts, is handled. The storehouse consists of a building 238 ft. x 42 ft., partially enclosed, with an enclosed storeroom and office 112 ft. x 42 ft. on the north end. The building is of frame construction, the open portion being enclosed from the roof down to a point 13 ft. above the ground with a galvanized corrugated iron siding. The heavier materials, as frogs, switches and guard rails, are stored in this open area, each class and weight by itself so that any material can be secured at once without rehandling. The smaller materials, as guard rail clamps, emergency lights, nut locks, etc., are stored on the platform at the north end of this shed, while the various tools are kept in the enclosed portion of the building next to the office. Track bolts and spikes are stored on the platform on the opposite side of the track which passes through the building.

The open portion of the building, in which the heavier materials are stored, is served by a five-ton Shaw traveling electric crane which moves on an overhead track with a span of 38 ft. 6 in. between rails. The crane is equipped with a 10 h. p. motor for movement transversely, a 15 h. p. motor for the large hoist and a 10 h. p. motor for the small hoist. The crane handles all heavy material and is operated by the supervisor's clerk from the office, assisted by two blacksmith's helpers from the maintenance of way blacksmith shop who place the clamps



Plan of Pittsburgh & Lake Erie Storehouse at McKees Rocks, Pa.

on the material and steady it when moving. It requires about 50 hours per month of the clerk's time and 200 hours of the laborer's time to handle the material, practically all of which is unloaded and loaded from gondola and flat cars, except bolts and spikes, which are shipped in box cars. In contrast with this, before the crane was installed, a gang of from 20 to 25 men was required an average of four days a week during the summer to handle the material, spending the rest of their time on regular track work. Not only has the installation of the crane greatly decreased the cost of handling the material, but



Pittsburgh & Lake Erie Maintenance Storehouse at McKees Rocks, Pa.

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it has also permitted its loading at any time during working hours, for the men required are now always present; it has also eliminated the frequent injuries common in handling heavy material.

One car of miscellaneous track material and small supplies is loaded for each of the three supervisors' divisions monthly. Special shipments for definite pieces of work and emergency material are sent out continually, no emergency material being stored elsewhere on the division. All rail and track fastenings for relaying work are shipped from the mills direct and unloaded at the point required, but all bolts and spikes pass through the storehouse, although they are not necessarily unloaded from the cars if required on the line in carload quantities at the time of receipt. During the past season 1,140 kegs of bolts, 2,500 kegs of track spikes, 327 frogs and 388 switches complete have passed through the storehouse in addition to proportionate amounts of miscellaneous track material.

A space at the end of the open building and a small building adjacent are devoted to a maintenance of way blacksmith shop for light repairs of frogs, switches and track tools, one blacksmith and two helpers being employed. The storehouse crane serves this end of the shop and handles the heavier materials for the blacksmith shop.

SCRAP YARD.

All scrap on the division is collected monthly and brought to a central yard about one mile west of the storehouse. At this point a platform 700 ft. x 40 ft. is provided with a track on one side level with the platform and another on the opposite side depressed so that the top of a gondola car is level with the platform, the topography of the land favoring this arrangement. As the cars of scrap come in they are weighed on the high track before unloading. The material is sorted and classified in separate piles for sale, that suitable for repair purposes being turned over to the blacksmith. The purchasing department is advised from time to time of the accumulation of this material and it is loaded on its instructions into cars on the low track. Beyond the rear end of the platform the two tracks converge, with the high track about 3 ft. above the low one, so that material can be transferred from car to car if desired without going over the platform. The amount of scrap received here amounted to 22 cars during the month of November, 1912, although the monthly average is only about 12 cars.

These installations were worked out under the direction of Edwin F. Wendt, assistant engineer, Pittsburgh & Lake Erie, and are in charge of W. E. Davin, supervisor at McKees Rocks, Pa.

THE APPEARANCE OF TRACK.

By GEORGE J. SHARKEY,
West Shore, Kingston, N. Y.

There are many little considerations in closing a summer's track work which, if taken care of, add distinctly to the effectiveness of the season's work by improving the appearance of the track. All clay and rock cuts and ditches should be thoroughly cleaned, the ditches to be well sloped and graded to insure a free run of water. The material from the cuts can be used economically in widening shoulders or strengthening riprap. The right of way should be systematically mowed, never allowing the weeds and grass to gain any headway. No ties should be piled along the right of way, as they can be burned as the work progresses just as easily as at the end of the season. The trackwalker, foreman or other members of the section gang can pick up waste paper and other debris as they walk over the track and touch a match to it in some safe place. A complete picking up of scrap at least monthly and storing for sale or sending to the scrap platform, adds considerably to the credit revenue, prevents a further waste by the weather and greatly improves the appearance. Clean station platforms and dust-free driveways at freight houses should be considered. A little cleaning up on Fridays around stations adds to Saturday's and Sunday's dressing up and leaves a strong impression. Well maintained fences, cattle guards and crossings are most essential. A little wire here and a little paint there work wonders. A neat ballast line either on stone or gravel gives a simple yet effective set off to the track.

The opinion gained of a track both by the traveling public and the officers is governed largely by the appearance. If an officer finds things scattered and unkempt he will undoubtedly look further to find things to criticize, while if he finds things in a shapely order, he will invariably overlook a little discrepancy here and there, feeling that everything could not be reached at once, but that each will be taken care of in turn. If the subject of appearance is given constant attention the usual inspection will be invited, instead of scorned, and the usual rush before inspection will be eliminated.

A BLOW TORCH FOR CLEANING SNOW AND ICE FROM SWITCHES.

A gasolene blow torch has recently been devised and put in service for removing snow and ice from frogs, switches and interlocking connections. It operates in a manner similar to the ordinary gasolene blow torch and can be handled by one man. It is made of heavy brass tubing 2 in. in diameter and about 5 ft. long., with a burner at one end of the tube and a gasolene valve and pressure pump at the other end. A controling valve is placed inside the tube to regulate the flow of fuel. This tube has a capacity of three quarts of gasolene, or sufficient to last about three hours. The flame is about 2 in. in

Using Blow Torch and Pick for Removing Ice.

diameter and about 12 in. long. The over-all length of the device is 5 ft. 9 in., and it weighs about 8 lbs.

The torch is designed for the purpose of thawing ice, snow or sleet about switch points, derails, frogs and other movable track connections, and is of special assistance in automatic signal territory, or in power interlockings where switch adjustments must necessarily be accurate. It was tested a few days ago in the Chicago Great Western yards at Chicago, following a sleet storm. One man using the torch cleaned 160 switches in three hours. This work would have required about five men for an equal time using picks and brooms in the old way. The torch is manufactured by the T. Turner Brass Works, Sycamore, Ill.

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AMERICAN WOOD PRESERVERS' CONVENTION.

Abstracts of Papers Presented at the Ninth Annual Meeting Held This Week in Chicago, with Resume of Discussions.

The ninth annual convention of the American Wood Preservers' Association was held at the Hotel Sherman, Chicago, January 21-22-23, 1913, with about 200 members and guests in attendance at the various sessions. The officers of this association for the past year were: President, E. A. Sterling, forest and timber engineer, Philadelphia, Pa.; first vice-president, A. M. Smith, Ayer & Lord Tie Co., Argenta, Ark.; second vice-president, H. M. Rollins, Gulfport Creosote Co., Gulfport, Miss.; third vice-president, G. B. Shipley, Pittsburgh Wood Preserving Co., Pittsburgh, Pa.; secretary and treasurer, F. J. Angier, superintendent timber preservation, Baltimore & Ohio, Baltimore, Md.

In his opening address, President Sterling called attention to the shortage in the supply of creosote which has become more pronounced during the past year and to the action he had taken to prevent the placing of a 10 per cent. import duty on creosote oil, as outlined in the proposed Underwood tariff revision bill, basing his plea upon the fact that the wood preserving industry is so closely allied with the conservation of timber resources that the placing of this tax on creosote would work to the harm of that industry and thereby to the conservation of the forests. He also advocated the taking up by the association of a limited amount of committee work, believing that the association is now strong enough to take up some of the more serious problems confronting the industry and to work out solutions for them.

The annual report of the secretary-treasurer showed a total membership of 157, a net gain in membership of 53, or over 50 per cent., within the past year, while the finances were in an equally prosperous condition.

THE PRODUCTION AND SUPPLY OF COAL TAR CREOSOTE.

By E. A. Sterling.
Consulting Timber Engineer, Philadelphia, Pa.

In 1912 the consumption of creosote in the United States on the basis of the average 7½ per cent. increase of the previous four years, exceeded 78,000,000 gal., of which about three-fourths was imported. In the same year R. P. Perry* estimated that 165,000,000 gal. of coke oven and gas works tar would be produced, and an additional 375,000,000 gal. would go to waste in beehive coke ovens. The tar actually produced would have yielded, if distilled to hard pitch, approximately 50,000,000 gal. of creosote; while the tar which was not even recovered would have given us another 112,000,000 gal., or a theoretical grand total of 162,000,000 gal. The first 50,000,000 gal. includes the water gas creosote derivable from part of the gas works tar. This amount is indeterminable, but it will serve the purpose to reduce the total figure on this account by 12,000,000 gal., making it 150,000,000 gal.

We thus have a potential creosote supply nearly double our present requirements, or enough to treat about 1,500,000,000 board ft. with 10 lbs. per cu. ft., whereas in 1911, 882,000,000 ft. were treated with straight creosote. Actually we are producing only about 15 per cent. of our potential creosote supply, or 30 per cent. of our consumption, and are drawing on the European market for the balance, which amounts to about 45 per cent. of what we are wasting at home. This waste is not wanton nor deliberate, but merely a result of economic conditions.

The available supply of creosote obviously depends first on the amount of coal tar produced, and, secondly, on the manner and completeness with which it is distilled. We have not produced creosote up to the limit of our tar production because it has not been profitable to distill to hard pitch, and we have not recovered all the tar possible on account of the capital outlay involved and the lack of a market for certain coal tar products. In the United States the present outlook for an increased production of tar and creosote is promising.

Gas works tar is produced in many of the larger cities, and while the use of electricity for lighting and the manufacture of petroleum gas tend to keep down the output of gas works coal tar, indications are that the present output will remain fairly constant, or, if anything, increase. The increasing cost of petroleum will discourage water gas installations and to that extent increase the output of coal gas.

Coke oven tar is the largest source of creosote and it is mainly in this kind of tar that we may look for an increased output. Quite recently at some of the larger iron and steel manufacturing and distributing centers there have been extensive developments in by-product ovens. The more notable examples are at Birmingham, South Chicago, Joliet, Gary, Milwaukee and South Bethlehem. It is stated that during 1912 new by-product ovens went into operation which have a capacity of 35,000,000 gal. of tar per annum, although this output may not be immediately reached.

The refining of coal tar in the United States has developed along different lines than in Europe. We have concentrated largely on pitch, while Europe has specialized on coal tar by-products, each country catering to its market. A fundamental handicap in this country until recently has been the lack of a market for the pitch, which is the largest constituent. Gradually the soft and medium pitch came into use for roofing papers, road binders, paving block filler and other purposes; while more recently the hard pitch has been in demand as a binder for briquettes, for electric carbons, and cast carbon forms of many kinds. The lighter oils, such as benzol, naphtha, toluol, crude carbolic acid, etc., find various uses, while the heavy oils constitute the creosote for wood-preserving purposes.

It is probably in the manufacture of the more refined coal tar products that domestic developments will be most tardy, for as yet it has not been profitable to compete against Europe in the production of colors, perfumes, extracts and the numerous and varied oils and compounds derivable from coal tar. On the other hand, we are far ahead of European distillers in our knowledge of roofing and waterproof pitches and road binders.

With the development of a market for pitch and other tar products which makes it profitable to refine coal tar and to convert beehive coke ovens into by-product ovens, come other developments which, in the face of an increased tar output, tend to change the distillation methods so as to result in a decrease in the amount of creosote produced. These developments are an increasing use of refined tar for road purposes and of crude tar for fuel. On the other hand, the increasing demand for disinfectants, which can be made from tar, and the growing use and higher value of the middle and heavy oils used for wood-preserving purposes, may be expected to counteract the tendency toward the use of crude or refined tar. Still other important developments, which may cause the production of domestic creosote to increase more rapidly than the production of tar itself, are pending.

Whether the tar distillers in Europe can supply their local market and continue to take care of our increasing demands, depends on the rather complicated situation as regards European trade arrangements, and on the developments along the many diversified lines of coal tar use and distillation. We can, perhaps, draw certain conclusions from the fact that the exports of creosote from Great Britain have dropped from 150,000,000 tons to about 115,000,000 tons in 1912; while in Ger-

*From paper on "Tar Distillation in the United States," presented at the Eighth International Congress of Applied Chemistry.

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many, although the distillers are largely increasing their output and the amount of creosote exported in 1912 increased 25,000 to 30,000 tons, the production has not fully kept pace with the increased demand from many sources.

In Europe, as in the United States, there is an increasing use of tar for road purposes, and there are other developments which tend to disturb the tar market and force prices upward. Gas works tar has probably contributed a larger percentage of the total than in the United States, but it is likely that water gas will be produced in some of the larger gas works where coal tar has previously been the principal output, unless petroleum prices advance too sharply. In Germany the adoption of the Diesel engine has introduced a new factor and German distillers are advocating the use of creosote oil for fuel in this type of engine. Moreover, the German government is using increasing quantities of coal tar fuels in the navy, so it remains to be seen how these various developments will affect the available supply of wood-preserving oils.

The most definite conclusions we can draw from a limited survey of the foreign field is that Europe will be in position to continue the export of large quantities of creosote, but that the increasing demand and the various developments in the coal tar industry promise to strengthen prices, and in some cases materially reduce the supply available for export.

The procuring of an adequate supply of creosote at reasonable cost may be safely considered a vital factor in the wood-preserving industry in the United States, even though other preservatives, particularly zinc chloride, are used in large quantities. Even before there was any question as to the creosote supply being inadequate, the factor of transportation made itself strongly felt. Plants on or near the Atlantic and gulf seaports were always sure of a foreign supply, and could at the same time draw on the domestic market. Inland and Pacific coast plants are more or less handicapped unless located near some of the large producing centers. With comparatively few large pieces of production, and most of these east of Chicago, rail freights figure strongly in the delivered cost. On the Pacific coast the question of procuring a supply of creosote oil has always been difficult to solve, and it is not certain how much the Panama canal will improve the situation.

Up to a year or two ago it is not likely that railroads or commercial treating companies were often deterred from building plants by uncertainty as to their oil supply. Plant construction for a time went ahead at a rapid rate on the assumption that the creosote supply would take care of itself, which it largely did. It may do the same in the future and the indications are favorable, but at present it would be unwise to start a large development without looking into the situation carefully.

There is very little which wood preservers can do about the question of creosote supply. They can, however, do considerable in the matter of consumption. First of all, it would no doubt help both the domestic and foreign producers in meeting the requirements, if the consumers would anticipate their needs as far ahead as possible. In the matter of consumption the tightening up of the market should strongly stimulate investigations of preservative mixtures and of new preservatives. Crude oil, water gas creosote, and refined tar in mixture with creosote will bear further investigation, while blast furnace oil, of which some of the English roads are using considerable quantities, should be tested out further. Crude oil is being given a thorough trial by the Santa Fe, and since the sources of suitable cheap asphaltic oil are in regions where creosote is high in price, its use with reasonable restrictions should reduce the drain on creosote. Water gas or oil tar creosote has not received general recognition as a wood preservative and investigations have demonstrated that it lacks the high antiseptic qualities of coal tar creosote, yet it is not unlikely that it will eventually be used. The most rational way of using it, in the light of our present knowledge, would be to add a comparatively small percentage of it to coal tar creosote for the purpose of cheapening the latter.

It would also be profitable to look closely into our treating methods and eliminate excess injections of oil where it is reasonably certain, because of mechanical wear or for other reasons, that the lighter treatments would be sufficient. Even a 10 per cent. economy in the use of creosote throughout the country would go a long way towards keeping within the limits of supply.

A COMPARISON OF ZINC CHLORIDE WITH COAL-TAR CREOSOTE FOR PRESERVING CROSS-TIES.

By HOWARD F. WEISS,
Director, Forest Products Laboratory, Madison, Wis.

Although a great many preservatives to preserve cross-ties have been tested, zinc chloride and coal-tar creosote are now by far the most extensively used in the United States. The author has frequently been called upon to compare these two preservatives; in fact, the number of such requests has been so large that it has led to an examination of the merits and deficiencies of each preservative. This paper aims to present the information which has thus been collected and to invite discussion. Please note, however, that only cross-ties are considered, and the data which follow should not be confused with poles, piling or other products.

According to statistics gathered by the Federal government, the number of cross-ties treated with zinc chloride in the United States shows no increase in the past four years, while the number treated with creosote has increased rapidly, as shown by the following figures.

	1907.	1908.	1909.	1910.	1911.
Zinc chloride	9,464,765	8,640,230	8,051,054	9,195,861	9,445,961
Creosote	5,750,874	9,620,420	9,943,360	14,441,843	16,510,721

This in itself might be looked upon as an answer to the query: "Which is the better of the two?" But after a careful investigation it appears that this question cannot be so easily dismissed. I asked twelve leading operators of wood-preserving plants for their opinion as to why the number of Burnettized ties in this country did not increase. Their replies, which are instructive and certainly worth careful thought, group themselves as follows:

Poor workmanship in Burnettizing, either through ignorance or otherwise.
The zinc leaches from the ties, or the railroads fear that it will.
The salesmen of coal-tar creosote are more industrious than the zinc salesmen.
Zinc-treated ties cause trouble with the automatic signal apparatus.
The empty-cell creosote processes reduce the initial cost of treating with creosote.
Railroads consider creosote cheaper in the long run, and because ties are growing scarcer they want to give them the treatment which makes them last the longest.
Railroad engineers have concluded that zinc chloride has a tendency to corrode spikes.
The treatment is now largely east of the Mississippi, where the climate is moist, while Burnettizing began west of the Mississippi, where the climate is dry.
Heavier tie-plates are now being used, warranting a more permanent preservative treatment.

The factors which I have considered in comparing the two preservatives under discussion may be grouped as follows:

(1) The toxicity of the preservative—that is, its ability to prevent decay.
(2) The ability of the preservative to penetrate the tie.
(3) The permanency of the preservative in the tie.
(4) The effect of the preservative on the strength of the tie.
(5) The effect of the preservative on the corrosion of spikes and plates, and the operation of block signals.
(6) The financial saving due to the use of the preservative.

Of somewhat lesser importance are:

(7) The uniformity in composition of the preservative and ease of securing it.
(8) The combustibility of the preservative.
(9) The ease of handling the preservative and ties treated with it.
(10) The ease with which the penetration of the preservative can be determined.

(1) Zinc chloride relies upon its toxic properties solely to protect ties from decay. Creosote, in addition to this, has more or less of a waterproofing effect, which also acts as a protection against decay. According to the toxic tests made by Malenkovic, zinc chloride offers about twice as much resistance to fungus attack (penicillium) as coal-tar creosote free from phenol. Tests made at the Forest Products Laboratory show that ordinary coal-tar creosote has about the same toxicity as zinc chloride,

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0.4 per cent. being sufficient in each case to prevent fungus growth (Fomes annosus).

(2) In the author's opinion, the ability of the preservative to penetrate the wood during treatment is given, in practice, too little consideration. All toxicity data show that both zinc chloride and coal-tar creosote are powerful fungicides, and that small quantities of them will inhibit decay. It is good practice, therefore, to diffuse the preservatives thoroughly through the tie so that as many of the wood cells as possible will be poisoned. A tie might contain 10 or 12 lbs. of creosote per cu. ft. and yet be poorly treated if the oil is not well diffused; in fact, not nearly as well preserved as a tie having only 4 or 5 lbs. of the oil per cu. ft., but with the oil uniformly and deeply distributed.

It is well known that water solutions will penetrate wood more easily and thoroughly than oils; for example, in making what are called the "penetranee tests' at the Forest Products Laboratory it took about three minutes to force zinc chloride solutions through 6 in. of hemlock parallel to the grain, while creosote took over 30 minutes. Again, under similar conditions in treating red oak and maple ties we forced about 50 per cent. more by volume of zinc chloride solution into them than we did coal-tar creosote. Any process which aims to impregnate ties with only a certain amount of preservative irrespective of the penetration secured is, in the author's opinion, operated on an incorrect basis; and any specification which will enable ties to be treated in this manner is a poor specification. In treatments with zinc chloride I believe a strong preliminary vacuum should be drawn, and the solution admitted to the cylinder without breaking the vacuum, after which pressure should be applied and held to "refusal." The absorption of dry salt can then be controlled by varying the concentration of the solution rather than by varying the amount of solution forced into the ties. Unfortunately, this simple treatment can not be used with creosote (except with certain resistant ties) because too much oil would be absorbed and the treatment would become too expensive.

(3) Permanency, as applied to preservation, involves two phenomena, volatilization and leaching. Zinc chloride under conditions of use is non-volatile. Creosote, on the other hand, evaporates from the tie. The rate at which it evaporates depends on many conditions, such as its composition, method of injection, atmospheric conditions during seasoning, etc. This objection to creosote has led in some cases to the use of tar as an adulterant, the idea being that such a mixture will hold in the tie the more volatile constituents of the oil. It is quite probable that tar will do this, but there are strong objections to such practice, and it is the author's opinion that it should be adopted only after we have secured much more convincing data than we now have.

Creosote is practically insoluble in water, while zinc chloride is readily soluble. From tests made in the Forest Products Laboratory it appears, however, that certain amounts of zinc chloride can not be leached out of wood even by very severe soaking. Just how much of the zinc chloride thus remains is not known to the author, but tests on this point are now under way at the laboratory. It is claimed that the leaching of zinc chloride in ties can be retarded by air-seasoning them after treatment, or by coating them with an oil. I have no conclusive data on either of these claims.

(4) With decay largely eliminated from properly preserved ties, and with the tonnage of our roads constantly increasing, the problem of prolonging the life of ties from rail and spike cutting is becoming more and more acute. Obviously, a preservative which will decrease the strength of ties when injected will be subject to serious criticism. Tests made by the Forest Service some six years ago on loblolly pine ties indicate that the presence of zinc chloride did not weaken the wood under static loading, but tended to make it brittle under impact, while no decrease in strength was noted for ties treated with creosote. Tests made since then indicate that both preservatives weaken the wood, although, if *properly injected*, the weakening thus caused is too small to be of practical importance. In one case a decrease of 40 per cent. in the bending strength of wood creosoted by a commercial plant was, however, observed.

(5) Some pieces of flange steel of equal dimensions, weight and quality were immersed, respectively, in coal-tar creosote and a 6 per cent. solution of zinc chloride for three weeks and constantly heated at 98 deg. C. At the end of this time the steel in the creosote lost .0064 gram, while that in zinc chloride solution lost 1.4636 grams. Of course this was a very severe test, not comparable to what takes place in the track; but even at atmospheric temperatures the corrosion of steel spikes and plates in contact with zinc-treated ties is probably greater than with creosoted ties. Whether it is of sufficient intensity to be a real detriment is not known to the author. The consensus of opinion among those who claim experience seems to be that if the zinc ties are properly seasoned before placing in the track the corrosion is of no appreciable consequence.

The presence of zinc chloride in wood is very liable to decrease the resistance of the tie to the passage of an electric current; consequently, if the flow of current is away from the track a marked corrosion of the spikes will occur. This action may, however, take place in untreated ties, especially when wet. Zinc chloride, being deliquescent, tends to keep the ties moist, while creosote tends to waterproof them; hence deterioration of spikes subject to the passage of electric currents is more likely to take place in ties treated with zinc chloride than in those treated with creosote.

The electrolytic action of zinc chloride and creosote in ties is a subject about which much discussion has occurred, particularly in connection with the operation of automatic block signals. The most accurate tests known to me, bearing on this subject, were made by J. T. Butterfield, of Purdue University, in 1910. His tests concluded that ties treated with creosote offer greater resistance than those treated with zinc chloride, and less resistance than untreated ties, as follows:

Kind of Wood.	How Treated.	Ratio of Resistance (Treated to Natural).
Loblolly pine	Full cell process	0.34
Shortleaf pine	Full cell process	0.79
Red oak	Burnett process	0.16

It is the experience of several signal engineers that zinc-treated ties will cause trouble with the block signals if they are placed in the track unseasoned, or if the length of blocks is too great. A shortening of the circuit to about 1,000 or 1,200 ft. has, in many instances, remedied these difficulties.

(6) A discussion of all factors finally simmers down to a discussion of cost. Because of the scarcity of authentic service records generalities must still be used. The numerous test tracks now placed throughout the country will, it is hoped, furnish us with accurate data upon which to base decisions. Quoting from a report of the Wood Preservation Committee of the American Railway Engineering Association: "Creosoting at present can not be relied upon to preserve ties more than 15½ to 19 years, an absolute maximum, unless the ties are protected against mechanical deterioration. If badly injected they perish from decay in 5 to 12 years. Burnettizing, when well done, can be relied upon to preserve ties from 10 to 14 years. There are great differences in the thoroughness with which the work can be done."

From records at hand it is assumed that a tie which, in an untreated condition, would last 5 years, when properly treated with zinc chloride will last, on an average, 12 years, and with creosote 17 years. The cost of the tie untreated is assumed as 45 cents; the cost of creosoting, 30 cents; the cost of Burnettizing, 15 cents, and of placing in the track, 15 cents. We then have:

Cost of untreated tie in track, 60 cents.
Cost of Burnettized tie in track, 75 cents.
Cost of creosoted tie in track, 90 cents.
Life of untreated tie in track, 5 years.
Life of Burnettized tie in track, 12 years.
Life of creosoted tie in track, 17 years.

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From these values, figured at 5-per cent. compound interest, we find:

Annual cost of an untreated tie, 13.86 cents.
Annual cost of a Burnettized tie, 8.40 cents.
Annual cost of a creosoted tie, 8.01 cents.

And if figured without interest:

Annual cost of an untreated tie, 12 cents.
Annual cost of a Burnettized tie, 6.25 cents.
Annual cost of a creosoted tie, 5.29 cents.

From which it may be deduced that both preservatives are very economical to use in comparison with untreated ties, and that of the two, creosote is ultimately slightly cheaper. Under the assumptions here made zinc-treated ties must last about 12½ years in order to have the same annual charge as creosoted ties, while the creosoted ties must last 15½ years to have the same annual charge as the zinc-treated ties. The author leaves the reader to manipulate these figures in any way he sees fit.

(7) The zinc chloride produced in the United States is, for a commercial product, extremely uniform in its composition and the quality can be readily duplicated and obtained. Creosote, on the other hand, varies considerably in its composition, and is not easily secured in satisfactory grades. The American Railway Engineering Association recently drew up three specifications for creosote to be used in tie preservation, and more discussion has taken place over what kind of an oil should be used than over any other feature of wood preservation. It is the author's opinion, however, that these conditions are changing for the better and that the future looks bright.

(8) Zinc chloride is non-inflammable; creosote is inflammable; hence a zinc chloride plant presents a lower fire risk than a creosote plant. Zinc chloride-treated ties can be considered more fire resistant than untreated ties. When freshly treated, creosoted ties are easily ignited, but their resistance to inflammability increases as their seasoning progresses. Inflammability tests gave a temperature of ignition for zinc-treated wood of 287 deg. C., 19 per cent. of the wood, by weight, being burned. Freshly creosoted wood tested under the same conditions ignited at 176 deg. C., and 40 per cent. of its weight was burned. When, however, it was air-seasoned for 90 days after treatment the temperature of ignition was 216 deg. C., and the loss in weight 27 per cent.

(9) Zinc chloride solutions can be readily handled at much lower temperatures than coal-tar creosote and do not present the many difficulties of heating that accompany the operation of creosote plants; on the other hand, they cause a great plant depreciation, due to their corrosive action. Several cases have come to my attention where trouble was experienced in getting track men to handle creosoted ties, supposedly on account of their disagreeable nature and their effect on the health of the men. Such objections can, however, be avoided. I have heard of no complaints against zinc-treated ties in this connection.

(10) The presence of creosote in the ties can be detected more readily than the presence of zinc chloride and a knowledge of the depth of penetration is highly important. A chemical analysis of the treated ties is not feasible for daily use, so that the best method of detecting the depth of penetration in zinc-treated ties is to cut a section and apply chemicals to produce color changes, or to heat the freshly-cut section in an oven above the boiling point of water. However, a careful inspection of the treating plant and process is worth as much, if not more, than a critical examination of a few ties.

SUMMARY OF RESULTS.

All the factors discussed above show that there are good grounds for hesitating in the selection of a preservative to be used in treating ties, and that the conditions peculiar to each road, or even parts of the same road, should affect such a decision. No sweeping generality can have much practical significance. The more noteworthy points brought out by this study are:

Zinc chloride and coal-tar creosote, when used under normal conditions, are both effective preservatives of cross-ties, and there is little choice between them as far as annual charges are concerned.

Creosoted ties in general cost initially more than Burnettized ties, the cost of treatment being from about 2 to 3 times as great.

Creosoted ties last, on an average, longer in the track than Burnettized ties, hence require less frequent renewals and changes in the roadbed.

If creosote advances appreciably in price it will very probably result in stimulating the number of ties treated with zinc chloride.

DISCUSSION.

E. B. Fulks, American Creosoting Company, thought that the evaporation of creosote is not serious as only a small portion of the oil disappears and this is confined to the outer surface of the tie. Sufficient oil still remains to prevent decay. Experiments with evaporation are usually greatly accelerated as the test samples are exposed to the air on all sides while with ties only one surface is exposed. Realizing that this evaporation does take place, some men mix certain proportions of high grade tar with the creosote, which tar acts as a filler near the outer surface of the timber to retard this evaporation. He defended the use of this tar as an aid to creosote and not as an adulterant.

W. F. Goltra advocated the consideration of crude oil on the same basis as zinc chloride and creosote, believing it to be equally efficient as a preservative with the other two materials. He questioned Mr. Weiss' assumptions as to the average life of creosoted ties, giving statistics to show that with the treatment of 22 lbs. per tie which Mr. Weiss considered, a maximum life of 10 years was all that could be expected. On this assumption the comparison of annual charges for the two methods would show an advantage for zinc chloride of 2½ cents.

Walter Buehler, Kettle River Company, said that experience showed that ties saturated with petroleum are effectively preserved against decay but when allowed to dry out, lose their immunity from decay.

G. E. Rex, A. T. & S. F., in reply to questions regarding the results secured from crude oil, said that of 14 ties treated experimentally in 1901, two have decayed up to the present time, although four others have been removed for examination. The two which decayed were loblolly pine and the fact that such decay appeared would indicate that crude oil has not the necessary antiseptic qualities.

H. F. Weiss said that his objections to the use of tar in creosote are that it has not been fully tested in service, that it reduces the penetration in the wood and that it collects on the surface of the ties, making them difficult to handle.

EXPERIMENTAL TREATMENTS, WITH REFERENCE TO THE EFFECT OF INITIAL AIR PRESSURE ON PENETRATION OF CREOSOTE.

By R. S. Belcher.

Chemist, Texas Tie & Lumber Preserving Co., Somerville, Tex.

The question of the extent to which initial air pressure retards penetration of creosote oil, has been of considerable interest to me, and to satisfy my curiosity I made six runs in the experimental cylinder, with and without initial air pressure. Sawed and hewed longleaf, shortleaf, and loblolly pine ties were used, all the ties having been seasoned five months. It was one of the objects of these test runs to ascertain the absorption and penetration of two runs having the same differential; that is, one having, say, 75 lbs. oil pressure and no initial air pressure, and the other having 100 lbs. air pressure, and 175 lbs. oil pressure, the excess of oil pressure over air being the same in both cases.

In Run 1, 100 lbs. oil pressure was pumped on the ties with no air pressure to oppose it except the air naturally in the wood cells, the average absorption of this run being 54.60 lbs. per tie, or 16.72 lbs. per cu. ft. In Run 2, 75 lbs. air pressure was used

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to oppose 175 lbs. of oil pressure, the absorption being 21.15 lbs. per tie, or 6.56 lbs. per cu. ft.

Run 3 had an initial air pressure of 100 lbs. and an oil pressure of 175 lbs., while Run 4 had no initial air pressure and 75 lbs. oil pressure. The absorption in Run 3 averaged 9.10 lbs. per tie, and 3.37 lbs. per cu. ft., while in Run 4 the absorption was 20.50 lbs. per tie or 7.68 lbs. per cu. ft.

Run 5 had the same treatment as Run 2, namely, 75 lbs., air pressure and 175 lbs. creosote oil pressure. The absorption on this run averaged 11.30 lbs. per tie or 4.24 lbs. per cu. ft., being less than the absorption of Run 2 on account of the fact that the ties treated were heart ties, while Run 2 was composed of sap ties. The excess of oil pressure over air pressure in Run 5 was 100 lbs., as compared with 75 lbs. in Run 3.

In Run No. 6 it was the object to see how quickly 5 lbs. per cu. ft. could be put into the ties, and what kind of penetration would be secured, no initial air being used. When sufficient creosote had been pumped from the measuring tank to give 5 lbs. per cu. ft., the treatment was stopped. This took exactly five minutes from the time the cylinder was filled, and the pressure had gone up to 100 lbs. The cylinder was then immediately drained and a vacuum drawn to dry the ties. This run had an absorption of 13.60 lbs. of creosote per tie, or 5.13 lbs. per cu. ft. The penetration was considerably better than was expected, but it was very uneven and the sap wood was not entirely treated.

It would seem that while initial air pressure lowers the amount of creosote absorbed by the timber, it interferes with the penetration very slightly, if at all, thus securing the maximum penetration with the minimum quantity of oil, and that the benefit derived from initial air pressure is greater proportionately in timber with a large percentage of sap wood than in timber which is mostly heart wood. This being the case, it would follow that best results can be expected in so far as maximum penetration with small amounts of oil is concerned, by using reasonably high oil pressure, and as high air pressure as possible, and yet leave in the timber the required amount of creosote.

DISCUSSION.

B. Kuckuck, of C. Lemheck & Co., advocated treating timber to refusal to insure thorough treatment. This is expensive when creosote is used and it has been diluted with other materials, but timber filters liquids. By using initial air pressure it is possible to dilute the creosote with air and so distribute it throughout the timber at moderate cost.

G. B. Shipley, Pittsburgh Wood Preserving Company, said that considerable experience had shown him that better penetration was secured with an initial pressure than with full cell treatment. This initial pressure varies with the different kinds of timber.

THE REQUIREMENTS FOR SUCCESSFUL TIMBER TREATMENT.

By HERMANN VON SCHRENK,
Consulting Timber Engineer, St. Louis, Mo.

Timber treatment has grown so rapidly in the United States that the amount of material treated every year is ten times what it was seven or eight years ago, and the number of men engaged in the industry has correspondingly increased. As the use of treated wood has increased, some facts as to the treatment of timber have become more or less axiomatic. Briefly stated, in order to get good results from treated timber the following points must be observed: Only perfectly sound timber should be treated. In order to obtain the best results, properly seasoned material should be used. A good preservative is essential to long life. Proper injection as to quantity and penetration is essential. Proper subsequent handling of the timber is essential.

In my investigations I have found that the premature failures of so-called treated timber were almost without exception due to the non-observance of one or more of the above principles. I am perfectly sure that in the early days a good deal of timber was treated which was sap rotten. It was not realized ten years ago, as it is today, that timber may be very badly decayed in the interior and yet show absolutely no evidence on the outside. With the best intentions, therefore, many sticks of wood were doubtless treated which we would unhesitatingly throw out today. Many of the failures were, however, due to the fact that timber was treated because of certain contract requirements and in spite of a better knowledge of the person responsible for the actual treatment. The lessons to be drawn from failures are very obvious, and I believe we should take cognizance of them, particularly in view of more thorough knowledge of all the factors surrounding the operations which make for successful treatment.

While there is no doubt very general agreement among the men engaged in the timber-preserving industry as to the fundamental conditions enumerated above, we all know that frequently, under stress of business circumstances, they are not adhered to. The consumer frequently makes demands which cannot be fulfilled, and if they are, they are bound to result in speedy and ultimate failure.

The inspection of material before treatment should be made with greater care. I believe that every treating company should be empowered to refuse to treat material which it knows to be defective. In other words, I do not think that anyone is warranted, under any circumstances, in treating material which he knows to be unfit because of various defects. A defective stick was never improved by any kind of treatment.

The same holds true for improperly seasoned material. The excuse is frequently given, in demanding treatment of absolutely green material, that emergencies have arisen which necessitate such treatment. Unfortunately, with the increased use of timber in its various forms, the tendency to require and do such rush work seems to be increasing. It is frequently inconvenient to wait six or eight months, or more, to properly season material; besides, it costs considerable for interest charges. What has been said about the inspection of the material before treatment holds equally for the preservative used and the manner of treatment.

I may be treading on delicate ground when I refer to the relation which should exist between a treating company and its customer. I have no hesitation, however, in saying that I believe it to be the duty of the man who knows how timber should be treated to protest vigorously against any requirements which necessitate his treating a customer's material in a manner which he knows to be wrong. I wish to protest against the tendency which requires the actual treating operation to be conducted in accordance with any demands which may be made by the customer, because not only does this give disappointing results so far as any particular piece of work is concerned, but also because it reacts on the company doing the work and on the industry as a whole. The people as a whole are apt to forget when the piece of so-called treated material fails, that that particular piece of material was treated under unusual conditions, no matter how much these conditions may have been justified at the time. I wish to protest against the tendency to rush work under "necessity." We might as well face the problem now and say that successful treatment of timber can only be accomplished by observing certain laws, and that when one or more of these laws are broken, the consequences will be swift and certain. I know that there are difficulties which both the consumer and the timber-preserving company have to meet, and, as in all other affairs, that there are emergencies which will warrant doing exceptional things. I know also, however, that frequently requirements are made in the best of faith which it is hard to object to. I believe it would be perfectly proper for this association to give expression to some of the sentiments herein expressed. I would favor the passage of some resolution emphasizing the necessity for a careful observance of the principles referred to.

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DISCUSSION.

C. G. Crawford, American Creosoting Company, and J. H. Waterman, C. B. & Q., strongly endorsed the position taken by Dr. Von Schrenk, the latter stating that unfit ties are very carefully culled at the Galesburg plant. These ties are used for steam shovel tracks and sill ties.

J. B. Card and other members favored thorough seasoning of all ties received at the plants green, believing air seasoning cheaper than steaming.

PRESERVATION OF LUMBER FOR CAR CONSTRUCTION.

By J. H. WATERMAN,
Supt. Timber Preservation, C. B. & Q., Galesburg, Ill.

Observation leads me to make the statement that treating lumber with creosote for car construction will be necessarily limited, on account of the fact that it is impractical to paint timber after it has been creosted. Most roads in this country have a standard color for their cars, and they would not want to change that color to black in order to please the wood preservers. If any road should desire to change their stock car color to black, then the creosoted timber would be ideal, for the cars would be permanently painted, providing the timber was framed before it was treated.

So far the Burlington has treated only car sills and car decking. We have treated a total of 23 runs of fir car sills with the following results:

Average absorption, per cu. ft., 11.41 lbs.
Board feet treated, 326,204.
Average steam pressure, 15 lbs.
Average time steamed, 2 hours 23 minutes.
Average initial vacuum, 23 in.
Average time initial vacuum held, 1 hour 37 minutes.
Average solution pressure, 175 lbs.
Average time solution pressure held, 17 hours 26 minutes.
Average final vacuum, 20 in.
Average time final vacuum, 1 hour.

To date we have treated 39 runs of fir car decking as follows:

Average absorption, per cu. ft., 14.33 lbs.
Board feet treated, 1,013,472.
Average steam, 15 lbs.
Average time steamed, 57 minutes.
Average initial vacuum, 24 in.
Average initial vacuum held, 1 hour 6 minutes.
Average solution pressure, 175 lbs.
Average solution pressure held, 13 hours 10 minutes.
Average final vacuum, 21 in.
Average time final vacuum, 1 hour.

In the sap wood of the sills we got a thorough penetration; in the hardwood not to exceed 1 in. all around. The car decking, when dry, was thoroughly penetrated with creosote. This car decking is 1¼ in. thick.

We feel that it is not only practical, but that it pays, to treat the car sills and car decking for stock cars. It would be impractical to treat car decking for box cars on account of the odor. They could not be used for flour and many other lines of merhandise, which would absorb the odor. For stock cars it also acts as a disinfectant, and from that point, I believe, it would be effective. There is no question but that it lengthens the life of the timber very materially; how much I am not able to say, for we have only practiced treating car sills and decking for about one year. The treated lumber is being used as sills in all new stock cars that we build with wooden sills, and as decking in all of them.

DISCUSSION.

G. B. Shipley advocated the empty cell or zinc chloride processes as cheaper and giving life equal to mechanical life.

HISTORY OF WOOD PRESERVATION.

By W. F. GOLTRA,
President, W. F. Goltra Tie Co., Cleveland, O.

Numerous ingredients have been proposed for the preservation of timber from decay. The chief ones which have been tried, some of which have been recommended, are as follows:*

Acids: sulphuric, tar, vitriolic; carbonates of barytes, potash and soda; chlorides of mercury, sodium and zinc; sulphates of alumina, barytes, copper, iron, lime, magnesia, soda, zinc; muriate of soda; nitrate of potash; fish, whale and other animal oils; linseed, cedar and other vegetable oils; petroleum and crude oils and other mineral oils; oils from distillation of tar obtained from coal (creosote), wood and petroleum; molasses and low syrups; wax, glue; resins and gums of different kinds; quick lime or hydrate of lime.

Active progress in timber preservation dates from the year 1832. During this year Mr. Kyan patented in England the process of corrosive sublimate, or bichloride of mercury, for preventing decay of timber, although Sir Humphry Davy had previously used a weak solution of sublimate, to be used as a wash where rot made its appearance. Corrosive sublimate has the strongest antiseptic properties among metallic salts; therefore its action is highly preservative, but it has several disadvantages. This process is usually called "Kyanizing," after the name of the inventor. It consists of steeping the wood in a solution of corrosive sublimate, the strength of which is usually 1 lb. of salts to 99 lbs. of water. The work is usually performed in open masonry pits, without pressure, because of the corrosive effects of the chloride of mercury on metal. It is a very slow process compared with those in which the wood is impregnated under pressure. The process is still used in a small way for impregnating railroad ties in Southern Germany, and there are a couple of small plants in our New England States. Kyanizing was introduced in England in 1836, but has gone out of use long ago. The process is suitable for treating timbers on a small scale only. Chloride of mercury corrodes iron and steel, and therefore retorts made of this material are impractical. Simple immersion being found imperfect as a means of injecting the sublimate, Mr. Kyan made an attempt to improve the efficiency of the solution by forcing it into the wood by pressure process. Wooden closed tanks were substituted for the open ones and forcing pumps were added to the equipment.

In 1838 Sir William Burnett, formerly director general of the medical department of the English navy, made known his invention which consists of destroying the tendencies of certain vegetable and animal substances to decay by submitting them to the action of chloride of zinc. The degree of dilution recommended by Mr. Burnett is one part by volume to fifty parts of water. At first the method of impregnation was by immersion in open tanks. In 1847 a powerful cylinder of Burnett's construction, hermetically closed, was laid down adjoining the sawmills in Woolwich dockyards. With this it was possible to treat large timbers and to apply a pressure as high as 140 lbs. per sq. in and by creating a vacuum, extract the moisture from the pores of the wood, which were afterwards filled with chloride of zinc. This process is usually called "Burnettizing," after the name of the inventor. Chloride of zinc is not considered as strong an antiseptic as chloride of mercury, and even considerably less than sulphate of copper, but it is much cheaper than either of these, being, in fact, the cheapest of all the preservatives. In general, no reaction takes place between chloride of zinc and iron when spikes are driven into zinc-treated ties, but the drawback in its use is that it is, like chloride of mercury, easily soluble and therefore apt to leach out of the wood impregnated with it. The substance is, therefore, unsuitable for timber to be used in water, such as piling and dock timbers, but it is an excellent preservative for railroad ties and other timbers not constantly exposed to the action of water. This process is in use on many railroads in Europe and America.

Modifications of zinc chloride processes have been proposed to correct the principal objection above mentioned. One of them is known as the B. M. process (Bruning-Marmetschke process for preserving wood, H. Bruning, manager, Schopfurth, Germany), which consists of adding aluminum sulphate to zinc chloride, it being claimed that zinc chloride salts are made more permanent in the wood.

The modern creosoting process was invented by Mr. John

*The details of the earlier processes, most of which were never developed successfully, were given at considerable length in the first third of the paper.

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Bethell, of England, and patented by him in 1838. Mr. Bethell's patent relates more particularly to the method of treatment than to the kind of preservative employed. This consists of the use of closed vessels to contain the timber, in which a vacuum was first produced, the timber being partially surrounded by the chemical, and being preferably placed in an upright position. It was then fully surrounded by the chemical and pressure applied to force it into the wood. Mr. Bethell mentions dead oil of coal tar as one of the preservatives which can be used.

Previous to the time of Mr. Bethell's invention practically all impregnation of wood was accomplished by immersion in open tanks or open boilers, and it may be said that he is the inventor of what is commonly known today as the pneumatic pressure process—or, at any rate, he was one of the first to use this process to any appreciable extent.

Rutger's zinc-creosote process, patented in Germany in 1874, consists of four operations: steaming the timber; producing a vacuum and admitting the preservative fluid; applying pressure, and applying a final vacuum to hasten the drying of the material. The preservative is a mixture of creosote oil and zinc chloride. A modification of this process, known as the Card process, has been employed at several plants in the United States. It consists in forcing an emulsion of zinc chloride and creosote into the wood at one operation. J. D. Card proposed injecting a small amount of tar oil, then immediately thereafter injecting a solution of zinc chloride. He claimed that by this means he secured a much better distribution of the oil in the wood than was possible with the ordinary injection of the same amount of oil and at the same time thoroughly protected the interior of the stick with zinc chloride. Mr. Card introduced the Wellhouse process on the Atchison, Topeka & Santa Fe at the Las Vegas, N. M., works built in 1885. This process consisted of the injection of zinc chloride, followed by injections of solutions of glue and tannin, the object of the two latter being to plug up the ducts of the timber by artificial leather formed by the glue and tannin. This treatment has been in use in this country for a number of years with satisfactory results.

Another treatment used considerably in this country is the Allardyce process, which consists of an injection of a 2 per cent. solution of zinc chloride into the wood, followed immediately by an injection of about 3 lbs. of creosote oil per cu. ft. A number of ties treated in this way by the International Creosoting & Construction Co., at Beaumont, Tex., were laid in track in 1900, and a large percentage of them are still in service.

THE PIECEWORK OR UNIT SYSTEM OF HANDLING TIES AND TIMBERS.

By W. W. Eldridge,

General Piecework Inspector, Chicago, Burlington & Quincy.

Our company has been using the piecework system of handling ties and timbers at both our plants for several years with what we consider the best of results.

The object of piecework is to get one dollar's worth of labor for one dollar, and to give one dollar for one dollar's worth of labor, or in other words, to increase the efficiency in handling ties and timbers so as to get the largest possible output at the least cost. The advantages of the piecework system are numerous. In the first place it reduces by approximately one-third the number of men required to do the work, and hence makes a corresponding decrease in the amount of supervision needed. It gets the "cream" of the laborers. There is no place for the "drone" in the piecework system. It systematizes the work and assists materially in accounting, figuring costs, etc. It places each individual workman in business for himself, and enables him to secure pay for what he does. Being paid for what he does, it is natural for him to combine mental ability with physical strength, in order to accomplish all possible. Knowing that he is getting paid for what he does, and that in proportion as his efforts are increased his earnings are increased, he is able to make better wages than his fellow-workmen in other lines on a day-rate; hence he is satisfied with his job at all times, and when a "shortage of labor" comes, he will stay with you. All of these advantages tend to promote efficiency.

The installation of the piecework system is no small task. A great deal of tact and good judgment must be exercised, and unless it is established on good business principles it will be a failure rather than a success. Be open with your men in everything you do in connection with their work, as it is of the utmost importance that the men fully understand what you expect of them, and what they can expect of you in return. You must have confidence in your men and they in you to obtain the best results. Every detail should be fully explained to them.

The installation of the piecework system would need to be worked out to fit conditions peculiar to each individual plant, hence it would be useless for me to attempt to outline what rates should be applied, but there are several important underlying principles that should apply to all.

Select a competent foreman, wide awake and energetic, familiar with every detail of the work, and thoroughly acquainted with the most practical way to handle ties and timbers so that he can impart his knowledge to his men. He should not be a slave driver, but should be firm and diplomatic in all his relations with his men. The men should understand that his word is law, but if for any reason they deem his demands unreasonable they should be at liberty to put the case up to the general foreman or other higher authority for final decision. In my opinion the superintendent or manager personally should make the final decision, if necessary to carry it that far.

Care should be exercised in perfecting an organization to place the men to the best advantage, and to see that there are no more men in the gang than needed, and yet enough to handle the work without delay to other parts of the organization.

Price schedules should be made to cover every operation. These schedules may be based on any of the following units, depending entirely upon your own views and the existing conditions:

Ties; per tie, or per tram loaded.
Lumber, switch ties and crossing plank; per 1,000 ft. B. M.
Piling; per pile, or per lin. ft.

We have found the following a very good plan:

Unloading and storing ties on ground, per tie.
Loading trams for treatment; per tram.
Unloading treated ties from trams to cars; per tram.
Unloading treated ties from trams to ground; per tram.
Piling, when handled with derrick; per pile.
Piling when handled by hand; per lin. ft.
Paving blocks; per sq. yd.
Lumber; per 1,000 ft. B. M. in all cases.

In wording the schedules particular attention should be given to the phraseology to see that it is clear, concise and easy to understand. All the work which the men are expected to perform under any schedule should be fully covered. In handling ties and lumber of all kinds a distinction should be made between hard and soft wood, as pine or fir weighs approximately 3 lbs. per ft., while oak weighs 5 lbs. per ft. You would not expect any man to handle 5,000 lbs. for the same price as 3,000 lbs.

A competent man should be selected to make the schedules and establish the rates of pay. To get the best results he should have a knowledge of handling men and material. He should be competent to recommend practical changes or improvement of conditions, tools or other devices that will facilitate the handling of the ties or timber. Often a dollar judiciously spent to improve conditions means many in return. In establishing prices it is important that all the facts and figures bearing on the operation be accumulated in order that prices may be established on an intelligent basis. To accomplish this the party getting the information should be on the ground personally, to watch the operation from start to finish, and to make notes as to the number of men, kind of material handled, how handled, time consumed by each man, degree of efficiency, or anything else that would have an important bearing on the word-

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ing of the schedule or the base rate. Prices should be based on three things; the authorized hourly rate, degree of efficiency obtained under the day rate system, and the conditions and tools furnished.

All prices should be made on a basis that is fair to the employer and the employee. Once a price is established it should never be changed unless there is a change in conditions. Suitable blanks should be provided for keeping the time and checking material in and out. These will be turned in to the timekeeper daily.

In establishing the piecework system, it is a good plan to start with one gang. Advise them daily of their earnings and arrange it so that the rest of the men working on a day rate will know what this gang is earning. They will immediately begin to get interested and ask for the piecework system, and in a short time the entire force will be working on the piecework basis.

Foremen should be on a monthly basis. In no case should a foreman have supervision over more than twelve men, and eight or nine men is better, in my opinion, when handling ties or lumber by hand. The duties of the foreman are to instruct his men what to do, give them the benefit of his experience in handling material, keep them supplied with work at all times, see that it is properly done, and keep track of their time and the material handled, checking it personally in all cases.

When unloading ties to season, also loading trams for treatment, each man works as an individual. When handling treated ties the men generally work in pairs or gangs of three, each man getting an equal proportion of the earnings of the gang. If a man is taken out of the gang during the day and another put in his place, the foreman should make proper record so that the earnings can be properly apportioned. When unloading ties to season at our plants we make no effort to sort them. The sorting as to kind of wood and grade is done when loading them on trams. When unloading switch ties by hand we find a gang of four men the best, and when handling switch ties, piling and lumber with a locomotive crane, three men in addition to the engineer. In all cases I would advocate the same rate from start to finish of an operation, unless some unusual condition arises. The men get the same for the last tie as for the first.

In storing ties to season in eight to one piles, the maximum height of the pile should be 16 to 18 ft. Treated ties when piled on the ground should be in solid square piles eight to ten ft. high.

Someone has said that the efficiency of a timber-treating plant should be based on the number of retort hours worked out of the total possible retort hours. In obtaining efficiency in plant operation the fact must not be lost sight of that good and effective treatment is the first or primary object, and in securing such treatment your supervision, organization and system of handling must be the best possible. This is what we claim to have under the piecework system. During the year 1912 at our Galesburg plant each of the three retorts were in actual operation 98¾ per cent. of the time. This means that out of a total of 7,488 possible retort hours for each retort they were operated 7,394.4 hours, holidays excluded.

DISCUSSION.

George E. Rex, Santa Fe, told of the universal application of piecework in Santa Fe plants. In the Albuquerque plant five Mexican laborers who would earn about $35 a month at day rates now earn from $100 to $125 a month on a piecework basis.

W. A. Fisher, Atlanta Coast Line, reported the use of a piecework system on that road, the laborers being negroes. The men can often finish a good day's work early and go home better satisfied.

Several members spoke of the difficulty in fixing a fair piecework rate for handling material with machines. A representative of the Philadelphia & Reading told of the handling of ties by locomotive cranes in its plant, for which no piecework rate has been established.

TESTS TO DETERMINE THE EFFECT UPON ABSORPTION AND PENETRATION OF MIXING TAR WITH CREOSOTE.*

By F. M. BOND,
Forest Products Laboratory, Madison, Wis.

Adequate depth in the penetration of a preservative is recognized as of fundamental importance in the wood-preserving industry, and this has been the principal goal of many preservatives and processes. Recognizing the importance of this factor, there have been developed at the Forest Products Laboratory an apparatus and method of testing which render it possible to make accurate comparisons of the penetrating qualities of a preservative, considering the great variability to be found in wood. An investigation has been begun upon some of the factors which are believed to determine largely the penetrating power of creosotes and mixtures of creosotes and tars into specimens of a single species of wood.

Clear heart commercial longleaf pine specimens, approximately 2 by 4 in. in cross section and of various lengths, were used A hole one inch in diameter and approximately one inch deep was bored in the center of one 4-in. face of each specimen. The specimens were cut in series, each set being of adjoining material, comprising as nearly as possible different portions of the same growth rings. All of the specimens were air dried under cover before being tested and contained a very small amount of moisture when they were treated.

The impregnating oils were all derived from or consisted of one or more of the following: A commercial creosote, a gas-house coal tar containing approximately 30 per cent. of free carbon and of 1.273 specific gravity, a by-product coke-oven coal tar containing approximately 16 per cent. of free carbon and of 1.232 specific gravity, and a by-product coke-oven coal tar containing approximately 6 per cent. of free carbon and of 1.184 specific gravity.

It was the purpose to use oils as nearly as possible like those used in practice. The creosote was purchased from regular stock and the tars were collected direct from the producing apparatus by a representative of the Forest Service.

The free carbon was removed from a portion of each of the tars and the amount of free carbon in the tars was determined to the nearest one-half of 1 per cent. by careful quantitative filtering. The percentage of free carbon in a given mixture was regulated by mixing in the proper proportions a tar containing the normal amount of free carbon with the tar of the same origin from which the free carbon had been removed.

The specific gravities and viscosities were obtained very aceurately.

The apparatus was designed to expose the wood in the 1-in. hole to the preservative under conditions similar to those which obtain during the pressure period of the usual timber treating cylinder, except for the fact that only a given surface of the specimen under test is subjected to the impregnating oil. In order to compare the relative penetrations of the oils, at approximately 24 hours after treatment, each specimen was sawed transversely and longitudinally through the center of the hole. The fresh areas of treated wood which were thus exposed, were measured by means of a planimeter and the penetrations were determined by using these values, together with measurements of the depths of the holes in the specimens, which were obtained by the use of a steel scale.

The following series of oils for each of the three tars were tested at a temperature of 160 deg. F. and a pressure of 75 lbs. per sq. in. for their relative absorptions and penetrations in two sets of matched specimens, using tar from which the free carbon had been extracted in each case: All creosote, 75 per cent. creosote, equal parts of creosote and tar, 75 per cent. tar, and all tar.

For each of the three tars there was tested at a temperature

*The experiments described are still in progress.

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of 160 deg. F. and a pressure of 75 lbs. per sq. in. a series of mixtures, each of which contained 50 per cent. of creosote and 50 per cent. of tar by volume, but different percentages of free carbon. Two sets of matched specimens were used in each series.

A series of mixtures, each consisting of 50 per cent. of creosote and 50 per cent. by volume of one of the tars containing the normal percentages of free carbon, or of one of the tars from which the free carbon had been removed, was tested at a temperature of 160 deg. F. and a pressure of 75 lbs. per sq. in., using two sets of matched specimens. This series included, of course, mixtures of each of the carbon-free and the normal-free carbon tars.

While data obtained under a given set of conditions upon well-matched specimens of wood are comparable, provided one condition only whose result is unknown be varied at a time, results from different sets of matched specimens are not necessarily comparable. Pieces of wood will behave differently when there is a variation in either the number of annual rings per inch, the ratio of the amounts of summerwood and springwood, the amount of resin present, or a number of other characteristics. Experiments upon specimens which are matched as described in this paper are in reality conducted at different points along the same piece of straight-grained wood, which is sawed into short lengths simply for ease of handling. There is, therefore, a minimum of the variability common between different pieces of wood. When the results of tests upon sets of matched specimens of diverse origin are compared, however, the variability between the wood of the two sets may be greater than the variations in the factor which is being examined, thus obscuring the results.

The data which have been obtained seem to indicate at this time the following:

The difficulty of penetration into longleaf pine of mixtures of creosote and a given tar from which the carbon had been removed was in proportion to some direct function of the amount of tar in the mixture.

There was no apparent relation between the amounts of carbon-free tar in mixtures of creosote with the three tars and the corresponding absorptions and penetrations into longleaf pine.

There was no apparent relation between the viscosities and specific gravities of mixtures of creosote with the three carbon-free tars and the corresponding absorptions and penetrations into longleaf pine.

The difficulty of penetration into longleaf pine of mixtures of equal parts of creosote and a given normal tar was in proportion to some direct function of the amount of free carbon in the mixture.

There was no apparent relation between the amounts of free carbon in mixtures of creosote with the three normal tars and the corresponding absorptions and penetrations into longleaf pine.

There was no apparent relation between the viscosities and specific gravities of mixtures of creosote with the three normal tars and the corresponding absorptions and penetrations into longleaf pine.

The free carbon appeared to occur in agglomerations of different sizes in the three tars.

There was no apparent penetration of the free carbon into longleaf pine.

The free carbon appeared to form mats of different degrees of density and imperviousness on the surfaces through which the oils entered the wood.

The tar producing the free carbon mat which appeared to be of greatest density and imperviousness was the tar in which the number of the smaller free carbon agglomerations appeared to be relatively greatest and was also the tar of which the normal amount of free carbon appeared to produce the greatest difference in penetration into longleaf pine, although this tar contained the smallest percentage of free carbon.

The tar producing the free carbon mat which appeared to be of least density and imperviousness was the tar in which the free carbon agglomerations appeared to be of greatest size, and was also the tar of which the normal amount of free carbon appeared to produce the least difference in penetration into longleaf pine, in spite of the fact that it contained the largest percentage of free carbon.

DISCUSSION.

S. R. Church, Barrett Manufacturing Company, questioned the conclusion that the penetration of a mixture of creosote and tar was in proportion to some function of the amount of tar in the mixture, and E. B. Fulk, American Creosoting Company, thought the number of test specimens too small to warrant any of the conclusions made. Both speakers emphasized the possibility of variation in other factors having concealed the true variation due to tar content.

Walter Buehler, Kettle River Company, told of an experience tending to prove that the waterproofing of wood necessary for satisfactory service of paving blocks can be secured better by treatment with a mixture of tar and creosote than with creosote alone.

C. G. Crawford, showed that the conclusions drawn should not be applied to ties of timbers containing heart wood.

ADZING AND BORING TIES AND THE COST OF INSTALLING PLANTS OF THIS KIND.

By James A. Lounsbury,
Vice-President, Greenlee Bros. & Co., Chicago.

The folly of paying 20 to 35 cents per tie for chemical treatment and then to so mutilate the ties by hand adzing and spike driving as to greatly reduce the beneficial effect of the treatment is too obvious to require argument. Hand adzing is resorted to commonly to correct defects in the tie surface, but this is at best only a partial remedy, and its effect on the impregnated part of the tie is destructive. The advantage of having a full and perfect bearing for the rails over the whole width of the face of every tie is evident. It reduces rail cutting, decreases the danger of half moon breaks in rail bases, reduces disturbance of the ballast and gives added firmness and stability to the track. Where plates are used it is a practical necessity to give them a full bearing on the ties, as the increased surface makes it more difficult for them to properly seat themselves under traffic. If their bearing on the tie is not parallel with the bottom of the rail they increase the danger of rail breakage, as they form an anvil upon which the impact of rapidly moving loads is received. If the point of support is along one edge of the rail base only, the danger to the rail is apparent.

Many tests made by the U. S. Bureau of Forestry, by several universities, and independently by a number of the railroads, have demonstrated conclusively that common square spikes have increased holding power when driven into previously bored holes. It is unfortunate that there are almost no reliable data showing the comparative resistance to lateral pressure of spikes driven directly and those driven into previously bored holes. This is of even more importance than the resistance to vertical pull, as upon it depends the maintenance of gage and the prevention of rail spreading under high speed trains. It is probable that the resistance to flange pressure is increased in much greater proportion than the resistance to vertical pull, because the spike in a bored hole has a backing of solid wood instead of being surrounded by torn and broken down fibres, as is the case when driven directly. The use of screw spikes, of course, makes pre-boring absolutely necessary. A number of roads are already committed to this form of rail fastening, and its extended use is only a matter of time. At present probably 75 per cent. of the ties that are bored are for square spikes.

Of chief interest, however, to the members of this association, is the great advantage from a treating standpoint of having the adzing and boring of ties done before the treatment takes place. The vital points of a tie are the parts under the rails and contiguous to the rail fastenings, and this is where the impregnation should be most thorough. In air seasoning the ties become case hardened on the outside, and this hard skin is more difficult of penetration than the portion immediately beneath.

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In adzing previous to treatment this more resistant portion is removed for a distance of 12 to 14 in. in length for each rail bearing. This permits the chemical to penetrate more freely transversely to the grain. The holes bored for the spikes give the chemical free entrance into the interior, allowing it to radiate from each hole by end grain penetration, thoroughly saturating these portions even when the tie as a whole is not given a heavy treatment. How much this saturation of the parts of the ties subject to earliest failure will increase their life cannot be measured until sufficient time has elapsed to allow accurate comparative data to be obtained, but there is no doubt that it will greatly increase the efficacy of the treatment and produce results far out of proportion to the cost of the adzing and boring operation. It is stated by engineers who have had several years' experience with adzed and bored ties that the saving in time and labor in putting the ties in track is sufficient to pay the cost of the adzing and boring, leaving all the other advantages a net gain.

The adzing and boring of ties has been standard practice in Europe for upwards of 20 years, and the results have proved its economy. Owing to the abundance of cheap labor in those countries, the development of machines of the highest labor-saving capacity has not been rapid. Their ties are more carefully made, and therefore machines are not required to meet such wide variations as in this country. In England the majority of ties are sawed from dimension stock and vary little in size. A range of 1½ in. difference in thickness is all that is provided for in their machines, while ours must be designed so that ties from 5 in. to 10 in. thick, and from 7 in. to 14 in. wide, may be run promiscuously. Again, their ties being practically of the same width, no provision need be made for centering so that the holes will always be properly placed in the face of the ties. With our extreme variations in width, and the fact that no two ties are alike in shape, that crooked and straight ties must follow each other through the machine, it is necessary to center each tie over the boring bits so that the holes shall be accurately placed in relation to the center line of the face of the tie. In other words, the machine must take ties as they come, of all sizes and shapes, and automatically adjust itself to variations and irregularities, without human aid and without decrease in its rate of production.

Two distinct patterns of adzing and boring machines are built for different methods of mounting. One is designed for installation on a stationary foundation, and the other, a more compact form, for mounting in a car. As more machines are specified for stationary mounting, this type is known as the standard pattern. It is more open in design and accessible in its working parts than the more compact car type. The question of which method of mounting is preferable must always depend upon yard and plant conditions, and each case must be decided on its merits. It is probably true, however, that there are more treating plants in which the stationary mounting will give the higher economy in operation than those in which the movable type will give the better results.

The location of the stationary machine in relation to the retort house, power house, etc., in the case of plants already built, must, of course, be governed by the space that may be available, because it must be made to fit into conditions as they exist. In laying out a new plant the location is subject to control, and can be made where the least switching and handling of ties will be involved.

Wherever possible the machine should be placed between the stacking yard and the cylinders, so that all ties must pass it in their movement between those points. The narrow gage tracks should be arranged so that trams from any part of the yard may be brought to the machine with the minimum amount of switching, and by-pass tracks must also be provided by which timbers not to be machined, such as switch ties, bridge timbers, piling, etc., can pass the tie machine without interfering with its supply. The tram track on the in-feed side of the machine should be about 1 ft. higher than that on the delivery side, and should run out to a spring switch, so that an unloaded tram, given a start, will run by gravity past the spring switch, reverse its direction and return on the discharge side of the machine ready to be loaded for the cylinder. The space required between these supply and delivery tracks should never be less than 32 ft. centers when the ties are to be taken from the tram and placed on the machine conveyor by hand. If the dumping hoist and the skid are employed the minimum distance between track centers is 46 ft. These dimensions apply only to the machine without the cut-off saw attachment. If the latter is required, 6 ft. should be added to the track center distances.

Where drainage will permit, the best form of foundation is to enclose a space 11 ft. x 20 ft. with a concrete wall, the interior being excavated and a cement floor laid. The side walls should be 7 ft. to 8 ft. high to give good head room below, as in the basement so formed the 50 horse power motor for driving the machine is placed, together with the shavings exhaust fan. The top of the foundation should be about 3 ft. above the grade line, making the actual excavation only about 5 ft. deep. Steel I-beams and a 4 in. plank floor form the support for the machine. The weight of the latter is 20,000 lbs. This form of foundation is not always necessary, but is the most advisable when conditions permit.

The smallest building which will accommodate the machine and appliances is about 25 ft. square. This, however, leaves the men unloading trams on the in-feed side, and the train loaders on the discharge side exposed to the weather. It is better to provide a building 25 to 30 ft. wide, and long enough to span both the supply and delivery tracks so that the tie handlers may work under cover. Of course, in the South the matter of protection is not so important, and can be arranged to suit local conditions.

One of the most important facts to be borne in mind in considering the installation of a machine of this kind is that, in order to bring the cost of the adzing and boring operation down to the lowest point it is necessary that it be operated continuously at its full capacity, and that there shall be no irregularity in the tie supply nor any interference with the quick handling of trams at either side of the machine.

Machines designed for mounting in cars perform the same operations in practically the same way, but, as stated before, the dimensions are held down in order to bring them within the limit of width of a wide box car, having extra wide doors through which the conveyors extend. The original installations (two machines on the Santa Fe and one on the Northern Pacific) were all of this type. The car used for this purpose should be of steel under-frame construction, 40 ft. long, 9½ to 10 ft. wide, of 40,000 lbs. capacity, and not less than 9 ft. high in the clear. The cars are usually made self propelling from the same source of power which drives the machine, a clutch being provided by which the machine is disconnected and the car axle drive thrown into gear when the car is to be moved. As the car is commonly designed to move only from stack to stack in the tie yard only, the speed is kept down to about three miles an hour.

The kind of power to be used in these movable plants is often a somewhat troublesome problem. Electric drive is by far the most reliable and satisfactory if it is available. In yards using electric switching locomotives and strung with trolley wires the application of electric power is easy, but where this is not to be had, some other power must be used, usually a self-contained gasolene engine of about 60 horse power installed in the car with the machine. This gives satisfactory results, but requires more careful management than would be necessary with an electric motor.

The track arrangement in a yard already laid out is, perhaps, the most important factor in determining the comparative merits of the stationary and car mounting. The usual system, a three-rail track between the tie piles, would make it necessary for the trams to follow directly behind the machine car, a position which is not convenient for loading by the machine con-

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veyor, as a right-angled change of direction must be made by the ties in their progress from the machine to the tram. The Somerville plant of the Santa Fe has a temporary track 60 to 90 ft. long which is placed between the tie pile and the three-rail track, and upon this the machine car is placed. One rail length after another is moved forward and laid ahead of the car. This leaves the tram track clear, and trams can be brought up to the side of the machine car, allowing the conveyor to discharge the machined ties directly into them. On the feeding side the ties are thrown down from the top of the piles and placed directly on the in-feed conveyor, so that one handling is saved by the movable machine arrangement. This, however, is offset by the time lost in changing the position of the car. On an average it is probable that about one-third more ties can be put through the stationary machine in a day than through the movable plant.

The cost of installing machines for adzing and boring ties is a difficult thing to cover without definite specifications. It is more an engineering problem than a manufacturing one, as the conditions are not the same in any two cases. The cost of the machine itself may vary as much as $1,500, depending on what is wanted in the number of boring spindles, the lengths of conveyors, and whether or not the machine is to be provided with cut-off saws, branding device, dumping hoist and other special features. The cost of the power plant may also vary between wide limits—a steam engine and boiler, or a gasolene engine, costing much more than an electric motor. The building may be sufficient to protect the machine only, or may be large enough to cover both tracks and give protection to the tie feeders and loaders. One machine in the South is placed on a foundation of heavy creosoted timbers laid on top of the ground and is covered by an open shed. Another on the Pacific Coast is placed on the end of a dock of piling, 18 ft. above the ground, into which the piles are driven. It is all a question of the governing local conditions, and how much money the purchaser is willing to spend. Some plants have been installed complete for $10,000, and the cost of others has run as high as $15,000, but in the long run the most thorough work is the cheapest, the saving in operation and maintenance paying large interest on the additional cost.

Does adzing and boring pay? It is believed that the increase in life that may be expected from ties adzed and bored before treatment will not be less than one-third, but to be conservative we will consider that it is only 15 per cent., or say 21 months of added service. In the case of a railroad using 1,000,000 ties a year, costing when treated, delivered and put in track 85 cents each, the total saving in tie renewals will amount to something over $100,000 a year.

DISCUSSION.

G. E. Rex, Santa Fe, favors the use of adzing and boring machines very strongly. On one grand division of the Santa Fe untreated hard wood ties are being adzed with good results, although the greatest benefit of the process is secured on ties to be treated. The Santa Fe has operated two machines for 19 months. They can adze 3,000 ties a day at a reasonable cost.

Other members also reported favorable results from the use of adzing machines; some of whom mentioned minor mechanical changes which should be made to the machines to secure the best results.

NATURAL AND ARTIFICIAL SEASONING OF DOUGLAS FIR FOR TREATMENT.

By F. D. Beal,

Manager, St. Helens Creosoting Co., Portland, Ore.

This subject is one on which a large amount of knowledge is yet to be obtained. Although we have been treating Douglas fir for about 24 years, we cannot say that we have yet developed a method of seasoning that is wholly successful under all conditions.

The wood, when air seasoned, is so hard and refractory that sufficient penetration by pressure treatment alone can not be obtained to insure the full protection of the wood for a sufficient length of time to make the treatment a paying proposition. Therefore, it was decided very early in the treating of Pacific Coast timber that some means of artificial seasoning would have to be resorted to in order to prepare the wood for the reception of the preservative.

The first move was to take up the steaming and vacuum process; that is, turning saturated steam directly on the timber and raising the temperature to a point to insure the thorough heating of the interior wood and the vaporizing of all sap, moisture, etc. The writer used to think they were vaporizing the wood itself, judging by the pitch, resin, etc., that came out through the drains. This was carried on until the maximum vaporizing point was reached. A vacuum pump was then started, heat being maintained in the cylinder by the circulation of superheated steam through the steam heater pipes in the bottoms of the cylinders. This process was carried on until the balance of the moisture was fully extracted from the cylinder. In this manner the wood would take the preservative under pressure very readily, but the strength was so impaired as to practically condemn it for use in structures.

Various other schemes were tried out with very little success until in 1894 John D. Isaacs conceived the idea of using a modification of the "Boulton method" of seasoning by immersing the unseasoned timber in creosote oil, using the oil as a medium for conveying the heat to the timber. The temperature of the oil is raised above the boiling point of water, thus vaporizing the moisture in the wood and allowing it to pass off through vent pipes into condensers through which cold water is circulated. This eliminates the use of a vacuum pump. In this manner, the timber was dried or seasoned with a lower degree of heat and left in good condition for the reception of the preservative under pressure. This method of seasoning has been carried on continuously on the Pacific Coast for over 20 years, and although there is some decrease in strength, the material is in much better shape and lasts longer than that air seasoned or steamed.

At present experiments are being carried on at St. Helens, Ore., at the St. Helens Creosoting Co.'s plant, under the direction of George E. Rex, of the Santa Fe, on the seasoning of 10,000 Douglas fir ties. The ties were selected and 5,000 of them which were weighed were tagged and numbered so as to keep a record of them. They were then placed in water during the months of May and June, 1912. They were cribbed in piles of about 60 ties, all being laid in one direction and separated by 1 in. strips nailed to the ties, their length being parallel to the current of the running fresh water, allowing the water to pass through the entire length of the ties.

These ties were left in the water until about September 15, when they were taken out and re-weighed to ascertain the amount of water absorbed. They were then placed in open piles to air season. When it is found that the ties are sufficiently dry they will be treated by the pressure process, without any artificial seasoning.

The object of these experiments is to find some process of seasoning without the application of heat which will allow the Douglas fir to retain its natural strength as much as possible and will not cause the excessive checking and splitting which occurs when lumber of this species of wood is seasoned in the open air, and will leave the wood in condition to receive preservative treatment. The idea of putting the ties in the water was to allow them to water season so as to wash out all of the saps and natural wood moisture. By piling them in open piles the moisture that was absorbed during the immersion is allowed to evaporate and it is hoped the wood will not check or split. At this writing, November 20, 1912, the theory is working out admirably. The ties as yet show no evidence of splitting or checking in any manner.

One pile of the ties was selected to be weighed every 15 days

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to determine the rate of seasoning. The weights per tie and per cu. ft. are shown in the following table.

	Weight Before Placed in Water.	Weight on Taking from Water Sept. 21, 1912.	Weight Oct. 5, 1912.	Weight Oct. 21, 1912.	Weight Nov. 5, 1912.	Weight Nov. 21, 1912.
Total weight.....	8,328.5	9,389.0	8,169.0	8,045.0	8,038.0	8,155
Weight per tie...	120.7	136.07	118.39	116.59	118.2	118.18
Weight per cu. ft.	38.79	43.73	38.05	37.47	37.99	37.98

It was at first intended that the ties should be treated in the creosoting cylinder about November 1, but on account of the excessively heavy and continuous rain for the past month the seasoning has been retarded and it has now been decided to postpone the treatment until about February 1, 1913.

EFFICIENT HANDLING OF TIES AND MATERIALS AT TREATING PLANTS.

By A. M. SMITH,

Superintendent, Ayer & Lord Tie Co., Argenta, Ark.

We have been unable to find any method for handling ties better than hand labor. There are times when we can use machines to materially reduce the cost of handling. While we are using the machines the laborers having nothing to do, leave, and when we cannot use the machines we have no laborers and the loss through delay is greater than the amount previously saved. For handling lumber and piling we use traveling cranes, as more than 95 per cent. of this material comes to us and is loaded out in open cars. The machines we use have a lifting capacity of about one ton at a radius of 35 ft., and can be used for light switching service when necessary. Experience has taught us that switching with these machines should be avoided as much as possible. We use on the end of the hoisting or lifting line two pairs of hooks of suitable size for handling timbers and piling, one pair for piling with a spread of about 16 in. at the points and one pair for timbers and boards that will open to 30 in. at the points. For very small lumber we use two slings, made of round chains, and handle it in weights of about one-half to one ton.

We handle piling one piece at a time for lengths up to 60 ft. at the rate of 200 to 400 piles per day with a crew of five men to each machine. In handling lumber with the same machine and crew, the cost is from 10 to 25 cents per thousand feet. We use six of these machines at our Southern plants, and frequently work part of them both day and night. For night work, a head-light is placed on the machine so that the light is always under the boom.

PREPARING TIMBER FOR TREATMENT IN THE GULF STATES.

By R. L. ALLARDYCE,

Superintendent, International Creosoting & Construction Co., Texarkana, Tex.

In air seasoning ties I would require 90 days as a minimum and would prefer four months. The ties should be in open stack and I have found that better results can be obtained by stacking six or seven on two instead of on one as the German method calls for. The stacks should be at least three or four feet apart to allow the air to circulate freely and to give the bottoms of the alleys a little sunlight, otherwise the bottoms of the stacks become damp and moldy. In stacking on both sides of the tracks care should be taken that the stacks are directly opposite each other, making, if possible, a continuous alleyway across the yard, as this insures a better circulation of air. Ties that are loaded for treatment on damp days or in the early morning should have an initial vacuum of a half to one hour before treatment, as we have a very heavy dew to contend with at times. During this period of vacuum the closed steam coils should be used lightly to heat the ties to an even temperature, thus eliminating the dropping down of the warm oil on cold ties.

In steam seasoning there is less capital tied up, as the material is treated as it is received in the yard, and the cost is lowered by eliminating one handling. The interest on the purchase price of the material that is tied up for three or four months in air seasoning should also be considered a saving in the steaming method.

It is practically impossible to properly air season heavy materials. Caps or stringers of long leaf left in stack for five or six months, unless protected with S irons, will open up and the inspector will reject them on account of season checks. The cullage on this class of material is quite an item to commercial plants when the non-steaming method is used, for when the material is received at the plant it is up to specifications; six months later it is cull on account of season checks.

By steaming material that must be treated green all of the material is seasoned the same, and it gets a more even penetration; in the non-steaming method some of the material will season out faster than others, and in treating will absorb more of the preservative than required, while the slow seasoning pieces will not have the required amount in them. I have obtained good results from steaming, and do not know of any disadvantages.

The safe high temperature depends on the class of material that you are treating as well as its cross section. For this reason it would be almost impossible to give a factor of safety unless you could see the material to be treated. In this the operator should be governed by the sap drainage from his retort, as the flowing of the sap is a very important point in governing the steaming of the material regarding the temperature to be used as well as the duration of the steaming period. At times the sap will almost stop flowing, and it will be necessary to raise the temperature slightly to facilitate this flow.

OTHER PAPERS.

S. J. Record of the Yale School of Forestry presented a paper on sap in relation to the properties of wood, in which he said that the prevailing theory that sap in growing timber is down in winter and up in summer is erroneous. There is more sap in growing wood in winter than in summer, but this presence of sap is not important in the securing of sound timber. Decay depends principally upon the presence of fungi, and the reasons that summer cut woods decay more rapidly are that wood seasons more rapidly, causing checking and warping. The fungi are more active in warm weather and the sap is more conductive to fungi growth.

C. P. Winslow, Forest Products Laboratory, read a paper on the transmission of air pressure in cross ties. The tests described were made at the Forest Products Laboratory on red oak, soft maple, eastern hemlock and douglas fir ties. Pressure of 84 lbs. in the cylinder was applied in one series of tests and vacuums of 26 in. in another. The pressure in the interior of the ties was measured by inserting small pipes ending in a small air chamber in the center of the tie. The results obtained indicate that red oak transmits air most readily and douglas fir is least permeable. Little difference was found between eastern hemlock and soft maple, the indication being that the former is the more permeable. Tests showed five to ten minutes as sufficient to hold maximum pressure or vacuum in the cylinder to insure maximum condition in the ties. After successive applications of pressure, the permeability seemed to be increased. After successive vacuums the opposite effect was noted.

Papers of interest to our readers, but which lack of space prevents printing in this issue, will be abstracted in the February Maintenance Section. Among them are the following: "Timber for Creosoted Block Paving," by Harry G. Davis, manager paving department, Chicago Creosoting Company; "Treatment of Douglas Fir with Creosote Oil," by G. A. Coleman, Coleman Creosoting Company; "Notes on Analysis and Testing of Coal Tar Creosote," by L. B. Shipley, Barrett Manufacturing Company.

Other papers were presented on "The Care and Treatment of Floors," by George W. Saums; "Laying Wood Block Pave-

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ment," by H. S. Loud, chief engineer, United States Wood Preserving Company, New York; "The Preliminary Treatment of Timber to Insure a More Even and Satisfactory Impregnation with Creosote," by David Allerton, the Kettle River Company, Madison, Ill., and "How Nearly Does the Modern Yellow Pine Block Pavement Approach to the Ideal Pavement; What Improvements Can We Suggest," by H. L. Collier; and "Mutual Interest of Railroad and Commercial Companies in the Work of the Association," by L. B. Moses, Kettle River Company.

The annual banquet was held at Vogelsang's restaurant on Wednesday evening.

ONE-PIECE COMBINED RAIL BRACE AND TIE PLATE.

The one-piece combined rail brace and tie plate shown in the photographs is made of a ⅝-in. flat steel plate bent and forged to shape. The plate is shown punched for screw spikes, although it can be punched equally well for the ordinary drive spikes. The lower part of the upper portion is bent at such an angle that when the screws are driven tight it is in contact with the

One Piece Combined Rail Brace and Tie Plate.

upper side of the flange of the rail, while the upper portion of the brace supports the head and web as with the ordinary pattern. Two hundred of these braces have been in use since last August on wyes connecting the Chicago Junction Railway with the Chicago & Western Indiana at Butler street, and with the Chicago, Rock Island & Pacific and Lake Shore & Michigan Southern at Wentworth avenue, and on a sharp curve near Western avenue, where they have given satisfactory service and have greatly decreased the amount of attention previously required. This device has been patented by Robert D. Townsend, 5821 Michigan avenue, Chicago.

Combined Rail Brace and Tie Plate on Chicago Junction—C. R. I. & P. Wye, Chicago.

General News.

The government has sued the New York Central & Hudson River in the Federal court in Buffalo, N. Y., for alleged violation of the twenty-eight hour law, relative to feeding and watering live stock in transit.

The Cincinnati, Bluffton & Chicago has sued the Erie Railroad for $35,000 damages on account of the tearing up of the tracks of the C. B. & C., near Huntington, Ind., on January 12, for which certain officers of the Erie were arrested.

The Illinois Central has announced that 26 new experimental farms will be established along the lines of the system, including 15 at various points on the Central of Georgia. These will make a total of 27 experimental farms on the Illinois Central and 30 on the Central of Georgia.

The result of the strike vote now being taken by the brotherhood of firemen of the eastern roads is not to be made known until February 10. In the meantime, representatives of the conductors' and the brakemen's brotherhoods are now asking some of the principal roads for increases in pay.

A joint "Safety First" meeting will be held in Decatur, Ill., on the evening of January 25, by employees of the Wabash, the Cincinnati, Hamilton & Dayton, the Vandalia and the Illinois Central. C. W. Egan, general claim agent of the Baltimore & Ohio, will deliver an address, illustrated by stereopticon views.

Oklahoma manufacturing institutions have recorded themselves in favor of a workmen's compensation law. The measure probably will follow the Washington law, virtually giving state insurance, based upon the number of dependents rather than upon the earning capacity of the insured.—*Manufacturers' News.*

The state of Texas has begun suit in court against the Gulf, Colorado & Santa Fe, and the Galveston, Harrisburg & San Antonio, to collect penalties aggregating $700,000 for running trains behind time, in violation of the law of that state under which a penalty is imposed if a passenger train is more than thirty minutes late.

The first-aid-to-the-injured car of the American Red Cross Society is going over the Lehigh Valley, stopping at all division and terminal points, and employees are invited to attend lectures and demonstrations by first-aid experts. Two physicians who were pioneers in this form of relief are in charge of the car. Men on other railroads and in nearby manufactories are invited.

The anthracite coal railroads have petitioned the Supreme Court of the United States for a modification of the decree recently issued in which the roads are forbidden to make contracts, with coal operators, to buy their coal at a percentage of the selling price. The roads desire to continue the 65 per cent. contracts with those coal companies to which lands have been leased by the railroad companies.

Representatives of several commercial organizations of Omaha, Neb., held a conference with Vice-president C. G. Burnham, of the Chicago, Burlington & Quincy last week, to protest against the removal of the auditing force from Omaha to new office building in Chicago. It was announced that the company would adhere to its decision to concentrate the statistical force in Chicago in the interest of efficient management.

The principal railroads in Louisiana have filed a suit in court to enjoin the state railroad commission from enforcing its order requiring linen covers to be put on the seats in all passenger cars. The roads say that to provide these covers would cost several thousand dollars in the first place, and would involve a constant large expense for washing and care. The plush seats used are not unsanitary or uncomfortable, and there is no necessity for the linen covers.

Dr. C. G. Elmore has been appointed sanitary inspector of the Chicago & North Western. He is to inspect and inquire into the sanitary condition of passenger cars and stations, and for the present his efforts will be concentrated at Chicago, where he will inspect all cars arriving at or departing from the passenger terminal. He will make detailed reports and will hold

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frequent conferences with the foremen of the various coach yards to suggest improved methods.

A dock on which is a coal trestle, at the foot of Erie street, Buffalo, occupied by the Delaware, Lackawanna & Western, and claimed by the government of the United States, was taken possession of by a company of soldiers last Saturday, the Secretary of War having been advised by the attorney-general that the government was the owner of the property and that the railroad company was a trespasser. The land is valued at $1,000,000, and has been a subject of litigation for many years.

An Atchison, Topeka & Santa Fe train leaving Chicago on December 30, 1912, received 887 sacks of mail from Sears, Roebuck & Company, mail order merchants, going to postoffices in the state of Kansas. An extra full baggage car was required to carry this merchandise. While the government receives its full postage revenue from such excess mail, the mail carrying railway does not receive any compensation unless that amount of mail was included in the average ascertained at the last quadrennial weighing.

A wholesale flour dealer of New York City is said to have secured 50 carloads—10,000 barrels—of flour from the Central of New Jersey without having given up the bill of lading, which, according to the way bill, the railroad agent should have demanded. Having put the flour in storage, the merchant at once borrowed on it $28,000; and now he cannot be found. It is said that the railroad clerk who surrendered the flour without securing the bill of lading had also been serving in the capacity of bookkeeper for the flour merchant.

The Delaware & Hudson has increased the pay of shopmen, blacksmiths, machinists, boilermakers and helpers. The increase affects the pay of many hundred employees. The three principal railroads centering in Boston have increased the pay of freight handlers in that city, said to be about 4,000 men altogether. Men heretofore receiving $2.14 a day will now receive $2.30; this for ten hours. The rate for overtime will be increased from 30 cents to 34½ cents an hour. Certain improvements have been made in the working conditions also.

The federal court at New York City has appointed a new grand jury to go over the cases against President Mellen, of the New Haven road, and Chamberlin, of the Grand Trunk, for alleged violation of the anti-trust law, and it is probable that these men, together with Chairman Smithers, of the Grand Trunk, will be again indicted. The indictments reported a few weeks ago were made by a grand jury, one member of which lived in New Jersey, outside the district in which the action was taken, and Mr. Mellen's lawyers have presented the claim that this fact invalidated the indictment against Mellen.

A committee representing locomotive enginemen employed on the Chicago & Alton, has filed a claim for back pay at the rate of 25 cents an hour, in addition to the scale they have received, because of the discovery that they have been for several months running locomotives weighing in excess of 215,000 lbs., the weight on which their pay has been based. Since the contract with the engineers was signed in December, 1911, the Alton has bought a number of heavy mikado freight engines. Recently the weight of the engines was stenciled as 215,000 lbs. The enginemen now demand 25 cents an hour back pay for every trip on which they have run an engine weighing 215,000 lbs. or over, and the company is asked to weigh all of the engines and check up the trips.

George Bradshaw, general safety agent of the New York Central Lines, reports that during the six months ending November, 1912, the number of employees killed, in all branches of the service, on all parts of the New York Central Lines, 58, was 14 less than in the corresponding period of 1911, a decrease of 19.4 per cent. This decrease occurred notwithstanding a large increase in the volume of business done by the roads and a consequent increase in the number of persons employed. Mr. Bradshaw has prepared a table showing the percentages of persons injured in the principal shops of the companies for three months ending with November as compared with the three months immediately preceding; and at practically all of the shops there is a large decrease.

The Northern Pacific has announced the establishment of a department to be known as the Bureau of Efficiency, for the purpose of promoting safety and welfare of employees and of patrons of the company, and to supervise the work of making more effective all efforts for safeguarding persons and property. Charles T. Banks, special representative of the third vice-president, will be in charge of the bureau, with headquarters at St. Paul. The superintendent of each division will act as the local representative to whom employees are asked to offer suggestions and report dangerous conditions or practices. Employees are requested to confer freely with the superintendent on all subjects relating to the prevention of injuries or accidents, and to make suggestions for the improvement of the service for working conditions as they now exist.

If the people of New England want the New England railroad lines to give up their steamship lines to New York City, I am perfectly willing to do so and will accept the best possible bid I can get for the steamship lines. The people and shippers of New England may awaken to find that their shipping facilities and terminals thereby have been diminished and not increased, for with the sale of our steamship lines go half of our terminals in New York City, which half can be reached only by steamers. . . . . The New England lines have spent about $20,000 in advertising from Maine to Omaha, and Minneapolis to New Orleans, "Sail from Boston, but first see New England," and I think it is good advertising for the benefit of New England and its railroad lines and for the benefit of all the people in New England.—*C. S. Mellen.*

The strike of the 200 enginemen and firemen of the Bangor & Aroostook, in northeastern Maine, which began January 18, is said to have seriously crippled the freight service of the road. The company announced that it would be able to continue business in spite of the strike; and so far as passengers are concerned seems to have done so with considerable success, but shippers are complaining that freight is seriously delayed. Some of them have gone to the state legislature to try to get assistance in inducing the company and the strikers to arbitrate the complaints of the men. The strikers asked for the same rates of pay as those which were granted recently by the arbitration board in connection with the 54 principal eastern roads, but the Bangor & Aroostook, which was not represented in the committee of 54, replied that it could not afford to pay the rates approved by the arbitrators. At Boston this week it was reported that there had been an advance in the price of potatoes because of the probable shortage of that commodity, in consequence of the strike.

Grand Trunk Extensions.

The lines of the Grand Trunk Railway system in Quebec and eastern Ontario are now connected with the Grand Trunk Pacific west of Winnipeg; and a train load of wheat was sent east on December 27. The Grand Trunk Pacific line is not yet completed for the whole distance, the present connection being made over the Temiskaming & Northern Ontario. The T. & N. O. extends from North Bay northwestward to Cochrane, 253 miles, and the Grand Trunk track has just been finished from Cochrane westward. The G. T. P. is now in operation from Winnipeg westward to Edson, which is 130 miles west of Edmonton, and 923 miles west of Winnipeg.

Transportation Enterprise in Texas.

The record of new railroad construction in Texas was given in the *Railway Age Gazette* of December 27. Of interest also is a record of the extension of electric lines, as gathered by the Commercial Secretaries & Business Men's Association of that state. Interurban companies have built and put in operation 85 miles and graded an additional 143 miles. The new interurban projects now under course of construction aggregate 445 miles, and there are in operation in the state 267 miles. Sixty-three miles of the new construction during the year was in North Texas, while 22 miles was in the southern part of the state. The two leading lines opened during the year are the Dallas-Waxahachie and the Fort Worth-Cleburne line. Both of these lines traverse portions of the most densely populated and best agricultural sections of the state and, as in other states, the electrics lie in sections which already have the best steam railway facilities. But in the southern part of the state the interurban makes its appearance as a pioneer in transportation. A company started there intends to make a living on the shipments of fruits and vegetables which are harvested in that section the

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year round. This line will connect the cities of San Benito, Santa Maria, Monte Christo, Mission and Point Isabel.

The following table shows the location and length of Texas interurban lines:

Dallas to Sherman and Denison	75 miles.
Dallas to Fort Worth	35 miles.
Belton to Temple	13 miles.
Bryan to College Station	6 miles.
Galveston to Houston	50 miles.
Fort Worth to Cleburne	32 miles.
Dallas to Waxahachie	31 miles.
San Benito to Rio Grande Valley	14 miles.
Riviera to Rivera Beach	10 miles.
Total	267 miles.

Texas lines now operating motor car service are as follows: Texas & Pacific, Terrell to Mineral Wells; Texas Midland, Terrell to Paris; Gulf, Colorado & Santa Fe, Dallas to Cleburne; Galveston to Beaumont; St. Louis & San Francisco, Brownsville to Sam Fordyce; Brownsville to Mission; Victoria to Bloomington; Victoria to Port O'Connor; Beaumont to Houston; Sherman to Dallas; Quanah, Acme & Pacific, Quanah to Paducah; Quanah to Oklahoma points.

A Kind Word for the Railroads.

There is absolutely no reason why a woman with a tongue in her head need have the least fear or even apprehension about traveling alone. The big railroads are both mother and father to the unprotected female. In the stations are cozy couches on which the weary traveler can rest, and the mother with a fretty baby will be delighted at the sight of the little crib. It is possible almost to take a bath, with the wonderful lavatory facilities. Towels and soap, individual equipments of sanitary value, can be obtained for a nickel each. The matrons at the stations are women of refinement who watch over the women travelers with kindly solicitude. Argus like, they eye the loiterers or the young girls who regard the waiting rooms as good places in which to rouge and powder, until they are gently but firmly chased out.—*Leslie's Weekly.*

Fundamentals of National Efficiency.

I am afraid that neither the public nor the government is awake to the real state of things. In our endeavors to control corporations we too often try to lessen their efficiency instead of increasing it. We are appalled by a railroad accident, and we suggest that every engine should have two engineers instead of one. A fast train runs off the track, and a government officer suggests that people ought not to want to travel so fast. If these views prevail the day of America's greatness is done. A people that believes in divided responsibility and waste of time has no future. For there is competition between nations, whether there be competition within the nation or not. If we are content to take things easily, Germany will be only too glad to get ahead of us.—*President A. T. Hadley.*

A Model Statute Against Trespassing.

In response to a request from the governors or railway commissions of several states that a draft of an appropriate law against trespassing be prepared and submitted for their consideration, President Miller, of the Chicago, Burlington & Quincy, has had drawn up a proposed statute to be submitted to the state authorities. The suggested form for the proposed law is as follows:

"It shall be unlawful for any person to trespass by being upon, going upon or walking along, without right, any railroad track, right-of-way or station grounds.

"It shall be unlawful for any person, not being a passenger or employee, but a trespasser, to get on or off, or to ride upon, any railroad train, car or engine, or part thereof.

"Any person convicted of the violation of either of the preceding sections shall be punished by a fine of not less than $10 or more than $100 or by imprisonment in jail not exceeding thirty days, or both."

The requests for the draft of such a statute were elicited by a letter Mr. Miller addressed last year to the governors of the states traversed by the Burlington urging more stringent legislation against trespassing.

The Special Committee on Relations of Railway Operation to Legislation has issued a bulletin reprinting a portion of the address by C. C. McChord of the Interstate Commerce Commission delivered at Milwaukee on October 1, last, in which he called attention to the need for additional legislation against trespassing, and the article published in the *Railway Age Gazette* of December 20, on "Why 5,000 Trespassers are Killed Yearly."

Full Crew Law Proposed in Illinois.

Some people who have nothing to do with railroading, but who spend a lot of time in meddling with other people's affairs have decided that Illinois should have the "full crew law." Indiana has one and we suppose of course Oregon has one. Oregon has everything that Kansas used to have. The term "full crew" means that a freight train shall have more men connected with it than are necessary to operate it. It is a plan of the union to legislate extra men into jobs. No fair man who has ever given the matter consideration would maintain for a moment that such legislation as the "full crew law" is necessary in Illinois.—*Manufacturers' News.*

A Trip to the Panama Canal.*

The services of our civilians (railroad men, by the way), who initiated our work, are very cordially commended on the isthmus. After getting the work started the transfer of it to the army was no doubt a good move, because it has given stability to the whole affair; the organization and discipline are splendid. This illustrates the value of appointments for life in the army and navy, and of military standards of conduct, instead of the scattering of energy through the temporizing and terrorizing methods connected with governmental work at home in the nation, state, county and city. The physical work is a much simpler problem than it was for General Dodge to build the Union Pacific Railroad in 1867-1869, or for the Pennsylvania Railroad Company to get from New Jersey to Long Island under the Hudson river, the East river and New York City, and to build its splendid terminals in New York; and less difficult than to build the subways in New York City.

In computing the value of what we have got for the $40,000,000 we paid to the French, our government jots down the stock of the old and inadequate Panama Railroad at $9,000,000, which is nearly $200,000 a mile, and we are spending about $300,000 a mile more to relocate and rebuild most of it. The average capitalization of United States railroads is about $60,000 a mile. The gross earnings of the Panama Railroad are about $92,000 a mile per annum—as against $11,000 a mile average in the United States. The first class passenger rate is five cents a mile and its average rate per ton mile four cents—as against an average of three-fourths of one cent per ton mile in the United States, and when the railroad was threatened with congestion the company simply notified prospective patrons that they would not take any additional business.

The railroads of the United States are spending more every year for improvements, additions and new equipment to take care of expanding business than the whole expenditure in ten years on the isthmus. Two railroad companies alone have invested in terminals in New York City and vicinity in the last few years one-half as much as the entire cost of the canal. The City of New York is spending for a new water supply about half the amount of the canal cost, and you can see this immense work in a very agreeable motor trip from New York City. Please understand that I do not disparage the canal work at all. It is superb. To say anything less would be not only ungracious but unfair. It is well to have enthusiasm, but it is also well to have perspective and it is fruitless to travel if you do not compare this and that, and assemble conclusions, and so I could not forget that our railroads at home also represent the achievements of our own countrymen, who have always hanging over them the burden of sustaining their credit—a spectre unheard of in the Canal Zone.

It is expected that the first boat will be put through the canal about September, 1913, and that they will be ready for general business about a year later. I think that the effect on commerce of the United States, at least for the first few years, has been very much over-estimated by people all over the country. The tonnage per annum which government representatives estimate will go through the canal for the first few years is far less than that which goes through the Soo canal connecting Lake Superior

*From a memorandum by Frank Trumbull.

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with Lake Huron; it is not even as much as that now being hauled by the Chesapeake & Ohio Railway. The canal will cost about $375,000,000 and the result of that expenditure is placed without money and without price at the disposal of our coastwise commerce—to compete with the railroads. Outside of any question of violating the integrity of our pledge to other countries (concerning which Great Britain has already filed a protest) the ordinary railroad mind is, perhaps, too dense to perceive why after giving the United States' boats a monopoly of the coastwise commerce as against outsiders, and quarantining the canal against all railroad-owned boats, we should also pay the owners of the coastwise commerce lines a rebate. By rebate I mean the remission of tolls. The practical effect of this "special privilege" is, of course, to increase the burden on other commerce, or to increase the deficit from year to year in the interest account and maintenance and operating cost of the canal—a deficit which must be made up out of the public purse by taxation. Part of the latter is paid by the railroads through the federal income tax, and, indirectly through the protective tariff, and part by the people of States like Iowa, Kansas and Montana, far away from the seacoast, who would perhaps be glad to have more railroad employees. Query: Why are railroads expected to be self-supporting and the canal not expected to be? The interest and cost of maintenance and operation of this 50-mile canal will at first amount to at least one dollar per ton of steamer contents. The Chesapeake & Ohio Railway furnishes the equivalent of a canal in the shape of a highway across the Alleghany mountains, and besides, carried the freight itself in its own vehicles an average distance of 256 miles for $1.04.

School Children Warned.

The St. Louis & San Francisco has addressed to school principals in every important town in its territory, a statement showing that in the years 1901 to 1910, inclusive, 103,452 trespassers were killed or injured on the railways of the United States, of which 13,000 were under the age of 14 and 20,000 were between the ages of 14 and 21. The principals are requested, in the interest of the physical welfare of their pupils and for their educational value, to read these statistics to the children with such comments as the principals may see fit to make, and, if possible, to post these figures in conspicuous places. It is further suggested, in order to impress upon the children the injury done to the communities as well as the individual victims and their families and the importance and value of the exercise of care, that the children be requested to write essays upon "Safety First" and particularly upon the dangers of trespassing upon railroad property, either by walking on the track, playing in the yards, or riding moving trains.

Report on Irvington Collision.

The Interstate Commerce Commission has issued the report of Chief Inspector H. W. Belnap on the butting collision between a passenger train and a freight which occurred on the Cincinnati, Hamilton & Dayton at Irvington, within the limits of the city of Indianapolis, Ind., November 13, about 3 a. m., resulting in the death of 11 passengers and four employees and the injury of six passengers and five employees. Westbound passenger train No. 36 ran over a misplaced switch, and into the head of an eastbound freight train standing on a side track. The principal points in this report are given in a condensed form in our editorial columns. The conclusions of the inspector are that engineman Yorke, of the freight, failed to close the switch or to make sure that it had been closed; that brakeman Gross is equally responsible, he having failed to see that the switch was closed and also erroneously stated that the switch had been closed, when asked about it. Yorke also exercised poor judgment in calling in the flagman before the switch had been closed. The conductor and both brakemen displayed a lack of alertness in not relighting the switch. In conclusion the report says:

"Measures should at once be taken to provide that switch lamps be kept burning at night, and that employees be required to obey the rules in the absence of a switch light. In addition to reporting switch lamps found not burning, any employee who uses switches at night on which the lamps are not burning should be required to light them.

"It cannot be considered safe practice to require or permit a train to be operated over a busy railroad by a crew all of whom on the head end of the train are inexperienced or new men; and in all cases where newly promoted enginemen are used an experienced fireman should be furnished.

"The tonnage rating of engines should be fixed so that an engine can haul a train over the road without being required frequently to double hills. When trains are required frequently to double hills, the attention of employees, anxious to make reasonable time and to avoid delaying other trains, is diverted from their usual duties, and ordinary precautions are overlooked. Under these circumstances there are unusual opportunities for disastrous errors to occur.

". . . Had automatic block signals, or any form of signals employing continuous track circuits, been in use the open switch would have been indicated by such signals and, had they been obeyed, the accident would have been averted."

The Railway's Share of the Cost of Living.

Secretary Wilson shows that the proportion of the consumer's price that goes to the retailer as his compensation for delivering milk from the railway station to the residence of the consumer is more than six times as great as that received by the railway for carrying it from the dairy station to the city. When the farmer receives fifty per cent. of the consumer's price, the freight charge on butter is about five-tenths of one per cent. of the consumer's price; on eggs, six-tenths of 1 per cent.; apples, 6.8 per cent.; beans, 2.4 per cent.; potatoes, 7.4 per cent.; grain of all sorts, 3.8 per cent.; hay, 7.9 per cent.; cattle and hogs, 1.2 per cent.; live poultry, 2.2 per cent.; wool, three-tenths of one per cent. These percentages given by the Secretary are averages for the United States and, of course, do not hold good as to all shipments of the commodities mentioned, as there would necessarily be wide differences due to variations in the distances shipped and to other circumstances. They demonstrate, however, that, generally speaking, railway freight charges are relatively a small factor in the margin between the price received by the farmer and that paid by the consumer, and that the greater proportion of this margin goes to those who handle the products after they leave the hands of the carrier.—*W. Finley.*

The Train Despatchers of New York Harbor.

[*From The New York Sun.*]

One of the most serious things that could happen to New York would be to have the marine departments of its railways tied up for twenty-four hours; it would start a famine. The railroad fleet of tugs, lighters, barges and car floats numbers more than 2,000 craft. They carry from one land terminal to another about nine-tenths of all the freight that comes into and goes out of New York, or 10,000 cars daily. The movements of the units of this fleet are as carefully timed and regulated as the progress of the trains that bring the merchandise into the terminals at Jersey City, Hoboken and Weehawken.

Most of New York's daily supply of food lands at the docks during the night and is distributed by breakfast time. One day last winter when a gale blew at from seventy to ninety miles an hour for a long time the boats had a severe time.

The tugboats have engines of from 1,200 to 1,800 horsepower. The boilers carry a steam pressure of more than 185 lbs. The tugs, car floats, steam lighters and other craft that bustle about on the water day and night seem to move with as little system as a hansom cab, but as a matter of fact, you could look at a marine despatcher's sheet and, if you knew how to read it, you could tell within a few hundred feet just where each tug and each barge or lighter or float was at any moment of the day or night.

The marine despatcher has not the same worries as the despatcher on a single track line ashore. He doesn't have to bother especially about sidings and meeting points. But he has plenty to worry about just the same. The manufacturing industries around the harbor are just as fussy about getting their freight on time as they would be if they were waiting for it inland. All the big railroads have their chief despatchers tucked away some distance from the docks. Though the rivers are out of sight the chief despatcher carries their courses in his mind's eye, and issues his orders over the telephone to his assistants along the docks. He can get into communication instantly with the road's general offices, with all its freight stations in the city and with a score or so of

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his assistant tug despatchers at the river ends of the railroad freight piers. The despatchers in this department, like all other train despatchers, work in three tricks of eight hours each. Night and day, year in and year out, their offices are always open and always busy.

The chief despatcher gets word from some point a hundred miles inland, for instance, that ten carloads of apples, say, are coming in a certain freight train. These apples must be at a certain pier on the North River by 1 a. m. The shipper and the consignee have impressed on the general freight agent that they expect those apples to bring a fancy price because the market is bare. . . . Finally the train is reported within a few miles of the New Jersey terminal. The chief despatcher calls up one of his assistants along the waterfront. He knows that an especially swift and powerful tug is due to pass close to there in a few minutes and will ask for orders.

The assistant runs up the signal lights. The night is rainy and a heavy fog is creeping over the river. A man with a megaphone stands on the pier end. Suddenly he hears a hoarse shout from somewhere out in the murk. It is the tug asking for orders. A moment more and he sees the shadowy bulk a hundred feet away, steaming slowly. He megaphones his order to the captain to go to such and such a pier. . . . Only when the tugs change crews—the boats themselves are in service night and day—do they tie up at the piers. They get all their orders on the run, through flags and signal boards by day, through varicolored lanterns by night and through the megaphone when the visible signals will not give complete enough instructions. . . . In less than five minutes from the time the train halted in the yard the ten cars of apples are aboard the car float. In twenty minutes more they are across the North River alongside the pier. . . . When the weather is fine and the winds are still the despatchers can smoke their pipes tranquilly, but when fog or snow blots out the shore lights and those on the water the telephone and the telegraph chatter incessantly and feverishly. The men are tired out when their eight-hour trick is done.

The most trying time that New York's railroad fleet ever knew was one day and night last winter, when it had to battle with a hurricane. Never before had such a storm been known or had navigation been so difficult. For a time the wind blew at the rate of ninety miles an hour. There was no rest for the men in the boats or the men ashore while that storm lasted. Monstrous heavy floats across the water was slow and perilous work. The cakes of ice that were hurled against the river craft were a foot thick, but the gale tossed them about like shavings. It was bitter cold, and the boats and men were sheathed in ice. Every tug that the railroads had was pressed into service and toiled under a full head of steam. New York's day's rations were landed at her water gates at the usual hours between midnight and morning. The general public was not aware that anything unusual had been done, but the railroad men, from the general managers in their offices down to the stokers with aching backs and tired eyes, agreed that that bit of work was the greatest triumph of marine railroading. New York lives from hand to mouth as regards both fuel and food.

Firemen's Wages.

Railroad officers are generally willing to concede that the firemen's work has been largely increased in recent years; but in many instances the railroads have already voluntarily increased the pay since the introduction of Mikado locomotives. In some cases firemen are relieved at 75 miles, while at the same time drawing pay for 100 miles. On another road firemen's wages on Mikado locomotives have been advanced to $3.25 per day, where formerly they were $2.95 on all engines. The chief of the firemen's brotherhood, however, objects to any arrangement whereby a fireman is relieved at 75 miles in the middle of a division of perhaps 150 miles in length on the reasoning that it deprives a man of an opportunity for making overtime. He, therefore, demands two firemen to lighten the work, for which he expects the railroads to pay them two full days' wages. The railroads cannot see any reason in this.

"The whole question," said one general manager, "is simply one of unionism versus right or equity. Carter wants two firemen on all heavy engines because it will increase the membership of his organization. The trainmen's organizations have been instrumental in enacting the full crew bill because it adds another member to their organization for each train. Neither of these organizations will allow the extra man on the train to serve as a general utility man. The railroads would be willing to accept the full crew bill requirements if the extra man could be utilized to help the fireman, or if the extra firemen at times could help the train crew. But the men's duties have to be defined in order that there may be no uncertainty as to which union they are eligible to join.

"The railroads would be willing to put a day laborer on all locomotives to relieve the firemen. It takes no particular intelligence to shovel coal. Again the unions will not permit this. The extra man on the engine must be a firemen and draw a fireman's wages. We general managers are sometimes at a loss to know where our authority begins. We are beginning to realize where it ends."—*Wall Street Journal.*

American Institute of Consulting Engineers.

The annual meeting of the American Institute of Consulting Engineers was held on January 14, in New York. Prof. George F. Swain, of Harvard University, addressed the meeting on the subject of Education. The address was followed by a discussion in which Rudolph Hering, General C. A. Bingham, Prof. Gardner F. Williams of Ann Arbor, Mich., and Frank J. Sprague took prominent parts.

National Railway Appliances Association.

All railway officers who would be interested in the exhibits will this year receive a special invitation in the form of the association's year book, published this year for the first time, 8,000 copies of which will be distributed among all classes of railway officers, and not 3,000 copies, as mentioned in last week's issue.

Railway Supply Manufacturers' Association.

The assignment of space for the exhibits which will be held in connection with the Master Mechanics' and Master Car Builders' conventions at Atlantic City next June, will take place on February 14 and not on February 11, as mentioned in last week's issue.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 13 Park Row, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

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BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—R. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 1st Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 784, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Buffalo, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussells, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May, 1913, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, Chicago & North Western, Escanaba, Mich. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES' ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—G. H. Frasier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C. M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotehford, Union Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R.R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Brookstock Block, Pittsburgh. Meeting with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Simpson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 12, Chicago; June 10-11, New York, convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. J. Nolan, 264 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. Ryan, C. & N. W. Ry., Sterling, Ill. Convention, September 9-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3668 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—S. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Rensselaer Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Maehle, 7042 Stewart Ave., Chicago. Annual meeting, June 23, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

A bill has been introduced in the Minnesota senate prohibiting railways from making lower rates per mile for mileage tickets than for regular tickets.

George J. Charlton, passenger traffic manager of the Chicago & Alton, has been re-elected chairman of the executive committee of the Western Passenger Association.

Professor P. G. Holden, director of agricultural extension of the International Harvester Company, addressed the Traffic Club of Chicago at a luncheon on Tuesday, January 21, on the subject of "Greater Efficiency in Agricultural Production."

The Lehigh Valley reports that the quantity of milk carried in the cars of that road to New York City during the year 1912 was considerably larger than in 1911, the total number of cans being 1,821,522, an increase of 60,864 cars. The volume of this traffic is steadily increasing.

The National Industrial Traffic League has established permanent headquarters at Chicago, with offices in the Tacoma building. D. B. Chindblom, who has been assistant to H. C. Barlow, traffic director of the Chicago Association of Commerce, has been appointed assistant secretary of the league, and will be in charge of the office.

At the annual meeting of the Illinois and Iowa Demurrage Bureau, held at Peoria, on January 14, a resolution was passed recommending an increase in demurrage rates in Illinois for the purpose of promoting increased car efficiency by reducing undue detention of cars by shippers. William Rotchford, of Peoria, was re-elected manager.

For seven days—from January 25 to February 1—the Texas & Pacific will run an agricultural inspection train starting at Port Allen, La., and stopping at nineteen of the largest towns on the road in Louisiana. The lectures will be managed by the Louisiana State University, the State Department of Agriculture and the United States bureau of Farm Demonstration.

The annual report of the Suez canal shows that during the year 1912 the number of vessels passing through the canal was 5,373, and the receipts 135,720,000 francs ($27,145,000), an increase over the preceding year of 404 vessels, and an increase in receipts of 1,710,000 francs. Since the beginning of the present year the rate of toll charged vessels passing through the canal has been reduced to 6¼ francs per ton.

Representatives of the Transcontinental Freight Bureau held a conference with representatives of shippers for several days last week at Chicago at the suggestion of the Interstate Commerce Commission, for the purpose of adjusting differences in connection with a new tariff advancing many of the transcontinental freight rates which had been suspended by the commission. An agreement was reached on a large majority of the disputed points.

The Chesapeake Steamship Company is building two new steamers for its line between Baltimore, Md., and West Point, Va., and when these are finished, trips will be made every day between these two places. In connection with the expected increase in traffic, the Southern Railway is making extensive improvements on its track between Richmond and West Point, replacing with heavier rails all of the old 54-lb. and 60-lb. rails now in use.

The New York State Superintendent of Public Works reports that the aggregate amount of freight carried on the canals of the state during the past year was 2,606,116 tons, which was about 500,000 tons less than in 1911. Of the tonnage during the past year, only about one-fifth was through freight. The number of boats using the canals is diminishing and seems likely to continue to diminish until the completion of the barge canal, when larger vessels can be used.

The Local Freight Agents' Association of Chicago has issued a circular addressed to shippers, calling attention to the large amount of losses to shippers and railways through damage to freight because of improper packing and marking, and the use of inadequate containers. The Chicago Association of Commerce has organized a special committee, including representatives of railways, transfer companies and shippers, to make an

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investigation of the subject and ascertain the prevalence of any condition which requires preventive measures.

Representatives of the principal commercial associations of Illinois have adopted resolutions expressing an appreciation of the work of the Illinois Railroad & Warehouse Commission in bringing about harmony between the railways and shippers, and expressing the wish that if the board cannot be re-appointed by the incoming Democratic administration the new board to be appointed will emulate the example which has been set. The resolutions were signed by the Chicago Association of Commerce, Wholesale Grocers Exchange, Business Men's League of St. Louis, Bloomington Chamber of Commerce, Manufacturers' & Shippers' Association of Rockford, Peoria Commercial Club, Quincy Freight Bureau, and several large corporations, and were concurred in by the Illinois Freight Committee representing the railways.

As a result of the protest of several business men's associations on account of the increase in single trip suburban fares on the Illinois Central in Chicago to two cents a mile on January 1, the corporation counsel of Chicago has submitted an opinion that the city has the power to regulate suburban fares on steam roads within the city limits. On Saturday, January 18, representatives of the protesting organizations appeared before a meeting of the local transportation committee of the city council, which appointed two sub-committees, one consisting of three aldermen and six business men to negotiate with the Illinois Central for a restoration of the old fares, and the other a committee of aldermen to investigate suburban rates on all roads entering the city with a view to the passage of an ordinance prescribing maximum rates. John G. Drennan, district attorney, represented the Illinois Central at the meeting and contended that the city has no jurisdiction over the railroad rates, which are fixed by the state.

Traffic Club of Chicago.

The speakers for the sixth annual dinner of the Traffic Club of Chicago, to be held in Chicago on January 28, will be as follows: James Hamilton Lewis, John H. Atwood and Wilbur D. Nesbit. George A. Blair, general traffic manager of the Chicago & Alton, will act as toastmaster.

Traffic Club of New York.

At the regular monthly meeting of the Traffic Club of New York, which was held on January 21, instead of January 28, Franklin Matthews delivered an illustrated lecture on Panama, Its Canal and Romantic History.

Car Location.

The accompanying table, which is taken from Car Location, bulletin No. 1-A, of the American Railway Association, gives a summary of the location of freight car equipment by groups on November 30, together with surpluses and shortages on the same date.

Car Balance and Performance.

Arthur Hale, chairman of the committee on Relations Between Railroads of the American Railway Association, in presenting the statistical bulletin No. 136, covering car balance and performance for September, 1912, says:

The miles per car per day for September was 24.4, an increase of .1 over August, 1912. This figure for September, 1911, was 23.8.

Ton miles per car per day was 396 in September, 1912, compared with 385 in August, 1912; this is an increase of 7.61 per cent. over the figure for September, 1911, which was 368.

The proportion of home cars on line was 53 per cent. compared with 56 per cent. in August. This figure for September, 1911, was 64 per cent.

There is an increase of 28 per cent. in the percentage of loaded car mileage, compared with August, 1912. This figure for September, 1911, was 71.2 per cent.

The average earnings per car per day were $2.73, compared with $2.60 in August. There is an increase of 0.23 per cent. over the earnings for September, 1911, which were $2.57.

The table on the following page gives the car balance and performance in the month covered by the report and the diagram shows car earnings and car mileage and different car performance figures monthly from July, 1907.

INTERSTATE COMMERCE COMMISSION.

The commission has decided that all bridge companies whose bridges are used by interstate carriers shall make owners' reports to the commission.

The commission has suspended from January 10 until May 10 an item in a supplement to the tariff of the Chicago Great Western, which advances from $3 to $5 per car the switching charge at Faribault, Minn.

The commission has further suspended from January 18 until July 18, the supplements to certain tariffs, which advance rates for the transportation of grain between points in the state of Iowa and Chicago and other points.

The commission has further suspended from January 4 until May 3 certain items in supplements to Leland's tariff, which advance rates for the transportation of sand and gravel from points in Louisiana to points in Texas.

The commission has further suspended from January 4 until May 3 certain items in tariffs, which advance rates for the transportation of tin plate and sheet metal from eastern shipping points to points in Oregon, Washington, and other destinations.

The commission has further suspended from January 11 until July 11 certain schedules in certain tariffs, which contain advances in rates for the transportation of newsprint paper from Sault Ste. Marie, Ontario, to various points in the United States.

CAR LOCATION ON NOVEMBER 30, 1912.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	85,526	669,835	276,072	200,313	163,130	437,512	16,549	105,964	29,626	131,626	115,288	2,251,541
Home Cars on Home Roads	39,302	322,877	76,505	90,339	66,488	223,492	3,931	41,454	10,900	65,815	78,891	1,071,014
Home Cars on Foreign Roads	46,224	345,506	199,055	109,974	96,434	182,328	12,598	64,045	18,642	65,576	36,492	1,176,674
Foreign Cars on Home Roads	68,048	323,230	191,461	84,488	80,267	217,108	12,938	54,058	38,188	79,477	61,487	1,210,740
Total Cars on Line	107,350	647,107	267,966	174,827	146,775	490,600	16,889	95,512	49,088	145,262	140,378	2,281,754
Excess or Deficiency	21,824	*22,020	*7,594	*25,486	*16,147	34,780	340	*9,967	19,346	13,871	24,990	30,067
Surplus	348	2,770	284	1,280	388	6,862	622	2,317	2,014	8,713	537	26,135
Shortage	2,160	6,644	9,300	8,778	8,373	7,279	412	4,182	1,978	4,623	8,897	62,536
Shop Cars—												
Home Cars in Home Shops	5,339	26,794	11,304	9,778	8,333	23,217	366	4,932	1,079	4,376	1,722	97,240
Foreign Cars in Home Shops	1,849	7,785	5,823	2,196	2,352	6,242	364	1,430	1,360	2,695	140	32,436
Total Cars in Shops	7,188	34,579	17,127	11,974	10,685	29,459	930	6,362	2,439	7,071	1,862	129,676
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	45.95	48.33	27.71	45.10	40.76	50.78	23.87	39.12	36.79	50.00	68.37	47.57
Total Cars on Line	122.25	96.32	96.84	87.24	89.25	107.23	102.05	87.41	165.70	110.17	121.66	100.96
Home Cars in Home Shops	6.24	4.00	4.49	4.91	5.11	5.11	2.22	4.67	3.91	3.40	3.84	4.53
Foreign Cars in Home Shops	1.64	1.16	2.31	1.10	1.44	1.38	3.43	1.35	4.92	2.10	.31	1.51
Total Cars in Shops	7.88	5.16	6.80	6.01	6.55	6.49	5.65	6.01	8.83	5.50	4.15	6.04

*Denotes deficiency.

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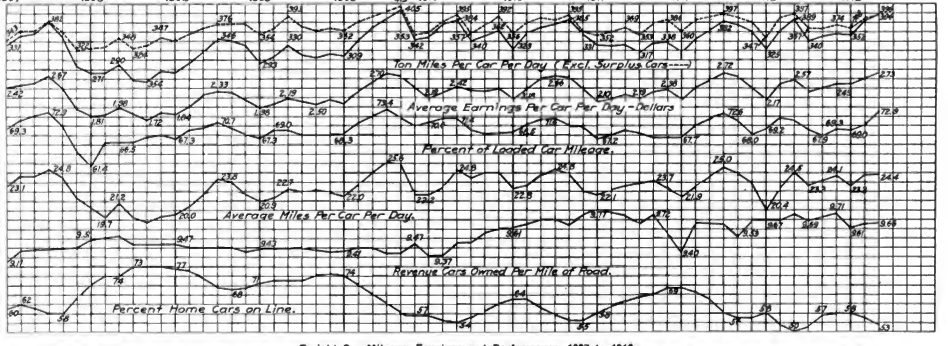
FREIGHT CAR BALANCE AND PERFORMANCE IN SEPTEMBER, 1912.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	85,023	680,207	215,151	191,067	173,215	398,148	17,273	140,997	26,957	143,397	121,107	2,192,542
Average number of system cars on line	42,847	337,016	116,503	93,548	78,488	259,509	4,655	64,264	18,977	67,791	81,048	1,164,646
Railway-owned cars: Average foreign on line	48,505	296,872	108,646	67,400	66,217	185,729	13,163	63,237	28,190	66,381	56,425	1,000,837
Total Railway-owned cars on line	99,412	633,888	225,149	160,948	144,705	445,238	17,830	127,521	47,167	134,172	137,523	2,173,543
Excess	6,329	*46,319	9,998	*30,119	*28,510	47,090	547	*13,476	20,210	*9,225	16,416	*27,059
Per cent. of cars on line to total owned:												
Home	50	50	54	49	46	65	27	46	70	48	67	53
Foreign	57	43	51	35	38	47	76	40	105	46	47	45
All railways	107	93	105	84	84	112	103	86	175	94	114	98
Private cars on line	4,212	46,013	11,515	2,903	6,941	17,332	2,528	11,578	4,061	11,535	3,024	121,642
Total, all cars on line	103,624	679,901	236,664	163,851	151,646	462,570	20,348	139,099	51,228	145,707	140,547	2,295,185
Per cent. of cars in shop	8.21	5.48	7.86	6.59	9.65	7.17	6.84	8.22	4.99	6.42	5.70	6.84
No. of freight engines owned	1,347	12,179	3,040	3,402	2,758	6,467	525	2,743	744	3,122	2,060	38,387
Average cars on line per freight engine owned	77	56	78	48	55	72	39	51	69	47	68	60
Total freight-car mileage	54,716,362	500,373,724	154,789,926	122,677,899	118,726,859	335,666,017	32,274,379	98,170,688	31,531,137	138,754,243	93,205,596	1,680,786,830
Average miles per car per day	17.6	24.5	21.6	25.0	26.1	23.4	54.4	24.8	20.8	31.8	22.1	24.4
Per cent. loaded mileage	75.5	69.8	74.6	70.0	74.5	73.8	75.1	73.9	75.3	75.4	78.3	72.9
Ton-miles of freight, including company freight	662,114,862	8,722,022,002	2,897,703,018	2,075,145,012	1,784,509,688	3,742,885,937	454,410,549	1,446,508,473	402,372,631	2,094,403,372	1,395,230,403	25,677,805,947
Average ton-miles, including company freight												
Per car-mile	12.1	17.4	19.6	16.9	15.0	15.2	14.4	14.7	13.2	15.4	15.0	16.2
Per loaded car-mile	16.0	25.0	26.3	24.2	20.2	20.4	19.2	20.0	17.5	20.4	19.1	22.3
Per car per day	213	428	423	422	393	355	785	366	275	488	331	396
Gross freight earnings	$7,199,451	$50,777,026	$15,636,572	$12,172,302	$12,158,320	$36,760,298	$3,792,032	$13,010,173	$4,335,301	$21,436,031	$10,510,283	$187,787,789
Average daily earnings: Per car owned	$2.52	$2.49	$2.42	$2.13	$2.34	$3.08	$7.32	$2.98	$5.36	$5.00	$2.89	$2.84
Per railroad car on line	2.35	2.67	2.31	2.52	2.80	2.75	7.09	3.40	3.06	5.34	2.55	2.88
All cars on line	2.26	2.49	2.20	2.48	2.67	2.65	6.21	3.12	2.82	4.92	2.49	2.73

*Denotes deficiency.



Freight Car Mileage, Earnings and Performance, 1907 to 1912.

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The commission has further suspended from January 8 until July 8 certain schedules of the tariff of the St. Louis & San Francisco, which made changes in the rules governing the concentration and re-shipment of cotton and cotton linters at Memphis, Tenn.

The commission has vacated its order of suspension in the proceeding, which involved advances in rates for the transportation of cotton linters from points in Texas to points in Minnesota and Wisconsin. The carriers have now withdrawn the advanced rates.

The commission has suspended from January 15 until May 15 schedules in certain tariffs which advance from 50 cents per net ton to 60 cents per net ton rates for the transportation of cement in carloads from Nazareth, Pa., and other points to Phillipsburg, N. J., and other points.

The commission has suspended from January 10 until March 31 an item in a supplement to the tariff of the Chicago, Burlington & Quincy, which cancels joint rates with the Chicago, Zeigler & Gulf for the transportation of petroleum oil and its products from Whiting, Ind., to Zeigler, Ill.

The commission has suspended from January 8 until May 8, certain schedules in the tariff of the Missouri Pacific, which advance rates for the transportation of soft coal and soft coal briquettes from southern Illinois mines to stations on the Gould Southwestern Railway in Arkansas.

The commission has vacated as of January 28 its order of suspension in the proceeding in which the original order suspended advances in class rates from stations on the Kansas City Southern to Topeka and Lawrence, Kansas. The carriers have withdrawn the proposed advances and restored the former rates.

The commission has vacated the suspension order in the proceeding which involved advances in rates for the transportation of cottonseed from points in Oklahoma to Kansas City, Mo., and other points. The carriers have filed tariffs which withdraw the advances under suspension and restore the rates formerly in effect.

The commission has suspended from January 21 until May 21 an item in the tariff of the Southern Pacific which advances from 50 cents per ton to $1.30 per ton the rate on oranges in carloads from Folsom, Cal., to Brighton, Cal. This local rate is used in combination with the rate from Brighton to make a through rate to the interstate points.

The commission has vacated the suspension order entered in the proceeding which involved advances in rates for the transportation of mixed shipments of hay, rice straw, straw, grain and grain products between Memphis, Tenn., and points in Arkansas. The carriers have withdrawn the advances under suspension and restored the previous rates.

The commission has suspended from January 15 until March 31 items in certain tariffs which advance export rates on lumber and articles taking the same rates in carloads from Alexandria, La., to New Orleans, La., from 7 to 9 cents per 100 lbs., and it has also advanced the lumber rates from points in Arkansas, Louisiana and Texas to St. Louis, Mo., and other points in Illinois.

The commission has vacated the suspension of tariffs involved in the proceeding which related to new regulations and practices governing the handling of hay and straw at the Thirty-third Street station of the New York Central & Hudson River and at the Thirty-sixth Street station of the West Shore, in New York. The carriers have filed tariffs which restore the old regulations and practices, and the commission has therefore vacated the proceeding.

The commission has suspended from January 15 until March 25 supplement 1 to Beck's tariff, which advances the rate for the transportation of freight from western points to stations in Rhode Island on the line of the Rhode Island company. Heretofore points on that line have taken the Boston rate basis. The suspended tariff provides for application to points on this line of arbitraries above the Boston rate basis, ranging from 3 to 8 cents per 100 lbs. on several classes of freight.

The commission has suspended from January 11 until May 10 a supplement to the tariff of the Kansas City Southern. The present tariffs of the Kansas City Southern provide for refrigeration of shipments of strawberries between points on its line, including transportation from southwestern Missouri points to Topeka, Kan., of shipments of 10,000 lbs. or more. The suspended supplement withdraws the privilege as to lots of 10,000 lbs. and provides for refrigeration only on carload lots.

The commission has suspended until April 30 certain items in Counties' tariff which provide for cancellation of an existing route on class and commodity freight including lumber and fruit from points west of Huntington, Ore., via the Oregon-Washington Railroad & Navigation Company in connection with the Atchison, Topeka & Santa Fe; Chicago, Burlington & Quincy; Chicago, Rock Island & Pacific, or the Missouri Pacific from points in Oregon via Denver or Pullman to eastern points.

The commission has suspended from January 1 until May 1, an item in a supplement to the tariff of the Delaware & Hudson, which eliminates the present milling-in-transit privileges on corn milled or mixed at Oneonta, N. Y., and destined to stations on the Boston & Maine. The effect of the item which has been suspended would be to require payment of local rates into and out of Oneonta on corn milled at that point and destined to Boston & Maine stations instead of the existing joint through rate from point of origin to Boston & Maine stations. On the traffic involved this would result in advances ranging from 6 to 13 cents per 100 lbs.

The commission has suspended from January 21 until May 21 certain items in a supplement to the tariff of the Illinois Central which canceled joint rates for the transportation of lumber from points in Mississippi on the Gulf & Ship Island Railroad and New Orleans Great Northern Railroad to trunk line territory, leaving combination rates to apply. The existing rates from points on the Gulf & Ship Island and New Orleans Great Northern are 33 cents to New York, 31 cents to Philadelphia and 30 cents to Baltimore. The application of a combination of local rates would result in an advance of 50 cents to the points named and in similar advances to other points in trunk line territory.

The Interstate Commerce Commission is to make a general investigation of the telephone business throughout the United States. The attorney-general of the United States has recently considered the question of proceeding against the telephone companies under the anti-trust law, but has decided not to do so; and he has sent to the Interstate Commerce Commission the facts which he has gathered. The attorney-general says that there are about 20,000 independent telephone companies in the country, operating about 4,000,000 telephones; this in addition to the 4,500,000 instruments of the American Telephone & Telegraph Company. Independent companies have asked the department of justice to proceed against the American company, but the attorney-general seems to have found no cause for taking such action.

Reparation Awarded.

Lafayette Taylor v. Norfolk & Western. Opinion by Commissioner Harlan:

The former rate of $1.20 a ton for the transportation of coal from the Thacker and Kenova coal fields of West Virginia to Rarden, Ohio, was found to have been unreasonable, and reparation was awarded on the basis of the subsequently established rate of $1. The latter rate, also complained of as unreasonable, was found not to have been excessive. (25 I. C. C., 613.)

Elevator Decisions.

In the matter of Keystone Elevator Company. Opinion by Commissioner Lane:

The commission ordered the Pennsylvania Railroad to cease and desist from leasing the elevator property located at North Philadelphia, Pa., to the Keystone Elevator & Warehouse Company so long as the stockholders of the latter are owners wholly or in part of the property passing through this elevator, and also to cease from paying any allowance for terminal services to this elevator company upon any property passing through the elevator belonging wholly or in part to any stockholder of said elevator company, unless such railroad's published tariffs

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shall at the same time offer such allowance to all other shippers using said or any other elevator in the city of Philadelphia. (25 I. C. C., 618.)

Empty Barrel Rates Increased.

Classification of Empty Barrels. Opinion by Commissioner Lane:

The advance objected to is change in the rating of empty tight cooperage barrels in carloads in southern classification from sixth to fifth class. The commission found that the carriers have justified the proposed advance, and the order of suspension will be vacated. (25 I. C. C., 641.)

Grain Rates Unreasonable.

Wichita Board of Trade v. Atchison, Topeka & Santa Fe, et al. Opinion by Commissioner Lane:

The complainant asks that the joint rates on grain and grain products from points in Kansas on the Union Pacific to points in Texas via the Atchison, Topeka & Santa Fe and via the Chicago, Rock Island & Pacific be reduced to the basis of rates prescribed by the commission in *Farmers, Merchants & Shippers Club v. A., T. & S. F.*, 12 I. C. C., 351, to apply on grain from points in Kansas on the Atchison, Topeka & Santa Fe and the Chicago, Rock Island & Pacific to points in Texas. The commission found that the present case is not controlled by the case cited. The rates attacked, however, are found to be unreasonable in so far as they exceed rates made on the basis prescribed in the above case with an arbitrary added to allow for a two-line haul. The carriers will be given an opportunity to publish and file such rates. No order will be entered at this time. (25 I. C. C., 625.)

STATE COMMISSIONS.

The Pennsylvania State Railroad Commission has investigated the freight rates on coal from the Clearfield region to Lancaster, and to points between Harrisburg and Lancaster, and recommends that they do not exceed $1.40 per gross ton.

The Nebraska Railway Commission, in its annual report, recommends legislation extending the commission's power to include the awarding of reparation in cases where rates are found to be excessive or discriminatory, to provide that no new tariff or freight classification may be made effective until approved by the commission, and to provide for the punishment of shippers, railway officials or employees guilty of false billing of freight.

The annual report of the Oregon railroad commission recommends legislation giving the commission power similar to that possessed by the Interstate Commerce Commission to suspend proposed advances in rates pending an investigation, and placing the burden of proof to sustain the reasonableness of such rates upon the carriers. The commission also repeats its previous recommendation for legislation giving the commission power to regulate the issuance of securities of public service corporations and asks authority to prevent the construction of grade crossings.

The New York State Public Service Commission, Second district, reports that shippers of fruit and vegetables, in the fruit district south of Lake Ontario, deal unfairly with the railroads. Delays in shipments are numerous. Market conditions in the fall of the year are uncertain and the prices are constantly changing, so that the situation fluctuates with great violence from day to day. The inability of the railroads to furnish cars results in what is usually termed "car shortage"; but a thorough investigation was made during the past shipping season, and it was found that a considerable number of shippers seem to think that they had the right to use cars as warehouses for any length of time they might see fit. The commission tells them that this is not only a wrong to the railroad, but a greater wrong to other shippers, who are thereby deprived of cars. The commission has frequently remonstrated with shippers, but the practice continues. During the month of November, the commission found 122 cases where cars were held for periods of from 5 to 25 days idle upon sidetracks, and gives a list of these in full in its report. It has also discovered 9 cases in September, 23 in October, and 30 in December.

COURT NEWS.

In the federal court at Macon, Ga., on January 18, the grand jury reported indictments against the Seaboard Air Line for violation of the law in the transportation of coal from Briceville and Oliver Springs, Tenn., to Helena, Ga. The coal came from points on the Southern Railway, and the government charges that it was billed through on a joint rate to points beyond where it was actually unloaded; so that the Seaboard secured a considerable part of the amount paid for transportation when it should have received little or nothing.

In the federal court at Boston the grand jury has returned two indictments against the New York, New Haven & Hartford for illegal transportation of milk from points in Connecticut to Boston. The company is charged with carrying milk cheaper for certain shippers than for others. The officers of the road say that the indictments are based on a question of interpretation of the language of tariffs which have been in effect ten years; also that the practice now complained of has been open and uniform during this time. The alleged offenses took place more than two years ago.

In the federal court at Buffalo, N. Y., the Grand Trunk and its general agent, Frank P. Dwyer, have been indicted for conspiracy to violate Section 6 of the Interstate Commerce law, in connection with the transportation of theatrical companies from Detroit to Buffalo, and from Buffalo to Toronto. The indictment charges that by means of a contract which ostensibly was for advertising in the programs of theaters rates for transportation of theatrical companies were unreasonably reduced. The contract for the season of 1910-1911 called for monthly payments by the Grand Trunk of $300, a sum grossly in excess of the true value, the amount of which was reached by deducting one-quarter of a cent a mile from the regular published rate. The facts in this case are similar to indictments recently returned in Chicago against the New York Central Lines, upon which a plea of guilty was entered and a fine of $40,000 paid by the carriers.

Commerce Court Overruled.

The Supreme Court of the United States, in a decision by Justice Lamar, in the case involving rates on freight from New Orleans to certain cities in Alabama, ordered reduced by the Interstate Commerce Commission, has sustained the Commerce Court in its opinion that the court may consider the question whether, in a given case, the commission has called for, secured or heard the evidence with due care and fulness; but holds that in this case the Commerce Court was wrong in deciding that the commission had neglected material evidence. The government attempted to establish in the commission a right to make rates without substantial evidence being presented at a hearing to show the unreasonableness of rates about to be replaced. The court decided that in making rates the commission could not rely on information gathered in investigations by itself, but must base them on evidence presented at a hearing where the railroads would have an opportunity to present their side. Justice Lamar quoted the government's contention that the Hepburn law in providing that rates should be set aside if, after a hearing, the commission should be of the opinion that the charge was unreasonable, meant that the commission's findings as to unreasonableness of rates were not subject to review by the courts; and in reply pointed to that clause in the law which required a "full hearing" to be accorded. The universal course of decisions in this country is that an administrative order by the government is void if issued without a hearing, or if the hearing was inadequate or unfair. On the government's further contention that Congress required the commission to obtain information to enable it to perform its duties, and that, therefore, when it issued an order, it was presumed to have obtained information to support its findings, Justice Lamar said:

"Such a construction would nullify the right to a hearing, for manifestly there is no hearing when the party does not know what evidence is offered or considered, or is not given an opportunity to test, or explain, or repudiate it. The information gathered may be used as the basis for instituting prosecutions for violations of the law and for many other purposes, but is not available as such in cases where the parties are entitled to a hearing."

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Railway Officers.

Executive, Financial and Legal Officers.

H. V. Wallace has been appointed co-receiver with the Continental Trust Company, Denver, Colo., of the Denver, Laramie & Northwestern, in place of Marshall B. Smith, resigned.

C. A. Goodnow, assistant to the president of the Chicago, Milwaukee & Puget Sound, has been appointed assistant to the president of the Chicago, Milwaukee & St. Paul, with office at Chicago.

Tilghman B. Koons, whose election as vice-president and freight traffic manager of the Central of New Jersey, with headquarters at New York, has been announced in these columns, was born May 29, 1852, at Treichlers, Pa. He began railway work as a telegraph operator on the Delaware, Lackawanna & Western in 1872, and in the early part of 1873 went to the Lehigh Valley as clerk in the general freight agent's office, at Mauch Chunk, Pa., remaining with that road until 1879, when he resigned on account of ill health. In the later part of 1880 he went to the Central of New Jersey as soliciting freight agent, with headquarters at Elmira, N. Y. From 1887 to 1898 he was successively general agent, division freight agent and division freight and passenger agent, with office at Mauch Chunk, Pa. In September, 1898, he was made general freight agent at New York, and on December 23, 1902, was appointed freight traffic manager, which position he held until his recent election as vice-president and freight traffic manager of the same road. Mr. Koons has been in the continuous service of the Central of New Jersey for the past 33 years.

T. B. Koons.

George L. Peck, who, on January 1, became fifth vice-president of the Pennsylvania Lines West of Pittsburgh, with headquarters at Pittsburgh, Pa., as already noted in these columns, was born July 10, 1858, at Sandusky, Ohio, and was educated in the public schools. He began railway work in June, 1873, with the Northwestern Ohio, now a part of the Pennsylvania Lines, and from July, 1876, to February, 1881, was chief train despatcher for the Pennsylvania Lines at Toledo, Ohio. He was then until December of that year a train despatcher for the Columbus, Hocking Valley & Toledo, and was chief train despatcher on the Pennsylvania Lines at Toledo from the latter date until March, 1882, when he became trainmaster of the Toledo division. In April, 1894, he was promoted to superintendent of the Richmond division, and in January, 1896, was transferred to the superintendency of the Pittsburgh division. Mr. Peck was appointed general superintendent of the Southwest System, with headquarters at Columbus, Ohio, on January 1, 1901, and in June of that year became general manager of all Pennsylvania Lines West of Pittsburgh, which position he held until he was elected fifth vice-president in charge of the transportation department, as above mentioned.

G. L. Peck.

Percy R. Todd, vice-president of the Bangor & Aroostook, with office at Bangor, Me., has been elected president, succeeding Arthur Holland, resigned. Mr. Holland remains as chairman of the executive committee of the board.

Walter E. Hackett has been appointed treasurer of the Chicago, Kalamazoo & Saginaw, the Detroit & Charlevoix, the Detroit Terminal Railroad and the Toledo Terminal Railroad, and has also been appointed local treasurer of the Michigan Central, the Toronto, Hamilton & Buffalo and the Detroit River Tunnel Company, with headquarters at Detroit, Mich., succeeding John E. Griffiths, deceased.

Operating Officers.

Y. M. Martin has resigned as trainmaster of the Missouri, Kansas & Texas at Waco, Tex., to engage in business at San Antonio, Tex.

W. D. Danley has been appointed superintendent of the transportation department of the Chicago, Peoria & St. Louis, with headquarters at Springfield, Ill., effective January 13.

C. E. Cate has been appointed assistant superintendent of the Sonora division of the National Railways of Mexico, with headquarters at Empalme, Sonora, Mex., succeeding C. J. Anderson, promoted.

Frank M. Lucore, assistant to the general agent of the American Railway Association, with office at Chicago, has been appointed assistant general manager of the Sunset-Central Lines of the Southern Pacific Company, in charge of distribution of equipment, with headquarters at Houston, Tex. Mr. Lucore was born April 12, 1869, and was educated in the common schools of Nebraska. He began railway service in 1888 as a clerk in the car accountant's office of the Burlington & Missouri River, and was subsequently to January, 1898, chief clerk in the same office. He was then acting car accountant until June, 1899, when he was made car accountant of that road. He was appointed assisting car accountant of the Chicago, Burlington & Quincy, with headquarters at Chicago, on July 1, 1903, where he remained until he became assistant to the general agent of the American Railway Association in the spring of 1907. This position he now leaves to go to the Sunset-Central Lines of the Southern Pacific, as above noted.

F. M. Lucore.

C. S. Ruttle, superintendent of the Detroit, Bay City & Alpena, has been appointed general superintendent, and will continue as general freight and passenger agent, with headquarters at Bay City, Mich. A. C. McDaniel, auditor and car accountant, has been appointed superintendent also, with office at Bay City.

Mott Sawyer, superintendent of the Bellingham Bay & British Columbia at Bellingham, Wash., has been appointed superintendent of the Columbia division of the Chicago, Milwaukee & St. Paul, with headquarters at Malden, Wash., the former road having been purchased by the Chicago, Milwaukee & St. Paul.

S. H. Charles, trainmaster of the Missouri, Kansas & Texas at Parsons, Kan., has been appointed superintendent of the

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Oklahoma district, with headquarters at Oklahoma City, Okla., to succeed W. E. Brown, resigned. Mr. Charles is succeeded as trainmaster by C. I. Evans, road foreman of engines at Parsons. Effective January 15.

A. B. Ramsdell, superintendent of the St. Louis division of the Chicago, Rock Island & Pacific, at Eldon, Mo., has been appointed superintendent of the Kansas division, with headquarters at Herington, Kan., succeeding G. W. Rourke, who has been transferred to the Illinois division, with headquarters at Rock Island, Ill., in place of H. L. Reed, who succeeds Mr. Ramsdell.

William Boas Wood, who recently became superintendent of the Eastern division of the Northwest System of the Pennsylvania Lines West of Pittsburgh, with headquarters at Allegheny, Pa., was born September 11, 1876, at Harrisburg, Pa. He attended the Sheffield Scientific School from 1894 to 1897, and began railway work in October of the latter year in the chief engineer's office of the Pittsburgh, Cincinnati, Chicago & St. Louis. On September 1, 1899, he was made assistant engineer of the Cleveland & Pittsburgh division of the Pennsylvania Lines West of Pittsburgh, and on January 1, 1901, was appointed engineer of maintenance of way of the Cincinnati & Muskingum Valley, remaining in that position six months, when he was transferred to the Cleveland & Pittsburgh division of the Pennsylvania Lines West in a similar capacity. Mr. Wood was promoted to superintendent of the Richmond division of the Pittsburgh, Cincinnati, Chicago & St. Louis on July 1, 1903, and was made superintendent of the Cleveland, Akron & Columbus on January 1, 1906. Six years later he again returned to the Cleveland & Pittsburgh division of the Pennsylvania Lines as superintendent, which office he held when he was advanced to the position of superintendent of the Eastern division, as noted above.

John Joseph McCullough, whose appointment as division superintendent of the Northern Pacific, with headquarters at Seattle Wash., has been announced in these columns, was born June 17, 1871, at De Soto, Ill. He attended the common schools from 1878 to 1885 and began railway work in May, 1888, as freight brakeman on the Illinois Central. Four months later he went to the Minneapolis & St. Louis, at Minneapolis, Minn., in a similar capacity and was promoted to freight conductor in 1891, leaving in 1894 to go with the Great Northern in yard service at Superior, Wis., and Duluth, Minn. He was made general yardmaster of the Lake terminals in 1896, resigning in September, 1900, to become general yardmaster of the Erie at Susquehanna, Pa., and three months later was transferred to the eastern terminals as general yardmaster and trainmaster, where he remained until 1906. He was then employed by the Minneapolis, St. Paul & Sault Ste. Marie at Minneapolis as yardmaster, and in November, 1907, became connected with the Northern Pacific as general yardmaster at Billings, Mont. In June, 1908, he was made assistant trainmaster on the Rocky mountain division; three months afterwards became senior trainmaster on the Montana division at Livingston, Mont., and in April, 1910, was promoted to inspector of terminals of the entire system, with headquarters at St. Paul, Minn., which position he held at the time of his recent appointment as superintendent of the Puget Sound division, as above noted.

J. J. McCullough.

The Western Maryland announces changes in superintendents' territories as follows: C. A. Steiner, with office at Cumberland, Md., is now in charge of all territory west of George's Creek Junction, Md., and of the first and second districts south of Knobmount, W. Va.; F. L. Brendel, with office at Baltimore, Md., is in charge of all territory east of Edgemont, including the Baltimore terminal, and H. H. Berry, with office at Hagerstown, is now in charge of all territory west of Shippensburg, Pa., up to and including the switch at George's Creek Junction.

Traffic Officers.

E. F. Tillman has been appointed general live stock agent of the Frisco Lines, with headquarters at Ft. Worth, Tex.

A. T. Stewart, assistant to Vice-President J. M. Johnson of the Missouri Pacific, has been appointed assistant to the general traffic manager, with headquarters at St. Louis, Mo.

Henry Edwards Pierpont, general freight agent of the Chicago, Milwaukee & St. Paul, has been appointed freight traffic manager of that road, with headquarters at Chicago, effective January 15. He entered the service of the Chicago, Milwaukee & St. Paul in 1883 as a telegraph operator, and occupied various positions in the station and auditing departments, including the position of freight agent at Kansas City, Mo., until 1893, when he became division freight and passenger agent at LaCrosse, Wis. He remained in that position until January 1, 1896, when he was made assistant general freight agent, with office at Chicago. He filled the latter office ten years, being advanced to general freight agent on January 1, 1906, from which position he is now promoted to that of freight traffic manager, with headquarters at Chicago.

H. E. Pierpont.

W. M. Coble has been appointed soliciting agent of the Macon, Dublin & Savannah, with office at Jacksonville, Fla., and R. E. Phillips, traveling freight agent at Atlanta, Ga., has resigned, and his former position has been abolished.

N. J. Ferguson, traveling freight and passenger agent of the Quebec, Montreal & Southern, with office at Montreal, Que., has been appointed general freight and passenger agent, with headquarters at Montreal, succeeding D. I. Roberts, resigned.

Gay W. Norman, traveling passenger agent of the Grand Trunk, with office at Kansas City, Mo., has been appointed traveling passenger agent, with office at Chicago, succeeding M. J. Corcoran, resigned, and W. M. Lewis succeeds Mr. Norman.

Thomas Grayson Smiley, who has been appointed freight traffic manager of the Western Maryland, with headquarters at Baltimore, Md., as has been announced in these columns, was born on May 26, 1864, at Baltimore. He was educated at Knapp's Institute, Baltimore, and began railway work on March 1, 1880, as a messenger in the general freight office of the Baltimore & Ohio. He has since seen service in the freight traffic department of that and other roads, including the Columbus, Hocking Valley & Toledo, now the Hocking Valley; the Cleveland, Cincinnati, Chicago & St. Louis; the Ohio Southern, now a part of the Detroit, Toledo & Ironton, and the Western Maryland. In the early part of 1907, he was promoted from freight tariff agent of the Western Maryland to assistant general freight agent, and in July of the same year was made general freight agent of the same road, which position he held at the time of his recent appointment as freight traffic manager, as above noted.

O. S. Lewis, division freight agent of the Cincinnati, Hamilton & Dayton, has been appointed division freight agent of the Baltimore & Ohio Southwestern, with office at Cincinnati, Ohio,

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to succeed W. C. McLaughlin, who has been appointed freight tariff agent of that road and the Cincinnati, Hamilton & Dayton, with office at Cincinnati, in place of J. W. Allison, who succeeds Archibald Fries as assistant general freight agent of the Baltimore & Ohio Southwestern and the Cincinnati, Hamilton & Dayton at Cincinnati. Edward Hart, Jr., assistant general freight agent of both roads at St. Louis, Mo., has been appointed western general freight agent of the Baltimore & Ohio Southwestern, with headquarters at St. Louis, and the former office is abolished. P. D. Freer succeeds O. S. Lewis as division freight agent of the Cincinnati, Hamilton & Dayton, with office at Dayton, Ohio.

Frederic A. Miller, general passenger agent of the Chicago, Milwaukee & St. Paul, has been appointed passenger traffic manager, with headquarters at Chicago, effective January 15. Mr. Miller was born April 10, 1858, at Hartford, Pa., and began railway work in August, 1874, with the Cairo & Vincennes, now a part of the Cleveland, Cincinnati, Chicago & St. Louis, filling the positions of cashier and ticket seller at Cairo, Ill., and freight and ticket agent and clerk in the general freight and passenger office until 1878, when he was made general passenger agent of that road. He resigned in 1882, and for one year was union ticket agent of the Wabash, St. Louis & Pacific, the St. Louis, Iron Mountain & Southern, and the Mobile & Ohio at Cairo. Mr. Miller then went to the Chicago, Milwaukee & St. Paul as clerk in the general passenger department. Two years later he was made general agent at Chicago, and from 1887 to October, 1900, he was assistant general passenger agent. He was then appointed general passenger agent, and now becomes passenger traffic manager, as noted above, having completed thirty years of service with the St. Paul road.

F. A. Miller.

Engineering and Rolling Stock Officers.

George W. Robb, master mechanic of the Grand Trunk Pacific, has transferred his office and staff from Rivers, Man., to Transcona, Man.

A. L. Grandy, division engineer of the Pere Marquette at Saginaw, Mich., has been appointed chief engineer, with headquarters at Detroit, Mich.

Benjamin T. Payne has been appointed general bonus supervisor of the Atchison, Topeka & Santa Fe, with office at Topeka, Kan., effective February 1, succeeding John Epler.

J. O. Ely, assistant engineer of the Louisville & Nashville, at Knoxville, Tenn., has been appointed roadmaster of the Lexington and Eastern division of the Louisville & Nashville.

W. A. Hawley has been appointed division engineer of the Erie & Ashtabula division of the Northwest System of the Pennsylvania Lines West of Pittsburgh, with headquarters at New Castle, Pa., succeeding W. R. Hillary, promoted.

D. Patterson, master mechanic of the Kansas City, Mexico & Orient, with headquarters at Wichita, Kan., will hereafter handle all matters pertaining to the motive power and car departments, and the office of general superintendent of motive power and car departments heretofore held by Fred Mertsheimer is abolished.

E. F. McCrea, division engineer of the Cincinnati division of the Southwest System of the Pennsylvania Lines West of Pittsburgh, has been appointed division engineer of the Cleveland & Pittsburgh division, Northwest System, with headquarters at Cleveland, Ohio. E. G. Johnston, assistant engineer, Southwest System, at Indianapolis, Ind., has been appointed assistant division engineer of the Eastern division, Northwest System, with headquarters at Pittsburgh, Pa.

A. P. Prendergast, who has been appointed superintendent of motive power of the Baltimore & Ohio at Baltimore, Md., as has been announced in these columns, entered the service of the Baltimore & Ohio, in 1885, as an apprentice in the shops at Wheeling, W. Va. After completing his apprenticeship he pursued a technical course while employed at Pittsburgh and Youngstown, Ohio, later becoming gang foreman in the Baltimore & Ohio shops at Wheeling, W. Va., and then machine shop foreman at Cumberland, Md., where he also served as roundhouse foreman. He was later made general foreman of locomotive and car repairs and then promoted to master mechanic at Grafton, W. Va. He was subsequently transferred to the Riverside shops at Baltimore, and on January 1, 1910, became master mechanic at the Mount Clare shops, Baltimore. On November 16, 1910, he became superintendent of motive power of the Baltimore & Ohio Southwestern at Cincinnati, Ohio, and in May, 1912, his authority was extended over the Cincinnati, Hamilton & Dayton.

OBITUARY.

I. T. Preston, general agent of the Frisco Lines at New Orleans, La., died on January 14.

Earl P. Douglas, formerly agent of the Star Union Line at Des Moines, Ia., died in that city on January 19, aged 76 years.

F. G. Hudson, general attorney for the St. Louis, Iron Mountain & Southern for the state of Louisiana, with headquarters at Monroe, La., died on January 17, at Hot Springs, Ark.

George W. Parker, general agent of the Illinois Central at St. Louis, Mo., died in that city on January 19. He had been in railway service since 1862, when he was made district attorney in Illinois for the St. Louis, Alton & Terre Haute. He was subsequently general counsel, vice-president, vice-president and treasurer, vice-president and general manager, and from 1885 to 1890, president of that road. Later he became general agent of the Illinois Central. Between 1869 and 1874 he built the St. Louis & Cairo Short Line, which was sold to the Illinois Central in 1896. In 1886 and 1887 he was president of the American Railway Association.

William Greene Raoul, for many years prominent in the railroad business in Georgia and in Mexico, died on January 19, at Atlanta, Ga. Mr. Raoul was elected vice-president of the Central of Georgia in June, 1880, and from January, 1883, until January, 1887, was president of the same company. From April, 1887, to April, 1904, he was president of the Mexican National and of the Texas Mexican, and also of the National Railroad of Mexico. Prior to 1880 he had been successively assistant roadmaster, roadmaster, superintendent, and general superintendent on railroads in Georgia. He was for a time president of the Atlantic & Birmingham.

John Thomas Wann, formerly auditor of the Erie, died at his home in Buffalo, N. Y., on January 12, at the age of 75. He was born in Ireland, and educated at the Royal Academical Institution, Belfast, and began railway work in 1871 in the accounting department of the Atlantic & Great Western, now a part of the Erie. From 1872 to 1874 he was secretary to vice-president, and then for six years was secretary to receiver of the same road. Upon reorganization of the Atlantic & Great Western in 1880, Mr. Wann remained with General Devereaux, who was the president of the Cleveland, Columbus, Cincinnati & Indianapolis, with general offices at Cleveland, Ohio, and was secretary of that company up to February, 1890, when he returned to the A. & G. W. (the New York, Pennsylvania & Ohio) as auditor. In November, 1895, he was appointed auditor of the reorganized Erie Railroad Company, and went to New York. He was the chief accounting officer of the Erie up to his resignation in the fall of 1902, from active business. He was a man of high character, of dignified, though affable manners, and of wide acquaintance with the leading railroad men of his time.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

P. WELSH, Vancouver, B. C., is making inquiries for 1 locomotive.

MITSUI & COMPANY, New York, are making inquiries for 3 locomotives.

THE ST. LAWRENCE BRIDGE COMPANY has ordered 1 locomotive from the American Locomotive Company.

THE PENNSYLVANIA LINES WEST, have ordered 40 consolidation locomotives from the American Locomotive Company, 15 passenger locomotives from the Baldwin Locomotive Works, and 10 switching locomotives from the Lima Locomotive Corporation. The consolidation locomotives will be equipped with superheaters, will have 26 in. x 28 in. cylinders, 62 in. driving wheels, and in working order will weigh 254,000 lbs.

CAR BUILDING.

THE NORTHERN PACIFIC is in the market for 6 postal cars.

THE NEW YORK, CHICAGO & ST. LOUIS is in the market for four all steel passenger coaches.

THE LOUISVILLE & NASHVILLE is said to be in the market for 500 gondola cars. This item has not been confirmed.

THE DULUTH, MISSABE & NORTHERN has ordered 1,000 freight cars from the Western Steel Car & Foundry Company.

THE CHICAGO, INDIANAPOLIS & LOUISVILLE has ordered 2,000 freight cars from the Haskell & Barker Car Company.

THE DULUTH & IRON RANGE has ordered 800 steel ore cars from the Standard Steel Car Company, and 200 ore cars from the American Car & Foundry Company.

THE CAROLINA, CLINCHFIELD & OHIO, mentioned in the *Railway Age Gazette* of January 17, as being in the market for from 500 to 2,000 freight cars, is not in the market for any freight equipment at the present time.

IRON AND STEEL.

THE CHICAGO & ALTON has ordered 1,100 tons of steel from the Wisconsin Bridge & Iron Company.

THE TEXAS & PACIFIC has ordered 1,050 tons of structural steel from the Phoenix Bridge Company.

THE ATCHISON, TOPEKA & SANTA FE has ordered 250 tons of structural steel from the American Bridge Company.

SIGNALING.

The New York State Public Service Commission has ordered the installation of an interlocking plant at Cheektowaga, where the Lehigh Valley and the Erie are crossed by the International (electric) railway. The International is required to pay the whole expense of installation, maintenance and operation. It appears that the International is bound by a contract with the Lehigh Valley to install crossing protection upon demand of the chief engineer of the L. V. This demand was made and a plant was constructed at an expense of about $5,000, which cost was paid by the International. After the construction of this plant, and when it was about ready to be put in use, it was inspected by the electric railroad inspector of the commission, who pronounced the same dangerous to operate by reason of its proximity to the tracks of the Erie; the situation being such that a car moving south and crossing the Erie tracks might be halted by the derail so that the rear end of the car would remain upon the Erie tracks, thereby exposing it to being run into by a passing train of the Erie. The result was that the signals were not put in use. The commission is now satisfied that the interlocking should be installed so as to include in its operation the crossing of the Erie.

Supply Trade News.

Harry Lowman, formerly with the mechanical department of the Southern Railway at Washington, D. C., has entered the sales department of the Chicago Car Heating Company.

The Epping-Carpenter Company, Pittsburgh, Pa., manufacturer of pumping machinery, has opened a branch office at 131 State street, Boston, Mass., in charge of James J. Hart, formerly with the International Steam Pump Company and the Warren Steam Pump Company.

W. W. Talbert has been appointed sales engineer of the Union Switch & Signal Company, Swissvale, Pa., in the central district, with headquarters at Chicago, succeeding W. M. Vandersluis. J. F. Talbert has been appointed superintendent of construction for the central district, succeeding W. W. Talbert.

The annual convention of the sales and factory organizations of the Chicago Pneumatic Tool Company, was held at the show rooms of the company, 1337 South Michigan avenue, Chicago, on January 9, 10 and 11, concluding with a banquet on Saturday evening, January 11, at the Chicago Automobile Club. Nearly 100 of the company's representatives were present. The meeting was opened on Thursday morning with an address by President W. O. Duntley, and the succeeding meetings were divided into sessions devoted respectively to the air compressor department, railroad department, Cleveland plant, general sales department, Detroit plant, electrical department and commercial automobile department.

George Myrick Sargent, of Evanston, Ill., the founder of the first plant in the United States for the exclusive manufacture of brake shoes, and at the time of his death a director of the American Brake Shoe & Foundry Company, died at Atlantic City, N. J., on January 16, at the age of 83. Mr. Sargent patented and developed in 1878 an improvement in brake shoe manufacture, which was finally developed into the American Brake Shoe & Foundry Company. He was born in Sedgwick, Maine, March 29, 1830, and after being engaged for several years in various lines of business in the east entered the iron industry at Moline, Ill., in 1870 as part owner of the Moline Malleable Iron Works. In 1876 he removed to Chicago and invented and designed an improved brake shoe, subsequently known as the Congdon, and organized a company for its production under the name of George M. Sargent & Co. In 1878 it was incorporated as a stock company under the name of the Congdon Brake Shoe Company, and in 1893 a new corporation was organized to carry on the business under the name of the Sargent Company, with Mr. Sargent as president. The company operated two plants, one for the exclusive manufacture of cast iron brake shoes, and another, which after 1896, was devoted almost entirely to the production of couplers, knuckles and steel brake shoes. This business was successfully carried on until 1901, when the American Brake Shoe & Foundry Company, promoted by W. D. Sargent and others, was organized and when it purchased the Chicago Heights plant. Shortly afterward the original plant of the company at Fifty-ninth street, then devoted to steel casting work, was acquired by the American Steel Foundries. Mr. Sargent was elected a director of the American Brake Shoe & Foundry Company. He was also for several years president of the Live Poultry Transportation Company, and in 1904 he was elected vice-president for Illinois of the National Association of Manufacturers. He was for many years a well known figure in railway and supply business circles,

George M. Sargent.

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and up to 1895 had attended 17 conventions of the Master Car Builders' and Master Mechanics' associations.

The Standard Heat & Ventilation Company, Inc., 141 Cedar street, New York, has recently been incorporated and has bought the rights of the Ward Equipment Company, New York, and the Safety Car Heating & Lighting Company, New York, relating to car heating and ventilating, and will make and sell the devices in these special lines hitherto furnished by the two latter companies. The Safety Car Heating & Lighting Company will also act as its agent. The company has now at its disposal a new plant especially equipped for the manufacture of railway car heating and ventilating appliances. The directors of the company are as follows: C. B. Adams, Wm. Barbour, R. M. Dixon, A. W. Kiddle, W. B. Albright, J. F. Deems, W. L. Garland, A. C. Moore and John E. Ward. The officers of the company are as follows: President, J. F. Deems; vice-presidents, A. W. Kiddle and A. L. Whipple; treasurer, A. C. Moore, and secretary and assistant treasurer, John J. Clapp.

The general contracting firm of James Stewart & Co., New York, has been incorporated under the same name, with $3,250,000 capital. The $3,750,000 stock is divided into $1,000,000 7 per cent. cumulative first preferred stock, $1,500,000 7 per cent. cumulative second preferred and participating stock, and $1,250,000 common stock. All of the stock has been issued except $250,000 of the common stock, which will be held in the treasury. There will be no public offering of the shares, as Alexander M. Stewart and James C. Stewart, who constituted the old firm, have together with their friends, purchased all stock available. The officers of the new company will be A. M. Stewart, president; J. C. Stewart, vice-president; Henry W. Lohmann, second vice-president and western manager; C. F. Transom, third vice-president and chief engineer; W. A. Rowan, treasurer, and J. B. A. Fosburgh, secretary. The balance sheet of the new corporation shows total net assets of $2,857,109 after payment of all obligations, of which $1,637,997 is cash and liquid items, the balance of $1,219,112 being in real estate and equipment. The company has $20,000,000 worth of business booked at present; during 1912 its net earnings were in excess of $350,000. Average net earnings for the past five years were in excess of 10 per cent. on its present capital.

TRADE PUBLICATIONS.

ELECTRIC FANS.—The General Electric Company, Schenectady, N. Y., has published its 1913 catalog of electric fans, illustrating and describing fixed and oscillating desk and bracket fans for alternating and direct currents; also ceiling fans and ventilating fans.

PNEUMATIC COMPRESSORS.—The Chicago Pneumatic Tool Company has published in bulletin No. 34 F a detailed description of the design and construction of class G, Chicago pneumatic compressors. This bulletin is 28 pages long and shows many illustrations and diagrams.

SOUTHERN RAILWAY.—The land and industrial department of this company has published a list of mines and quarries in the territory served by the lines of the Southern Railway, showing their location and the kind and amount of output. It has also published a list of live stock shippers and slaughter and packing houses, showing the location, kind of stock handled and the annual output.

ELECTRIC PRODUCTS.—The Sprague Electric Works of the General Electric Company, New York, has published bulletin No. 115, on its electric products. This bulletin supersedes bulletin No. 114, and points out the advantages of Sprague electric direct current generators and switchboards, direct current and alternating current motors, exhaust fans, electric hoists, etc. The bulletin is attractively illustrated.

RAILWAY ELECTRIFICATION IN ITALY.—In the course of an interesting article in the *Elektrische Kraftbetriebe und Bahnen*, it is pointed out that the remarkable progress in the electrification of railways in Italy is due in no small measure to generous subventions by the government. According to the importance of the lines—be they suburban, interurban or main lines—the Italian government grants subventions. Of the sum allocated one-tenth is devoted to construction and nine-tenths to operation.

Railway Construction.

ASHERTON & GULF.—According to press reports a contract has been let for building an extension of about 10 miles to Carrizo Springs, Tex. The line is now in operation from Artesian Wells northwest to Asherton, 32 miles. (October 18, p. 774.)

ATHABASCA & GRANDE PRAIRIE.—Application has been made in Canada for a charter to build from some point at or near the junction of the Solomon river with the Athabasca river in Alberta, northwesterly to a point at or near the junction of the Smoky river with the Muskeg river in the same province, thence north to Dunvegan, passing through Grande Prairie at a point on the westerly side of Bear Lake. Pringle & Guthrie, Ottawa, Canada, are solicitors for applicants.

BALTIMORE & VIRGINIA.—An officer writes that the company may let contracts soon for building a section of the line. The plans call for building from Baltimore, Md., south through Anne Arundel and Calvert counties to Drum Point, on the Patuxent river. Part of the grading has been finished ready for tracklaying, and a small amount of track has been laid. The plans include putting up a few trestles, also some terminal docks and shop buildings. The company expects to use gasolene motor cars on the line. H. M. Thompson, Baltimore, may be addressed. (August 25, p. 390.)

BRANTFORD & HAMILTON (Electric).—An officer writes that the company will carry out work with its own men on an extension from the present line at Langford, in Brantford township, Ont., north and westerly to Galt, about 17 miles. (December 27, p. 1288.)

CANADIAN CENTRAL & LABRADOR.—Application has been made to the Canadian parliament for incorporation by this company to build from Cochrane, Ont., northeast, to a point at or near Cape St. Lewis on the Atlantic coast, with a branch to a point at or near the mouth of the Hamilton river, Que., and a branch to the city of Quebec. Smith & Johnston, Ottawa, are solicitors for the applicants.

CANADIAN NORTHERN PACIFIC.—A contract has been given to the Northern Construction Company for building an extension of the Vancouver Island line from New Westminster, B. C., to Steveston, about 12 miles. (October 18, p. 774.)

CAPE GIRARDEAU & NORTHERN.—Incorporated in Missouri with $2,500,000 capital as a consolidation of the Chester, Perryville & St. Genevieve, and other roads formerly in the Hauck system, a total of 106 miles. It is understood that an extension will be built from Farmington, Mo., north to a point in the lead belt, probably to Flat river. J. R. Byrd, St. Louis, is president, R. H. Schultz, general manager. The general offices of the company are at St. Louis.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY.—According to press reports, this company, which operates a 14-mile line from Mattoon, Ill., east to Charleston, is planning to build a network of interurban lines, including a line from Mattoon, west via Pana and Taylorville, to Springfield, about 80 miles.

CHESTER, PERRYVILLE & ST. GENEVIEVE.—See Cape Girardeau & Northern.

CHICAGO, TERRE HAUTE & SOUTHEASTERN.—This company has given a contract to the Crowley-Salisbury Construction Company, Davenport, Ia., to build a branch to coal fields in southern Indiana. The work on the new branch will be mostly rock excavation.

CINCINNATI, LOUISVILLE, LEXINGTON & MAYSVILLE (Traction).—An officer of this company, which started work some time ago on a line from Covington, Ky., south, writes that grading has been finished on 15 miles, and contracts are to be let at once. The plans call for building from Cincinnati, Ohio, to Lexington, Ky., and from Louisville east to Maysville. The maximum grade will be 1¼ per cent., maximum curvature 4 deg. There will be one 500-ft. bridge and another 200 ft. long, also a number of station buildings. W. T. S. Blackburn, president, Dry Ridge, Ky. (May 31, p. 1220.)

CUYUNA NORTHERN.—According to press reports this company will build an 8-mile extension from the Cuyuna Mille Lacs mine

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in Minnesota, to a point on the Northern Pacific between Cedar Lake and Aitkin. It is understood that the work is to be started in the near future. (March 15, p. 525.)

EASTERN MIDLAND.—Incorporated in Pennsylvania with $400,000 capital, to build from Matamoras, Pa., southwest to the Delaware Water Gap, about 40 miles. The incorporators include A. D. Thornburg, Aspinwall; H. C. Miller, McKeesport, and H. Hunt, Bellevue.

LAKE ERIE & YOUNGSTOWN (Electric).—This company has increased its capital stock from $300,000 to $4,800,000, and will issue $4,500,000, ten-year 5 per cent. bonds. Construction work on the line from Youngstown, Ohio, north to Conneaut Harbor, about 60 miles on a private right of way has been under way for some time. (May 10, p. 1077.)

NEW YORK ROADS.—Bids are wanted January 28, by the New York Public Service Commission, First district, New York City, for the construction of Section No. 2 of the Woodside, Astoria and Corona Rapid Transit Railroad of New York City. It is to be a two and three-track elevated railroad in Second or Debevoise avenue, beginning 300 ft. south of Beebe avenue and extending to a point about 300 ft. south of Ditmars avenue, with five local stations and one express station.

NORTH EASTERN.—See North Railway.

NORTH RAILWAY.—This company, which was incorporated in Quebec in 1906 as the the North Eastern, is applying for a Canadian charter, and for an extension of time to build from the east shore of Lake Temiskaming near Ville Marie, east, passing the southern bays of lakes Des Quinze, Victoria and Kakebonga to the city of Quebec, and to build extensions as follows—from the main line to Ottawa and from Montreal to Quebec; from Quebec and Montreal to the boundaries of the states of Maine, New Hampshire and Vermont, with power also to build a bridge across, or a tunnel under the St. Lawrence river for railway and other traffic. Pringle & Guthrie, Ottawa, are solicitors for the applicants.

PACIFIC & PEACE RIVER.—This company is applying in Canada for an extension of time to build the authorized line from Bella Coola on Burh channel, B. C., thence via the Bella Coola river to a point at or near Fort Fraser, or from a point at or near Dean channel to Fort Fraser, thence north passing east of Stuart lake to a point at or near Fort St. James and north to Fort McLeod, through the Pine pass to Peace river at or near Dunvegan, about 480 miles. J. A. Ritchie, Ottawa, Ont., may be addressed. (March 22, p. 701.)

RALEIGH, ATLANTIC & WESTERN.—Application has been made for a charter in North Carolina to build a line northwest and southeast from Raleigh, N. C., in all about 52 miles. J. H. Pou, Raleigh, is said to be interested.

SAN ANTONIO & AUSTIN INTERURBAN.—This company, with a capital of $25,000, has asked for charter in Texas, to build from San Antonio, Tex., north via Davenport, New Braunsels, San Marcos, Kyle, Buda and Manchaca to San Antonio, about 85 miles. The incorporators include W. B. Tuttle, vice-president of the San Antonio Traction Company; Frederick Terrell, R. R. Russell, F. C. Gross, San Antonio; W. C. Barber, San Marcos, and G. W. Littlefield, Austin.

SAN ANTONIO, UVALDE & GULF.—This company has increased its capital stock from $230,000 to $280,000. Work will begin at once, it is said, on an extension from a point in Atascosa county, near the Live Oak county line, south through the counties of Atascosa, Live Oak and San Patricio, to Mathis, about 50 miles.

SOUTHERN RAILWAY.—This company will at once start work on extensive improvements on the line between Richmond, Va., and West Point, 39 miles. The line will be relaid with heavy rail, replacing lighter sections. The track will be reballasted, sub-structures strengthened and the entire roadway put in condition to handle heavier traffic. It is expected that the work will be completed within six months.

SUMPTER VALLEY.—According to press reports this company has made two surveys over different routes for an extension from the present southern terminus at Prairie City, Ore., south to Burns in Harney county, about 70 miles.

TOPPENISH, FORT SIMCOE & WESTERN.—According to press reports this company, which was organized some time ago to build from Toppenish, Wash., west, will resume work this spring on the section to White Swan, 20 miles.

TWIN FALLS, OAKLAND & SAN FRANCISCO.—According to press reports this company has been organized to build from Twin Falls, Idaho, south to Wells, Nev., about 100 miles. Dr. T. O. Boyd is president; D. J. Roberts, vice-president and general manager; G. D. Aiken, second vice-president and assistant general manager; A. J. Teadey, secretary, and H. J. Failing, treasurer. The headquarters of the company are at Twin Falls.

WASHINGTON ROADS.—According to press reports the McCoy-Loggie Timber Company, of Bellingham, Wash., will build a logging road up North Fork, about six miles, connecting with the Northern Pacific near Saxon. Work is to be started early this spring. It is expected that the cost of the line will be about $100,000. Eugene Loggie is manager.

WEST TENNESSEE TRACTION.—An officer writes that contracts are to be let soon and the company expects to begin work about April 1, on a line from Memphis, Tenn., northeast via Bartlett, Arlington, Brandon, Mason and Brownsville to Jackson, 86 miles. Financial arrangements are partially completed to build the first section from Memphis to Arlington, 21 miles. This section has been located, the rights of way secured and terminal arrangements made at Memphis. A contract to use the tracks of the Memphis street railway company into Memphis has been entered into. D. P. Bennett, president, D. G. Sargent, vice-president and general manager, Memphis. (December 27, p. 1288.)

RAILWAY STRUCTURES.

BUFFALO, N. Y.—The New York Public Service Commission, Second district, has ordered the Delaware, Lackawanna & Western to eliminate its crossing of the tracks of the Buffalo Creek, the Pennsylvania Railroad and the New York, Chicago & St. Louis near Smith street, between the Abbott road and the Buffalo river, Buffalo, by elevating the tracks of the D. L. & W. After the approval of the plans by the commission the D. L. & W. is required to complete the work by January, 1914. The expense of the elimination is to be borne by the D. L. & W. except that the sum of $10,000 shall be paid by each of the other three roads. The crossing consists of seven parallel tracks running in a northerly and southerly direction, of which the New York, Chicago & St. Louis owns and operates two, the Pennsylvania Railroad two, and the Buffalo Creek three. Running in an easterly and westerly direction and crossing the above-mentioned seven tracks at grade there are two tracks owned by the D. L. & W.

BUTTE, MONT.—Plans and specifications have been prepared, and bids have been asked for a new passenger station for the Great Northern, which will cost approximately $125,000. The building will have a frontage of 120 ft., and will be 180 ft. long.

CHICAGO, ILL.—The Central Terminal Railway, a subsidiary of the Canadian Pacific, has acquired 13 additional parcels of property in the vicinity of West Fifteenth and South Union streets for its new freight terminal. The company is also purchasing land for auxiliary yards at Harvard street and Forty-eighth avenue. Thus far it has acquired for both sites 252 parcels of land for a total stated price of $2,480,681.

PORTLAND, ORE.—The Spokane, Portland & Seattle is planning to erect an eight story freight terminal building some time during the year.

SAN ANGELO, TEX.—It is expected that work will be started shortly on a new eight-stall roundhouse for the Gulf, Colorado & Santa Fe.

VAN BUREN, ME.—An officer of the International Railway of New Brunswick is quoted as saying that the Maine legislature has passed a bill giving the International a franchise for a railway bridge across the St. Johns river from St. Leonard's, New Brunswick, to Van Buren, Maine. The New Brunswick government has already granted similar rights on the Canadian side, and the bridge will be built during the coming summer. The building of an international bridge at St. Leonard's will give the International direct connection at Van Buren with the Bangor & Aroostook.

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Railway Financial News.

ATLANTIC, NORTHERN & SOUTHERN.—Judge Arthur, in the district court at Atlantic, Iowa, on January 13, ordered the resale of this company and declared forfeited the money paid from time to time by Leslie W. Shaw, of Philadelphia, Pa., on account of the purchase price of $402,000 bid at the time of the sale September, 1912.

BOSTON & LOWELL.—The Massachusetts railroad commission has approved the issue of $1,000,000 twenty-year 4½ per cent. bonds for refunding a like amount, due February 1, 1913.

BROOKLYN RAPID TRANSIT COMPANY.—This company's subsidiary, the New York Municipal Railway Corporation, has applied to the New York Public Service Commission for authority to execute a first mortgage to the Central Trust Company, New York, as trustee, to secure an issue of not exceeding $100,000,000 of 53-year 5 per cent. bonds dated July 1, 1912. The proceeds will be used for new equipment for the construction of subways and for the strengthening and construction of elevated lines.

CHICAGO & NORTH WESTERN.—Kuhn, Loeb & Company, New York, have bought from this company the following securities, have resold the equipment issue and will offer the other blocks in the near future: $5,700,000 equipment trust certificates of 1912 ($10,000,000 authorized); $2,500,000 Des Plaines Valley first mortgage 4½ per cent., due March 1, 1947; and $1,120,000 St. Paul Eastern Grand Trunk first mortgage 4½ per cent. bonds of 1913-January 1, 1947.

CLEVELAND & PITTSBURGH.—The New York Stock Exchange has listed $2,019,100 additional 4 per cent. special guaranteed betterment stock issued to pay for improvements as follows: Right-of-way and track elevation, $303,816; second, etc., track and yards, $219,503; station buildings, $2,587; docks and wharves, $1,240,106; freight cars, $55,936; passenger cars, $192,465; balance on account of 1910 improvements, $4,688.

CLEVELAND SHORT LINE.—The directors have voted to increase the common stock from $3,750,000 to $4,750,000, the proceeds to be used in completing the line under construction. The Lake Shore & Michigan Southern owns all the $3,750,000 common and $3,525,000 preferred stock.

ERIE & CENTRAL.—Stockholders of this company, the stock of which is owned by the Delaware, Lackawanna & Western, have voted to lease the road to the Delaware, Lackawanna & Western for 99 years from July 1, 1913.

HUDSON & MANHATTAN.—Kuhn, Loeb & Company, New York, Robert Fleming & Company, London, and Harvey Fisk & Sons, New York, as readjustment managers, have prepared a plan for the readjustment of the finances of this company. This plan will reduce the fixed charges by over 25 per cent. and will provide for the payment of $21,157,000 Hudson Companies' notes which mature between February 1, 1913, and February 1, 1914. The company has not been earning the interest on its 4½ per cent. first mortgage bonds. Bondholders and stockholders to become parties to the readjustment must deposit their bonds (with February 1, 1913, coupon attached) and their stock or voting trust certificates with the Guaranty Trust Company, New York, or with Robert Fleming & Company, London, on or before February 14, 1913. It is said that between 85 and 90 per cent. of the Hudson & Manhattan bondholders have already signified their willingness to participate in this plan.

LARAMIE, HAHN'S PEAK & PACIFIC.—A bondholders' and noteholders' protective committee has been formed consisting of Alexander J. Hemphill, Henry Sanderson, W. Frederick Snyder and Lawrence Barnum, with the Guaranty Trust Company of New York as depository, and Hornblower, Miller & Potter as counsel, and L. B. Franklin, 28 Nassau street, New York, as secretary. This committee calls for the deposit only of the first refunding mortgage 6 per cent. bonds and the collateral trust 7 per cent. notes. Another committee, consisting of Frank D. Pavey, chairman; Thomas E. Eaton, Robert H. Gault, James W. Green, William B. Randall and Charles H. Thomas, requests deposits of first refunding bonds with the New England Trust Company, Boston, Mass., and the Security Transfer & Register Company, New York.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—William A. Read & Company, New York, are placing at par and interest new 4½ per cent. equipment notes series E, dated January 1, 1913, and due $159,000 semi-annually from January 1, 1913, to January 1, 1923, both inclusive. The total issue is $3,180,000. The pledged equipment is all new and of large capacity, consisting of 25 locomotives, 49 steel passenger and mail service cars, 1,500 steel frame box cars, 400 steel underframe ballast and flat cars, 300 ore cars and 20 cabooses.

NEW YORK CENTRAL LINES.—J. P. Morgan & Company, the First National Bank, and the National City Bank, all of New York, are offering $12,540,000 4½ per cent. certificates issued under the New York Central Lines equipment trust of 1913. The certificates are offered in series having progressive dates of maturity, from January 1, 1914, to January 1, 1928, at prices to net about 4.65 per cent. The certificates are guaranteed by the New York Central & Hudson River and five of its principal controlled lines. Of this issue $24,000,000 certificates are authorized.

NEW YORK, CHICAGO & ST. LOUIS.—An annual dividend of 4 per cent. has been declared on the $14,000,000 common stock, payable March 1 to holders of record January 31, comparing with 3 per cent. paid in each of the three preceding years.

NEW YORK, NEW HAVEN & HARTFORD.—Morton F. Plant, of New London, Conn., and Lawrence Minot, of Boston, Mass., have been elected directors. They succeed George MacCulloch Miller, who retired on account of age, and Augustus S. May, treasurer of the company, who served temporarily.

NORTHWESTERN PACIFIC.—The control of this company has passed from the Atchison, Topeka & Santa Fe to the Southern Pacific in accordance with the agreement recently made between the two latter companies. The Southern Pacific will have the control for one year at the end of which time the Atchison, Topeka & Santa Fe will again assume control.

PENNSYLVANIA RAILROAD.—This company has acquired the Cambria & Clearfield, which operates about 399 miles in Pennsylvania. The road has been part of the Pennsylvania for some time, the Pennsylvania owning practically all of the capital stock and operating the road under lease.

SCOTT CITY NORTHERN.—Dewey Dunn and W. H. Wagner were appointed receivers on January 11 in proceedings brought by Attorney-General Dawson, of Kansas, on the ground of alleged over-capitalization and insolvency and mismanagement of its officers. The line extends from Scott City to Winona 53 miles, and has a capitalization of $1,325,000 each of stock and bonds.

SOUTHERN PACIFIC OF MEXICO.—The following directors have resigned from the board: F. V. S. Crosby, R. L. Gerry, R. S. Lovett, Alex. Millar and W. V. S. Thorne. Julius Kruttschnitt succeeds R. S. Lovett on the board and is chairman of the executive committee. The other vacancies were filled by the election of L. J. Spence, F. W. Mahl, W. A. Worthington, and W. F. Bull. Alex. Millar also resigned as secretary of the board, the vacancy not being filled.

TENNESSEE CENTRAL.—A protective committee has been formed for the general mortgage 5 per cent. bonds due 1954, consisting of Alexander J. Hemphill (chairman), Graham H. Harris, Breckenridge Jones, Walter T. Rosen, and Albert H. Wiggin, with Lewis B. Franklin, 28 Nassau street, New York, as secretary, and Roberts Walker and Van Vorst, Marshall & Smith as counsel. Deposits are requested to the Guaranty Trust Company of New York. According to press reports Federal Judge E. T. Sanford on January 18 ordered the receivers to issue $330,000 6 per cent. receivers' certificates, the proceeds to be used for new equipment and improvements.

VIRGINIAN.—Stockholders will vote at the annual meeting on February 1 on the question of reducing common stock from $34,850,000 to not less than $31,271,500.

Samuel L. Fuller has been made a director of this company, succeeding Franklin Q. Brown.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,082 copies were printed; that of these 6,288 copies, 6,771 were mailed to regular subscribers and 960 were provided for counter and news companies' sales; that the total copies printed this year to date were 82,051 copies—an average of 8,970 copies a week.

VOLUME 54. JANUARY 31, 1913. NUMBER 5.

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WHATEVER the reason assigned for not paying employees in cash—whether it be that it necessitates running extra trains over the road, the employment of highly paid paymasters, the interference with employees' work, or the danger of handling large amounts of cash out on the road—the underlying and controlling objection is based on the dislike of operating men to interference from the treasury department. It was this desire to get rid of annoyances that has led many roads to change from a system of payment by cash to a system of payment by check. The treasury department itself has been largely responsible for this distrust of its methods. On the Pennsylvania Lines West this prejudice and dislike have been almost entirely overcome simply through a common-sense policy of co-operation which the paymasters have pursued. In working out the system that is being used on these lines and which is described elsewhere in this issue, the co-operation of the division superintendents was sought and obtained, and the result has been that employees are being paid not only in a manner that is satisfactory to the treasury department, but also to the operating department and to the employees themselves. There is no more complicated network of lines in the country than those of the Pennsylvania Lines West, and it probably required consistent thought and effort and a great deal of patience to lay out the routes and times of payment in such a manner as to interfere least with the employees' work and with the regular operation of trains. Whether or not the effort and the patience required are too great a price to pay for the advantages of the cash system of payment is a question that each general manager has to decide for himself. If, however, he is willing to expend the effort and patience, the experience of the Pennsylvania has demonstrated quite clearly that it is entirely possible to pay all classes of employees in cash promptly and entirely satisfactorily.

THE method of dealing with attachments and liens against employees' wages illustrates possibly better than anything else can the spirit which lies behind the system of paying employees in cash on the Pennsylvania Lines West. There is nothing in the law of any of the states through which these lines run which would compel the railroad company to notify an employee of an attachment obtained on his wages. It would be easy to argue that employees should not run into debt and that a man who had his wages attached was not deserving of consideration. This is not the argument that is accepted in regard to employees on the Lines West. The railroad company goes to considerable trouble and some expense to notify a man whose wages have been attached of the fact and he is advised to consult at once with the nearest company's solicitor. Men are not permitted to make an assignment of their wages. If a man urgently needs money before the end of the month, it is possible for him to obtain it from the railroad company. In dealing with loan brokers the company advises its men to make a tender of the amount due, with legal interest, and if the loan broker refuses this tender, the company assumes the burden of paying the employee the wages due him and fighting the case, if necessary, against the broker. It was at one time the practice to discharge a man who was found to be in debt to a loan broker, but this had the effect of helping the loan broker. A Pennsylvania employee was considered a preferred risk simply because after he had once gotten in the grasp of the money lender the severest possible pressure could be brought to bear to compel the payment of any interest, no matter how exorbitant, through the fear of exposure. Now this fear has been removed and the employee who has been unfortunate and has gotten himself in trouble can feel that the company is his friend rather than the money lender's instrument of vengeance. Of course the man who habitually gets in debt is not a desirable employee and is not retained. The attitude in regard to money lenders and attachment of wages for bills is only one of a number of ways in which the company is making a consistent effort to gain the loyalty of its employees through a consideration for their convenience in the matter of receiving their wages that, it would seem, is bound to have a very considerable effect.

IN his paper on Freight Car Tactics, which was published in our issue of January 24, Arthur Hale spoke of the box car as a legal-tender car, because it may be interchanged generally by the railroads and used for transporting practically any kind of commodity. In the discussion of this paper at the annual meeting of the Central Railway Club, attention was directed to the fact that although the American Railway Association has established standards as to the size and capacity of such cars, nothing has been done towards the establishment of standards for their physical condition. A little less than a year ago we called attention in a series of articles on Defective Box Cars

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and Damaged Freight, to the fact that an extremely large proportion of the box cars had roofs, sides or ends which allowed moisture to leak through into the car and thus unfitted it for safely transporting such commodities as flour, cement, grain, etc. Very many of the cars have defective sides, ends or floors which allow grain or similar material to leak out and can only be prepared for transporting such materials safely by going to considerable expense, which must be incurred as often as the cars are used for such service. It was suggested, therefore, that if box cars are to be considered as legal-tender cars there are a great many counterfeits in circulation. Such a large proportion of the merchandise transported in box cars can be damaged by these defects that it would seem advisable for the American Railway Association to outline certain physical conditions which must be complied with in order that the cars may safely be used for such purposes, and then that some distinction be made between the cars in 100 per cent. condition and less, so that the poor cars can be discriminated against, thus forcing the roads that own them to put them in better condition. Two causes are responsible for the cars being in defective condition. Either they were poorly designed or constructed, because of ignorance or a desire to save money in the first cost, or they have not been properly maintained. In the first case it would be necessary to spend considerable money in rebuilding and placing them in proper condition, but this would probably be saved many times over before the cars became useless, by the reduction in the expense of maintenance and in the damage to the lading. The second cause would, of course, be overcome by seeing that proper attention was given to the maintenance of the cars. As a rule this has always resulted in a net decrease in the total cost of maintenance over any given period of time. In the interests of efficiency and economy of the individual roads and the railroads at large some steps should be taken toward keeping the legal-tender cars in 100 per cent. condition. It would prove to be no small task, but in the end would undoubtedly be a wise and far reaching investment.

AN EXAMPLE OF GOOD REGULATION.

THE report of the New York State Public Service Commission on the Corning collision, noticed in the *Railway Age Gazette* of January 17, page 105,* embodies such an excellent treatment of its subject that it may be said to mark a decided advance in governmental efficiency in the matter of safety on railroads. Our forty-three state commissions have made very slow and irregular progress in their function of correcting the neglect of railways, and the activities of the federal government in the same direction have been characterized by many and serious mistakes, though producing at the same time some beneficial results. In the case of the state governments the responsibility for inefficiency may be traced quite directly back to the voters, for the most of the weakness of state bodies has been due to the employment of the elective system, instead of having commissioners appointed; too short tenure of office, low salaries and the evils incident to adherence to political instead of business principles. But in the Corning report we see the fruits of the course opposite to this in a shining example, in fact. The voters of the state of New York had seen the evils of corrupt government so clearly that in 1906 they chose, as governor, Charles E. Hughes, incorruptible, farsighted and thoroughly public spirited. Mr. Hughes, in selecting men for the public service commissions, got the very best men that he could find available, and in this he was aided by a law providing much better salaries than are usually allowed for commissionerships. One of the five commissioners at Albany is a mechanical engineer with railroad experience. The commission, in selecting its inspectors, also sought men of railroad experience, judicial temperament and fitness for the several kinds of work to which they were assigned. Both the governor and the commission had a good degree of success in their quest for competent men; so that we have here an illustration of how very simple are the means and methods needed for good government when men wholly devoted to the public interest follow persistently a rational course.

The Corning report may almost be called an essay on safe train-running. Not the least of its merits is the lucid arrangement, secondary matters being put in their proper secondary place. "The question of supreme importance is how to prevent accidents," rather than merely to minimize the effect of the accidents. Every state railroad commissioner will find profit in reading this report a second time. The paragraphs addressed to the brotherhoods lay down the law—the moral law—in no uncertain terms. That many employees in all departments (thoughtlessly or otherwise) habitually shield fellow employees who are careless or incompetent, is all too well known. That a brotherhood which formally declares adherence to high ideals is bound to take vigorous action to repress every kind of conduct which violates those ideals is a solemn truth; and the Commission does a valuable public service in so frankly calling attention to these conditions.

On the main issue, discipline of employees, the report goes at once to the normal starting point; that is, the offices of the assistants to the superintendent, on whom devolves the immediate responsibility for discipline. There is no possible substitute for strong men in these positions. These officers must not only be strong—"capable of dealing justly and fearlessly"—but they must feel secure in their places. It will not be out of place to add, what has been said in these columns many times, that these men, like the division superintendent, should be kept in one place long enough to give the position the benefit of the incumbent's individuality, and the knowledge and ability that depend on this. Too frequent promotions may be almost as injurious as too frequent changes for other causes. All this implies the need of better salaries, of course.

This part as well as much of the rest of the report, is in general terms, and evidently is intended to apply not alone to the road on which this collision occurred. The commission has been studying the conditions very carefully throughout the state of New York for five years. Moreover, the writer of the report recognizes, as a practical matter, whatever theorists might say, that roundhouse foremen, trainmasters and road foremen cannot surely be depended on to reform themselves; he addresses himself to the higher officers: "There should be greater care in the selection," etc. Again, we read: "Managers and superintendents should enforce discipline at any cost." This phrase—"at any cost"—is a reminder of the fact, known to all operating officers of the larger roads, that rigid discipline, which is absolutely fundamental in such an exacting business as running express engines, is costly, in more senses than one, and that if it is to be administered successfully it must be reasonably uniform on all of the divisions of a road.

As has been suggested, a main purpose of this editorial is to make readers want to go over that report a second time. We shall not take the time to enlarge on all of the points which merit commendation. Not the least of these is the declaration that the main reliance (for protection against rear collisions) must be on the fixed signals; that we put too much dependence on the flagman and his uncertain methods. We ask of him impossible things. The exposure of the utter baselessness of Schroeder's explanations and excuses is another point of interest. Many investigations are deficient in this feature. The commission holds that questions of steel cars and fire dangers call for much in-

*The full text of the report, which has since been issued, contains a number of photographic illustrations showing the situation at the place where the collision occurred, and also showing the damage done to the steel cars. The commission, in discussing the condition of engineman Schroeder on the morning of the collision concludes that the fear that Schroeder was not fit for his duties was the reason why the fireman was in the engineman's cab; the explanations given by the fireman attributing some other reason, or reasons, are believed to be entirely inadequate. Inspector Buchanan, in his report, discusses the question of having a third man on the locomotive to make sure that a good lookout shall be kept. He decides against that proposal, and adds that inquiry from the larger railroads indicates that the "Mother Hubbard" type of engine is being eliminated from future plans.

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vestigation before any governmental action would be warranted. We need not enlarge on the difference in the tone of this paragraph as compared with that which pervades the discussions on this subject in some other quarters—before the House Committee at Washington, for example. Indeed these New York Commissioners are in some respects so cautious and conservative that if they were in the position of the Commerce Court they would be in imminent danger of having their heads cut off!

SOME MORE REASONS WHY RAILWAYS ARE UNPOPULAR.

THE railways of the United States are more popular than a few years ago. They are so because they have set out to make themselves so. They have tried to popularize themselves by correcting things that are wrong and remediable in their service and rates, and by explaining things that merely seem wrong or are not remediable. But the roads are not nearly so popular as they want to be, and ought to be for their own good and the public's. This is largely because there still exist conditions that need to be changed. More people come in contact with railways as passengers than in all other ways. The way passengers are served, will, therefore, make a road more "boosters" or critics than anything else. And the way passengers are still treated by the roads and their employees in many instances makes thousands of critics.

This paper published a few years ago (*Railway Age Gazette*, November 19, 1909) an article entitled "Some Reasons Why Railways are Unpopular," in which were given specific examples of the sort of shortcomings of the railways or their employees we now have in mind. Recently many roads have conducted campaigns among their employees on the subject of consideration for and courtesy to passengers. In many passenger cars and stations, placards are tacked up stating that the managements desire their patrons to be given every reasonable consideration and attention, and asking patrons to report to headquarters all cases of incivility, etc. These things have had a wholesome effect. But it is still true that a large part of the employees who deal with passengers are not as civil as they ought to be and that many are careless or incompetent.

Furthermore, there are serious defects in the passenger service of numerous roads which the managements alone can correct. This is especially true on branch lines. One of the most serious shortcomings is the glaring disproportion between the amount of attention given and money devoted to providing through passenger service and local passenger service. When we observe the kind of local service given on most branch lines and on many main lines we do not wonder that public sentiment in communities outside the cities often becomes hostile to the railways or that the people of these outside communities often encourage the development of electric interurban lines and flock to them when they are opened.

Take, for example, the difficulty that people at towns and small cities often meet in getting proper sleeping car accommodations. Our experience has been that in most cases when the agent at a country station is asked to wire reserving a lower berth he fails to do so, and the passenger has to take an upper berth, or gets none. The passenger in that case criticises the railway management. Why shouldn't he? The agent represents the management; and the management is properly held responsible for his faults of omission and commission. Here is a specific instance which illustrates what often happens: A traveler going from a good-sized city to a small town had to change trains at 3:30 o'clock a. m. He asked the ticket agent at the point of origin to telegraph for a lower berth for him on the train to which he was to change. When this train came in he hurried, carrying two heavy pieces of baggage, toward the rear where the sleeping cars were. None of the doors of the sleeping cars was open; and he had to carry his baggage back to the chair car and go through the train back to the sleeping cars. He finally found a porter who was awake, but who knew nothing about his reservation. The ticket agent should have wired for the reservation, but apparently did not. And the doors of at least one of the sleeping cars should have been opened, anyway; for the rules require this at every station where a stop is made. In this case complaint was entered, and both the railway management and the Pullman Company took prompt action.

Here is another experience of the same traveler: Desiring to leave New York for Chicago he telephoned for a drawing room on a through sleeping car operating over two lines connecting at Buffalo. When the ticket was delivered it was not for a drawing room, but a section, and it was returned. Then the ticket agent said that the drawing room could not be reserved until the next morning, one hour before the time for the train's departure. Repeated inquiries as to why at last elicited the information that the agent was preparing to sell the passenger a drawing room on a car that went to St. Louis, in consequence of which, without previous warning to him, he would have had to change cars at Buffalo. Naturally, he got angry and went by another route. And if he had gone the way he originally planned and had found he had to change at Buffalo, he naturally would have been indignant. Think of such things happening in connection with transportation between two such points as New York and Chicago!

Recently an eastern business man who was traveling from one end of the continent to the other reserved a drawing room from one of the large interior terminals to the Pacific Coast. When he got on the train he found the same drawing room had been sold to other persons who were in possession of it and refused to give it up. He stood on his rights, insisted on having a drawing room, and the railway had to put an extra sleeping car on the train and haul it 2,400 miles. That was pretty expensive for the railway. But who ought to bear the expense and annoyance caused by the carelessness or incompetency of railway employees?

The dining car service of the railways of the United States is the best in the world. But things occasionally happen in dining cars that are enough to try the soul of patience. There is a certain railway president who has a disconcerting way of turning up in unexpected places. He turned up for breakfast at 7:30 o'clock one morning recently in a dining car on one of his own trains. He found the car cold and unclean, the cooking poor and almost every feature of the service unsatisfactory. When he finished breakfast he called the dining car conductor and told him to hand in his resignation at the end of his run. The astonished conductor asked for an explanation. The president replied that if that morning's service was a sample of what was being given on that car, and the conductor did not know why he should resign, that was a conclusive argument for discharging him. The result was that the conductor was not discharged, but that he became a chastened and a more efficient employee. Railway presidents and vice-presidents are mighty busy men. They haven't time to become regular inspectors of dining car service. But the spreading of the news of a few incidents like that over a railway helps a lot.

A short time ago a man and his family had to travel across country on local trains from a station on one main line of a certain railway to a station on another of its main lines. The distance was relatively small, but the circumstances were such that, carrying a good deal of hand baggage, they had to change trains several times. When the ticket agent at the point of origin sold their tickets he said they would have to make three changes and would arrive at their destination at 6 p. m. When they reached the point where they made the third change they found that they would have to make still a fourth change farther on and that instead of reaching their destination at 6 p. m. they would reach it almost two hours later. The agent at the point of origin, without looking the matter up, had carelessly assumed that they would catch a certain train at the

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point of their third change, when in fact that train was regularly scheduled to leave one hour earlier than their train was scheduled to arrive. There is a good deal of difference between making three expected changes of trains and four changes, one of which is unexpected, and between arriving in a strange place at 6 p. m. and at 8 p. m. A ticket agent who will sell tickets over such a route without making absolutely certain that he is giving passengers correct information is careless or incompetent. And every man who travels much as an ordinary passenger can testify from his experience that such things happen every day on railways all over this country.

We propound the following conundrum: Why is a station bulletin board? Theoretically, its purpose is to give information to passengers regarding the time of arrival and departure of trains. In practice, the number of bulletin boards at country stations that regularly give correct information is small. And when at 9:30 a. m. the waiting impatient traveler, noting that his train is bulletined to arrive at 9 a. m., inquires of some station employee when it will be along he will in a majority of cases get a curt answer. The answer may not be curt enough to make the basis of a complaint to the management, but it is likely to be quite curt enough to give the inquirer a feeling of resentment that will later manifest itself in some form of antagonism to the railway.

Speaking of bulletin boards brings to mind our old friend, the late passenger train. The muck-raking author of an article in one of the current magazines greatly exaggerates the proportion of late trains in this country and makes their lateness the basis for some bitter and unjust criticism of the managements of American railways. But the facts are, that many trains in all parts of the country are late; that while there are good explanations of this condition there is no good excuse for it and that it does furnish a good text for muck-raking the roads. The best management of the best railway cannot prevent trains from being late occasionally. Any good management can keep them from being late chronically. If a road's trains are chronically late it is a sure sign either that the published schedules are too fast, or that there is not enough effort made to keep trains on time. If the published schedules are too fast, the only fair way to treat the public is to lengthen them. If the schedules are not too fast, they can ordinarily be maintained.

The main cause of late trains is unnecessary delays at stations. The employees of the roads, of the express companies and of the postoffice department often fail to plan for putting their traffic on and off the trains promptly; they often move with leaden feet while putting it on and off; and in consequence often a train departs late. When one train—especially on a single track line—leaves a station late, the first step has been taken toward demoralizing the whole train service, if the lost time is not made up at once by fast running; and if it is attempted to make it up by fast running there is likely to be an accident that will cause more and greater delays if not something worse. The speed of trains should be strictly regulated according to the character of track and equipment; and such regulation could be carried out and trains ordinarily kept on time if more were done to reduce the many needless delays at stations. Numerous trains that make long through runs and arrive on time at terminals arrive late at many intermediate stations. Every time a train arrives or departs late at any place it makes critics and enemies for the roads. Are critics and enemies so much more to be desired at intermediate places than at terminal points.

There are many roads that make great efforts to keep their trains on time; but there are so many through sleeping car routes over connecting lines that the better managed and equipped roads have to share the odium caused by the shortcomings of their weaker brethren. When will the managements of all American railways get the courage to make slow schedules for slow trains or exercise the necessary supervision to keep all trains on time except under extraordinary conditions? And how can any management hope to make its railway really popular with its patrons until it regularly does what it promises to do and what they pay it for doing? Some of the state railway commissions recently have been agitating regarding this matter of late trains and threatening to bring suits to have the roads heavily fined for not maintaining their schedules. Can any one say that the public and public officials have not a right to complain when trains are chronically late?

The incidents and conditions mentioned all point to the need for more and better supervision of station and train service. This better supervision should begin with the selection of employees, it should extend over their training, and it should include incessant inspection and disciplining in order to make sure that they are doing, and will do, what they have been instructed to do and what the rules require them to do. This need for more and better supervision is, of course, much greater on some roads than on others. But it exists more or less on practically all. Most of the additional supervising could be done by the present officers if they would constantly keep their eyes open for defects of service and promptly apply the obvious remedies. One trouble is that many railway officers are so used to the existence of conditions which annoy their patrons that they actually do not notice them. Another trouble is that the very fact that a man is an officer of a railway prevents him from seeing some things that others see because employees are all on their good behavior when he is about. Also, there is a considerable number of men in official positions on railways—as in all other businesses—who have got into ruts and lack the energy or disposition to get out of them and do things that they haven't been used to doing. All of these classes of officers need an awakening as a necessary prerequisite to the awakening of the employees under them. Probably in order to get adequate supervision of station and train service most roads would have to incur some additional expense. But isn't it worth while? There is no better asset of a business than pleased patrons; and there is no worse liability than disgruntled patrons.

NEW BOOKS.

Traveling Engineers' Association. Proceedings of the twentieth annual convention. Illustrated. Bound in leather, 410 pages, 6 in. x 9 in. Published by the Traveling Engineers' Association, W. O. Thompson, Secretary, Buffalo, N. Y. Price $1.50.

At the last convention of the Traveling Engineers' Association, held in Chicago, August 27-30, 1912, a number of the more important and interesting problems in connection with locomotive and train operation were presented for discussion. In each case the author of the paper, and especially the members discussing it, approached the subject with the evident intention of obtaining the greatest benefit possible in the time at their disposal. In consequence both the papers and the discussions were most valuable. They are given complete in the proceedings. The committee on subjects wisely provided but six topics, as follows: Benefits to be derived from chemically treated waters in connection with the increased efficiency of locomotives; Fuel economy and the relation of mechanical appliances, such as superheaters, mechanical stokers, brick arches and the handling of trains; Handling of long passenger and freight trains with modern air brake equipment; Inspection of locomotives and form of work reports that should be required of engineers on arrival at terminals; How to interest enginemen in the economical use of fuel and lubricants, and the advantages and disadvantages of lead on modern locomotives. The volume includes a copy of the constitution and by-laws, a list of members with their addresses, and a list of the subjects presented for discussion at each of the previous conventions. The subjects which will be presented at the 1913 convention are also given.

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LIFT BRIDGES OVER THE BUFFALO RIVER.

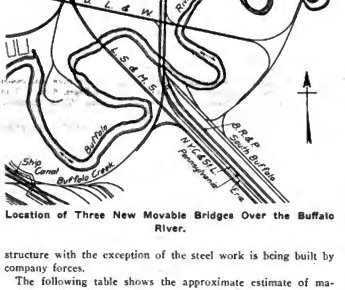
The Construction of Three Movable Bridges Replacing Fixed Spans to Allow Navigation of a River at Buffalo.

By Emile Low.*

The main harbor of the city of Buffalo comprises the Buffalo river and the City Ship canal, the former a natural stream, and the latter an artificial waterway. From a stream originally less than 10 ft. deep, the Buffalo river has gradually been deepened by dredging to 23 ft. below mean lake level, this depth now being available at the Lake Shore & Michigan Southern bridge. A contract for deepening the river to 23 ft. above this bridge has been let to the Great Lakes Dredge & Dock Company, Chicago, and in order to utilize this section for navigation and industrial purposes, movable bridges are being substituted for the present fixed spans. Work is now in progress on three railway bridges used by five roads, the Lake Shore & Michigan Southern, the New York, Chicago & St. Louis, the Pennsylvania, the Buffalo Creek, and the Buffalo, Rochester & Pittsburgh.

LAKE SHORE & MICHIGAN SOUTHERN BRIDGE.

The previous crossing of the Lake Shore & Michigan Southern comprised two fixed spans of 110 ft. each. As the new bridge is to occupy the site of the old one, a temporary double track pile bent trestle with three plate girder spans was built south of and parallel to the old bridge. At the bridge crossing, solid limestone is found at an elevation about 36 ft. below mean water level. The abutments rest on pile foundations, 30 ft. piles being driven to rock. The substructure comprises two abutments, A at the west end and B at the east end, and four piers Nos. 1, 2, 3 and 4. The substructure is of 1:2½:5 concrete. The entire



Location of Three New Movable Bridges Over the Buffalo River.

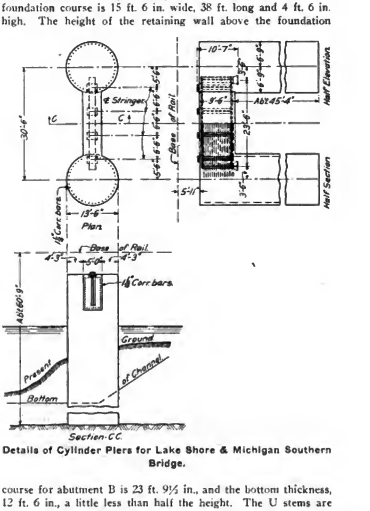
structure with the exception of the steel work is being built by company forces.

The following table shows the approximate estimate of materials required in the foundation:

	Concrete.				Reinforcement.				
	Total Yardage.	Cement. Sacks.	Sand. Cu.yds.	Broken Stone. Cu.yds.	Piles.	¾ in. sq. Lin.ft.	1¼ in. sq. Lin.ft.	Cross Girders.	Castings.
West Abut. A.	390	2,030	180	360	80	760	....	..	..
Pier 1	590	3,070	270	540	...	....	6,480	1	2	4
Pier 2	590	3,070	270	540	...	760	6,240	1	2	4
Pier 3	620	3,225	285	570	...	...	6,240	1	2	4
Pier 4	620	3,225	285	570	...	....	6,240	1	2	4
East Abut. B.	370	1,925	170	340	75	760	....	..	..	..
Total	3,180	16,545	1,460	2,920	155	1,780	25,200	3	6	8

*Consulting Engineer, Buffalo, N. Y.

The two abutments are of the U type, with battered front faces and vertical backs, abutment B being at right angles to the center line, and abutment A having a skew of 79 deg. 16 min. 38 sec. The respective heights are 28 ft. 3½ in., and 27 ft. 8¼ in. Abutment B has 75 supporting piles in 5 rows of 15 each. The foundation course is 15 ft. 6 in. wide, 38 ft. long and 4 ft. 6 in. high. The height of the retaining wall above the foundation



Details of Cylinder Piers for Lake Shore & Michigan Southern Bridge.

course for abutment B is 23 ft. 9½ in., and the bottom thickness, 12 ft. 6 in., a little less than half the height. The U stems are very short, only 4 ft. The embankment will spill around the abutments in the usual manner. The only reinforcement in the U abutments is in the foundation course, there being 76 corrugated bars, ¾ in. sq. and 10 ft. long, spaced 6 in. center to center. The piles project into the foundation course 12 in., and the corrugated bars are laid in a row 3 in. above the tops of the piles.

The piers are concrete cylinders in pairs. Piers 1 and 2 are on a skew of 79 deg. 16 min. 38 sec. from the center line. Piers 3 and 4 are at right angles to the center line. The height of the cylinders varies from 51 to 52 ft., owing to the variation in the level of bed rock. The diameter of the cylinders is 13 ft. 6 in., and the distance between their centers is 30 ft. 6 in. at right angles to the center line. The cylinders are connected at the top by reinforced concrete girders or struts, 9 ft. 6 in. deep. The width for pier 1 is 5 ft. 6 in., and for piers 2, 3 and 4, 5 ft. The reinforcement for each cylinder consists of 80 corrugated bars, 1¼ in. square, 30 ft. long, placed vertically in the periphery and 6 in. back from the face. The spacing is approximately 12 in. center to center. In addition, the tops of the cylinders of

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pier 2 are reinforced by 52 corrugated bars ¾ in. square, 5 ft. long, placed vertically in the line of the diameter and at right angles to the center line.

The strut connecting the cylinders of pier 2 is reinforced by 48 corrugated bars, 1¼ in. square, 30 ft. long, placed 6 in. from the side and bottom faces and 12 in. below the top faces. The spacing is about 6 in. center to center. The struts in piers 1, 3 and 4 contain an imbedded steel plate girder. Pier 1 contains 56 corrugated bars, 1¼ in. square, 30 ft. long and piers 3 and 5 have 48 bars of the same dimensions. The plate girders are 25 ft. long and 8 ft. high, and rest on cast iron pedestals imbedded in the concrete at the proper elevation. The plate girders also carry the pedestals supporting the superstructure.

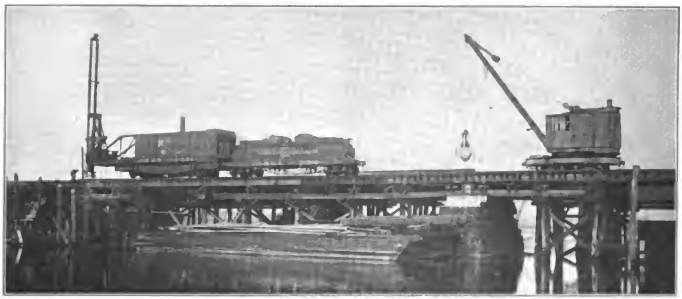
The cylindrical piers were constructed inside circular cofferdams composed of Lackawanna arched-web steel sheet piling. The light section was used, each piece building 14 in. of wall, and weighing 35 lbs. per sq. ft. of wall. The weight per lineal foot of piling bar is 40.83 lbs. Each cylinder, 18 ft. in diameter, consisted of 50 sheet piles, each 45 ft. long. To furnish a template or guide for driving the cylinders, five wooden piles were first driven, one in the center, and four at the corners of an inscribed square. Diagonal braces connected the circumferential piles, crossing at the center pile. A circular wooden frame or ring, 6 in. deep, and made up of three layers of 2 in. lumber was then attached to the top of the piles, around the outside of which the steel sheet piles were driven.

The steel sheet piling was driven by a revolving pile driver mounted on a suitable car body or frame. A special tender accompanied the pile driver, supplying water and fuel. The enclosed material in the steel cylinders was removed by an orange peel dipper operated by a revolving derrick, mounted on a car, the excavation being completed while the cylinder was filled with water. Owing to the hardness of the material immediately overlying the bedrock, a layer of several feet in thickness had to be left in for future removal.

The next work was to brace the interior of the cylinders to prevent collapse when the water should be pumped out. This was accomplished by building heavy circular frames or rings of timber made up of two courses of old 9 in. x 18 in. stringers, bolted together. The frames were 17 ft. 6 in. in diameter, with a central opening 10 ft. 6 in. square. Four hook eyes were placed at the corners of the square for handling.

These heavy frames were placed in the cylinders by the revolving derrick, large vertical posts, about 5 ft. high, securely held by diagonal bracing or inclined struts, having first been attached to the top of the first one. A second ring or frame was then laid on top of the posts of the first one and both were driven down by the pile driver. This procedure was repeated until five frames had been driven in place, the lowest one being stopped about 5 ft. above bedrock by the remaining material. The cylinder was then pumped out and the remaining material down to bedrock removed in large buckets. Octagonal forms were then built inside the cylinders, resting on the bedrock, which were filled with concrete dumped into vertical chutes reaching to the bottom.

After the foundation had been placed, the lower frame was removed and another course of concrete added, octagonal in cross-section as before. At an elevation of about 21 ft. below the completed top of the cylinder (or about 5 ft. below water level) the cross-section was changed to a circle. The octagonal forms were left in place. The forms for the upper parts of the piers were built at Collinwood, Ohio, near Cleveland, and consisted of staves 10 ft. 6 in. long held in place by three hoops. To prevent deformation during transportation and handling, temporary rings were placed in the interior which were removed after the forms were placed in position on the octagonal foundation courses. The forms were built similar to a water tank, but without a bottom. There were 100 staves in each, each stave being 5¼ in. wide and 2¾ in. thick. The diameter of the forms was 13 ft. 6 in., the same as that of the finished pier. Two forms in height were used, the upper one having suitable openings on one side to allow the placing of the steel plate and reinforced concrete girder connecting the upper portion of the two cylinders forming each pair.



Track Pile Driver and McMyler Derrick With Orange Peel Bucket; Lake Shore & Michigan Southern.

The concrete mixing plant was installed on three flat cars. On one were built the storage bins for holding the sand and broken stone, with a platform for the cement. Another carried the inclined plane up which the loaded material car was run to the mixer, which was installed on a third car. The mixer is one built by the railway company and is a cylinder revolved in a vertical plane. It has two openings, opposite to each other and closed by hinged doors. The concrete materials are dumped into a chute above, dropping into the mixer; the door is closed and the mixer revolved a sufficient number of times; the lower door is then opened and the mixed concrete allowed to drop into a chute under the car and leading to the work. The concrete is made in large batches, the charging car having a capacity of about 31 cu. ft. Usually a batch contains 5 bags of cement, more being used for foundation work than above ground and water.

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The sand for concrete was obtained from pits at Irvington, on the shore of Lake Erie, 28 miles west of Buffalo, and the broken limestone, partly from Kelley Island, in Lake Erie, near Sandusky, Ohio, and partly from Akron, N. Y., 22 miles east of Buffalo. The engineering department of the Lake Shore & Michigan Southern prefers broken stone to a natural mixture of sand and gravel, owing to the difficulty of securing a properly graded mixture.

The superstructure consists of a 50 ft. deck girder, a 112 ft. 6 in. through girder, a Strauss trunnion bascule bridge with a movable span of 131 ft. 6 in., and a tower span of 49 ft., and a 56 ft. deck girder in the order named going east, all spans being double track. The front end floor beam is on a slight skew,

Circular Cofferdam of Lackawanna Arched Web Steel Sheet Piling Showing Template Around Which Piles Are Driven; Lake Shore & Michigan Southern.

while the trunnion end of the bridge is of necessity square. One bottom chord is therefore slightly longer than the other, while the top chords are of equal length.

The bridge is operated by means of two pinions, one on each side, turning in bearings secured to the tower, which engage cast steel racks bolted to the operating struts. The operating machinery consists of two 50 h. p., a. c. motors connected to the operating pinions through a train of reduction gears and an equalizing gear. The motors are each provided with a solenoid brake, and one motor driven emergency brake, which is normally set, is provided. This brake is released by a motor, and is held in release as long as current is applied to this motor. Cutting off the current, or any failure of current will result in the instantaneous application of the brake. The emergency brake may also be released mechanically when the bridge is to be operated by hand. In addition to electrical operation, hand operation is also provided for. By means of hand cranks placed in the tower, the operating machinery can be actuated by two men. The operator's house is located on shore close to the bridge and contains the controllers for the leaf motors and other electrical apparatus and indicating devices.

The break in the floor between the fixed portion and the moving leaf is located in front of the main trunnion, and the live load, therefore, does not tend to open the bridge. Front end locks are provided, however, which hold the bridge firmly to the rest pier. The movement of the latch bars automatically stops the motors and sets their brakes at each end of their travel. Hand operation is also provided for operating the locks in case of emergency. The operating and lock motor circuits are connected with the interlocking system, so that current is not available for operation until the signals have been set at "danger," and these signals cannot be set at "clear" until the bridge is closed and the locks driven in. In like manner current is not available for the leaf motors until the locks have been withdrawn.

An automatic cut-off is provided which will throw the circuit breakers out and cut off the current from the leaf motors and set their brakes when the bridge has reached the nearly fully open position. A foot switch is provided, which will enable the operator to release the motor brakes and allow the bridge to "coast" if desired. In closing the bridge current is available to hold the leaf down firmly on its seat until the locks are fully driven in. Mechanical indicators will be located at the pivot end and front end of the bridge, placed on the stationary and movable parts, so that they can be seen from the operator's house, and to which the operator can sight and thus determine the nearly closed and open positions of the bridge. Electric light indicators are also provided in the operator's house showing the operator the various positions of the locks and the bridge leaf. The movements of the locks and bridge itself open and close the circuits of these indicator lights.

This bridge was designed by B. R. Leffler, bridge engineer, and is being built under the supervision of G. C. Cleveland, chief engineer of the Lake Shore & Michigan Southern.

THE BUFFALO CREEK RAILROAD BRIDGE.

This bridge lies about 2,000 ft. southeast of the Lake Shore & Michigan Southern bridge, and about 100 ft. east of the

Interior View of Cofferdam Steel Sheet Piling With Timber Ring In Place for Bracing Against Water Pressure; Lake Shore & Michigan Southern.

bridge used by the New York, Chicago & St. Louis and the Pennsylvania. It consists of four spans, a Strauss bascule span 213.5 ft. long, two through plate girder spans, 89 and 88.5 ft. respectively, and one deck plate girder span, 38 ft. long, the total length between back wall faces being 429 ft. There are two abutments and three piers, abutment 1 and pier 2 being at right angles to the center line, and piers 3, 4 and 5, and abutment 6 having a skew of 54 deg. 53 min. 30 sec. The elevation of bedrock is about 47 ft. below mean lake level.

The concrete piers are supported by bearing piles driven to bedrock. The piles of piers 2, 3, 4 and 5 are 25 ft. long, and of abutment 1, 30 ft. long. The foundation of abutment 1, and

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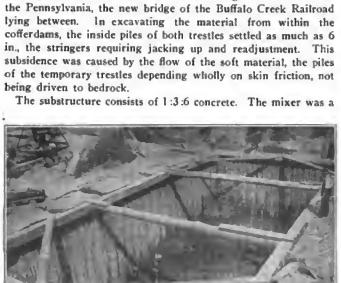
piers 2 and 3, which support the Strauss bascule span, are spread considerably beyond the upper neat lines. The number of supporting piles is 140, 164 and 132 respectively. Piers 4 and 5 and abutment 6, contain 116, 96 and 40 piles.

The cofferdams were all built of Lackawanna steel sheet piling, straight web section, 12¼ in. x ⅜ in., weighing 35 lbs. per sq. ft. of wall and 37.187 lbs. per lin. ft. of piling bar. The length used was 34 ft. It was usually driven 8 to 9 ft. below the bottom of pier elevation and allowed to project 3 to 4 ft. above water level, the depth of water ranging from 8 to 10 ft. The cofferdams were built 5 ft. wider and longer than the neat dimensions of the masonry. The steel sheet piling was driven by a two-ton drop hammer. The wooden supporting piles for the abutment and piers were driven with a steam hammer, weighing 4,500 lbs., with a 3 ft. fall. The material being soft, the piles were easily driven to rock. In abutment 1 and pier 2, the piles "heaved up" 3 ft. and had to be redriven two or three times. In pier 3, this heaving amounted to only 1½ ft.

The new bridge occupies the same site as the old, which consisted of two 135-ft. three-truss double track iron spans designed for a load of 2,000 lbs. per lineal foot. To maintain the traffic, a double track pile bent trestle was built south of and parallel to the old bridge. A similar trestle to the north carries temporarily the traffic of the New York, Chicago & St. Louis and the Pennsylvania, the new bridge of the Buffalo Creek Railroad lying between. In excavating the material from within the cofferdams, the inside piles of both trestles settled as much as 6 in., the stringers requiring jacking up and readjustment. This subsidence was caused by the flow of the soft material, the piles of the temporary trestles depending wholly on skin friction, not being driven to bedrock.

The substructure consists of 1:3:6 concrete. The mixer was a



Cofferdam, 30 ft. x 60 ft., of Straight Web Section Lackawanna Steel Sheet Piling; Buffalo Creek Railroad.

Ransome, of about ¾ cu. yd. capacity, the usual charge being two bags of cement, 6 cu. ft. of sand and 10 cu. ft. of broken stone, the sand and stone being measured in wheelbarrows, gaged by known measures. The concrete in some cases was mixed on shore, run out in cars and dumped directly into the forms. In others it was deposited by buckets, and in others through chutes.

Abutment 1 and pier 2, which are built at right angles to the center line, have a foundation area of 20 ft. x 53 ft., and 24 ft. x 54 ft. respectively. Owing to the skew of the crossing, piers 3, 4 and 5 are longer, the foundation area being 18 ft. x 58 ft., and 14 ft. x 57 ft. respectively. The spacing of the piles in the rows is 2 ft. 6 in. to 3 ft., the rows being on 3 ft. centers.

The superstructure in general is similar to that for the L. S. & M. S. over the same river. The length on center line of bridge is 165 ft., one truss being a panel length longer than the other, since the skew is greater than in the L. S. & M. S. bridge.

The plans of the substructure were prepared by S. M. Kieland, engineer, Buffalo Creek, and the work was done by the A. P. Chapman Co., Buffalo, N. Y. The plans of the superstructure were prepared under the direction of the late Chas. W. Buchholz, consulting engineer, and F. A. Howard, engineer bridges and buildings of the Erie. The steel work is being fabricated and erected by the American Bridge Company.

THE NEW YORK, CHICAGO & ST. LOUIS BRIDGE.

This bridge, which is also used by the Pennsylvania, crosses the river about 100 ft. north of the Buffalo Creek Railroad crossing, the two bridges being parallel. The present bridge is a double track steel structure of two spans, the length of each span under copings being about 135 ft. The old steel work was

Cofferdam of Wakefield Sheet Piling; New York, Chicago & St. Louis.

partly dismantled and used temporarily as a platform from which to conduct operations connected with the building of the new bridge.

The superstructure of the new bridge consists of two through plate girder approaches, each 89 ft. long, and a Scherzer rolling lift bridge with plate girder track span. The moving span is skewed at the front end, and square at the rear end, with unequal truss lengths, the short truss being 154 ft. 7 in., and the long truss 175 ft. 5¼ in. center to center of bearings. The span length of the bascule on the center line of the bridge is 165 ft. ⅛ in. The track girder span is 40 ft. The lift bridge over the main river channel has a width of 100 ft. between the fender lines, the clear river width under each of the plate girder spans being 62.5 ft. The water surface width of the river is 256 ft., and the bottom width 150 ft., with a water depth of 22 ft. at mean lake level, the distances given being those at right angles to the current.

The bridge will be operated by two 75 h. p. motors having a speed of 475 r. p. m. on a three phase 25 cycle alternating current at 445 volts. These motors and the machinery through which the power is transmitted to the main operating pinions are located upon a machinery platform placed above the clearance line and between the trusses at the rear end of the bridge just in front of the counterweight box. The power of the motors is transmitted through gearing to the main operating pinions, the shafts of which pass through each truss at the center of roll which is at the center of the segments. The centers of the shafts driving the pinions at any position of the bridge are always equi-distant from the surface of the track plates, and the motion of the pinions is horizontal and parallel with the surface of the track plates.

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Racks with which the main operating pinions engage and by means of which the bridge is actuated are located outside of the plane of the trusses on independent fixed rack supports. These rack supports are bracketed out from each end of the track girders with diagonal braces running from the center of the rack girder down to the end posts of the rack supports at points opposite the tops of the track girders. The simplicity and efficiency of this operating mechanism makes possible a great saving in the machinery.

As an auxiliary equipment for operating the bridge when electric current is not available a gasolene engine will be provided. This engine will be located in the operator's house and the power will be applied to the machinery through friction clutch couplings. The bridge can also be operated by hand.

When in the closed position the bridge is locked by a lock bar of forged steel 10 in. x 1½ in., this bar engaging with a casting anchored to the masonry of the front pier. The lock is actuated by a hand lever in the operator's house through a pipe connection with a device at the break between the movable span and the fixed span to allow for the connection being broken when the bridge is operated.

An air buffer is provided at the front end of the moving span for seating the bridge on the front pier without shock or jar. This buffer is of simple design, with a 12 in. bore and a 24 in. stroke. It is attached to the front floor beam at about the center line of the bridge, the plunger coming in contact with a casting anchored to the masonry of the front pier. Bumping blocks are provided at the rear end to prevent the bridge moving beyond the fully opened position.

The front lock mechanism is interlocked with the signal system and with the bridge operating mechanism, so that the lock cannot be opened and the bridge operated until the signals are set at danger and the derails opened, and the bridge must be closed and locked before the signal can show clear and the derails be closed.

The operator's house, which is located on supports at one side of the track girder span, will contain all of the equipment for controlling the operation of the bridge. It will also have a mechanical indicator so placed as to be in full view of the operator showing the positions of the bridge at all times during operation. A bell will also be provided to be rung automatically by the bridge as a warning to the operator before the fully opened and fully closed positions of the bridge are reached.

Owing to the proximity of the Buffalo Creek Railroad bridge, the piers of the two bridges are on the same axes, the angle of skew being the same. As the bridge is being built on the site of the present one, traffic is diverted and temporarily maintained over a pile bent trestle erected to the south.

The substructure consists of three piers and two abutments, numbered from the east to the west, all masonry being of concrete, founded on piles driven to bedrock, which is reached at a depth of 45 ft. below mean water level. Abutment 1 and pier 2 are the main supports of the Scherzer rolling lift bridge, and were built inside timber cofferdams, built of Wakefield sheet piles, each composed of 2 in. x 10 in., and one 2 in. x 12 in. plank, 30 ft. long, assembled in the usual manner. Pier 3 located in the river was also built in a wooden cofferdam consisting of square timbers 12 in. x 12 in., grooved on opposite sides. The grooves were 2 in. square in cross-section, and when the timbers are in juxtaposition, a timber tongue, 2 in. x 4 in., was driven into the groove to render the cofferdam watertight. The timbers of the structure were driven by a floating pile driver. The concrete is a 1:2:5 mixture. A Ransome mixer was used, the charge being one bag of cement, two wheelbarrows of sand and four wheelbarrows of broken stone, gaged to give the required proportions. The cement and concrete aggregates were delivered in standard cars and wheeled up an incline to discharge into a hopper over the mixer which was placed about 6 to 8 ft. above track level. The concrete was made wet and delivered to the work in wooden chutes.

This bridge is being built under the direction of E. E. Hart, chief engineer of the New York, Chicago & St. Louis.

A PROPOSED NEW ENGLAND RAILROAD COMMISSION.

At the invitation of Governor Foss, of Massachusetts, a conference was held in Boston last Saturday, attended by the governors of all the six New England states except Maine, the governor of which was unable to accept the invitation. Governor Foss proposes a "New England railroad conference" to be composed of two citizens from each state; and, after the conference of Saturday, he gave out the following outline of the purposes which it is hoped to accomplish:

The conference will consider and report upon the general subject of railroad development and operation, and in particular will investigate the following phases of the railroad question:

1. The establishment of a permanent conference composed of the heads of the state commissions having supervision over railroads.

2. The question of creating state directors representing the various New England states in the management of the railroad system, and the general question of the participation of the public in the ownership or operation of transportation facilities, and the form of such participation.

3. The consideration of means whereby the projected Grand Trunk extension may be completed.

4. Means of providing through transportation by way of Boston, and the consideration of the best method of accomplishing this, whether by tunnels or belt lines, or both.

5. The project of electrifying the terminals and providing adequate electric traction throughout crowded urban and suburban districts.

6. A reasonable plan of interchangeable mileage tickets to be applied over the entire New England railroad system.

7. A plan of uniform legislation providing for the unification of the corporate entity which manages the railroads in a manner which will make the legal fact of unification correspond with the actual control now exercised. This will involve a consideration of the whole question of whether the Boston & Maine shall remain a part of the New Haven system or can better serve New England as a separate system, the question of the elimination of the Boston Railroad Holding Company, and the question to what extent, so far as the federal laws and the fixed policy of the several states permit, the railroad shall own and operate steamship and trolley lines.

8. A plan to co-ordinate and unify all lines and services.

9. Reduction of all leases of lines to absolute ownership.

10. The consideration of means to make the railroad corporation amenable in its entirety to public control, in the manner of a domestic corporation doing business in each state.

11. The consideration of uniform charters to the railroad corporation in each of the states in which it operates lines, with uniform reservations of power of control by the state.

Governor Haines, of Maine, in a letter to Governor Foss, written after reading the report of what was done at the Boston conference, commented at length on each of the eleven paragraphs of the resolutions adopted at the conference; and he called attention in rather plain language to some of the weaknesses of Governor Foss's proposals. The state of Maine already has a terminal of the Grand Trunk, and the relations between the state and the railway company appear to be quite satisfactory. Governor Haines says that a permanent conference "can do no harm and might do some good." He does not see how directors of a railroad can be appointed by a state which owns nothing in the property. He does not believe in state ownership. He has not much interest in the crowding of passengers in suburban trains, but he does expect that Maine, with its abundant water power, will soon have all its railroads operated by electric power. The legislature of Maine is now considering the establishment of a public utility court to take the place of its railroad commission, and therefore it does not seem desirable at present that the Maine commission should take part in a New England organization.

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THE PAYMENT OF EMPLOYEES IN CASH.

A Description of the Method Used on the Pennsylvania Lines West Where About $4,800,000 Is Paid Out in Cash Each Month.

Every officer and employee of the Pennsylvania Lines West, from the president to the switchmen and crossing men are paid in cash monthly; payments are made between the fourth business day and the twentieth of each month. It is not of much moment to the president whether he receives his salary in cash or by check, but it is of a great deal of importance to the switchmen.

The one point at which the employee comes most closely in contact with the company, is at the time he receives his wages. At this time he forms an impression of the attitude of the company; it becomes personal to him as something distinct from his particular boss. Unconsciously his own attitude toward the outside public reflects, to a certain extent, the attitude of the

pared and certified to by the auditor and made out and sent to the agents by the treasurer's department. Second, checks made in the same way may be delivered directly to the employees by the treasury department. This necessitates running a pay car. The third method is to have the treasury department pay directly in cash to each employee. This also necessitates the running of a pay car. The following is a list of some of the roads that now have one or other of the two check systems in use and those using the cash system.

CASH AND PAY CAR.

Birmingham Southern.
Central of New Jersey.
Hocking Valley.
New York Central & Hudson River.
Pennsylvania Company, Lines West.
Pennsylvania Railroad.
Vandalia.

No. 9

Chicago, Ill., _____, 19____ $_____

_____, 19____

Received of the Treasurer of the

EAST & WEST RAILROAD COMPANY

for payment of rolls month of _____, 19____

$_____

RECEIVED OF THE TREASURER OF THE EAST & WEST RAILROAD COMPANY

_____ Dollars,

to be applied to payment of rolls for month of _____, 19____

_____

Paymaster

Receipt Given by the Paymaster for Money Received from the Treasurer.

company towards himself. If this attitude is courteous, if, in the company's relations with the employee, there seems to be a real attempt to deal perfectly fairly, the man is inclined to feel that this is the attitude which he should take toward the company's patrons. On the other hand if the employee gets the idea that the company is dealing with him in a sharp manner and that regardless of justice the company will see that its own interests are preserved, then when the employee represents the company in its relations with the general public his attitude will reflect this feeling.

In the payment of wages, there are three objects to be attained. The employee should get the wages which he has earned

CHECK AND PAY CAR.

Chicago, Burlington & Quincy.
Grand Trunk.
Illinois Central.
Intercolonial Railway.

CHECK AND NO PAY CAR.

Atchison, Topeka & Santa Fe.
Baltimore & Ohio.
Buffalo & Susquehanna.
Central of Georgia.
Chicago, Rock Island & Pacific.
Chicago & Western Indiana.
Evansville & Terre Haute.
Gulf, Colorado & Santa Fe.
Kansas City Southern.
Lehigh & New England.
Lake Shore & Michigan Southern.
Michigan Central.
Missouri, Kansas & Texas.
Norfolk Southern.
St. Louis & San Francisco.
Seaboard Air Line.
Southern Railway.
San Pedro, Los Angeles & Salt Lake.
Union Pacific.
Wheeling & Lake Erie.

On the Pennsylvania Lines West there are five pay cars; three starting from Pittsburgh, one from Columbus and one from

No. 1

EAST & WEST RAILROAD COMPANY

To _____ Dr.

For Services as _____ of _____ Division

under the direction of _____ as returned on Pay Roll Number _____

registered in the Office of the Auditor, in the Month of _____, 19____

Name	Time	Rate	Grade	No. Days	No. Hrs.	No. Hrs. Ov. Work	Amount Earned	Office of Payment	Amount	Amount Paid

I certify the above to be a correct transcript from the Roll above named and that the same remains unpaid on the Roll

Countersigned, _____ _____ Paymaster

Auditor

RECEIVED _____, 19____, of the EAST & WEST RAILROAD COMPANY

in full for the above account _____ Dollars ($_____)

Witness _____

This form to be used, when payments are completed, for showing the name, occupation, time, rate of pay, deductions and amount payable to any employee who has failed to receive his money. After being checked against the roll and approved by the Auditor, it is returned to the Paymaster so that payment can be made at any time the employee should call for it.

Duplicate from Pay Roll.

as quickly and as conveniently as possible. Some means should be adopted by which the company can be sure that the employee earning the wages actually receives what he has earned and gives a valid receipt. The third object is that payment shall be made by a different department than the one which prepares the pay roll and hires the employee. There are three common methods of payment. Checks may be delivered by the company's agents to the employees; these checks having been pre-

No. 1

TO BE USED ONLY IN CASE OF SICKNESS OR UNAVOIDABLE ABSENCE

EAST & WEST RAILROAD COMPANY

_____ Division

_____, 19____

Pay to _____ the amount due me for services rendered

in the month of _____, 19____, as _____ under the direction

of _____ and his receipt shall be a full release and discharge

for the same.

WITNESS _____

MUST BE SIGNED BY EMPLOYEE IN INK

Issued only by heads of departments.

Pay Order Issued Only in Cases of Sickness.

Terre Haute. These five cars between the fourth and the twentieth of each month distribute about $4,800,000 cash. Each car is in charge of a paymaster, who has a clerk, and in addition there are three or more guards on the pay car. In point of complication, the Pennsylvania Lines West presents as difficult a problem for the routing of pay cars as any system of lines in the country. The lines, of course, lie in territory east of the Mississippi river, so that there is not, possibly, the same danger of an organized attack on the pay car as would be the case on some lines in the West; on the other hand, the problem

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No. 1

PAY ROLL No._____ C. T. No._____ M. of W. No._____ Shop No._____ ACCOUNTS PAYABLE _____ DIVISION

EAST & WEST RAILROAD COMPANY

To SUNDRY PERSONS, DR.

For Personal Services Rendered as _____ During the Month of _____ 19____

No.	NAME	OCCUPATION	TIME: Hours	Trips	Days	Months	Piece Work	Rate	AMOUNT EARNED	DEDUCTIONS: BOARD In Favor of	Amount	COMPANY COLLECTIONS: Rent	Tobacco + Supplies	Other Deductions	AMOUNT PAYABLE	No.	Receipt of the EAST & WEST RAILROAD COMPANY the amount opposite my name in the following Roll, in full for all labor and services by me rendered during regular and irregular hours during the month specified, is hereby acknowledged. SIGNATURES	WITNESSES
1																1		
2																2		
3																3		
4																4		
5																5		
29																29		
30																30		
		TOTALS																

I certify that the above named persons have been diligently employed in the service of this Company, and that the time and rates are correct _____

Examined and Approved _____ Superintendent

Examined and Approved _____

Authorized, Examined and Found Correct _____

APPROVED _____ General Manager

Audited and Approved for $_____

Approved for Payment: _____ Auditor

_____ Comptroller

Pay Roll No. 1.

No. 2

PAY ROLL No._____ C. T. No._____ ACCOUNTS PAYABLE _____ DIVISION

EAST & WEST RAILROAD COMPANY

To SUNDRY PERSONS, DR.

For Personal Services Rendered as _____ During the Month of _____ 19____

No.	NAME	OCCUPATION	TIME AND RATE OF PAY: Trips	Rate	Trips	Rate	Hours	Rate	Hours	Rate	AMOUNT EARNED	DEDUCTIONS: BOARD In Favor of	Amount	COMPANY COLLECTIONS: Rent	Tobacco + Supplies	Other Deductions	AMOUNT PAYABLE	No.	Receipt of the EAST & WEST RAILROAD COMPANY the amount opposite my name in the following Roll, in full for all labor and services by me rendered during regular and irregular hours during the month specified, is hereby acknowledged. SIGNATURES	WITNESSES
1																		1		
2																		2		
3																		3		
4																		4		
5																		5		
29																		29		
30																		30		
		TOTALS																		

I certify that the above named persons have been diligently employed in the service of this Company, and that the time and rates are correct _____

Examined and Approved _____ Superintendent

Examined and Approved _____

Authorized, Examined and Found Correct _____

APPROVED _____ General Manager

Audited and Approved for $_____

Approved for Payment: _____ Auditor

_____ Comptroller

Pay Roll No. 2.

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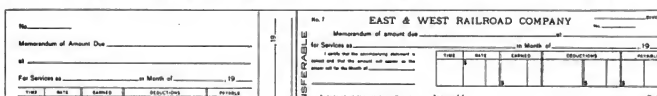
of paying employees and especially train crews, without unduly delaying traffic is far more difficult on these lines than would be the case on western lines where traffic density is much less.

Of the three cars running from Pittsburgh, one goes over the Eastern division, Western division and the Fort Wayne side of the Chicago Terminal division. The second car pays men is to provide space for different rates paid, so that a full thirty names may be shown on each roll. The rolls are made up on a typewriter, two carbons and an original being made. One carbon is sent to the pension department and one is retained in the superintendent's office, while the original roll on stiff paper is sent to the auditor's office, after having been



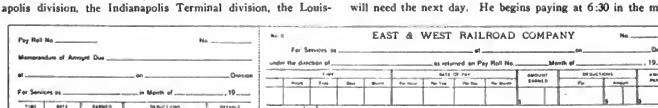
This form is issued by the superintendent and is sent to an agent of the company before whom the employee must present himself and be identified.

Form Used to Pay Employees Who Leave the Service.

over the Erie & Pittsburgh division; the Cleveland & Pittsburgh and the Marietta division. The third car pays over the Pittsburgh division of the Panhandle; the Cincinnati & Toledo division of the Panhandle and over the Akron and Zanesville divisions. The car leaving Columbus runs over the Indianapolis division, the Indianapolis Terminal division, the Louisville division, the Richmond division, and the Logansport division. The car leaving Terre Haute runs over all of the divisions of the Vandalia and the Panhandle side of the Chicago Terminal.

There are two forms of pay rolls used; the one shown herewith as No. 1, is for agents and their forces, operators and employees of the transportation department, working by the month or day, and for all employees in the maintenance of way department and in shops. No. 2, is for all transportation employees in train service; the object in having the second form for train-

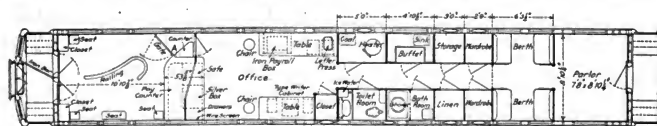
signed by the superintendent and approved by the general manager. It is there audited and approved for payment and is sent to the treasury department. It reaches the treasury department on the third business day of the month, and on the same day the paymaster receives the treasurer's check for the cash that he will need the next day. He begins paying at 6:30 in the morn-



Check Sent to Employee Who Is Unable to Meet the Pay Car.

ing on the fourth day. Where the employee is known to the paymaster no witness' signature is required; where the paymaster does not know the employee and in all cases where the employee must sign his name by mark, a witness' signature is required.

A diagram of the arrangement of pay car is shown here-



Plan of the Pay Car.

with. The paymaster's clerk stands at "A" with the rolls arranged in a clip at his left hand; this clip is provided with an ink well and space for a pen on the right hand side. It will be seen that the paymaster's clerk has the rolls directly under

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No. 14

EAST & WEST RAILROAD COMPANY

TREASURY DEPARTMENT

_____, 19____

_____

_____

_____

Dear Sir:—

Please give below the information requested, and return this promptly

Respectfully,

_____

Paymaster

Name _____

Occupation _____

Amount payable from _____ to _____ inc., $_____

Amount payable from _____ to _____ inc., $_____

Residence _____

Married or Unmarried _____

Yours truly,

_____

_____

_____, 19____

Paymaster's Request for Information from Superintendent.

No. 11
COPY ONLY

EAST & WEST RAILROAD COMPANY

TREASURY DEPARTMENT

Chicago, Ill., _____, 19____

_____, Solicitor

Dear Sir:—

I send you herewith papers in garnishment proceedings as per statement below.

Please acknowledge receipt on attached blank, and oblige

Yours truly,

_____

Paymaster

CASE NUMBER	DEFENDANT	PLAINTIFF	OCCUPATION	AMOUNT CLAIM

_____, 19____

_____, Paymaster

Dear Sir:—

The receipt of your favor of _____ instant, enclosing papers in garnishment proceedings in cases Nos. _____ to _____, inclusive, is hereby acknowledged.

Yours truly,

_____

Director

Form Used by the Paymaster in Making a Report to the Company's Solicitor in Attachment Proceedings.

his hands, and at the same time, the employee has the portion of the roll to which he puts his signature directly in front of him. The paymaster stands behind the 53-in. counter and faces the rear doors of the car. He has an unobstructed view of the entire car back of the counter. Employees enter the car at the rear door at the left. There is a guard stationed between the two doors at the rear and one or two guards are placed where seats are shown outside of the pay

No. 11

EAST & WEST RAILROAD COMPANY

_____ DIVISION

ATTACHMENT

Case No. _____

_____ Plaintiff

vs.

_____ Defendant

Occupation _____

_____ J. P

_____

Claim, $_____ Costs, $_____ Total, $_____

Writ served at _____ M. _____, 19____

Answerable at _____ M. _____, 19____

Employing Officer asked to state Amount Due Defendant _____, 19____

AMOUNT DUE DEFENDANT AT DATE OF SERVICE			
Pay Roll No.	Month	Amount	

Writ sent to Solicitor _____, 19____

Reported to Solicitor _____, 19____

$_____ due

Case compromised for $_____

Order of Court to pay $_____ received and forwarded to Solicitor _____, 19____

Received _____, 19____ Approved Order for $_____

Date of Remittance to Court _____, 19____

Fee Collected, $_____

Court Receipt attached to _____

Case Disposed of in Month of _____, 19____

_____, 19____

In the above action please pay into Court, out of money due me, the sum of $_____

_____

Attachment Envelope with Record of the Case.

counter. The employee steps up to the paymaster's clerk, gives his name and signs his name on the line opposite the amount due him; the clerk calls off the amount due, this is repeated by the paymaster, who counts out the money from the drawer under the counter, the amount is again repeated by the clerk, is verified by the paymaster and is pushed across to the employee, who steps to one side, counts his money, and passes out by the rear door at the right. When gangs of

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men are being paid, the foreman enters first, signs his name, receives his pay and steps inside the curved railing shown on diagram; the members of the gang follow in the order in which their names appear on the roll; after each one of the gang has been paid the foreman signs each roll once, as witness for the men in that gang. As the clerk calls each man's name, the foreman answers present for him. It is almost impossible for the wrong man to be paid under this system, if the rules are carefully followed. The foreman has the man that he is identifying directly in front of him and only a foot or two away.

In paying officers, instead of calling out the amount due, the clerk writes the amount on a slip of paper and hands it to the paymaster, who counts out the cash and lays the slip of paper on top of the amount and passes it across the counter.

Train crews have precedence over all other employees; there is room so that a line of trackmen can step to one side and let road enginemen and trainmen pass directly to the clerk and paymaster with no delay. It is a fact that on the Pennsylvania Lines West, from 300 to 350 employees are paid in an hour. There is not the least hurry or confusion, and almost never does a question arise that cannot be answered almost instantly and satisfactorily by the paymaster. It will be noticed that there is room for three men to stand across the counter; one is signing his name, one is receiving his money, and one counting his money. Where the lower class of employees sign their names and receive from $30 to $75, the paymaster is a little ahead all of the time of the employee who finds his money waiting for him by the time he is finished with the pen; where the employee is of the higher grade, and makes less of hard labor in signing his name and receives from $100 to $200, the paymaster is usually a fraction of a second behind the man in getting the cash across the counter.

The underlying objection that railroad men generally have had to the payment by cash is that the treasury department has not been broad enough, or shown common sense enough to cooperate with the operating department. It would seem that it would not take a high order of intelligence to realize that in making payments of wages the treasury department is not conferring a favor on the operating department, or on the individual employee. It has been a spirit of co-operation in the running of the pay car that has made payment in cash on the Lines West an unquestioned success. The system is by no means capable of running itself; the paymaster must be a high-class man, who can be trusted with large sums of money, but fully as important, he must be a man who can enter into the spirit that lies back of the use of the cash system; this spirit is somewhat intangible, of affording every possible facility to the men. At terminals and shops an old coach is attached to the rear of the pay car so that men waiting to be paid may be protected from the weather.

The object in having a treasury department is to have money paid by a different department than the one which authorizes

No. 13

EAST & WEST RAILROAD COMPANY

TREASURY DEPARTMENT

Chicago, Ill., _____, 19____

_____

_____

_____

Dear Sir:—

Please take notice that a suit has been instituted before _____

at _____, wherein _____ is plaintiff, and you are defendant, and that this Company has been made Garnishee therein.

Claim and probable costs, $_____

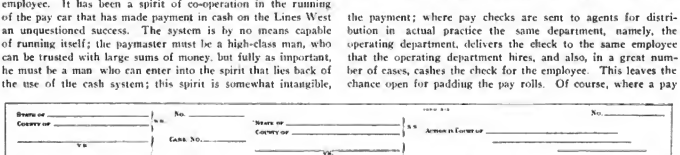
This proceeding is for answer on the _____ day of _____, 19____, at _____ M., and notice is hereby given that you must make such defense as you desire against this suit, set up any exemption you may claim, or offer objections as to the jurisdiction of the Court.

_____

Treasurer

Notice to Employee That His Wages Have Been Attached.

the payment; where pay checks are sent to agents for distribution in actual practice the same department, namely, the operating department, delivers the check to the same employee that the operating department hires, and also, in a great number of cases, cashes the check for the employee. This leaves the chance open for padding the pay rolls. Of course, where a pay



On the back of the check is printed: Endorsement of this check by the Payee is an acknowledgment of payment thereof in full and that the Railroad Company as garnishee is released from any and all liability as far as within entitled case is concerned.

Check Used to Pay Into Court Judgments Obtained in Attachment Proceedings.

but it may be suggested by saying that the burden of seeing that the employee gets his wages easily and quickly rests not on the employee, but on the paymaster. In running the car, the operating department is consulted and every effort is made to put the employee to as little trouble as possible, the car stops at each crossing, at each point where it is most convenient for men to reach it, and is handled at all times with the sole object of distributes pay checks directly to employees, this danger is done away with; the operation of a pay car in this case is a little less costly than under the cash system, but on the other hand, the convenience to the employee is very greatly less. The company receives a valid receipt in either case and the expense of preparing the checks from the rolls is considerable.

The most fruitful source of danger of fraud on the one

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hand, or of inconvenience to the employee on the other hand, is in cases where a man leaves the service, or, for some other reason, must be paid before the rolls are made up, and before the pay car makes its trip. Under the cash system on the Pennsylvania Lines West, Form No. 7 is used in such cases. This form is issued by the superintendent, requires the signature of superintendent and the counter signature of some one designated by him, and is sent in a sealed envelope to the paying agent, who is authorized to give cash to the employee on proper identification and is then permitted to remit the signed receipt as cash with his other cash. Where an employee has been unable to meet the pay car and it is found necessary to pay him before the pay car makes its next trip, a check (Form 6) is sent directly to the employee.

A very important use of this check on the Pennsylvania Lines West is in cases where employees are, because of sickness or from some other unavoidable cause, in urgent need of money. In such cases a check may be sent before the end of the month, and the relief granted is often of very great importance, while the loyalty gained from such treatment is a matter that can hardly be measured in dollars and cents.

In a case where the employee misses the pay car one month, a copy from the pay roll (Form 3) is made and is sent out each month on the car for two years, or until the pay has been received and receipted for by the man who has earned it. The man signs this duplicate in the same way as he would the pay roll and it is then attached to the pay roll to which it belongs.

The forms used in connection with the attachment of employees' wages or liens obtained on the wages are shown herewith, the explanation of the use is given with each form.

Some conception of the labor involved in paying out nearly a million dollars from each car in small denominations in 16 days may be gained when it is said that 145,000 pieces of money are handled in one day by the paymaster. The silver is in a drawer at the right hand side of the counter, and the bills, which are in three piles, 5's, 10's and 20's, in a drawer at the left hand side of the counter. Silver dollars and change are used to pay fractions of $5, and unless a man has particularly asked for larger denomination bills, nothing larger than a $20 bill is used to pay with.

The paymasters receive a day or two in advance their checks for daily requirements. These checks vary from $80,000 to $150,000, and are drawn to the paymaster's order by the treasurer. They are drawn on a bank in a town which the paymaster will reach on the day he needs to cash the check and the paymaster keeps the bank informed ahead of time of the denominations of bills which he wants. A consistent effort is made to get clean bills. By paying in no higher denomination than a $20 bill, although it takes a little more of the paymaster's time, the employee is given his wages in a form that is most convenient for him. He does not have to wait to go to a bank to have a $50 bill changed; he has some large and some small bills, and, most important of all, he is not dependent on the saloon keeper for favors, as is the case where checks are used. Neither does he have to ask a favor of the railroad company's agent, as is the case where checks are used and companies' agents are authorized to cash these checks.

The success of such a system as that used on the Pennsylvania Lines West for the payment of employees depends on the care in working out the details, in the training of men, and the perfection with which every minutest detail is gone through with. We have become accustomed to accept without question the fact that a variation of a hundredth part of an inch in some piece of machinery will throw the entire machine out of order. A system of paying by cash where such large quantities of cash are handled requires a machine that is as delicately and truly adjusted as a watch. Every detail and every measurement of a pay car must be studied and adjusted and readjusted until it exactly fits and meets its requirements. A delay of a fraction of a second in turning over the rolls in the clip will add up to a strikingly large figure when multiplied by the number of times that the rolls have to be handled in 16 days by the paymaster's clerk. The paymaster has no way of checking up the amount of money which he pays out until the end of the 16 days. It is therefore, absolutely essential that each transaction, that is, each payment, shall be perfectly made. To do this at the rate of 300 payments an hour without confusion and without hurry requires a high class of man for paymaster, as well as a minutely worked out system.

A CONTINUOUS RAIL.

A composite rail consisting of a base section and a separate top section which staggers joints and which can be rigidly attached to the base, has been developed by the Continuous Rail Company, and has been tested with satisfactory results in street railway tracks in Leeds, England; Paris, France, and Chicago, Ill. While a number of advantages that the rail possesses for street railway work do not apply to main line service on steam roads, there are advantages claimed for such service that are attracting the interest of the steam railway engineers to whom designs have been presented.

For use in paved streets the combined rail can affect a very great saving, because in renewing, only the top section of the

Electric Machine Used for Crimping Flanges of Continuous Rail on Base Section.

pavement need be disturbed to allow the lips holding the top section to the base to be cut away and those on the new section to be rolled into contact. For electric lines the increased conductivity resulting from the action of the alternate sections as a mechanical bridge over the joints of the other sections, allows a material saving in copper bonding.

The principal advantages urged for such a rail in main lines of steam railways are the absence of open joints and the ability to renew the worn heads without displacing the base of the rail. For exposed track the joint in the top section would be placed at a distance from the joint in the base equal to about 10 per cent. of the length of the rail, or 3 ft. in a 30 ft. rail. To allow for expansion and contraction, the lips holding the top section on the base would only be bent into contact and would not be crimped tightly to the base over this short sec-

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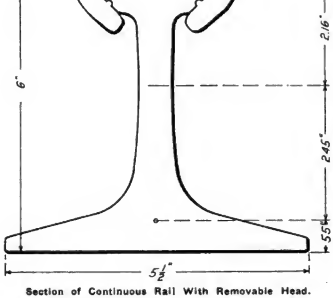
tion between the two joints, making a slip joint. This would allow free longitudinal movement between the base and the top section for the last 3 ft. of the "taking off" rail, the receiving rail being made fast. The joints in the head section of the rail would be supported by a solid base rail, eliminating low joints and the tendency to extreme wear and breakage at the joint. It is also claimed that the danger from broken rails would be very materially decreased, as a break in either the base or the head could scarcely occur directly above or below a joint in the other portion of the rail and a break resulting from a defect in either section would still leave the rail strong enough to carry traffic. The higher original cost of the continuous rail is offset by the fact that the worn head can be removed and a new one put on without taking out of service the heavy base section.

It has been shown by examination of continuous rails in service that the quality of the metal is better than that in standard rails, because in the continuous rail the head section is so rolled in the mills that the tread receives the direct pressure of the rolls at each pass.

In laying the rails the top section is dropped over the base



Section of Continuous Rail With Removable Head.

section and a machine for bending the lips is then run over the track, making the connection shown on the drawing. When these lips are first bent the metal along the inner edge of the section is in compression and that along the outer edge in tension, tending to draw the lips away from the base section. The operation of rolling is continued, however, until the metal in the lips is caused to flow transversely and becomes materially elongated so that the stresses are reversed, bringing compression along the outer edge and tension along the inner edge. As the result of this cold rolling process, the lips of the upper section are converted into springs to grip the head of the lower section. In a test made by R. W. Hunt & Co., a pressure of 72,330 lbs. was required to start a slipping movement of the head section over the base in a test piece 12 in. long cut from a rail that had been laid in the track. To remove the worn head a rolling cutter is substituted for one of the rollers and the machine is passed back and forth along the rail until a cut through about two-thirds of the thickness of the lip is made. It is then possible to break the remaining thickness, remove the old top section and place the new one.

A section of the continuous rail corresponding to the New York Central 100-lb. rail is shown in the accompanying drawing. The area of the base section is 7 sq. in., and of the top section, 3.74 sq. in., giving the combined section a weight of about 108 lbs. As shown in the sketch, the proposed section is so designed that the neutral axis is an equal distance from the top and bottom of the compound rail. The moment of inertia of this section is 50.76, and the section modulus 16.92.

Although no continuous rail has been installed on steam roads, it is thought that the first development for such lines will be the combination of open-hearth base and rolled manganese top. It is claimed that such a construction would insure a better grade of metal in the tread than can be secured with solid manganese rails, would offer all the improved wearing qualities of solid manganese rails at a lower price and in addition, would provide for the renewal of the manganese tops at a comparatively low cost.

PROTEST AGAINST FREIGHT CLASSIFICATION BY GOVERNMENT.

The National Industrial Traffic League has issued an appeal to its members to use every influence against the passage by Congress of the bill, already passed by the Senate, to require the Interstate Commerce Commission to formulate a uniform classification. In its circular the league says:

"We fear a legislative-made classification would be too rigid and not sufficiently flexible to meet the varying conditions existing in different territories and constantly arising under the varying demands of commerce. We believe the right of initiative in the making of the classification of freight should continue with the carriers through a proper body constituted for that purpose; that the work of the classification committee, or committees, should be subject to review upon formal complaint as to any specific item or items, or, upon its own initiative, by the Interstate Commerce Commission as now authorized by the act to regulate commerce."

NEW ZEALAND RAILWAYS.—The railway system in New Zealand comprises about 2,761 miles. Broadly, the system in the north island consists of the north and south trunk line running fairly central, and connecting Auckland and Wellington, the capital, with loops and important branches to east and west ports with some short spurs. In the south island the main line is an east coast one, with several branches running inland, more especially in the south. In the north and east of the south island the lines are at present isolated, but construction now in hand will lessen this defect. Many of the lines have entailed expensive construction, even with the economy in rough country that the narrow gage undoubtedly gives. Up to the date of the last report of the railways the cost has been an average of $53,615 per mile.

TASMANIAN RAILWAYS.—Tasmania possesses 477 miles of railway on the 3 ft. 6 in. and 2 ft. gage, there being 25 miles of the latter. The main line from Hobart to Launeeston, which was the first railway to be constructed, was opened in 1876 by the Tasmanian Main Line Railway Company, and was operated by that company until 1890, when it was purchased by the government. It is 113 miles long. Another, the Launceston & Deloraine, 45 miles long, was projected by a private company, helped by the government, but had to be taken over by the latter in 1872. A third line of private ownership opened in 1884 was that of the Emu Bay Company, which is still in their hands. The extensions since the above date are chiefly branches of the main line. The average cost per mile of the Tasmanian railways, some of which are through rough country, has been $42,660. The gross receipts last year were $1,389,580, the working expenses $1,077,650, and the net receipts $311,930.

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LOCOMOTIVE TENDER DERAILMENTS.

More Contributions to the Controversy Which Started Last September. A Suggestion as to the Westport Wreck.

In the *Railway Age Gazette* of September 27, 1912, page 569, E. W. Summers of Pittsburgh, Pa., in a communication entitled "A Fortunate Wreck," commented upon tender derailments. A number of our readers took exception to his theories, while others agreed with him in whole or in part, the controversy extending over a couple of months.* Because of the heavy demands on our space it was not possible to publish several communications which were received during the latter part of the year, and which have an important bearing on the subject. Three of them are presented herewith in the order in which they were received:

"G. E." REPLIES TO MR. SUMMERS.

Under date of November 11, "G. E." wrote as follows:

In Mr. Summers' further discussion† of the subject of tender derailments, he disagrees with my statement that the velocity of the wheel is practically unaltered. Let us consider the simple case assumed by him, of a single wheel rolling along the track at a velocity of 88 feet per second, striking an obstruction one-

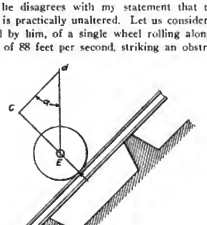

Fig. 1.

half inch high. Its kinetic energy before striking (neglecting that due to rotation) is about 240,796 foot pounds. To raise the wheel ½ in. a portion of this amounting to $\frac{2{,}000}{2 \times 12}$ is expended, leaving 240,713 foot pounds. The velocity corresponding to this energy is $\sqrt{\frac{240{,}713 \times 2 \times 32.16}{2{,}000}} = 87.98$, or about ¼ in. per second less than when it struck the obstruction. Now the average velocity as it rolls onto this half-inch elevation, can be roughly taken as one-eighth inch per second less than 88 feet. The time required will be $\frac{1}{3 \times 88} = \frac{1}{264}$ seconds, so the distance lost will be approximately $\frac{1}{8 \times 264} = .00047$ inch. If the wheel is urged along by the momentum of the rest of the truck, the loss is but a small part of this. Is is enough to slew the truck?

Referring to Fig. 1 (the same as Fig. 3, page 783, October 25, 1912), let us assume the weights to be free to move to the left, just as the wheel of Figs. 1 and 2 (September 27, 1912, p. 570), is free to rise. If v is its velocity, the component of the velocity perpendicular to the rail is $v \sin a$. Then the effect of the blow will be practically the same as if the weight struck the rail perpendicularly with a velocity of $v \sin a$. The energy of the blow would, therefore be $\frac{w\, v^2 \sin^2 a}{2g}$. But Mr. Summers says the force of the blow (by which we must understand him to mean the energy of it) is reduced in proportion as the sine of the angle a is less than 1. This would make it $\frac{w\, v^2 \sin a}{2g}$. If Mr. Summers was correct, we might have the weight strike two rails perpendicular to one another, the blows being $\frac{w\, v^2 \sin a}{2g}$ and $\frac{w\, v^2 \cos a}{2g}$. In other words, we would put $\frac{w\, v^2}{2g}$ foot-pounds of work into the weight, and get back $\frac{w\, v^2}{2g}$ (sin a + cos a). We would build a "perpetual motion" machine at once.

Notwithstanding these differences in calculations, Mr. Summers is certainly correct in calling attention to the danger in high speeds over the track he describes, and I have no desire to disparage his design of truck.

Since the tender frame and the truck bolsters are held in the same relative positions, notwithstanding the location of the side bearings, it is difficult to see how the spacing of them can have any effect upon tender derailments. The thousands of six wheel trucks and of recent four-wheel trucks for steel cars, having side bearings far outside the journals, carrying loads with high centers of gravity, have reputations for safety which cannot be assailed.

FROM MR. SUMMERS.

Under date of November 25, 1912, E. W. Summers, president of the Summers Steel Car Company, Pittsburgh, Pa., wrote as follows:

I am pleased to have the criticism and endorsement of Prof. Lewis E. Moore, of the Massachusetts Institute of Technology, as published in your issue of November 15, 1912, page 919, on my tender derailment articles.

This computation, coming from one of his position and standing, in such an institute as "Boston Tech.," should be accurate and be received as such by the readers of these communications. I have not attempted to make an accurate calculation of the forces set up and am willing to accept the results as found by Professor Moore. I can not agree with some of his assumed conditions; viz. (1) that "If the obstruction is practically unyielding, it will cause the wheel to rise over it. When the center is directly above the obstruction, *the wheel will be moving in a direction parallel to its original direction, in that case, horizontal.*" (Italics mine.) It will not do this, its trajectory at that high velocity will be a curved line for a distance after the center of the wheel is directly above the obstruction. (2) Quoting from Prof. Moore's communication, second column, page 920, "The actual fact of the matter is that the center of gravity of the train and of each car of the train must move in a practically straight line on straight track of uniform grade. The rocking which is so often noticed is caused by a transverse rotation of the car about its own center of gravity, *the center of gravity itself moving in a straight line.*" (Italics mine.)

If you have a *straight track* of *uniform grade*, the car will move in a straight line parallel with the track. The irregularities in supposedly straight track cause the car to rock, pitch, twist, pound and do all kinds of stunts. There is a tendency to rotate about its own center of gravity when a force is applied at one side of its center of mass, and this undoubtedly is what happens within the limitation of the possible lateral movement between the parts of the truck and the car body or tank.

In Fig. 2 is a cross section through an ordinary tender tank and center bearing truck. Fig. 3 shows the same tank in cross

Railway Age Gazette, October 11, page 662; October 18, page 723; October 25, page 783; November 8, page 874; November 15, page 919; December 13, page 1130. See also article by A. Stuchi in the issue of January 17, 1913, page 111.

†*Railway Age Gazette*, October 25, 1912, page 783.

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section carried on a balanced side bearing truck. In each case the center of gravity of the tank and its load, exclusive of the truck, is located at about 7 ft. above the rail. In Fig. 2 the center of gravity is 4 ft. 8 in. above the center plate and 3 ft. below the top of the tank. The tank is often known to sway sideways at the top from 4 to 6 in. each side of its central position. In the illustration it is shown 5 in. to one side. If this rotation was to take place about its center of gravity, the bottom of the tank or the center plate would have to move sidewise in the opposite direction about 7¼ in. This is a physical impossibility; only a small part of 7¼ in. movement can take place through the play of parts of the truck.

In Fig. 3 there is no center support, and a lateral movement can take place. The maximum movement of 2¾ in. is shown, but this does not occur when moving at high velocity. For slow movements the center of rotation is about the intersection of the truck and the vertical hammering between side bearings, common with the ordinary center bearing truck, is entirely eliminated.

The vertical reaction of 352,000 lbs., and the horizontal one of 86,000 lbs., as found by Professor Moore, due to lifting 2,000 lbs. ½ in. in 1/264 of a second will have an increase limited only by the strength of the resisting structure when subjected to the condition shown in Fig. 2, if the left hand wheels are compelled to make an abrupt upward change in direction due to track conditions.

In Figs. 2 and 3, I have purposely chosen a tank having a height of top and center of gravity much lower than many that are in use, rather than to show extreme conditions.

Within the limitation of remaining on the track the results of excessive reaction are shown on the treads of wheels. Quoting the statement of a prominent steel wheel maker, as follows:

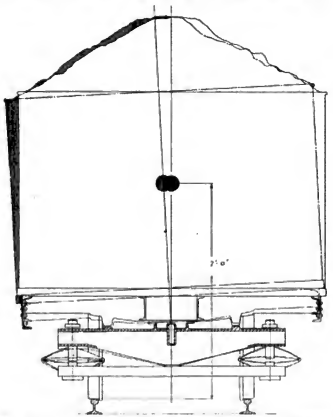

Fig. 2—Cross Section Through an Ordinary Design of Tender and Center Bearing Truck.

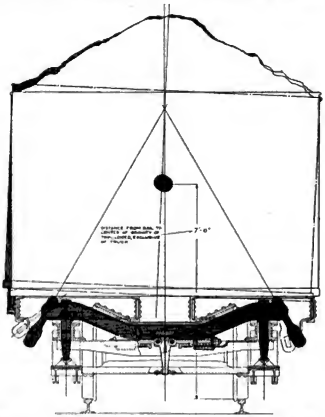

Fig. 3—Cross Section Through Tender With Balanced Side Bearing Truck.

center lines of the inclined hanger bars extended until they meet above the center of gravity position of the tank.

A lateral movement of the heavy shaded parts of the truck can take place by reason of the horizontal springs which are attached to the king pin. The cradle member, upon the outer ends of which the car is supported through the inclined hangers, is pivoted about the king pin. On account of the inertia of the tank and its load, the center of gravity with this construction can and does move in a straight line when traveling at high velocity. The cradle moves sidewise and the vertical truck springs give in such a way as to permit the tank or car body to actually *rotate about its own center of gravity.* This "phase of the question of dynamics" will bear close analysis.

With the side bearing truck illustrated in Fig. 3, the distortion of position shown by the shaded parts at the side and above the tank is that which the parts will assume when standing on a track having a warped surface of about 7 in. in the length of the tender, or from centers of trucks. This shows clearly the flexibility of connection between truck and tank. Rocking in the ordinary sense does not occur with cars carried on this kind of a

"Over 90 per cent. of the trouble commonly known as 'shelling,' 'spalling,' or 'flaking' of wheels, no matter whether they are solid steel or steel tired wheels, occurs in connection with wheels in service under tenders."

PROF. MOORE ON THE WESTPORT WRECK.

Under date of December 10, 1912, Lewis E. Moore, assistant professor of civil engineering at the Massachusetts Institute of Technology, wrote as follows:

I have been thinking over the Westport accident in connection with my letter on tender derailments published in your issue of November 15, and have been particularly struck by the fact that the tender in this case left the rails at a point about as far beyond the crossover as the distance between the two curves in the crossover. The idea of rhythmic oscillations in cars, engines and tenders under certain conditions, which I advanced in the letter above referred to, is interesting in this connection. Let us consider for a moment what would happen under such circumstances. When the tender entered the crossover it would careen sharply to the left, owing to its being carried on springs,

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and also owing to its high center of gravity. In this position, the left hand wheels (on the outside of the curve *A*, Fig. 4) would be held hard down on the rails and the right-hand wheels would have the load materially lightened on them and might even raise from the rails, although I am quite certain they would not in the first oscillation. Raising from the rails would not, however, produce a derailment under these conditions, because the wheels on the *outside* of the curve would be held down hard on the rails. As the tender entered the curve *B* just before leaving the crossover, it would be recovering from its careen to the left and swinging to the right like an inverted pendulum. This curve to the left would accentuate the careen to the right, which the tender had already begun under the action of the springs in trying to resume their normal shape. This would cause the right-hand wheels to bear down hard on the outer rail of the curve *B*, and would probably lift the left hand

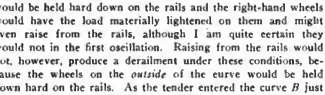

Fig. 4—Arrangement of Tracks at Westport.

or inner wheels up from the track for an instant, but would not cause a derailment, because of the fact that the *outer* wheels would be held down hard on the rails. The tender would then swing back again in a pendulum like fashion toward the left and ordinarily would come to rest after a series of oscillations. What may have happened on this swing toward the left in this Westport case is of interest. As the tender oscillated again toward the *left*, it started around a curve also to the left, and when it reached its extreme of oscillation at *C* was bearing heavily on the left-hand or *inner* wheel. The right-hand or outer wheels, upon which outer wheels devolved the duty of keeping the tender from leaving the rails, were *raised* a little; it need not have been over an inch from the track, for a passing instant, and of course could not longer perform their function of keeping the tender following the curve and the derailment occurred.

In support of this theory, I have endeavored to make a rough mathematical or rather mechanical investigation with the following results: In the first place, it would be impossible for the centrifugal force alone to raise the wheels from the track on a curve such as the one in this crossover. The weight of the tender was about 67 tons fully loaded, and if the radius of the curve in the crossover be taken as 900 ft., and the center of gravity of the tender be assumed as 8 ft. above the rail and the speed 45 miles an hour, or 66 ft. per second, the centrifugal force would be

$$\frac{W}{g}\frac{v^2}{r} = \frac{134{,}000 \times 66 \times 66}{32.2 \times 900} = 20{,}200 \text{ lbs., and}$$

the forces acting on the tender would be as shown in Fig. 5. This set of forces alone could not possibly cause derailment unless the rails should spread, which did not occur in the case under discussion. The tender is not, however, rigid on the wheels and the centrifugal force (Fig. 5) will push it over to the left compressing the left-hand springs and relieving the right-hand ones. The springs then try to assume their original shape, which has a tendency to make the tender oscillate to the right.

If the tender strikes a curve to the left of the 900 ft. radius at this time, the forces acting on the body of the tender will be as shown in Fig. 6. The wheels and springs are removed in this figure and the tender body above the springs is shown diagrammatically. The vertical forces are unbalanced as far as rotation about the center of gravity is concerned and tend to turn the tender in a right-hand direction, *aided now by the centrifugal force*. The result of this combination of forces is that the distance through which the tender will oscillate before the springs stop it is much greater than before, and probably will be enough to lift the left-hand wheels off of the track, but will not cause a derailment because the right-hand wheels keep it following the curve. At the extreme point of the oscillation, the tender will be in the position shown in Fig. 7. If the track be straight from this point on, the action of the springs will be to rotate the tender to the left, compressing the left-hand springs and reducing the pressure on the right-hand ones until very likely the right-hand wheels will be lifted off the track and the forces will be as shown in Fig. 8. If, however, a curve to the left be encountered during this oscillation, the tender will surely leave the track when the right-hand wheels lift, as it depends upon the flanges of the right-hand wheels to make it follow the curve.

For the action outlined above to occur as shown the time of oscillation of the tender must be such that the springs will be throwing the tender to the right when the curve *B* is struck. If the elapsed time interval be great enough for the tender to have swung from left to right and to have started back to the left again as the tender enters the curve *B* the centrifugal force and the action of the springs will mutually counteract each other, and the tender will be steadied by the curve *B* instead of being made to oscillate more violently.

In this case the distance from the beginning of the crossover to the point of derailment was about 200 ft., with the end of the crossover a little over half way from the beginning of the crossover to the point of derailment. In this distance the tender would make about 2½ oscillations, a half one first to the left, then a full one to the right and a full one to the left, or one full swing in about 100 ft., or say 1½ seconds at a speed of 45 miles an hour.

If the radius of gyration of the tender about its axis of rotation were about 7 ft., the time of vibration *T* would be

$$T = \pi\sqrt{\frac{k^2}{ag}}$$

where k^2 = the radius of gyration of the tender about its axis of rotation.
a = distance from center of gravity of tender to axis of rotation.
g = acceleration of gravity, or 32.2 ft. per second per second.

For our purposes, considering the approximations that we must make, *K* may be taken equal to *a*, and if both be taken as 7 ft.

$$T = 3.14\sqrt{\frac{7 \times 7}{7 \times 32.2}} = 1.46 \text{ seconds.}$$

The value of 7 ft. for the radius of gyration is entirely reasonable, owing to the fact that the centrifugal force, acting as it

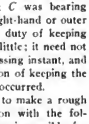

Fig. 5.

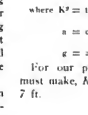

Fig. 6.

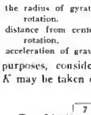

Fig. 7.

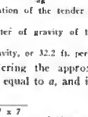

Fig. 8.

does through the center of gravity, gives the tender a translatory motion sidewise which combines with the spring action to cause rotation about a "virtual axis" below the center of gravity of the tender, and thus makes the radius of gyration greater than that about the gravity axis of the tender.

Of course the centrifugal force on the curve after leaving the crossover will tend to counteract the swing of the tender to the left, but this force is comparatively small, being only

$$\frac{13{,}400 \times 66 \times 66}{32.2 \times 5{,}200} = 3{,}480 \text{ lbs.}$$

and will be overcome by the reaction of the springs.

The sloshing of the water in the tender will, of course, make

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an exact solution impossible, but it should be noticed that the action of the water will augment the effects pointed out above. As the tender strikes the right hand curve *A*, the water will slosh over to the left, then to the right as the left-hand curve *B* is struck, and then to the left in an attempt to seek its level after coming out of the crossover. It would just about be clear over to the left of the tender again at the point *C*, where the wheels left the rails as its oscillation also would be rhythmic.

This solution is different from that in the report, but it only requires the wheels to lift less than an inch, whereas the solution given in the report* required the wheels to lift a foot off of the rails and to run for some distance in that position. The centrifugal force could not possibly do this unaided in this case unless it produced oscillations similar to those herein outlined. The report states that the tender was careened to the right and remained in this position while it was "going from the west end of the crossover to the point where the main rail meets the facing switch." If this were the case and it was careened as much as the report assumes, why did it not leave the track where the trailing point of the crossover met the stock rail of track No. 3? The extra width of rail head necessary to produce a derailment under the theory outlined in the report existed at this point.

If the oscillation theory I have given is correct, as I am sure it is, the only effect the facing point switch from track No. 3 to the siding had on the wreck was to deflect already derailed wheels further from the main track.

SUPREME COURT SUSTAINS NEW ORLEANS-MOBILE RATE REDUCTION.

The decision of the Supreme Court in the case of the Interstate Commerce Commission against the Louisville & Nashville, in which the commission appeals from the decision of the Commerce Court, in the New Orleans rate case, was noticed in last week's issue, page 185. The Commerce Court disapproved the commission's order reducing freight rates from New Orleans to Mobile and Montgomery. The commission is now sustained in its decision that the road, having maintained low rates for many years, is bound to continue them, having failed to show sufficient reason for an advance which was made in 1907. The Commerce Court held that the commission had reached its decision without giving proper weight to the evidence; but the Commerce Court is now overruled.

The decision of the Supreme Court, handed down by Justice Lamar, January 20, deals with the subject under nine heads. Under the first he emphasizes the right of all parties to a rate controversy to have a full hearing. A finding without evidence is arbitrary and baseless. The plea of the government, in behalf of the Interstate Commerce Commission, if allowed, would mean that the commission had a power possessed by no other officer, administrative body or tribunal under our government. The commission could disregard rules of evidence and capriciously make findings by administrative fiat. Such authority is inconsistent with rational justice and comes under the constitution's condemnation of all arbitrary exercise of power. Ten decisions are cited to the effect that administrative orders, quasi-judicial in character, are void if a hearing was denied; or if that granted was inadequate or manifestly unfair, or if the finding was contrary to the indisputable character of the evidence.

2. The Interstate Commerce law calls for methods of procedure that "conduce to justice."

3. After hearing, the commission may set aside a rate shown to be unreasonable. If there was no evidence to show unreasonableness, there was no jurisdiction to make the order. The court will not review the commission's conclusions of facts by passing upon the credibility of witnesses or conflicts in the testimony; but the legal effect of evidence is a question of law. A finding without evidence should be set aside "by a court of competent jurisdiction."

4. The law requires the commission to obtain information [without hearings] to perform its duties; but, says the court, such information, while properly used as a basis for instituting prosecutions and for other purposes, is not available where a party is entitled to a hearing. The fact that the commission is not limited by strict rules as to the admissibility of evidence makes it all the more obligatory to preserve the essential rules of evidence. The commissioners cannot act upon their own information as could jurors in primitive days.

5. There was water competition from New Orleans to Mobile, from the beginning, when the road was built, in 1871. In 1887 the rate from New Orleans to Montgomery was adjusted in accordance with the award of Judge Cooley. This award took into consideration rates from points on the Mississippi river in Kentucky to Montgomery, and in certain other territory. The increases which are the subject of controversy were made in 1907. The decision discusses only typical rates. The through rate on class 3, from New Orleans to Montgomery, 68 cents, was 13 cents higher than the combination of the locals from New Orleans to Mobile, 25 cents, and Mobile to Montgomery, 30 cents. New Orleans merchants, to get the advantage of the lower rate shipped goods to Mobile, had them unloaded and then reshipped to Montgomery. When the commission ordered that the through rate should not exceed the sum of the locals the road advanced the local from New Orleans to Mobile from 25 to 38 cents. On December 31, 1909, the commission directed the old locals to be restored, and a corresponding reduction made in the through rate. In evidence before the commission were reports of the railroad company showing earnings and expenses in detail, and tariffs of other railroads for comparison. The commission took the testimony of merchants from New Orleans who had lost business by the increase in rates. The commission found that the rate per ton per mile to Montgomery was higher from New Orleans than from Memphis; that many departures had been made from the Cooley award, and that westbound rates to New Orleans had not been increased. It was held that the old low local rate out of New Orleans had been so long in force as to create a presumption that it was reasonable and compensatory.

6. The court holds it not necessary to review all of the facts in the suit; only the most salient points are mentioned. The validity of the commission's order does not necessarily depend upon the correctness of all of the findings. The question is whether there was substantial evidence to support the commission's order.

7. In the conflict of evidence as to whether comparisons with other rates were proper, the court holds that the value of such evidence varies according to circumstances, but the weight to be given to it is to be decided by the body experienced in such matters and familiar with the complexities, intricacies and history of rate making in each section of the country. As to whether the lower rates westbound were justifiable, the commission was authorized to judge.

8. The abnormally low rate forced by water competition furnished no just standard of reasonableness. Water competition was not potential for some years prior to the increase made in 1907. When made, the increase was not because of the absence of water competition, but to make the sum of the locals correspond with the through rates.

9. The reduction ordered by the commission will upset the Cooley award, under which rates had been adjusted throughout a large section; but that was a matter properly to be decided by the commission. The commission's order was not arbitrary, but was sustained by substantial, though conflicting evidence. The courts cannot settle the conflict, nor put their judgment against that of the rate making body; and the decree of the Commerce Court is, therefore, reversed.

*Railway Age Gazette, November 29, 1912, page 1035.

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THE USE OF HIGHLY SUPERHEATED STEAM.

As the Demands for Power Are Increased In the Operation of a Superheater Locomotive, the Efficiency Increases.

By Gilbert E. Ryder.*

Since the success of the locomotive superheater became established in this country, about 2½ years ago, there have been over 6,000 applied to new and existing locomotives in operation on more than 100 railroads. The type best adapted to American practice has proved to be the fire tube superheater furnishing steam with from 200 degs. to 250 degs. superheat. With this high degree of superheat the steam has a specific volume roughly 30 per cent, larger than that of saturated steam at the same pressure. In passing from the superheater into the cylinders some of the superheat is lost and the specific volume is reduced to a point approaching that of saturated steam. There is, however, at the moment of cut-off, or at the point where the expansive action of the steam commences, fully 100 degs. of superheat in the steam, which is enough to carry it through the expansion and out the exhaust without any condensation. The entire elimination of all losses through condensation, together with the somewhat increased specific volume of the steam, effects, under average conditions, a saving of 30 per cent. in the steam consumption per indicated horsepower and a corresponding saving in fuel of 25 per cent. as compared with a saturated locomotive of the same type, operating under the same conditions.

The increase in hauling capacity is obtained by the increase

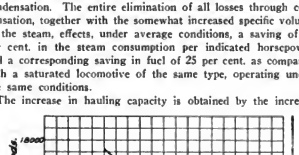

Fig. 1—Drawbar Pull of Saturated and Superheated Steam Locomotive.

in efficiency of the locomotive, made possible principally by the entire elimination of condensation and in a small part by the increase in specific volume of the steam. To illustrate the increase in drawbar horsepower obtained, it is convenient to assume two locomotives of the same dimensions and working under the same conditions of boiler pressure, cut-off and speed, developing the same indicated horsepower, one using saturated steam and the other using highly superheated steam. Under average conditions the superheater locomotive will burn at least 20 per cent. less coal per indicated horsepower. Then, if the same amount of coal is burned in the superheater engine as in the saturated engine, and if the efficiency of the boiler is the same, and the engine efficiency remains constant, the indicated horsepower developed would be 25 per cent. more than that of the saturated engine. That is, if a given amount of coal is burned in a superheater locomotive, say 80 lbs., a certain horsepower will be developed; then, in order to develop the same power, 100 lbs. must be burned in a saturated locomotive.

Only about 70 per cent. of the cylinder power, or the indicated horsepower, is available at the drawbar of the tender in the operation of saturated steam passenger locomotives at average speeds. By the addition of the superheater, the weight, dimensions, etc., of the locomotive are not changed materially and therefore, its efficiency as a whole, will increase over the saturated locomotive at corresponding speeds, because the cylinder power is greater, while the actual machine and tender friction remain practically constant. For example, a saturated locomotive developing 1,000 h. p. at the cylinders on a given amount of coal, 30 per cent. or 300 h. p., being consumed in the engine and tender, will have available at the tender 700 drawbar h. p. A superheater locomotive of the same dimensions operating at the same coal rate, will develop 1,250 h. p. at the cylinders. The loss between the cylinders and the drawbar will practically remain the same, or 300 h. p., which will leave 950 h. p. available at the drawbar, which is approximately 35 per cent. greater than that developed by the saturated locomotive. This example shows clearly what increase in hauling capacity is possible by superheating. Results of test and road conditions have verified these figures many times.

It requires greater cylinder power to maintain a certain drawbar horsepower at the higher speeds. When the saturated locomotive has reached its limit in indicated horsepower, the superheater locomotive still has a margin in cylinder power because of the lower steam rate and consequent increased boiler capacity. In other words the engine efficiency, or the percentage of the indicated horsepower which is available at the drawbar, varies with the speed at which the locomotive is operated. The hauling capacity of the locomotive at different speeds depends on the tractive effort that can be developed and sustained at these speeds. The maximum sustained tractive effort depends in turn primarily on the boiler capacity. To show the supremacy of the superheater locomotive, as far as sustained tractive effort is concerned, the curves in Fig. 1 compare the drawbar pulls in pounds of a saturated and a superheated locomotive of the same general dimensions, at speeds ranging from 25 m. p. h. to 84 m. p. h. for the saturated locomotive, and to 95 m. p. h. in the case of the superheater locomotive. At 80 m. p. h., the sustained tractive effort of the superheater locomotive is about 33 per cent. above that of the saturated locomotive, and represents the increased hauling capacity available at the drawbar at this speed obtained by the use of highly superheated steam. In connection with these curves it is interesting to note that the limit in speed of the saturated locomotive with the train that it was pulling was very nearly reached at 85 m. p. h., indicated by the fact that the curve falls rapidly from 75 to 85 m. p. h. The same reference to the other curve would indicate that the limit of the superheater locomotive with its train, which was the same weight, was not reached at 95 m. p. h., the conditions limiting the speed probably being those of track, rather than that of insufficient boiler capacity.

The supremacy of the superheater over the saturated engine, or the increased hauling capacity obtained by it is clearly shown by a comparison of the curves in Fig. 2. While they show the drawbar horsepower of the saturated and superheater locomotives sustained at various speeds, considered in Fig. 1, they are representative of results that may be expected by the introduction of the superheater. The maximum drawbar horsepower of the saturated engine was developed at about 33 m. p. h., while the superheater locomotive developed its maximum drawbar horsepower at 50 m. p. h.

The increased hauling capacity realized in actual service by the use of highly superheated steam varies widely. The ton mile basis, however, which is generally used, is not altogether reliable and does not show the true increase in hauling capacity

*Locomotive Superheater Company, New York.

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that is obtained. For example, we may consider a saturated locomotive operating a train of eight cars, weighing say 500 tons, over a 100 mile division, which would represent 50,000 ton miles. By the introduction of the superheater it is found possible to haul ten cars over the same division in the same time, burning the same amount of coal. When the superiority of the superheater locomotive is considered on the ton mile basis, the increase in ton miles, due to the superheater, in this case is 20 per cent., while in reality, there may have been many points on the division where the superheater locomotive was developing a drawbar horsepower much more than 20 per cent. in excess of that developed by the saturated locomotive.

In order to utilize to the fullest and most economical extent, the increased capacity of the boiler obtained by the superheater, the diameter of the cylinders should be increased in proportion to the increase in boiler capacity. It is not enough to merely increase the cut-off or the length of admission, because if this only is done, the steam will not be used at the same efficiency. That is, the cut-off coming later in the stroke, the steam does not have an opportunity to expand through the necessary range to insure its most economical use. The terminal temperatures and pressure are high, and consequently, the losses are greater. When superheaters are applied to existing locomotives the adhesive factor and the strength of the parts to withstand the greater piston thrusts must be taken into account. It is generally possible to increase the cylinder diameter to some extent without danger. This fact makes the superheater an economical remedy for locomotives where cylinders are too large for the boiler, or, in other words, for locomotives deficient in boiler capacity.

In the rating of locomotives the boiler capacity is in most cases either directly or indirectly the limiting factor and the maximum starting effort that the locomotive is capable of exerting is of secondary importance. Passenger locomotives and freight locomotives into the rating of which the speed element enters, are rated according to the ability of the boiler to furnish steam and maintain a certain tractive effort at the desired speed. The maintained tractive effort is only a fraction of the maximum starting effort of the locomotive, so that in almost all cases, it may be said that the tonnage rating is in reality based on the capacity of the boiler. Then, inasmuch as the increased hauling capacity is based upon the ability of the boiler to furnish sufficient efficient steam, the superheater installed in the boiler provides a reserve source of power which is amply sufficient to meet the demands that are made upon it. In fact, it has been said that the superheater locomotive cannot be overloaded, but that it will pull all that it can start. It is also a fact, that as the demands for power are increased in the operation of the superheater locomotive, the efficiency increases, which makes it possible to "beat it," under conditions where a saturated locomotive must be favored.

All parts of the locomotive require a certain amount of attention in order that they be properly maintained. There are, however, some parts, the maintenance of which is more vital to the efficiency of the engine than others. The superheater may be considerably neglected without resulting in a complete engine failure, but any neglect will affect its efficiency and the ultimate results in economy that may be realized will not be obtained. One instance, which I recall was that of an engine in passenger service, running out of Chicago. For some time this engine had been reported as not steaming well. The front end was examined and there were found to be three holes each of about ¼ inch diameter in the unit pipes, having been cut by the action of the steam from a leak in the front flue sheet flange. Had there been a leak of this size in the steam pipe of a saturated engine, it would have been impossible to operate at all. The superheater locomotive, however, had a sufficient margin in steam capacity to make the schedule time over the division, although the economy that should have been obtained was not being realized. This incident is mentioned to bring out the importance of making periodical inspections and tests of the superheater, and particularly of the front end, in order to find any leaks that will affect the economy of the operation before they have become so large that the engine must be taken out of service to repair them. The practice of making an inspection every thirty days will insure a better economy in the performance of the engine, as well as prevent any small leaks becoming so large as to necessitate extensive repairs.

Another point to be carefully watched in the maintenance of the superheater locomotive is that of keeping the large flues clean so that the flow of gases through them will not be retarded or altogether stopped. The water heating surface in the boiler of the superheater locomotive is less than that of the boiler of the same design for saturated locomotives, and the large flues constitute a large percentage of this surface. The flue cleaning periods cannot be fixed to apply to all operating conditions; the quality of the coal used principally governs the fixing of these periods.

From a maintenance standpoint, the care of the flues necessitates the use of the flue roller, prosser expanders and beading tool. In using these tools, experience has proved that the prosser should be given the preference, using the roller only when absolutely necessary, and omitting the beading process

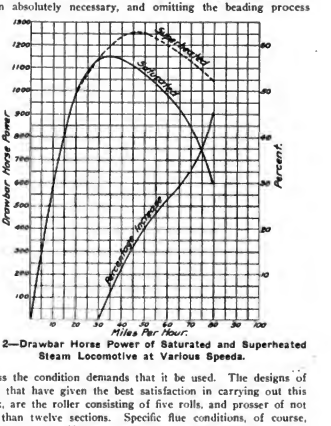

Fig. 2—Drawbar Horse Power of Saturated and Superheated Steam Locomotive at Various Speeds.

unless the condition demands that it be used. The designs of tools that have given the best satisfaction in carrying out this work, are the roller consisting of five rolls, and prosser of not less than twelve sections. Specific flue conditions, of course, demand that specific methods be used in caring for them, but the above applies in general.

The firing should be light and regular, on account of the fact that the coal economy is improved by the superheat, thereby necessitating the burning of a smaller amount of coal to develop the same power. The aim of the fireman on a superheater locomotive, in order to get the best results, and to make the work easier for himself, should be to maintain a fire that will result in the highest firebox temperatures. This practice will insure, as far as combustion is concerned, the highest degree of superheat and therefore, the best efficiency for the locomotive. In running locomotives equipped with superheaters the engineer should, in addition to satisfying himself that all parts are operative, carry the water in the boiler as low as operating conditions will permit.

DISCUSSION.

In the discussion of Mr. Ryder's paper special emphasis was laid on the necessity of keeping the superheater flues clean and

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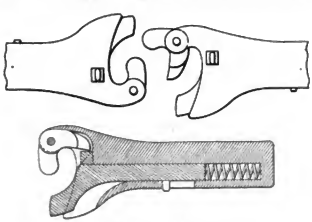
of having the engine house foremen enforce this rule. The Chicago & North Western provides its inspectors and flue cleaners with flash lamps for this purpose. The greatest economy of superheater locomotives has occurred on long hard passenger runs. It was the consensus of opinion that it would pay to replace the slide valves with piston valves on old power in order to use superheated steam. In some cases this has been done without making an entirely new cylinder casting. The fact was also brought out that the stroke of an engine could be made shorter when superheated steam is used. The superheater damper has been removed on some locomotives, but it has been found that the superheater tubes deteriorate more rapidly when this is done.

A NEW DESIGN OF CAR COUPLER.

The aim of the inventor of the Stark coupler, which is shown in the illustration, was to obtain a coupler which would be automatic in all coupling conditions. The principal feature of the device is the plunger shown in the sectional view. This is intended, when struck by another coupler, to compress the spring at the bottom of the pocket and permit the opposing knuckle to enter. When pulling, the tongue of the knuckle forces the lock-



New Design of Automatic Coupler.

ing pin against the plunger and a series of corrugations on the faces between the plunger and the locking pin prevents the plunger from moving. It is claimed for this coupler that with the two knuckles in any relation whatever, there is no difficulty in coupling cars on either straight track or track with any degree of curvature. It is patented by C. H. Stark, Strasburg, Virginia.

VICTORIAN RAILWAY DEVELOPMENT PLAN.—Hitherto it has been the policy of the Victorian Railway Commissioners to construct lines on routes favorable to immediate profit bearing on the capital outlay. In order, however, to assist remote and isolated districts the government recently introduced into the Legislative Assembly a bill entitled The Developmental Railway Bill. The object of this bill is to permit the construction of lines in isolated districts even where the lines are likely to be operated at a loss for a number of years. Power is to be given to the Legislative Assembly to order the construction of one of these proposed lines at a time. A fund is also to be accumulated from the money received from the sale of Crown lands and added to that now in hand for the railway construction account, and this will be devoted to meeting deficits arising out of the working expenses and the interest on cost of construction for a period of 20 years. The bulk of the permanent way and other materials, rolling stock, etc., will more or less be provided locally, but there are certain types of plant, machine tools, etc., which will have to be imported for the local repair shops on the route.

General News.

The Wabash Railroad has increased the pay of shopmen in most cases from 6 to 10 per cent.

The Pennsylvania Railroad has notified all of its connections, and also the Pullman Company, that wooden sleeping cars will no longer be accepted to be moved in Pennsylvania trains.

A full crew bill has been introduced in the legislature of New Mexico requiring an additional brakeman on passenger trains of more than five cars, and freight trains of more than 40 cars, and a fireman's helper on Mallet engines.

The Georgia Railroad, after extended conferences, has raised the pay of conductors and trainmen, about 300 men altogether. Train porters and switchmen are included in the advance. Many of the men will receive 10 per cent. increase, and some of them more than that.

A hearing before a master in chancery was begun at Chicago on January 27 in the suit by the federal government against several Oregon and California railways to cancel land grants of timber property on the ground that the railways have violated their government contracts for the disposition of the lands.

A. L. Ruthven, inventor of an automatic train stop, has been tried in the Federal court at New Orleans and has been convicted and sentenced to three years imprisonment in the Federal prison at Atlanta, Ga., for using the mails to defraud. He was selling stock at two dollars a share. Ruthven was also indicted in Canada.

The Clinchfield Railway Club has been organized with a membership of about 250 employees of the Carolina, Clinchfield & Ohio. All classes of employees are eligible to membership. The club has leased rooms at Erwin, Tenn., including two reading rooms and a hall, which will be provided with railway and general literature, newspapers and periodicals.

Isaiah Hale, safety commissioner of the Atchison, Topeka & Santa Fe, has announced a series of free lectures and entertainments for employees of the company, with moving pictures, lantern slide, music, readings and talks on the value of "Safety First," to be held at various towns on the lines of the road during the next two months. The moving pictures will illustrate accidents to trains and in shops and yards.

A committee of the Indiana senate has been holding hearings on a proposed bill providing for the separation of grades on the railways of the state, requiring the road community to pay 25 per cent of the cost and the railways the other 75 per cent. It is provided that the railway commission shall not make more than one order of this kind against a railway in any one year, and that no more than one grade separation shall be ordered for each 200 miles of track.

The Northern Pacific has offered to give its abandoned right of way and old roadbed between Tacoma, Wash., and Vancouver to the state of Washington for the proposed Pacific automobile highway. The property cost the railroad company more than $2,000,000, and the consideration asked is $1. The company had intended to build four steel bridges across the Cowlitz and Tottle rivers. The substructures for these bridges are in good condition and would be available for bridges for the proposed highway. Some of the roadbed has stood for 30 years and there is a graded right of way on which $1,000,000 was spent in 1899 and 1890.—*Exchange.*

As was noted last week the conductors and trainmen of the principal eastern roads are presenting demands or requests for increases of pay. In Canada, according to the press despatches, this movement is participated in by the enginemen as well as the conductors and brakemen; but the committees of employees will not call upon the officers of the Canadian roads for some little time yet. On the Bangor & Aroostook, where the enginemen struck last week, the conductors and trainmen are now demanding an increase in pay. The B. & A. relieved the congestion of freight on its line last Sunday, and seems likely to be able to vanquish the striking enginemen and firemen.

The New York Railways Company, operating surface street railways in New York City, has announced an increase of pay

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of employees which aggregates $150,000. The general manager, in announcing this increase at a social meeting of employees, said that the company intended also to establish a number of stores at which the employees could buy the necessaries of life at cost. These stores will be available not only for the employees of the New York railways, but also for those of the Interborough Rapid Transit Company, the lines of which are operated in the same interest. The first store will be at Fiftieth street and Eighth avenue, Manhattan.

A statistician in Pennsylvania calculates that in the year 1912 120,000,000 tons of water were pumped out of the mines of the Lehigh Valley Coal Company, about 15 tons of water for every ton of coal produced. This is believed to be about the average proportion for all the companies operating in the anthracite region. The output of water from the Pennsylvania anthracite mines long ago overtook and passed the output of coal, but no one thought twelve or fifteen years ago that the pumping problem would be as serious as it now is. The cost of pumping is one of the most important elements in the increased cost of mining. As the richer and more accessible veins of coal have been exhausted, shafts have been sunk lower and lower. In his last annual report the chief of the Pennsylvania Department of Mines gives the number of pumps used for pumping water out of the anthracite mines as 901, and their total capacity as 929,248 gallons a minute.

Indiana, the legislature of which is one of the most fertile fields for new railroad laws, is coming to the front in good shape for 1913. Representative Cunningham, of Miami county, proposes to compel railroads to install "automatic fireboxes" on locomotives! If this scheme should succeed we may next hope, perhaps, to have some legislative provision which will automatically deal with hot boxes—preventively. Two bills have been introduced to require railroad companies to pay employees twice a month. There is a movement among employees in opposition to this proposal, but certain employees drawing moderate pay say that the opposition comes from a few railroad men who receive high pay and who, therefore, can readily get credit at the stores for a month at a time. The Brotherhood of Railway Trainmen is fathering a bill to regulate the promotion of brakemen and firemen to the position of conductor and engineman, by requiring two years' experience in each case.

George Bradshaw, general safety agent of the New York Central Lines, has issued to the members of the safety committees on those lines a circular letter asking each member, on all of the committees, to speak, within thirty days, to three employees in his own branch of service, explaining briefly the purpose of the safety movement. Committee members are asked to impress on the individual the importance of the rules and regulations, to call attention to typical risks and to cite examples which will impress the argument presented. And each person spoken to is to be requested in turn to go and talk with three other employees; and thus Mr. Bradshaw's idea, if carried out, will soon extend the safety propaganda to everybody in the service. The New York Central Lines' committees now number sixty, and on them there are about 900 members; and although the movement was started only last May, Mr. Bradshaw feels highly gratified with the results already accomplished.

For the second time in their history—of 35 years—the elevated railroads of Manhattan, New York City, have had a train accident in which a passenger was killed. This was a rear collision on the Third avenue line Saturday afternoon, January 25, the leaving train being at a standstill. The other was running slowly but the rear car of the leading train and the front car of the following one were badly crushed at the ends, and a policeman riding in the second train, sitting immediately behind the motorman's box was stunned, and his body was jammed under the seat in the motorman's box. The car took fire immediately from a short circuit and it is believed that the policeman was burned to death. From the testimony of a passenger it seems that the motorman had neglected to keep a good lookout, the train ahead having been in sight for some distance. Seven years ago a number of passengers were killed at Fifty-third street and Ninth avenue, when a car fell off the elevated structure because of too high speed on a sharp curve. Aside from that case the present is the first train accident in which a passenger has been killed. For many years these roads have carried over 500,000 passengers a day, and many times a million in one day.

Governor Advocates State Ownership of Pere Marquette.

Governor Ferris of Michigan has been quoted in the newspapers as urging that the state take over the ownership of the Pere Marquette.

"My legal knowledge on the subject of state ownership of railroads is exceedingly meager," he said, according to the reports. "But under certain conditions, it seems to me, it would be wise for Michigan to own the Pere Marquette Railroad. This system, so called, forms a network throughout Michigan. If the state can legally take over this road it would be a godsend to the people. Furthermore, Michigan could then furnish a practical illustration of public ownership."

Government Report on Montz Collision.

The Interstate Commerce Commission has issued the report of Chief Inspector Belnap on the rear collision on the Yazoo & Mississippi Valley, at Montz, La., November 12, in which 15 passengers were killed and 249 were injured. The report contains a detailed statement of the circumstances attending the collision, but contains only a few items of importance in addition to facts already published. It appears that the flagman, whose neglect was the immediate cause of the collision, and who was only 19 years old, had worked for the company about six years and had been employed as a section foreman for two years before he entered the train service. The engineman of the freight train, who was held responsible for running much faster than 25 miles an hour, the limit of speed prescribed for his train, had been in service since 1900 and had been engineman since 1906. He had been disciplined twice for responsibility for collisions; in April, 1908, and December, 1910. Mr. Belnap calls attention to the fact that the ten minute time interval prescribed by the rule does not afford safety at night when open telegraph offices are long distances apart. Referring to the reason given by the road for not using the block system—that all the available money was being used on portions of the road where traffic conditions more urgently required the block system, he says: "This argument, of course, applies only to the automatic block system. There is no reason why a manual block system could not be introduced on this division, the maintenance of a few more night offices being all that would be required to secure the additional factor of safety afforded by such a block system."

An Automatic Train Stop on the H. & B. T. M.

The Huntingdon & Broad Top Mountain Railroad (which connects with the Pennsylvania at Huntingdon, Pa.) has in experimental use an automatic train stop, which has been installed by the Safety Block Signal Company, of Atlantic City, N. J., of which the secretary is W. F. Shaw.

Carried on the locomotive is a contact wheel which, at each signaling point, comes in contact with a rail or ramp, fixed on the sleepers between the rails, in such a way that the wheel is slightly lifted. In its upward movement this wheel actuates a valve which causes the movement of a piston, in a pneumatic cylinder, so arranged as to shut off steam and apply brakes; this in case the block section ahead is occupied and it is desired that the train be stopped. If, however, the block section is clear, an electric current, from a battery at the roadside, passes through the ramp and the contact wheel and energizes an electro-magnetic valve on the engine which prevents the operation of the piston which, if not thus held, would apply the brakes. The general principle, it will be seen, is similar to that of the cab signal used on the Great Western Railway of England. After an engine has been stopped by the automatic apparatus, the engineman can release the brakes; but only after disturbing a recording device, which will record the fact that he has taken such action. Mr. Yohn, superintendent of the road, informs us that satisfactory tests were made with the apparatus December 27. Two locomotives are equipped with this stopping mechanism.

Earnings of the Steel Corporation.

The report of the United States Steel Corporation for the quarter ended December 31, 1912, shows that the total net earnings were $35,185,557, after deducting all expenses incident to operation, including those for ordinary repairs and maintenance of plants and fixed charges of subsidiary com-

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panies. This figure was about as expected. For the full year, net earnings aggregated $108,178,307, an increase of $3,872,841 over the preceding year. Notwithstanding this increase in net earnings, the surplus of $3,610,129 was $1,055,366 less than reported in 1911. This was due to an increase of $4,828,729 in depreciation and sinking funds on bonds of subsidiary companies. Last year the Steel Corporation earned approximately 7 per cent. on the preferred stock, and 5¼ per cent. on the common stock. The surplus reported for the last quarter of 1912 amounted to $7,410,979, which after deducting a net deficit for the three previous quarters of $3,800,850, left a balance of surplus for the year 1912 at $3,610,129. For the last two years the surplus has aggregated only $8,200,000, and outlays for new construction have amounted to close to $80,000,000. No appropriations from earnings for new construction have been made during that time. The net earnings for the last quarter were divided as follows: October, $12,485,412; November, $11,120,749; and December, $11,579,396.

Conditions of Firemen's Wage Controversy.

Elisha Lee, chairman of the committee representing the fifty-four eastern roads in negotiations concerning wages, has issued a circular calling attention to a statement which has appeared, in connection with the firemen's strike vote, to the effect that the responsibility for failure thus far to arbitrate the matters in controversy rests upon the railroads and not on the firemen. This statement, made under the authority of the leaders of the firemen, has been sent out with the blanks for ballots. [The ballots are to be returned February 10.] To confute it Mr. Lee says:

1. The railroads are prepared to apply to the firemen—and have already communicated this to their committee—the conclusions embodied in the award of the board, which, to the satisfaction of the country, recently arbitrated the differences between the locomotive engineers and the railroads. The roads have also signified their willingness to grant certain increases in wages.

2. The railroads are prepared to arbitrate the present case independently by a board of five members appointed by some such disinterested authorities as Chief Justice White of the United States Supreme Court, Judge M. A. Knapp, and Commissioner C. P. Neill, as was done in the engineers' case.

The railroads' committee says that in the instructions to the various lodges sent out by the Firemen's Committee, there is this paragraph:

"Under no circumstances should any person voting be told that 'there is no danger of a strike,' for it is expected that every man will vote just as he intends to act. If he does not expect to leave the service of the company, if necessary, he should not deceive the officers of the Brotherhood by voting Yes."

The railroads, says Mr. Lee, stand prepared to grant certain increases; and they agree that the firemen deserve adjustments in their wages; but the amount claimed is neither warranted by conditions, nor within the power of the companies to pay, having due regard to their other obligations. Continuing, he says:

"At a recent conference between the firemen's committee and the railroad managers, President W. S. Carter, of the firemen, used this language: 'I speak the truth when I say that railroad employees are anxious that our little private troubles should not result in injury to both of us. This public that you are talking about sometimes had best not know our troubles. If there is anything in the world we absolutely refuse to do, it is to go through with what the engineers went through, which was practically a fiasco.'"

In a later circular, Mr. Lee says:

"It has been stated in the press that the firemen prepared to arbitrate under the Erdman Act, while the railroads decline to do. The ballot which is worded so as to demand an increase in the firemen's payroll of $9,600,000, or 35 per cent. annually. Assuming, however, that the real object of the ballot is to force upon the railroads arbitration under the Erdman Act, the railroad companies wish their position made clear. The railroads are prepared to arbitrate before a commission of five or seven or nine men. . . . This was done in the engineers' controversy. It was fair. It satisfied the people of the country.

"The objection to the Erdman Act is apparent from a statement of what the act plans, namely, that arbitration shall be by a commission of three, one appointed by each side, and the third by the other two, or else by Judge Knapp and Commissioner Neill. The whole decision is in the hands of one man. It is too much power for one man to have. The Erdman Act was drafted to settle labor disputes on single railroads, not on all the railroads of a large territory.

"P. H. Morrisey, the engineers' representative on the recent Arbitration Commission, recognizes this defect of the Erdman Act. He says: 'The Act might also be amended so that the arbitration board might have three, five, seven or nine members, depending upon the magnitude of the issue, with the neutral representatives holding the balance of power.'

"The neutral members of a wage arbitration affecting railroads represent the public. It is the interests of the public, along with their employees' and their own, that the railroads are endeavoring to protect. They maintain that the engineers' arbitration board was right in saying: 'The most fundamental defect of the Erdman Act is that the interests of the public are not guarded by it.'"

American Wood Preservers' Association.

At the closing session of the convention of the American Wood Preservers' Association, Thursday afternoon of last week, a resolution was adopted petitioning the Ways and Means Committee of Congress to retain creosote upon the free list, calling attention to the injury to the wood preserving industry and to the conservation of forests as a whole if the import duty of 10 per cent. proposed by the Underwood bill be allowed to pass. In addition to petitioning the various members of Congress, a committee was appointed to appear before the Ways and Means Committee at the proper time.

Another resolution was adopted opposing a bill now before Congress for taking the control of the forests from the national government and placing it with the individual states.

The following officers were elected for the ensuing year: President, A. E. Larkin, manager Republic Creosoting Company, Minneapolis, Minn.; first vice-president, J. H. Waterman, superintendent of treating plant, Chicago, Burlington & Quincy, Galesburg, Ill.; second vice-president, E. F. Fnlks, American Creosoting Company, Chicago; third vice-president, George E. Rex, manager of treating plants, Atchison, Topeka & Santa Fe, Topeka, Kan.; secretary-treasurer, F. J. Angier, superintendent of timber preservation, Baltimore & Ohio, Baltimore, Md. New Orleans was selected as the location for the next meeting.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W. Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—E. R. Weminger, 13 Park Row, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—G. P. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

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BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—A. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday except in August, Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussells, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May, 1913, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, Chicago & North Western, Escanaba, Mich. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION OF U. S. AND CANADA.—A. P. Daoe, B. & M., Reading, Mass. Annual meeting, September 9-11, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES' ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—Angus Kenzie, Room 1, St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, New York, week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY MECHANICAL ENGINEERS' ASSOCIATION.—A. M. Waitt, Manufacturers' Assoc.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assn. Ry. Elec. Engrs.

RAILWAY PURCHASING AGENTS' ASSOCIATION.—Edward S. Hammatt, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEPARTMENT ASSOCIATION.—W. L. Huggins, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York, convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCES ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Telegraph Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W. Sterling, Ill. Convention, September 9-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—J. W. Taylor, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—Wm. M. Kingsley, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwith, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolsoo Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meets monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Maekie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—Fred Bullard, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

Wholesale dealers at New York City are said now to have on hand at freight terminals about 1,000,000 barrels of flour, which is one-third more than is usual at this time of the year—or at any time. The flour warehouses at all of the railroad terminals are crowded.

The Southern Railway is to run an agricultural instruction train over its lines in Virginia from February 6 to February 27, making stops at 36 places. The train will be made up of five cars, of which two are to be used for lectures and two for exhibits. The Virginia Department of Agriculture will co-operate with the road.

After a conference with a committee representing various local business associations, and including three aldermen, President Markham, of the Illinois Central, has agreed to restore the round-trip suburban fares in Chicago to the rates charged before January 1, when the rates were advanced to two cents a mile. The old round-trip rates will be restored on February 1, but the one-way single fares will remain at two cents a mile.

A supplement to Western Classification No. 51 has been completed by the Western Classification Committee following the recommendations of the Interstate Commerce Commission for changes in the classification following the commission's investigation. It is intended to put the supplement into effect on short notice on February 14, if it is approved by the commission, simultaneously with No. 51, which will have been suspended for a full year on that date.

The Missouri Pacific is to establish five large demonstration farms and is planning to go into this work for the benefit of the farmers on a large scale. The farms will range in size from 25 to 40 acres. They will be under the supervision of L. A. Markham, agricultural commissioner of the road, whose office is at Little Rock. Mr. Markham was formerly in the service of the agricultural department at Washington, and he will have the co-operation of that department as well as of the state agricultural colleges of Arkansas and Louisiana. Three of the farms will be in Arkansas and two in Louisiana, and probably a sixth will be established in southern Missouri. It has been decided to continue this experimental work at least three years, whether results be favorable or otherwise.

Proposed Reports of Traffic Statistics.

The Interstate Commerce Commission, having conferred with prominent railway officers and secured the co-operation of a committee of the Association of American Railway Accounting Officers, is considering the question of formulating a general scheme of traffic statistics under which reports would be made by the carriers giving information such as might be useful to the commission in considering questions before it, especially questions regarding increases or decreases in freight rates. As a preliminary to this, a circular has been issued signed William J. Meyers, statistician of the commission, calling for information from the railways to be sent in before February 10 as to the practicability of making the proposed report, and asking also for opinions as to the best method of procedure. It is desired to have records of the movement of imported commodities from principal traffic centers to other traffic centers, showing both tonnage and revenue. The tonnage is shown also in carloads. In the circular now sent out Mr. Meyers presents a suggested standard list of commodities; a standard list of districts of production and of consumption and a sample statement form. Under one of the plans proposed all of these traffic statistics would be made up at the station of destination so as to insure accuracy in spite of diversions in transit and other irregularities, such as stopping in transit for manufacture or partial manufacture. The tentative list of commodities contains 98 items. The tentative list of points of origin and destination covers the whole of the United States, and also has a dozen items to represent foreign countries; for example, the districts in Massachusetts are (1) Boston, Cambridge and Lynn; (2) Brockton; (3) Fall River, New Bedford; (4) Holyoke, Springfield; (5) Lawrence, Lowell; (6) Somerville; (7) Worcester; (9) remainder of Massachusetts. Railway officers

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receiving this circular are asked to make criticisms or offer alternative plans and to give an estimate of the expense of producing records under the plan proposed.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 135A, giving a summary of car surpluses and shortages by groups from October 11, 1911, to January 15, 1913, says: The total surplus on January 15, 1913, was 53,230 cars; on December 31, 1912, 50,659 cars; on January 17, 1912, 102,479 cars.

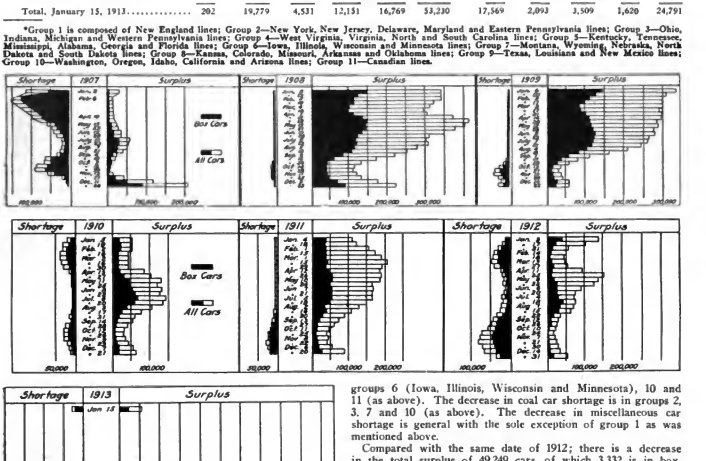
Compared with the preceding period; there is an increase in the total surplus of 2,571 cars, made up as follows, 6,701 box, 450 flat, 92 miscellaneous, and a decrease of 4,672 coal car surplus. The increase in box car surplus is in groups 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 3 (Ohio, Indiana, Michigan and western Pennsylvania), 4 (the Virginias and Carolinas), 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), 9 (Texas, Louisiana and New Mexico), 10 (Washington, Oregon, Idaho, California, Nevada and Arizona), and 11 (Canadian lines). The increase in flat car surplus is in groups 1 (New England lines), 7 (Montana, Wyoming, Nebraska and the Dakotas), 9, 10 and 11 (as above). The decrease in coal car surplus is in groups 2, 3, 5, 7 and 8 (as above). The increase in miscellaneous car surplus is in groups 2, 3, 10 and 11 (as above).

The total shortage on January 15, 1913, was 24,791 cars; on December 31, 1912, 33,601 cars; on January 17, 1912, 12,194 cars. Compared with the preceding period; there is a decrease in the total shortage of 8,810 cars, of which 6,527 is in box, 658 in flat, 1,227 in coal and 398 in miscellaneous cars. The decrease in box car shortage is in all groups, except in 1, 5, 7 and 9 (as above). The decrease in flat car shortage is general except in

CAR SURPLUSES AND SHORTAGES.

	Date.	No. of roads.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—	January 15, 1913	7	50	770	137	35	992	319	44	173	178	714
" 2.—	" 15, 1913	31	1,047	42	1,653	135	2,877	41	0	1,190	0	1,231
" 3.—	" 15, 1913	29	2,691	317	1,694	1,181	5,883	1,593	10	531	202	2,336
" 4.—	" 15, 1913	11	4,826	91	768	1,126	6,811	885	474	442	0	1,801
" 5.—	" 15, 1913	26	411	13	538	615	1,577	3,160	979	653	66	5,058
" 6.—	" 15, 1913	30	763	471	2,063	2,390	5,707	5,463	468	502	606	7,039
" 7.—	" 15, 1913	5	38	253	109	380	780	503	0	10	46	559
" 8.—	" 15, 1913	16	1,458	350	2,089	1,713	5,610	751	19	0	23	793
" 9.—	" 15, 1913	15	2,855	239	398	580	4,072	50	4	8	18	80
" 10.—	" 15, 1913	23	4,319	1,368	2,682	7,892	16,261	541	41	0	396	1,018
" 11.—	" 15, 1913	7	1,321	610	0	722	2,653	4,023	54	0	85	4,162
Total,	January 15, 1913	202	19,779	4,531	12,151	16,769	53,230	17,569	2,093	3,509	1,620	24,791

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages from 1907 to 1913.

groups 6 (Iowa, Illinois, Wisconsin and Minnesota), 10 and 11 (as above). The decrease in coal car shortage is in groups 2, 3, 7 and 10 (as above). The decrease in miscellaneous car shortage is general with the sole exception of group 1 as was mentioned above.

Compared with the same date of 1912; there is a decrease in the total surplus of 49,249 cars, of which 3,332 is in box, 4,747 in flat, 30,619 in coal, and 10,551 in miscellaneous. There is an increase in the total shortage of 12,597 cars, of which 8,699 is in box, 1,908 in flat, 934 in coal and 1,056 in miscellaneous cars.

The accompanying table gives car surplus and shortage figures by groups for the last periods covered in the report and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

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Traffic Club of Chicago.

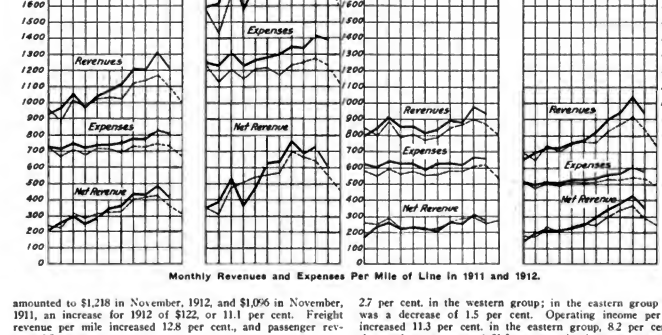
The sixth annual dinner of the Traffic Club of Chicago was the most successful in its history, there being 650 members and guests present. The speakers were John H. Atwood, of Kansas City; W. D. Nesbit and James Hamilton Lewis, of Chicago. George A. Blair, traffic manager of the Chicago & Alton, was toastmaster.

Summary of Revenues and Expenses of Steam Roads in November.

The Bureau of Railway Economies' summary of revenues and expenses and comments thereon for November, 1912, are as follows: The railways whose returns are included in this bulletin operate 221,110 miles of line, or about 90 per cent. of all the steam railway mileage of the United States. The total operating revenues for the month of November, 1912, amounted to $269,345,082. This includes revenues from freight and passenger traffic, from carrying mail and express, and from miscellaneous sources. Compared with November, 1911, the total operating revenues of these railways show an increase of $30,984,296. These total operating revenues per mile of line outside operations less taxes, amounted in November to $363.75 per mile of line, and in November, 1911, to $315.06. This was an increase for 1912 of $48.69, or 15.5 per cent. Operating income for each mile of line for each day in November averaged $12.13, and for November, 1911, $10.50. This represents the gross income available to the railways for rentals, interest on bonds, appropriations, and dividends.

The operating ratio for November, that is, the per cent. of total operating revenues which was absorbed in operating expenses, was 66.4 per cent., which is comparable with 63.1 per cent. in October, 1912, and 64.4 per cent. in November, 1911.

The eastern group of railways shows an increase in total operating revenues per mile of line as compared with November, 1911, of 11.7 per cent., the southern group an increase of 7.6 per cent., and the western group an increase of 12.1 per cent. Operating expenses per mile increased 12.6 per cent. on the eastern railways, 7.5 per cent. on the southern railways, and 8.5 per cent. on the western railways. For the eastern group of railways net operating revenue per mile increased 9.6 per cent., for the southern group it increased 7.8 per cent., and for the western group it increased 18.6 per cent. The increase in taxes per mile was 7.8 per cent. in the southern group, and



Monthly Revenues and Expenses Per Mile of Line in 1911 and 1912.

amounted to $1,218 in November, 1912, and $1,096 in November, 1911, an increase for 1912 of $122, or 11.1 per cent. Freight revenue per mile increased 12.8 per cent., and passenger revenue 6.2 per cent.

Operating expenses, which include all the costs of maintaining track and equipment, operating trains, securing traffic, and of administration, amounted in November to $178,971,350. This was $18,968,253 more than for November, 1911. These operating expenses per mile of line amounted to $809 in November, 1912, and $736 in November, 1911, an increase for 1912 of $73 per mile, or 10.0 per cent. All the five primary operating expense accounts showed increases over 1911.

Net operating revenue, that is, total operating revenue less operating expenses, amounted in November to $90,373,732. This was $12,016,042 more than for November, 1911. Net operating revenue per mile of line amounted to $409 in November, 1912, and $360 in November, 1911, an increase for 1912 of $48 per mile, or 13.4 per cent. Taxes for the month of November amounted to $10,206,754, or $46 per mile, an increase of 1.4 per cent. over November, 1911.

Operating income, which is the net revenue from rail and 2.7 per cent. in the western group; in the eastern group there was a decrease of 1.5 per cent. Operating income per mile increased 11.3 per cent. in the eastern group, 8.2 per cent. in the southern group, and 21.3 per cent. in the western group.

Comparison of the returns for the five months of the fiscal year with those of the corresponding months of the previous fiscal year reveals an increase in total operating revenues per mile of 9.4 per cent., an increase in operating expenses per mile of 8.6 per cent., and an increase in net operating revenue per mile of 10.9 per cent. This net operating revenue per mile of the eastern group of railways increased 9.3 per cent., as compared with the corresponding period of the previous year, that of the southern group increased less than one-tenth of one per cent., while that of the western group increased 15.8 per cent.

When the returns for the 11 months of the calendar year 1912 are compared with those of the corresponding months of 1911, they show an increase in total operating revenues per mile of 5.8 per cent., an increase in operating expenses per mile of 6.3 per cent., and an increase in net operating revenue per mile of 4.5 per cent. There was an increase in net operating revenue per mile of 4.8 per cent. in the eastern group, an in-

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crease of 7.4 per cent. in the western group, and a decrease of 4.5 per cent. in the southern group.

The diagram shows the variations in total operating revenues, operating expenses and net operating revenue per mile for several months of the calendar year 1911 and of the calendar year 1912 to date. The following table shows the per cent. of operating revenues consumed by each class of expenses:

PER CENT. OF TOTAL OPERATING REVENUES.

	November.		Fiscal year ending		Calendar year ending	
	1912.	1911.	1912.	1911.	1911.	1910.
Maint. of way and structures	12.8	13.3	12.7	12.9	12.7	13.3
Maint. of equipment	15.5	14.9	13.8	15.5	15.5	15.2
Traffic expenses	1.8	1.9	2.2	2.2	2.1	2.1
Transportation expenses	34.1	34.0	35.9	35.5	35.4	34.7
General expenses	2.2	2.3	2.6	2.6	2.6	2.4
Total operating expenses	66.4	64.4	69.1	68.6	68.3	67.8

Car Location.

The accompanying table, which is taken from Car Location, bulletin No. 1-A, of the American Railway Association, gives a summary of the location of freight car equipment by groups on December 14, together with surpluses and shortages on the same date.

CAR LOCATION ON DECEMBER 14, 1912.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western N. & So. Fa.	Va., W. Va., Ala., Miss., Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	86,838	667,352	297,514	199,695	161,386	457,853	16,633	154,549	29,906	109,112	124,114	2,304,752
Home Cars on Home Roads	39,469	320,905	82,144	88,947	63,718	276,382	2,632	63,370	11,290	57,944	81,794	1,090,100
Home Cars on Foreign Roads	47,369	346,247	215,370	110,748	97,668	181,466	13,001	91,179	18,116	51,168	42,320	1,214,652
Foreign Cars on Home Roads	66,159	315,851	196,097	86,219	82,465	200,544	12,227	86,467	34,779	56,466	64,907	1,202,181
Total Cars on Line	105,628	636,756	278,241	175,166	146,183	476,931	15,859	149,837	46,569	114,410	146,701	2,292,281
Excess or Deficiency	18,790	*30,596	*19,273	*24,529	*15,203	18,978	*774	*4,712	16,663	8,298	22,587	*12,471
Surplus	729	1,999	325	1,398	82	5,284	590	2,330	1,459	11,587	831	26,614
Shortage	1,425	6,410	11,178	10,447	7,592	9,108	623	2,675	581	3,334	7,516	61,006
Shop Cars—												
Home Cars in Home Shops	4,895	25,496	11,665	8,995	7,613	21,974	301	7,210	1,152	3,080	1,805	94,186
Foreign Cars in Home Shops	1,689	7,051	6,074	2,081	1,001	6,168	604	2,302	1,762	1,919	179	31,334
Total Cars in Shops	6,584	32,547	17,739	11,076	9,414	28,142	905	9,512	2,414	5,003	1,984	125,520
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	45.45	48.10	27.61	44.54	39.48	60.32	21.84	41.00	39.42	53.11	65.90	47.28
Total Cars on Line	119.20	95.44	93.43	87.72	89.66	104.16	95.35	95.88	155.72	104.86	118.20	99.22
Home Cars in Home Shops	5.64	3.82	4.25	4.51	4.72	4.83	1.81	4.67	3.85	2.83	3.19	4.26
Foreign Cars in Home Shops	1.42	1.06	2.22	1.04	1.13	1.40	3.63	1.49	5.89	1.76	1.71	1.42
Total Cars in Shops	7.06	4.88	6.47	5.55	5.84	6.23	5.44	6.07	8.07	4.59	3.50	5.68

* Denotes deficiency.

Interstate Commerce Commission Investigates Issuance of Passes.

Interstate Commerce Commissioner James S. Harlan, held a hearing at Denver on January 23, 24 and 25, which was announced as the first of a series in a general investigation of the practices of the railways in the issuance of free transportation. The commission states that its inquiry has already shown that "carriers have very generally obeyed the letter of the law," but that information has reached the commission that "the issuance of passes for state travel has operated to defeat the purpose of the act to regulate commerce; that passes for state travel have been issued to certain shippers and denied to others; and that the moving consideration of such passes has been the routing of interstate shipments of property." Commissioner Harlan announced that no evidence taken in the hearing would be used in any way against those testifying and that the inquiry was for the purpose of determining what new regulations are necessary to prevent discrimination, and what further steps must be taken by the commission to enforce the law in regard to the giving of passes. Several of the Colorado roads were indicted last fall at Pueblo, Colo., for alleged discrimination in issuing intrastate passes to interstate shippers, following which the roads generally ceased the practice on December 1. Colorado has no state anti-pass law.

A large number of Denver railway officials testified regarding the issuance of state passes by their companies, and all expressed the opinion that the roads would greatly prefer to cease issuing passes altogether. They said that state passes had been given not for the direct purpose of influencing interstate traffic, but to cultivate friendship among shippers or men of influence, or to promote enterprises for the benefit of the community, and that competition had extended the practice to unreasonable limits. A large number of shippers who had been given passes were called as witnesses after lists of the recipients had been put in the record, and most of them testified that the issuance of free transportation had not influenced the routing of their business, but that they had accepted or solicited passes because it was the custom. Many expressed gratification that the practice had been discontinued.

J. B. Andrews, assistant to the vice-president of the Denver & Rio Grande, said that the roads welcomed the opportunity given by the indictments to cut off the passes on December 1; that state passes had been given to friends of railway officials, to mining men, stock men, politicians and business men, but that the company had not violated the federal pass law. He quoted from records of the company showing that in the month of June, 1912, free transportation had been issued to the amount of $65,000, or approximately 16 per cent. of the passenger revenue of the road. While most of the passes had been given to politicians and office holders, many were given to ministers and other persons of influence, to people traveling on business relating to the development of the state in various ways, and for charitable purposes.

Fred Wild, Jr., general freight agent of the Denver & Rio Grande, said the giving of passes had become a custom, and that while a pass might not influence the recipient to give the road his traffic, its refusal might cause the loss of business. He admitted that small shippers and people of no prominence or influence were refused passes, and that the practice was discriminatory.

G. W. Martin, general agent of the Rock Island, said his road issued 52 passes in September in Colorado, which was probably a fair average. When his attention was called to the fact that 31 of the 52 had been issued to a town near the Kansas-Colorado state line, he said he had no knowledge as to whether they were used to cover part of an interstate journey, but that passes issued to that point enabled the users to cover as much ground as possible in trips through the state.

F. A. Wadleigh, general passenger agent of the Denver & Rio Grande, said a large proportion of the passes given through his office were issued to such men as agricultural professors and officers of various organizations engaged in development work.

John F. Valley, general agent of the Chicago, Burlington & Quincy, said his road had discontinued the issuance of passes in Colorado five years ago, and that its freight business had suffered perceptibly.

Other railway men who testified admitted that passes were given to interstate shippers, but explained the practice with reasons other than the fact that the recipients were interstate shippers. A soliciting agent asserted, however, that he had found that some of his competitors had frequently left passes on the desks of shippers in their absence, and he had asked for passes to distribute to meet the competition.

The names of a large number of persons to whom passes had been issued by the roads were read into the record, and many of them were later called for examination. One man said he

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had paid fare for many years, until he thought his tickets appeared lonesome among so many passes on the train, and that the conductor seemed to regard him as a "boob" for paying fare, so he asked for and obtained passes.

Weighing Hearing at Chicago.

Commissioner Prouty, of the Interstate Commerce Commission, held a hearing at Chicago on January 24 and 25, as part of the investigation which has been conducted by the commission during the past year into the practices of the railways in the weighing of carload freight.

A. S. Dodge, superintendent of the Western Railway Weighing Association & Inspection Bureau, submitted a series of exhibits showing the work of the bureau during the past year. In 1912, 2,402,749 cars were weighed, both loaded and empty, on bureau scales, in addition to 4,209,368 weighed using the stenciled tare, making a total of 6,612,117. Of 172,463 cars check-weighed during the year, 125,203 were loaded with lumber and 47,260 with merchandise, and only on 19.295 cars, or 11.2 per cent, was it necessary to correct the waybills on account of a variation of 1,000 lbs. or over, between the check-weight and the first scale weight. The total number of cars checked under weight agreements was 1,751,051, of which only 4,155 were check-weighed. Of these only 415, or 10 per cent, showed a variation of over 1,000 lbs. These consisted largely of grain cars subject to Board of Trade weights. Of the empty cars weighed by bureau weighmasters from January 1 to October 31, 1912, inclusive, 10,501 cars, or 59.4 per cent, showed the stenciled tare greater than the actual tare by 10,191,747 lbs., or an average of 971 lbs. per car, while on 7,171 cars, or 40.6 per cent, the stenciled tare was less than the actual tare by 6,950,845 lbs., an average of 969 lbs. per car. Thus in nearly 60 per cent of the cases the variation between the stenciled tare and the actual tare operated in favor of the shippers. These figures compare with a similar statement submitted by Mr. Dodge in March, 1912, showing that on 59 per cent of the cars weighed in 1911 the stenciled weight was greater than the actual, or to the advantage of the shipper. Mr. Dodge also submitted a statement showing that 1,26,200 corrections in weight had been made by bureau inspectors during the calendar year 1912, which resulted in an increase of earnings to the carriers amounting to $236,448.01 and that $27,746.98 was collected during the year 1912 in payment of undercharges from shippers who have executed weight agreements with the bureau.

Mr. Dodge also submitted a statement of claims handled during the year, showing the percentage recommended paid, declined or otherwise disposed of by the bureau as follows:

Miscellaneous Claims.		
Total number handled, 23,682.		
Recommended lower scale weight.....	792	5 per cent.
Recommended estimated weight.....	140	1 per cent.
Recommended special agreement weight..	1,389	8 per cent.
Recommended for various reasons.....	8,923	53 per cent.
Recommended payment	11,244	67 per cent.
Recommended declined	5,633	33 per cent.
	16,877	100 per cent.
Lumber Claims.		
Total number handled, 14,184.		
Recommended estimated weight.....	792	8 per cent.
Recommended lower scale weight.....	1,323	14 per cent.
Recommended account no scale weight...	534	6 per cent.
Recommended for various reasons.....	1,231	13 per cent.
Recommended payment	3,880	41 per cent.
Recommended declined	5,609	59 per cent.
	9,489	100 per cent.
Grand Total.		
Recommended payment	15,124	57 per cent.
Recommended declined	11,242	43 per cent.
	26,366	100 per cent.

In reply to questions by Commissioner Prouty, Mr. Dodge also testified that from one and one-half to two minutes is required to weigh a car with one end coupled, and that the time would be nearly doubled if both ends were uncoupled; whereas, three cars may be weighed per minute in motion. He was strongly in favor of a reweighing of cars for less than 1,000 lbs. variation, and was inclined to the opinion that an allowance of one per cent, would be more nearly correct. Commissioner Prouty expressed his opinion that no such allowance as even 500 lbs. should be tolerated in the case of commodities that do not shrink in transit.

Mr. Dodge also pointed out that a check of the figures submitted by Chairman Staples of the Minnesota commission at the hearing last March, showing wide variations between the stenciled and actual weights, had shown that the Minnesota commission had not taken into consideration a large number of temporary grain doors and boards found in the cars at the time they were weighed empty, which were of course not included in the stenciled weights.

Charles Ware, general manager of the Union Pacific, testified as to changes in the weighing practices of his road, which have been made to correct defects which were brought out at the hearing in Salt Lake City last year. Since that time the company has adopted as standard a 150-ton 50-ft. track scale with concrete foundations, in place of the previous standard of 100-ton 40-ft. scales. The Union Pacific has track scales at 41 points.

A scale test car has recently been constructed to travel over the line for the purpose of checking the scales, and arrangements are now being made for the installation of the necessary machinery at a central plant to which the company's scales may be shipped for repairs, thereby eliminating delays incident to returning them to the manufacturers. Mr. Ware said that it is the desire of the Union Pacific to have the best possible scales, as correct weights are as important to the railroad as to the shipper, if not more important. Arrangements are now being made to install nine new scales, and a statement submitted by Mr. Ware showed that all of the various defects reported at the Salt Lake City hearing have been corrected since that time. Only 12 out of the 41 track scales now have timber foundations, and arrangements have been made to replace these with concrete.

A. F. Epright, supervisor of scales of the Pennsylvania Railroad, was questioned at some length regarding weighing practices of the Pennsylvania, particularly with reference to the handling of coal shipments, and F. E. Church, manager of the scale department of Fairbanks, Morse & Co., added to his testimony of last March regarding the mechanical features of scale construction. Mr. Church said that in his opinion accurate weights could not be obtained where cars are weighed in motion, which precipitated a lively discussion as to the necessity for and the accuracy of motion weighing. Commissioner Prouty said there could be no doubt that motion weighing was less accurate than weighing at rest, but from the train, but that there might be doubt as to the practicability of prohibiting motion weighing. In the discussion Commissioner Pronty charged H. W. Woolf, manager of the Southern Weighing & Inspection Bureau, with having attempted to influence Mr. Church's testimony by sending telegrams to the executive officers of several roads, members of the board, asking them to suggest to the company that some of his statements be modified at the next hearing. Commissioner Prouty expressed the opinion that this represented an implied threat of loss of business to Fairbanks, Morse & Co. Mr. Woolf denied any such intention, saying that his own experience of ten years had demonstrated that motion weighing, if properly performed, was sufficiently accurate, and that he wished to have some of the practical men employed by Fairbanks, Morse & Co. confer on the subject with Mr. Church, who had testified that he was a scale expert, but had had no experience in the actual weighing of cars.

The hearing is to be resumed at Chicago on February 26.

Interstate Commerce Commission.

The commission has suspended from February 1 until May 31, the items in certain tariffs, which advance from 30,000 lbs. to 33,000 lbs., the minimum carload weight on potatoes, effective during the period October 1 to May 31 of each year, from points in Wisconsin, Minnesota, Michigan and other states to points in Western Trunk Line and Central Freight Association territories.

The commission has decided to make a general inquiry into the issuance of free passes, and the first public hearing on the subject was held in Denver, Col., last week by Commissioner Harlan. It was in the state of Colorado that two railroad companies were indicted recently by a federal grand jury on the charge of issuing passes, for travel within the state, for the purpose of influencing shipments of freight in intrastate traffic.

The commission has suspended from January 1 until May 1, an item in a supplement to Griffin's tariff. Heretofore, this tariff has provided that refrigeration charges on perishable

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fruits between Utah and Colorado common points will be performed by the carriers at a charge of 12½ cents per 100 lbs. for the amount of ice furnished. The suspended item provides a flat charge of $40 per car. It is asserted by shippers that, under the present provisions, the icing charge upon this traffic does not amount to more than $24 per car on the average, as against the proposed flat charge of $40 per car.

Reparation Awarded.

Alfred Struck Company v. Louisville & Nashville et al. Opinion by the commission:

The commission found that interior house trimmings "in the white" as carried in southern classification did not include trimmings which have been treated before shipment to a coat of priming or filler and a coat of shellac. Classification of interior house trimmings as applicable in southern classification was not shown to be unreasonable. (25 I. C. C., 656.)

Complaint Dismissed.

Philadelphia Veneer & Lumber Company, Incorporated, v. Central Railroad Company of New Jersey et al.

The commission found that rates of 31 cents per 100 lbs., all-rail, and 29 cents per 100 lbs., rail-and-water, for the transportation of imported Spanish cedar logs from New York, N. Y., to Knoxville, Tenn., were not unreasonable or unduly discriminatory. (25 I. C. C., 653.)

Preston L. Hill v. Pennsylvania Railroad et al. Opinion by the commission:

The defendant's tariff did not provide for adjustment of charges on a "punch-cancellation" commutation ticket lost by the owner, but the ticket was subject to conditions which would not entitle the owner to receive redemption money on account of loss. The commission found that the failure of defendants to provide in its tariff for the payment of redemption money on account of lost and unrecovered commutation ticket of the "punch-cancellation" variety was not unreasonable. (25 I. C. C., 650.)

Minimum Weight Reduced.

Irvin Kibbe v. St. Louis, Brownsville & Mexico et al. Opinion by the commission:

The commission found that the minimum carload weight of 22,000 lbs. on calves from Refugio, Tex., to New Orleans, La., and St. Louis, Mo., was unreasonable, and prescribed a minimum of 17,000 lbs. for the future. (25 I. C. C., 661.)

Reparation on Mohair Shipments.

National Mohair Growers' Association v. Atchison, Topeka & Santa Fe et al. Opinion by Chairman Prouty:

Following the *Wool case*, 25 I. C. C., 675, abstracted below, reparation on shipments of mohair will be awarded from March 21, 1912. (25 I. C. C., 679.)

Scrap Iron Rates Reduced.

Bartlesville Salvage Company et al. v. Missouri, Kansas & Texas et al. Opinion by the commission:

The commission found that the rate of 20 cents per 100 lbs., minimum weight 30,000 lbs., for the transportation of scrap iron from Bartlesville, Okla., to St. Louis, Mo., was unreasonable to the extent that it exceeds 17 cents per 100 lbs., minimum weight 40,000 lbs., and prescribed that rate for the future. (25 I. C. C., 672.)

Rates on Trunk Covering Materials Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of tin plate and sheet metal from eastern shipping points to points in Oregon, Washington, and other destinations.

The attempt of certain shippers to move sheet metal of commerce under the description and rates applicable to trunk-covering materials directed the attention of the carriers to an obscurity in their tariffs and to the fact that lower rates were applicable to trunk-covering materials, although they are more valuable than the sheet metal of commerce. Tariffs filed to correct the improper relation of rates on the two commodities were suspended, but the commission found that the proposed increases are reasonable and the order of suspension was vacated. (25 I. C. C., 685.)

Empty Package Rates.

Portner Brewing Company v. Southern Railway. Opinion by the commission:

The assembling of empty packages at one point by the shipper, when the filled packages were shipped to several points, in order to obtain sufficient for return carload shipments, is contrary to a rule of the southern classification. Returned empty-package rate applied only from and to the points between which the original shipment moved. (25 I. C. C., 659.)

Excessive Rates Charged Due to Error.

Seaboard Refining Company, Ltd., v. Alabama Great Southern et al. Opinion by the commission:

The complainant contends that through the enforcement by the Texas & Pacific of certain regulations for the use of track receipts or switching tickets in handling refined oil from Gretna to New Orleans for delivery to connections, it was deprived of the benefit of the through rate from points of origin in Texas and Louisiana to Chicago and Cleveland on cottonseed oil refined in transit at Gretna. Reparation is asked. The commission found that the effect of the action taken by the Texas & Pacific was to make the movement from Gretna to Chicago an entirely new movement, and also that the road did not always enforce these regulations. The commission, therefore, decided that the action of the Texas & Pacific was in error and that the through rate should have been charged. Reparation was awarded. (25 I. C. C., 702.)

Carload Rating on Tobacco Established.

John J. Bagley & Co. v. Pere Marquette et al. Opinion by the commission:

As there was no carload rating established for the transportation of long-cut, fine-cut, cut plug, and granulated smoking tobaccos in carloads from Detroit, Mich., to New York, the commission established a rating of third class with a minimum of 24,000 lbs., subject to rule 27 of official classification. (25 I. C. C., 698.)

Potato Rates Adjusted.

Chamber of Commerce of the City of Beaumont, Tex., v. Texas & New Orleans et al. Opinion by the commission:

The commission found the rates for the transportation of potatoes and vegetables in carloads from St. Louis, Mo., to Beaumont, Tex., were unduly prejudicial as compared with rates on same commodities from St. Louis to Lake Charles, La., insofar as they exceed the differential resulting from the New Orleans combinations. The carriers were found to have justified the charging of lower rates for the transportation of potatoes, beans and vegetables in carloads from St. Louis, Mo., to Lake Charles, La., than from St. Louis, Mo., to Beaumont, Tex., and accorded limited relief from the operation of the fourth section of the act. (25 I. C. C., 695.)

Reparation on Wool Shipments.

In re investigation of alleged unreasonable rates and practices involved in the transportation of wool, hides and pelts from various western points of origin to eastern destinations.

Railroad Commission of Oregon v. Oregon Railroad & Navigation Company et al.

National Wool Growers' Association v. Oregon Short Line Railroad Company et al. Opinion by Chairman Prouty:

It is by no means true that because a rate is found unreasonable upon a given date it has been unreasonable during the two years preceding, and it can not be assumed that whenever the commission holds a given rate to be unreasonable it will, as a matter of course, award reparation upon the basis of the rate found to be reasonable as to all payments within the two-year limitation.

The commission is not satisfied that the complainant has shown that the rates as stated in the tariffs of the carriers were unreasonable up to the date of the original decision herein, March 21, 1912, mentioned in the *Railway Age Gazette* of April 19, 1912, but from that date the rates and regulations suggested by the commission are held to be reasonable, and

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the rates and regulations of the carriers have been unreasonable and unlawful to the extent that they have varied from these.

Reparation from March 21, 1912, will be awarded upon the basis of the rate found reasonable by the commission. (25 I. C. C., 675.)

Advances Permitted.

Rates on knitting-factory products. Opinion by Commissioner Lane:

The tariff schedules under suspension advance the joint rates on knitting-factory products in any quantity from Chicago and near-by points to Little Rock, Fort Smith, and certain other Arkansas points and cancel the proportional rates on these products from Memphis to the same destinations applying on traffic from southeastern points, leaving in effect from many southeastern points the through first-class rates constructed on a differential basis over St. Louis and leaving in effect from other southeastern points combination rates of which the factors west of the river are the first-class rates from Memphis. The commission found that the proposed advances are justified. The order of suspension was vacated. (25 I. C. C., 634.)

Rates on Potash Not Unreasonable.

Arkansas Fertilizer Company v. St. Louis, Iron Mountain & Southern et al. Opinion by Commissioner Clements:

The complainant alleges that the rates charged by the defendants for the transportation of nitrate of soda and potash salts from New Orleans to Little Rock are unreasonable, unjustly discriminatory, and subject it and the latter place to undue prejudice and disadvantage as compared with the rates on the same commodities from New Orleans to Memphis. The record discloses that the rates under investigation apply from other gulf ports as well as from New Orleans and via many routes; and that the rates to Memphis are lower than they otherwise would be by reason of actual and potential water competition, and by reason of the location of Memphis as a Mississippi river gateway. The commission found that the evidence was not conclusive and the complaint was dismissed. (25 I. C. C., 645.)

New Theories on Rate Making.

In re investigation and suspension of advances in rates by carriers for the transportation of coal and coke in carloads from points on the Louisville & Nashville to points on the Cleveland, Cincinnati, Chicago & St. Louis and other destinations. Opinion by Commissioner McChord:

The commission found that the defendant did not sustain the burden of showing the reasonableness of the proposed increased rate from the Appalachian and the St. Charles districts in Virginia on coal to the Ohio river and to points north and south thereof, and on coke to points north of the Ohio river. The defendant was therefore ordered to withdraw the tariff naming the proposed rates and to maintain the present rates. The commission found that the motive actuating a carrier in prescribing an advanced freight rate has no bearing upon the reasonableness of the increased rate. Nor can the reasonableness of rates be proved by categorical answers, *I. C. C. v. U. P. R. R.*, 222 U. S. 541,549. Where two routes are available it is unfair to consider only the cost via the more expensive route, and when such higher cost is due to improvements and betterments under way, the expenditures which were undoubtedly made to reduce the cost of operating, such cost figures are not representative. Traffic moving during a certain year should not be made to bear the entire cost of permanent improvements and betterments. The commission went into minute details regarding the cost of hauling coal, but its conclusions differed radically from those of the defendant. The commission found that anything above the out-of-pocket cost of handling traffic is a contribution to general expenses and to that extent relieves rather than burdens other traffic. In other words, the commission holds that in fixing a specific rate, only the cost of fuel, wages of crews and repairs to locomotives and cars should be taken into consideration. This means about 50 per cent. of the cost as figured by the defendant, the remaining 50 per cent. being made up chiefly of salaries of general officers and the way and structure account. While cost is an important element in determining the reasonableness of freight rates, it is not controlling, and a reasonable maximum rate is not only such a rate as pays a contributive share of all operating expenses. The carrier should make such improvements to its line as are necessary to reduce the cost of transportation, and if it does not do this, it can hardly claim that it may raise the rate because the cost of transportation is excessive. If a division as a whole is profitable, the fact that a certain portion or portions of it are not profitable does not justify increased rates. The expense which is incurred in originating traffic is a necessary incident to transportation and a condition precedent to the profitable operation of the line as a whole. The fact that one carrier does not receive proper remuneration for its share of the transportation over a joint route does not necessarily prove that the joint rate is unreasonable, but rather that the division of the joint rate is unreasonable. According to the defendant's figures, the cost to it for the transportation of coal exceeds its revenue, while according to the commission's figures the cost is only from 71 to 82 per cent. of the revenue. The commission also found that the present rate had been in effect nearly ten years and that the advance contemplated would probably exclude the Virginia operators from the northern territory. (26 I. C. C., 20.)

STATE COMMISSIONS.

The California railway commission has rendered a decision denying the application of the Southern Pacific to increase passenger fares on its ferry system between San Francisco and Oakland from 5 to 10 cents.

COURT NEWS.

The Supreme Court of the United States in a suit for damages against the American Railroad Company of Porto Rico, because of the death of an engineer, holds that the federal safety appliance act applies in Porto Rico.

In the federal court at Pittsburgh, Pa., this week, fines aggregating $12,950 were imposed for failure to unload cattle for feeding and watering within the twenty-eight hour limit, the roads fined being the Pennsylvania, the Pittsburgh, Cincinnati, Chicago & St. Louis, and the Baltimore & Ohio.

The government has withdrawn the suit which was entered in the United States District Court at Philadelphia some time ago asking that the Lehigh Valley Railroad Company be made to separate itself from the interests connected with it which mine and sell coal. The court dismissed the bill without prejudice.

Judge Baldwin, of the county circuit court at Chicago, has rendered a decision making permanent an injunction restraining the city of Chicago from enforcing an ordinance requiring the elevated railways to exchange transfers. The court held that the city had no jurisdiction over the fares of the elevated roads, because they were organized under the state railroad laws. The city is planning to appeal the case to the state supreme court.

Judge Callaghan, in the Municipal Court, New York City, in a suit against the Delaware, Lackawanna & Western has decided in favor of the plaintiff on a claim for $104 damages on a shipment of eggs contained in 297 boxes, a number of which were found to contain broken and cracked eggs. It appears that railroads usually are willing to pay for eggs broken in transit, in cases like this, but that the suit was brought because of the expense to which the consignee was put in repacking boxes which were probably damaged, but not certainly so. The cost of repacking a case of eggs is 10 cents, and it is said that in one terminal in Jersey City, in the last spring season, 86,000 cases of eggs had to be repacked. From this instance—a cost of $8,600—it is estimated that $100,000 is spent annually at the railroad terminals at New York City for repacking eggs. In the shipment on which was based the case which has just been decided, it was found that seventeen of the first twenty cases examined showed broken and leaking eggs. This proportion was so large that the consignee decided that he could not sell his eggs at a reasonable price unless he repacked every case in the lot; and the cost of examining cases which were not known beforehand to contain damaged eggs was what the railroad company refused to pay for. It is expected that the road will appeal this case to the Supreme Court of the state.

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Railway Officers.

Executive, Financial and Legal Officers.

E. J. Chamberlin, president of the Grand Trunk and the Grand Trunk Pacific, with headquarters at Montreal, Que., has been elected president also of the Central Vermont, succeeding E. H. Fitzhugh, resigned.

E. D. Sewall, assistant to the president of the Chicago, Milwaukee & St. Paul, has been elected vice-president, and D. L. Bush, general manager, has been elected vice-president, both with headquarters at Chicago. H. B. Earling, assistant general manager, has been elected vice-president, with office at Seattle, Wash., succeeding H. K. Williams, who has been made vice-president, with headquarters at New York. A photograph and sketch of H. B. Earling were published in the issue of February 16, 1912, page 317. C. B. Ferry, assistant secretary at New York, has been appointed also assistant to vice-president, with office at New York.

David L. Bush, who has been elected vice-president of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, was born on July 31, 1855, at Sharon, Wis. He began railway work in December, 1872, as night operator for the Western Union Railway, and was later to January, 1877, chief operator in the train despatcher's office of that road at Racine, Wis. He was subsequently until September, 1880, train despatcher; from May 1, 1877, to January 1, 1882, also superintendent of that road and the Sabula, Ackley & Dakota, and from September, 1880, to July 1, 1887, also superintendent of the Racine & Southwestern division of the Chicago, Milwaukee & St. Paul. On the latter date he was transferred to the superintendency of the James River division, and from February 1, 1888, to February 1, 1890, was superintendent of the Southern Minnesota division. He then became superintendent of the Hastings & Dakota division, where he remained until August 15, 1894, when he was transferred to the River division as superintendent, with headquarters at St. Paul, Minn. Mr. Bush was promoted to assistant general superintendent, with office at Milwaukee, Wis., on April 1, 1898, and was made general superintendent May 1, 1903. He was appointed general manager, with headquarters at Chicago, October 1, 1909, and his election to the office of vice-president, as noted above, became effective on January 23.

D. L. Bush.

Percy R. Todd, who has been elected president of the Bangor & Aroostook, with headquarters at Bangor, Me., as has been announced in these columns, was born in 1859 at Toronto, Ont., and was educated in the Collegiate Institute, Ottawa. He began railway work as a telegraph operator with the St. Lawrence & Ottawa, now a part of the Canadian Pacific, remaining in that position until 1875, when he became Canadian agent of the Ogdensburg & Lake Champlain, now a part of the Rutland, and four years later was made general traveling agent of the National Dispatch Line at Chicago. From July to December, 1885, he was commercial agent of the New York, West Shore & Buffalo, now a part of the West Shore, at Albany, N. Y., and then for one year was chief clerk to the general freight agent of the same road at New York. He was then for three years general freight and passenger agent of the Canada Atlantic, now a part of the Grand Trunk, at Ottawa, Ont., and the following three years was general freight agent of the West Shore at New York, and from 1892 to 1901, was traffic manager of the same road at New York. He was elected second vice-president of the New York, New Haven & Hartford in 1901, with headquarters at New Haven, and in 1903 was made first vice-president of the same road. In 1907 he was elected vice-president of the Bangor & Aroostook, with headquarters at Bangor, Me., which position he held at the time of his recent election as president of the same road, as above noted.

Edmund D. Sewall, assistant to the president of the Chicago, Milwaukee & St. Paul, at Chicago, has been elected vice-president, with headquarters at Chicago. He was born on April 12, 1855, at Wilmington, Del., and was educated at Taylor and Jackson's Academy in his native town. He began railway work in 1871 as a rodman, with the engineering corps of the Wicomico & Pocomoke, now a part of the Baltimore, Chesapeake & Atlantic, and was then consecutively from March, 1872, to July, 1881, with the engineering department of the Northern Pacific, the Chicago & Canada Southern, the St. Paul, Minneapolis & Manitoba, now a part of the Great Northern, and the St. Paul & Duluth, now a part of the Northern Pacific, and was a clerk in the general freight department of the St. Paul & Pacific, now a part of the Great Northern, also clerk in the local freight office of the same road at St. Paul, Minn. From July, 1881, to September of the following year he was assistant engineer and general superintendent's clerk on the St. Paul & Duluth, and then to January, 1883, was joint agent of the St. Paul & Duluth and the Chicago, Milwaukee & St. Paul at Stillwater, Minn. He was agent of the Chicago, Milwaukee & St. Paul from January, 1883, to May, 1888, when he was made traveling lumber agent, and in December of the following year became commercial agent of the same road at St. Paul, Minn. From March, 1895 to March, 1898, he was assistant general freight agent of the Superior division at Milwaukee, Wis., and then to May 15, 1902, was general northwestern agent of the same road at Minneapolis, Minn. He was assistant general superintendent from May, 1902, to June 1, 1906, at Minneapolis and then was appointed assistant to the president of the same road, with office at Chicago, remaining in that position until his election on January 23, 1913, as vice-president of the same road. He was also vice-president of the Chicago, Milwaukee & Puget Sound from January 1, 1909, to January 1, 1913.

A. R. Whaley, general superintendent of the Electric division of the New York Central & Hudson River, and manager of the Grand Central Terminal, with headquarters at New York, has been elected vice-president in charge of operation of the New York, New Haven & Hartford, with headquarters at New York, succeeding H. J. Horn, whose duties in future will be confined to the Boston & Maine, effective February 1. Mr. Whaley has been in railway service for the past thirty-five years, having begun as a brakeman on the Providence & Worcester, now a part of the New York, New Haven & Hartford, when he was sixteen years old. During the next fourteen years he was successively conductor, station master, assistant trainmaster and general yardmaster; and from this last position he was promoted to be general agent of terminals at Providence. In 1904 he was appointed superintendent of the New York division of the New Haven road, and two years later was chosen by the two roads, the New York Central & Hudson River and New York, New Haven & Hartford, as manager of the joint operation of the New York terminal. The enormous task of tearing down the old and building the new terminal, and the installation of elec-

A. R. Whaley.

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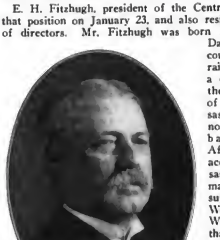
tric traction was then just being begun; and as general manager during the past 8 years Mr. Whaley has had the immediate responsibility of carrying on the business under the most trying conditions. Over 700 trains were moved in and out of the station every day with an average delay of less than a minute each. The following is from the *Wall Street Journal:*

Mr. Whaley was formerly superintendent of the New York division of the New Haven, and his return to the New Haven, which is gradually expanding its electrical zone eastward, is very natural. He will make his headquarters at the Grand Central Terminal, and in Boston. He started his railroad career when 16 years of age as a freight brakeman on the old Providence & Worcester at $1.62 a day. That was the time when brakeman on local freights worked twelve to eighteen hours a day. There were no train brakes at that time except in the muscles of the brakemen, who were happy and contented at their work. The career of Whaley from a freight brakeman to a position valued at $20,000 to $25,000 a year spans the most epoch making generation of thirty-four years in this country. As superintendent at Providence, he came to have charge of the first heavy traction electrical installation in this country which was on the line between Providence and Fall River. All the electric and terminal change-over at New York has been under him and he has had charge not only of operation but of the power houses, roadbed and equipment, and has been chairman of the committee of seven on auxiliary facilities which has passed upon the work of more than a dozen sub-committees in more than 100 meetings, everyone of which Whaley has presided over. He is the individual landlord or rent collector of the terminal. This terminal will be finished and fully thrown open to the public probably within forty-eight hours of the day Mr. Whaley graduates therefrom to go to the New Haven. Whaley believes in "system, organization and discipline, fair and firm." He says, "If you are fair you can be firm."

H. R. Williams, who was recently elected vice-president of the Chicago, Milwaukee & St. Paul, with headquarters at Seattle, Wash., as has been announced in these columns, has been transferred to New York as vice-president in charge of the financial and transfer departments. He was born on July 14, 1849, at Palmyra, Wis., and began railway work in January, 1867, with the Chicago, Milwaukee & St. Paul. He was telegraph operator for four years at various stations, then for two years was assistant train despatcher at Milwaukee, and later for eight years was train despatcher on the Hastings & Dakota and River divisions at Minneapolis. He was then for one year trainmaster on the Hastings & Dakota and the Iowa & Minnesota divisions. From January, 1882, to September, 1885, he was superintendent of the Iowa & Minnesota division, and then was superintendent of the Southern Minnesota division at La Crosse, Wis. In February, 1888, he was appointed superintendent of the Ottumwa & Kansas City Line at Kansas City, Mo., and Chillicothe, and from June, 1890, to March, 1898, was assistant general superintendent of the Northern district of the same road. He was promoted to general superintendent in March, 1898, and in February, 1900, was made general manager of the same road. In October, 1905, he was elected president of the Pacific Railway, which was incorporated to build the Washington section of the Chicago, Milwaukee & St. Paul extension to the Pacific coast, and in January, 1909, became president of its successor, the Chicago, Milwaukee & Puget Sound, which position he held until his election on January 1, 1913, as vice-president of the Chicago, Milwaukee & St. Paul, with office at Seattle, Wash., at the time the C. M. & P. S. was taken over as the Puget Sound Lines of the Chicago, Milwaukee & St. Paul. Mr. Williams' headquarters have now been transferred to New York, as above noted.

H. R. Williams.

E. H. Fitzhugh, president of the Central Vermont, resigned that position on January 23, and also resigned from the board of directors. Mr. Fitzhugh was born February 1, 1853, at Danville, Montgomery county, Mo. He began railway work in 1873 as a clerk in the office of the master car builder of the St. Louis, Kansas City & Northern, now a part of the Wabash, at St. Louis. After serving in the car accountant's office of the same company he was made chief clerk to the superintendent of the Western division of the Wabash, remaining in that position until 1889, when he became master of transportation for the lines west of the Mississippi river on the Wabash at Moberly. In January, 1896, he was appointed secretary to the general manager of the Grand Trunk at Montreal, Que., and the following July was made superintendent of the Middle division at Toronto, Ont. From May, 1899, to March, 1901, he was vice-president and general manager of the Central Vermont. He was appointed assistant to the president of the Southern Pacific in May, 1901, at San Francisco, Cal., remaining in that position until November of the same year. The following February he returned to the Central Vermont as vice-president and general manager, and on January 1, 1905, was elected third vice-president of the Grand Trunk, and also retained his office of vice-president of the Central Vermont. In January, 1910, he was elected first vice-president of the Grand Trunk, retaining also the vice-presidency of the Central Vermont, as well as the vice-presidency of the Detroit & Toledo Shore Line. In the latter part of 1911, he was elected president of the Central Vermont Railway, the Central Vermont Transportation Company, the Southern New England Railroad Corporation, the Southern New England Railway and the Montreal & Southern Counties Railway, at which time he relinquished his duties in connection with his former position to devote his time to the companies named. Mr. Fitzhugh was the chief coadjutor of the late Charles M. Hays in the extension of the Grand Trunk system into New England; and, as will be seen from the foregoing, he had been associated with Mr. Hays throughout his railroad career. It is understood that differences of opinion in regard to the Southern New England extensions have been a principal cause leading to Mr. Fitzhugh's retirement.



E. H. Fitzhugh.

Operating Officers.

A. E. Brown has been appointed trainmaster of the Southern Pacific, with headquarters at Roseville, Cal., succeeding J. W. Knightlinger, promoted.

J. A. Barker, road foreman of engines of the Chesapeake & Ohio of Indiana, has been appointed trainmaster, with headquarters at Boston, Ind.

S. B. Moore has been appointed trainmaster of the Missouri, Kansas & Texas of Texas, with office at Waco, Tex., in place of Y. M. Martin, resigned.

Robert J. Berry has been appointed inspector of transportation of the Louisiana Lines of the Southern Pacific, with headquarters at New Orleans, La.

W. B. Allen, trainmaster of the Chesapeake & Ohio of Indiana, at Peru, Ind., has been appointed inspector of transportation, with headquarters at Peru.

J. T. Haralson has been appointed an assistant superintend-

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ent of the Sonora division of the Southern Pacific of Mexico, with headquarters at Empalme, Sonora, Mexico.

Evert C. Blundell, assistant division superintendent of the Chicago, St. Paul, Minneapolis & Omaha at Eau Claire, Wis., has been appointed superintendent of the Nebraska division, with headquarters at Omaha, Neb., in place of J. R. Welch, who has been promoted to superintendent of the Minnesota & Iowa division, with office at St. James, Minn., succeeding F. E. Nicoles, promoted.

Edward T. Whiter, whose appointment as general superintendent of the Northwest System of the Pennsylvania Lines West of Pittsburgh, has been announced in these columns, was born on March 26, 1864, at Steubenville, Ohio. He was educated in the public schools of Steubenville, and began railway work March 1, 1881, as a telegraph operator for the Pennsylvania Lines. He continued in that capacity until May, 1885, when he was promoted to train despatcher, where he remained until July 1896. On the latter date he was appointed assistant trainmaster, and later he was advanced to trainmaster, which position he held until January, 1903. He was then made superintendent, and was in charge of the Eastern division of the Northwest system at the time of his recent promotion to the position of general superintendent of the latter system, with headquarters at Pittsburgh, Pa. Mr. Whiter has been continuously in the service of the Pennsylvania Lines since March, 1881.

E. T. Whiter.

Samuel H. Charles, who, on January 15, was appointed superintendent of the Oklahoma district of the Missouri, Kansas & Texas, with headquarters at Oklahoma City, Okla., as already announced, was born on February 2, 1869, at Berryville, Ark. He began railway work in December, 1884, as a messenger for the St. Louis & San Francisco, and in July of that year was advanced to telegraph operator, which position he held until August, 1890. He was then train despatcher and chief despatcher until March, 1900, and from the latter date to September, 1907, was trainmaster and assistant superintendent, when he was made superintendent. He resigned February 1, 1912, to go with the Missouri, Kansas & Texas as trainmaster at Parsons, Kan., from which position he is now promoted to that of superintendent of the Oklahoma district, as above noted.

L. A. Boyd, whose appointment as superintendent of the Raleigh, Charlotte & Southern, with headquarters at Biscoe, N. C., has been announced in these columns, was born on June 6, 1850, in Wayne county, Ind., and was educated at Alliance College, Alliance, Ohio. He began railway work in November, 1868, on the Pennsylvania Lines West of Pittsburgh as a telegraph operator at Pittsburgh. He was then despatcher at Dennison, Ohio, until 1873; train despatcher on the Little Miami division of the same road until 1880, and trainmaster on the Kentucky Central, now a part of the Louisville & Nashville until 1884. He was subsequently trainmaster and superintendent of the Indianapolis, Decatur & Western, now a part of the Cincinnati, Hamilton & Dayton, until 1892; and trainmaster on the Southern Railway and the Seaboard Air Line until 1906. His next position was superintendent until 1907, of the Northern Adirondack, now a part of the New York & Ottawa. From 1907 to 1912 he was general manager of the Raleigh & Charleston, and then was general manager of the Augusta Northern, which position he held at the time of his recent appointment as superintendent of the Raleigh, Charlotte & Southern, as above noted.

W. S. Wilson, trainmaster of the Grand Trunk at Stratford, Ont., has been appointed superintendent of transportation of the Ontario lines, with office at Toronto, Ont. P. J. Lynch, superintendent at Allandale, has been appointed superintendent of the Barrie division, with office at Allandale, including districts Nos. 11, 12 and 14. W. R. Davidson, trainmaster at London, has been appointed superintendent of the London division, with office at London, including district No. 17—(Sarnia tunnel to Hamilton and Petrolia branch); district No. 18—(Komoka to Glencoe); district No. 19—(Glencoe to Kingscourt Junction) district Nos. 20, 21 and 24. C. Forrester, trainmaster at Stratford, has been appointed superintendent of the Stratford division, with office at Stratford, including districts Nos. 15, 22 and 23. J. H. Gordon has been appointed superintendent of the Hamilton division, with office at Hamilton, including districts Nos. 13 and 16; district No. 17—(Hamilton to Niagara Falls); district No. 19—(Port Dalhousie to Port Robinson and Welland Junction to Port Colborne. G. A. Stokes has been appointed superintendent of the Toronto terminals. The office of master of transportation has been abolished. The following have been appointed trainmasters: W. J. Durkin, in charge of the 17th district (Sarnia tunnel to Hamilton, including Petrolia branch), 18th district (Komoka to Glencoe), 19th district (Glencoe to Kingscourt Junction), and 24th district, with office at London. R. H. Fish, in charge of the 20th and 21st districts, with office at Brantford. William Hall, in charge of the 13th and 16th districts, 17th district (Hamilton to Niagara Falls), 19th district (Port Dalhousie to Port Robinson and Welland Junction to Port Colborne), with office at Hamilton. C. J. McKeough, in charge of the 15th district, with office at Stratford. Walter White, in charge of the 22nd and 23rd districts, with office at Palmerston, and W. Culligan has been appointed chief despatcher at Stratford, and F. A. Rutherford has been appointed chief despatcher at London.

Miles Bronson, superintendent of the Electric division of the New York Central & Hudson River at New York, has been appointed also manager of the Grand Central Terminal, with headquarters at New York, succeeding to the duties of A. R. Whaley, who has resigned the position of general manager, as noted elsewhere. Mr. Bronson was born on May 8, 1875, in the village of Gauhati, province of Assam, British India. He began railway work in June, 1890, in the law department of the Grand Trunk, at Detroit, Mich., and held various positions with that company until May, 1895, when he became secretary to S. R. Callaway, president of the New York, Chicago & St. Louis at Cleveland, Ohio. In 1907 he was appointed superintendent of the Buffalo Terminal, which was then under construction. Before the road was opened for business, however, Mr. Callaway went to New York to succeed C. M. Depew as president of the New York Central & Hudson River, and Mr. Bronson became his secretary at New York, instead of going to Buffalo. He was later made assistant to the president. In November, 1900, he was appointed superintendent of the Harlem division, and in March, 1907, he was transferred to the River division; and in January, 1910, was promoted to the Mohawk division. In April, 1911, he was appointed superintendent of the electric division, and now becomes also manager of the Grand Central Terminal, as noted above.

M. Bronson.

Traffic Officers.

J. S. McKinnon has been appointed traveling freight agent of the Baltimore & Ohio, with headquarters at Atlanta, Ga.

R. B. Herrington has been appointed traveling freight agent of the Traders Despatch Fast Freight Line, with headquarters at St. Louis, Mo.

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E. A. Ackley has been appointed freight soliciting agent of the Southern, with office at Savannah, Ga., succeeding J. C. Hext, promoted.

C. B. Sipes has been appointed traveling freight agent of the Baltimore & Ohio, with headquarters at Columbus, Ohio, succeeding Howard L. Galleher, promoted.

William Carruthers, district freight agent of the Oregon-Washington Railroad & Navigation Company at Tacoma, Wash., has been appointed district freight and passenger agent, in charge of all traffic business between Tacoma and Vancouver, with headquarters at Tacoma.

R. D. Miller, commercial agent of the Southern, at Winston-Salem, N. C., has been appointed commercial agent at Anniston, Ala., succeeding W. G. Crutchfield, resigned to engage in other business. G. N. Lawson has been appointed commercial agent, with office at Winston-Salem, succeeding Mr. Miller.

James Edgar Davenport, division passenger agent of the Louisville & Nashville, with headquarters at St. Louis, Mo., has been appointed assistant general passenger agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with office at St. Louis, effective February 1. Mr. Davenport was born at Salem, Ill., where he began railway work as a telegraph operator for the Ohio & Mississippi, now a part of the Baltimore & Ohio Southwestern. Later he was agent for that road at Lebanon, Ill., and then went to St. Louis, Mo., as city passenger and ticket agent for the St. Louis Southwestern. Subsequently he was district passenger agent of the Toledo, St. Louis & Western; traveling passenger agent of the Choctaw, Oklahoma & Gulf, and city passenger agent of the Louisville & Nashville at St. Louis, until January 1, 1901, when he became division passenger agent of the latter road.

J. G. Hollenbeck, whose appointment as general passenger agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern has been announced in these columns, began railway service in 1893 as ticket agent of the Indiana, Decatur & Western at Indianapolis, Ind., and later became traveling passenger agent for the same road. In 1895 he became chief clerk in the passenger department of the Florida East Coast at St. Augustine, Fla., and two years later was appointed district passenger agent of the Louisville & Nashville at Atlanta, Ga. He was subsequently division passenger agent at the latter place until 1900, when he was made general agent of the passenger department of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with headquarters at Cincinnati, Ohio. He remained in that position for 18 months and was then promoted to assistant general passenger agent at Little Rock, Ark., which position he held on January 1 when he was appointed general passenger agent, with headquarters at St. Louis, Mo.

J. G. Hollenbeck.

Engineering and Rolling Stock Officers.

George O. Hammond has been appointed assistant to the mechanical superintendent of the New York, New Haven & Hartford, with headquarters at New Haven, Conn.

E. E. Finley has been appointed superintendent of maintenance of way of the San Antonio & Aransas Pass, with headquarters at Yoakum, Tex., succeeding Hans Helland, resigned.

The jurisdiction of W. J. Tollerton, general mechanical superintendent of the Rock Island Lines, with headquarters at Chicago, extends also over the St. Paul & Kansas City Short Line.

J. E. Osmer has been appointed superintendent of motive power and machinery and master car builder of the Ann Arbor Railroad and Steamship Lines, with office at Owosso, Mich., succeeding G. E. Coutant, resigned.

F. T. Chase has been appointed master mechanic of the Smithville district of the Missouri, Kansas & Texas Railway of Texas, with headquarters at Smithville, Tex. J. H. Dougherty has been appointed acting master mechanic of the Waco district of that road and the Texas Central, with office at Waco, Tex.

M. J. McCarthy, whose appointment as superintendent of motive power of the Baltimore & Ohio Southwestern and the Cincinnati, Hamilton & Dayton, with headquarters at Cincinnati, has been announced in these columns, was born at Susquehanna, Pa., in 1868. He served an apprenticeship with the Erie Railroad at Susquehanna, leaving that road in 1889. Subsequently he worked in various railroad shops in the West and Southwest as a machinist and foreman. He was with the Chicago, Burlington & Quincy at Burlington, Ia., for 10 years as machinist, inspector and general foreman; four years as division master mechanic of the Michigan Central at St. Thomas, Ont.; two years as division master mechanic of the Lake Shore & Michigan Southern at Elkhart, Ind.; 3½ years as superintendent of shops of the Cleveland, Cincinnati, Chicago & St. Louis at Beech Grove, Ind., and assistant superintendent of motive power of the latter road at Indianapolis, Ind., for 18 months. He held the latter position at the time of his appointment as superintendent of motive power of the Baltimore & Ohio Southwestern and the Cincinnati, Hamilton & Dayton, as noted above.

James Brattell Randall, whose appointment as master mechanic of the Louisville, Henderson & St. Louis, with headquarters at Cloverport, Ky., has been announced in these columns, was born on January 8, 1861, at Athens, Ohio. He received a college education, and on November 12, 1879, began railway work with the Pittsburgh, Fort Wayne & Chicago, now a part of the Pennsylvania Company, remaining with that road for five years when he went to the Indiana, Bloomington & Western, now a part of the Cleveland, Cincinnati, Chicago & St. Louis. He was then chief engineer of stations for four years with the Parkersburg Electric Light & Power Company, and later for one year was in the service of the Newport News & Mississippi Valley. On December 11, 1891, he became an engineman on the Louisville, Henderson & St. Louis, and on September 6, 1910, was promoted to assistant master mechanic, which position he held at the time of his recent appointment as master mechanic of the same road, as above noted.

J. B. Randall.

W. W. Colpitts has resigned as chief engineer for the receivers of the Kansas City, Mexico & Orient, to become associated with the firm of W. H. Coverdale & Co., consulting engineers, New York City. He will, however, retain his position as chief engineer for the receivers of the company's lines in Mexico. Mr. Colpitts was graduated from McGill University in 1899, with the degree of B.S., C.E., and in 1901 received the degree of M.S. from the same university. He began railway service in 1890 as a draftsman in the office of the chief engineer of the Intercolonial Railway. He filled various positions in the engineering departments of Canadian roads until 1898. During the latter year he was resident engineer of the Midland Railway of Nova Scotia; in 1899 he was chief clerk in the office of the president of the Canadian Pacific at Montreal, and in 1900 be-

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came assistant engineer in the construction department of that road. In 1901 Mr. Colpitts went to the Kansas City, Mexico & Orient as assistant engineer; was successively division engineer and assistant chief engineer until March, 1909, when he was appointed chief engineer.

Purchasing Officers.

U. K. Hall has been appointed general storekeeper of the Oregon-Washington Railroad & Navigation Company, with headquarters at Portland, Oregon, succeeding J. E. Mahaney, resigned.

OBITUARY.

Edward Reese, roadmaster of the Chicago, Milwaukee & St. Paul, at Savanna, Ill., died on January 13, aged 62 years.

J. McGie, superintendent of the Oklahoma division of the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., died at El Reno on Friday, January 24, at the age of 48 years.

Gaylord M. Beach, formerly special agent of the Pittsburgh & Lake Erie, with headquarters at Pittsburgh, Pa., died on January 1, at Crafton. He was born on July 10, 1831, at Mansfield, Ohio, and began railway work in 1850 as a laborer on track work on the Sandusky, Mansfield & Newark, now a part of the Baltimore & Ohio. From 1852 to September, 1857, he was in the engineering department of a number of roads, including the Bellefontaine & Indiana, the Erie, and lines now forming part of the Southern Railway. He was subsequently conductor on freight and passenger trains, then fuel agent, and later assistant roadmaster of the Cleveland, Columbus, Cincinnati & Indianapolis, and from June, 1869, to November, 1870, was superintendent of construction of the Indianapolis & St. Louis. Both of these roads are now a part of the Cleveland, Cincinnati, Chicago & St. Louis. In November and December, 1870, he was roadmaster on the Atlantic & Pacific, and the South Pacific, and then for eight years was real estate and tax agent of the Cleveland, Columbus, Cincinnati & Indianapolis. From December, 1878, to March, 1880, he was roadmaster, then to September, 1885, was in charge of the engineering department of the same road, and from October, 1882, to 1885 was in charge also of the engineering department of the Indianapolis & St. Louis. He was then for two months assistant general manager, and from October, 1885, to June, 1889, was general manager of these roads, and vice-president and general manager of the Dayton & Union. In June, 1889, he was appointed general manager of the Chicago & Atlantic, now part of the Erie, and from May, 1890, to January, 1898, was general superintendent of the Pittsburgh & Lake Erie and leased lines. He was then for one year assistant general manager, and from January, 1900, was special agent of the same road at Pittsburgh, Pa., until his retirement under the pension rules of the company on February 1, 1911.

G. M. Beach.

PRIZES OFFERED IN GERMANY.—The German Society of Mechanical Engineers offers a prize of $375 for the best treatise on annoying noises caused by city and street railways, their causes, and the best means of avoiding them; also similar prizes for a work on the heating of cars by steam, for one on cranes used in locomotive shops, and one of $500 for an investigation of car-springs, with designs and formulae. The formulae heretofore used are believed to be inadequate.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE SEABOARD AIR LINE is in the market for two Pacific type locomotives.

THE ERIE has ordered 10 Pacific type locomotives from the American Locomotive Company.

THE MICHIGAN CENTRAL has ordered 15 switching locomotives from the American Locomotive Company.

THE ATLANTA, BIRMINGHAM & ATLANTIC is said to be making inquiries for 5 locomotives. This item has not been confirmed.

AMSINCK & COMPANY, New York, have ordered 2 consolidation locomotives from the Baldwin Locomotive Works. These locomotives are for the Sabana Railway, Colombia.

THE DULUTH, SOUTH SHORE & ATLANTIC has ordered 12 consolidation locomotives and 3 Pacific type locomotives from the American Locomotive Company. The consolidation locomotives will have 21 in. x 30 in. cylinders, 55 in. driving wheels, and in working order will weigh 182,000 lbs. The Pacific type locomotives will have 21 in. x 26 in. cylinders, 67 in. driving wheels, and in working order will weigh 193,000 lbs. All of these locomotives will be equipped with superheaters.

THE CHICAGO, ROCK ISLAND & PACIFIC has ordered 30 superheater Pacific type locomotives and 30 six-wheel switching locomotives from the American Locomotive Company and 25 mikado locomotives from the Baldwin Locomotive Works. The Pacific type locomotives will have 27-in. x 28-in cylinders, 79-in. driving wheels, and in working order will weigh 291,000 lbs. The swtching locomotives will have 21-in. x 28-in. cylinders, 57-in. driving wheels, and in working order will weigh 165,000 lbs.

CAR BUILDING.

THE ILLINOIS CENTRAL has ordered 1,000 gondola cars from the Pullman Company.

THE HARRIMAN LINES have ordered 800 work cars from the Bettendorf Axle Company.

THE CHESAPEAKE & OHIO has ordered 2 postal cars from the Pressed Steel Car Company.

THE DENVER & SALT LAKE is negotiating with the American Car & Foundry Company for 100 box cars and 20 stock cars.

THE AMERICAN REFRIGERATOR TRANSIT has ordered 1,000 additional refrigerator cars from the American Car & Foundry Company.

THE PENNSYLVANIA RAILROAD is in the market for 5,000 all-steel gondola cars, 1,300 wooden-side gondola cars and 1,000 refrigerator cars.

THE FT. DODGE, DES MOINES & SOUTHERN is said to have ordered 200 box cars from the Lenoir Car Works. This item has not been confirmed.

THE PENNSYLVANIA LINES WEST are in the market for 3,000 all-steel gondola cars, 1,000 wooden-side gondola cars, 500 refrigerator cars and 500 box cars.

THE SOUTH BUFFALO has ordered 30 hopper cars from the Summers Steel Car Company. These cars will be built by the Standard Steel Car Company.

THE WHEELING & LAKE ERIE has ordered 1,000 coal cars from the Standard Steel Car Company, and 500 coal cars from the American Car & Foundry Company.

THE ALIQUIPPA & SOUTHERN has ordered 20 hopper cars from the Summers Steel Car Company. These cars will be built by the Standard Steel Car Company.

THE SOUTHERN RAILWAY has ordered 200 box cars from the American Car & Foundry Company, and 100 gondola cars and 50 hopper cars from the Cambria Steel Company.

THE LOUISVILLE & NASHVILLE, mentioned in an unconfirmed item in the *Railway Age Gazette* of January 24, as being in the market for 500 gondola cars, is in the market for that equipment.

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Supply Trade News.

J. B. Rider, general manager of the Pressed Steel Car Company, Pittsburgh, Pa., has been made a director of that company.

The Carbon Steel Company, New York, has moved its general offices from 30 Church street, to the Cameron building, New York.

Frank F. Fowle has resigned his position with the McGraw Publishing Company as one of the editors of the *Electrical World*, with office in New York, and has opened offices at 68 Maiden lane, New York, as consulting electrical engineer.

J. L. Stark, who has been general inspector of the car department of the Hocking Valley at Columbus, Ohio, has resigned to become a representative of the Chicago-Cleveland Car Roofing Company, with office at Chicago. Mr. Stark is president of the Chief Interchange Car Inspectors' & Car Foremen's Association of America.

Gilbert H. Pearsall resigned as secretary of Joseph T. Ryerson & Son, in charge of railroad sales, with headquarters in New York City, on January 1, to engage in business for himself. Edward T. Hendee, who has been assistant to the president of the company, has assumed the duties heretofore devolving upon Mr. Pearsall.

TRADE PUBLICATIONS.

METAL ROOFING.—The American Sheet & Tin Plate Company has published a small booklet entitled Better Buildings, which gives information relative to the uses and advantages of formed metal roofing and siding materials.

UNIONS.—The Jefferson Union Company, Lexington, Mass., has published an attractive illustrated folder in which it gives a brief sketch of the life and work of George Washington and discusses the construction and advantages of Jefferson unions.

METAL SAWS.—The Vulcan Engineering Sales Company, Chicago, has published a well illustrated catalog of its metal saws, including cold metal sawing machines, combination saw and rotary planers, cold saws, foundry saws, etc. Concise descriptions and dimensions are included.

TOOL STEEL.—The Firth-Sterling Steel Company, McKeesport, Pa., has published a small booklet entitled Which Do You Believe, the object of which is to show that even very small increases in production justify paying much more than a 50 per cent. increase in the first cost of tool steel. The booklet is really a brief description of the relation of tool steel prices to manufacturing costs.

ELECTRICITY IN EXCAVATION AND CONSTRUCTION WORK.—The General Electric Company, Schenectady, N. Y., has just issued an interesting bulletin (No. A4080) devoted to the use of "Electricity in Excavation and Construction Work." The bulletin deals with both the generating of the current and its use through motors. It touches on the advantages to be derived from the use of electric power, and refers briefly to its application to the work in connection with the Panama Canal, Catskill Aqueduct, New York Barge Canal, and in general building construction.

SOUTH AUSTRALIAN RAILWAYS.—Railways were early in starting in South Australia, the first one, between Adelaide and Port Adelaide, being opened in 1856, with the Victorian gage of 5 ft. 3 in., which was continued on the main lines connecting with Victoria, and extending northwards from Adelaide as far as Terowie. Later the state was induced to adopt the 3 ft. 6 in. gage; hence, of the total mileage of 1,676 miles given in the last report, 835 were on the smaller gage. Unlike New South Wales and Victoria, the lines converge on several ports apart from the Capital. The average cost of the South Australian lines, which contain no very remarkable engineering difficulties of construction, amounts to $43,485 per mile. The lines authorized or in progress amount to 103 miles on the broad and 186 on the narrow gage.

Railway Construction.

ALTON, ST. LOUIS & CAIRO (Electric).—An officer of this company, which was organized to build from Alton, Ill., south along the east bank of the Mississippi river to Cairo, 175 miles, writes that the line will be practically level, and will connect with several lines which now terminate at the Mississippi river. Steam will be used for the motive power for freight, and motor cars for passenger, mail and express service. Of the first 50 miles to be built from East St. Louis, Ill., to East St. Genevieve, 40 miles has been graded and only a little bridging and trestle work remains to be done. It is expected that contracts for track laying on this section will be let soon. The company expects to eventually extend the line to New Orleans. Thomas N. Chase is president, St. Louis. (January 17, p. 131.)

ALTOONA-NORTHERN (Electric).—Under this name work of transforming the old Wopsononock railroad, which will extend from Altoona, Pa., to Patton, Cambria county, 20 miles, has been started. The "Wopsy" road was built 22 years ago from Altoona to Dougherty, 14 miles, to tap a coal field. Last year control of the property was secured by Sigmund Morris, and the new company was formed to build an eight-mile extension and electrify the entire road, also to change it to standard gage. The Altoona-Northern has a capital of $750,000.

BEAUMONT & GREAT NORTHERN.—See Missouri, Kansas & Texas.

CHARLESTON-ISLE OF PALMS TRACTION.—An officer writes that contracts are to be let about July 1, to build an extension of the line now in operation from Mt. Pleasant, S. C., east to Isle of Palms, 9 miles, from the latter place east to McClellanville, about 27 miles. The company also operates a 2 mile ferry line to the city of Charleston. Contracts are also to be let at the same time for an extension from the northern terminus at Mt. Pleasant northeast to the Cooper river, and for building a reinforced concrete bridge over the Cooper river 5,000 ft. long, thence to the terminus in the city of Charleston. James Sottile is president, and W. W. Fuller, chief engineer, New Charleston Hotel, Charleston. (November 22, p. 1013.)

CLACKAMAS SOUTHERN.—An officer writes that contracts for bridge work have been given to the Interstate Contract Company, Portland, Ore., and all other work is being carried out by the company. No additional contracts will be let for work on the line building from Oregon City, Ore., south via Beaver Creek, Mulino, Molalla and Monitor to Mt. Angel, 32 miles. Track has been laid on 6,500 ft., and the company expects to have tracklaying finished to Molalla, 19 miles, by August 1, and to Mt. Angel by December, 1913. The work involves handling from 5,000 to 8,000 cu. yds. a mile, of which 85 per cent. is earth and 15 per cent. loose rock, and there remains about 17 miles yet to be graded. The maximum grades will be 2 per cent., and the maximum curvature 15 deg. The company expects to develop a traffic in lumber, logs and farm products. It is the intention of the company to use steam as the motive power for the present, and to electrify the line within two years. Frank Busch, president, and J. L. Stacer, chief engineer, Oregon City.

GREAT FALLS & TETON COUNTY.—See Great Northern.

GREAT NORTHERN.—An officer writes that the Great Falls & Teton County is being built from Power, Mont., west and northwest to Choteau, about 30 miles. No contracts have been let to build an extension from Choteau to Bynum. (October 18, p. 774.)

KENTUCKY SOUTHWESTERN ELECTRIC RAILWAY LIGHT AND POWER COMPANY.—Announcement has been made that this company, which was organized some time ago to build from Paducah, Ky., south to Mayfield, thence to Murray, about 45 miles, will start work on the line early this year. It is understood that the entire right of way has been secured. H. T. Rhodes, president, and W. A. Calhoun, consulting engineer, Paducah. (September 20, p. 559.)

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—This company has definitely decided upon a plan to extend its present lines by constructing about 725 miles of heavy, standard road through Montana. This northwestern extension is to connect

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with the Canadian Pacific system at a point near the extreme edge of the Montana-Idaho border. Other plans of the company include building 30 miles from Plaza, N. Dak., to the Missouri river, and an extension of the Ambrose line, 80 miles into Montana. This work, definitely decided upon some months ago, will be gone ahead with. (January 3, p. 38.)

MISSOURI, KANSAS & TEXAS.—An officer writes that surveys are now being made from Waco, Tex., southeast to the Beaumont & Great Northern at Weldon, also from this line at Livingston southeast towards Beaumont. The company recently bought the Beaumont & Great Northern, extending from Livingston northwest via Trinity to Weldon.

MOBERLY, HUNTSVILLE & RANDOLPH SPRINGS (Electric).—An officer writes that contracts are to be let in April to build from Moberly, Mo., west via Huntsville to Randolph Springs, 12 miles. The plans include putting up two or three small steel bridges, a power house and terminals. C. H. Dameron, president, and J. J. Munindger, chief engineer, Huntsville. (January 3, p. 38.)

MOBILE & BALDWIN COUNTIES (Electric).—Incorporated in Alabama with $50,000 capital, to build from Mobile, Ala., northeast to Bay Minette, about 23 miles, and eventually to extend the line southeast to Pensacola, Fla., an additional 50 miles. W. B. Miller, Chicago; J. P. Lowell, and M. H. Miller, Mobile, and J. R. Cross, Fairhope, Ala., are directors.

MONTEZUMA & WESTERN.—An officer writes that contracts are to be let this spring to build from a connection with the Colorado & Southern at Silver Plume, Colo., west via Montezuma to the Colorado & Southern at Keystone. The plans call for building 39 miles of narrow gage line. The total excavation will be about 600,000 cu. yds., of which 190,000 will be rock work. The maximum grades will be 3 per cent., and maximum curvature 25 deg. There will be 3,400 lineal feet of trestles and 7,600 ft. of tunnels. About one-half mile of track has been laid and about one-half mile of tunnel work has been completed. The company expects to develop a traffic in ore, timber and mining equipment. A. J. Woodruff, general manager; C. A. Hopkins, chief engineer, 707 Equitable building, Denver. (December 20, p. 1235.)

MONTOUR RAILROAD.—Contracts it is said will be let before the opening of spring to build extensions to connect with the Bessemer & Lake Erie near Homestead, Pa., about 40 miles. (November 29, p. 1053.)

NEW YORK CENTRAL & HUDSON RIVER.—Extensive improvements are now in progress at Rome, N. Y., consisting of the relocation of the main line through the city; the construction of a new passenger station, and the enlargement of the freight facilities, also the elimination of all grade crossings within the limits of the new line. This line is to be a cut-off three and a half miles long, and is being built about three-quarters of a mile south of the present location. The relocation is made necessary by the new barge canal, which crosses the old line both east and west of the city. The relocated line is parallel to and just south of the barge canal. The new line is to have six tracks, two more than at present. The R. W. & O., which now joins the main line just west of the passenger station will connect with the new line at the west end of the relocation, and cross the barge canal on an independent bridge. All highway undercrossings are to be reinforced concrete arches with spans varying from 35 to 45 ft. The freight yard will lie to the north of the new line just west of the point where it diverges from the old, and will have 16 yard tracks of about 4,500 ft. each, providing a total capacity of 1,760 cars, while a portion of the old line is retained with a new bridge over the barge canal as an industrial connection to the present yard and freight facilities. The new passenger station will be a two story brick structure 40 ft. x 210 ft., located about opposite the present station, with the second floor at the track level and a 16 ft. passenger subway having a baggage elevator and two stairways to each of the three outer platforms, access to the inner one being direct from the station. The total cost is estimated at about $2,000,000. and the work is being done by the M. A. Talbot Co., of Philadelphia, Pa., and Rome, N. Y. It is expected that the improvements will be finished during 1913.

NEW YORK ROADS.—The New York Public Service Commission, First district, will open bids on February 7, for the construction of Section No. 3 of the Woodside, Astoria and Corona rapid transit railroad. This section embraces the Corona branch, running from the Queens end of the Queensboro bridge out Queens boulevard, Greenpoint avenue and Roosevelt avenue to Sycamore avenue, Corona. It is to be a two and three-track elevated line. Bids for the construction of Section No. 2, the branch from the Queensboro bridge to Ditmars avenue, Astoria, were opened on January 28. (January 24, p. 191.)

OIL BELT OF ILLINOIS (Electric).—This company, which operates a line between Bridgeport, Ill., and Oblong, 25 miles, will issue bonds. Part of the proceeds of the bonds are to be used for future betterments and improvements. The line is now being extended 80 miles, to complete a through line from Charleston south to Mt. Carmel, 105 miles, through the oil belt, traversing Coles, Cumberland, Crawford, Clark, Lawrence and Wabash counties. W. E. Finley, president, and T. M. Mooney, secretary and treasurer, Bridgeport. (November 15, p. 973.)

OKLAHOMA ROAD.—According to press reports surveys have been made to build from Sapulpa, Okla., west to Cushing, about 40 miles. Former Governor Charles M. Haskell, is back of the project.

OMAHA, LINCOLN & BEATRICE (Electric).—An officer of this company, which operates a 6½ mile line from Lincoln, Neb., to University Place and Bethany Heights, writes that permission has been asked to issue bonds and stock to secure funds for building an extension of about 50 miles. The plans call for building northeast via Waverly, Greenwood, Ashland, Springfield, Papillion and South Omaha to Omaha.

PENNSYLVANIA RAILROAD.—An officer writes that bids are being asked for piercing three tunnels on the Allegheny division as follows: Tunnel at East Brady, Pa., to be 2,660 ft. long, will effect a saving in distance of 5 7/10 miles over the existing line; tunnel at Wood Hill, 2,870 ft. long, will effect a saving of 5 5/10 miles, and the third tunnel at Kennerdell, 3,350 ft., will effect a saving of 4 miles. (January 17, p. 132.)

PLATEAU VALLEY.—Organized in Colorado to build from Yeckel Junction, Colo., which is on the Denver & Rio Grande, near Grand Junction, east to Collbran, about 40 miles. It is understood that construction work will be started soon. Jacob Yeckel, president, and A. J. Halter, vice-president.

ROCK ISLAND, STUTTGART & SOUTHERN.—Incorporated in Arkansas with $300,000, to build from Mesa, Ark., south to Stuttgart, 22 miles. T. S. Bugbee, president; A. B. Copley, vice-president, and G. B. Pugh, secretary and treasurer.

SOUTHERN RAILWAY.—This company will let contracts soon for the construction of double track north from Monroe, Va., the southern terminus of the Washington division, to Amherst, eight miles. Contracts will also be let for the construction of double track from Twenty-seventh street, Birmingham, Ala., to the east end of the North Birmingham yard.

TIDEWATER SOUTHERN (Electric).—An officer writes that work is now under way to complete the line from Stockton, Cal., to Turlock, 50 miles. Contracts for this work were let about a year ago to the Daae Construction Company, Sacramento, Cal. Track has been laid on about 40.5 miles. There will be two steel bridges each about 240 ft. long, and about 2,000 ft. of trestle. J. H. Wallace, chief engineer, Stockton. (May 24, p. 1181.)

WESTERN MARYLAND.—All passing tracks are to be extended to 4,000 ft. clear length, and the construction of five additional passing tracks of the same length has been authorized on the 80-mile section between Hagerstown, Md., and Cumberland. This involves the construction of about 7½ miles of track at a cost of from $250,000 to $300,000.

WOPSONONOCK.—See Altoona-Northern.

NEW LINE FOR INDIA.—The Indian railway board has accorded its sanction to a survey being carried out by the Bombay, Baroda & Central India Railway for a line on the 5 ft. 6 in. gage from Gangapur, on the Nagda-Wertha section of the Bombay, Baroda & Central India Railway, to Luni, on the Jodhpur-Bikaner Railway, a distance of about 260 miles.

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Railway Financial News.

ATLANTIC COAST LINE.—The New York Stock Exchange has authorized to be listed on and after February 3 the $6,250,500 common stock which was recently offered to the stockholders at par, making the total amount to be listed $71,241,800. The proceeds of the sale of this stock will be used as follows: $6,210,000 will be paid for the company's subscription to the increased stock of the Louisville & Nashville; and $40,500 for additions and improvements.

BOSTON & MAINE.—J. P. Morgan & Co., New York, Lee Higginson & Co., Boston, and F. S. Moseby & Co., Boston, are offering at 100¼ the unsold portion of $10,000,000 5 per cent., one year, coupon notes dated February 3, 1913. The proceeds will be used as follows: About $5,000,000 to pay for Maine Central stock; and a part of the balance to take up small note issues maturing before June.

CANADIAN NORTHERN.—See Canadian Northern Alberta.

CANADIAN NORTHERN ALBERTA.—There has been deposited in the office of the Secretary of State of Canada a trust mortgage, dated November 29, 1912, made by the Canadian Northern Alberta to the British Empire Trust Company, Ltd., the National Trust Company, Ltd., and his Majesty the King and the Canadian Northern Railway securing 3½ per cent. 50-year debenture stock, guaranteed by the Dominion of Canada.

CENTRAL VERMONT.—E. A. Chittenden has been elected a member of the executive committee, and E. T. Smith has been elected a director, both succeeding E. H. Fitzhugh, resigned.

CHICAGO, MILWAUKEE & ST. PAUL.—Stockholders of record February 6, will be permitted to subscribe at par, not later than February 28, when payment must be made in full, for $13,957,400 4½ per cent. convertible bonds of 1912, up to 6 per cent. of their holdings. These bonds are part of an authorized issue of $50,000,000 and are of the same character as the $34,893,500 which were offered to shareholders last spring, as mentioned in the *Railway Age Gazette* of April 12, 1912. Kuhn, Loeb & Co. and the National City Bank, both of New York, have, it is said, underwritten the bonds. These bonds will mature June 1, 1932, but may be converted at par into common stock after June 1, 1917, and before June 1, 1922.

H. R. Williams, vice-president of this company, has been made also a director.

DULUTH, MISSABE & NORTHERN.—This company has called for payment, February 1, at the Central Trust Company, New York, at 105 and interest, $155,000 first consolidated mortgage bonds dated January 1, 1893.

GRAND TRUNK PACIFIC BRANCH LINES COMPANY.—The Grand Trunk announced in London on January 10 that it was authorized to receive subscriptions at 94 for the following bonds of this company; £240,700 ($1,203,500) 4 per cent. sterling bonds, due 1939, principal and interest unconditionally guaranteed by the government of the province of Saskatchewan; £238,600 ($1,193,000) 4 per cent. sterling bonds, due 1942, principal and interest unconditionally guaranteed by the government of the province of Alberta. The proceeds will be used for the construction in the provinces of Saskatchewan and Alberta of branch lines which will be operated under agreement by the Grand Trunk Pacific.

MARYLAND & PENNSYLVANIA.—Baker, Watts & Company, Baltimore, Md., has purchased an issue of $50,000 5 per cent. equipment bonds.

MEXICO NORTH WESTERN.—The holders of the 5 per cent. 50-year first mortgage bonds and the 6 per cent. cumulative convertible income bonds will vote on February 12 on the question of authorizing not more than £2,500,000 ($12,500,000) 15-year prior lien 6 per cent. bonds secured by a prior lien on the entire property. The directors have approved of this issue and suggest that enough of these bonds be sold to pay off the existing floating debt, approximately $5,500,000; to meet the coupons on the first mortgage bonds coming due next March, which amount to about $700,000; and also to provide for the general purposes of the company.

NEW YORK CENTRAL & HUDSON RIVER.—The New York Public Service Commission, Second district, has given its consent to the lease of the New York & Ottawa Railroad to the New York Central & Hudson River for a term of one year commencing February 1, 1913. It has been the practice of the commission to consent to the renewal of this lease from year to year.

NORTHERN PACIFIC.—The New York Stock Exchange has listed $1,084,000 prior lien 4 per cent. bonds, due January 1, 1997, the proceeds of which were used for part of the cost of double track, making the total listed $109,152,500.

OLD COLONY RAILROAD.—This company, which is leased by the New York, New Haven & Hartford, has sold at auction, through R. L. Day & Co., Boston, Mass., $630,000 stock at $176 per share.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—The directors who were elected last spring to serve temporarily pending the execution of the company's $200,000,000 mortgage, have resigned, and the board now consists of the following: George J. Gould, chairman; R. F. Bush, president; Finley J. Shepard, assistant to the president; James Speyer, Edgar L. Marston, E. T. Jeffery, E. C. Simmons, J. G. Metcalfe, Albert H. Wiggin, Jay Gould, Edwin G. Merrill, O. L. Garrison and C. A. Pratt. A new executive committee was also elected, composed of George J. Gould, chairman; B. F. Bush, Albert H. Wiggin, E. T. Jeffery, James Speyer, Edgar L. Marston and Finley J. Shepard.

SCOTT CITY NORTHERN.—It is understood that the securities of this company, consisting of $825,000 first mortgage bonds and $415,700 stock were purchased at auction by the Commonwealth Trust Company, St. Louis, and allied interests.

SOUTHERN RAILWAY.—This company has sold to J. P. Morgan & Co., New York, $5,000,000 five per cent. 3-year notes dated February 1, 1913, the proceeds of which are to be used, together with other funds, to pay at maturity the $10,000,000 three-year notes which mature on February 1, 1913. The bankers now offer the holders of these maturing notes to exchange them at par for the new 3-year notes at 99¾.

IMPORTANT CHINESE RAILWAY COMPLETED.—The railway from Tientsin, the port of Pekin, south by east 674 miles to Pukow, on the Yang-tse-Kiang opposite Nanking, was completed in December when the great bridge over the Hoang-ho was finished. The northern 425 miles were built by Germans, the southern 249 by English. The Chinese government purposes to work the road on its own account. This completes rail connection from Pekin to Shanghai, except for the crossing of the Yang-tsé-Kiang.

CONSTRUCTION IN ASIA MINOR.—December 21 a section some 30 miles long of the Bagdad Railway was opened in the Taurus mountains, and not long before a longer section of the same line was completed east of these mountains. There is some very heavy work to be completed in the mountains before the two sections can be connected. This work is near the northeast corner of the Mediterranean sea, which will be reached by a branch line to Alexandretta. It may be supposed that the Turks have other work than railway building to occupy them at the present time; but the enterprise is in the hands of Germans and others, while of course there has been profound peace in Asia Minor.

INDIAN RAILWAY POLICY.—The present policy of improving existing lines prior to making new extensions is justified by past experience. Opening a settled and thickly populated country such as India by railways is very different enterprise to opening new countries. In the latter, population and cultivation follow the railway, and traffic grows slowly with the development of the country, so that the resources of the line are not suddenly taxed, but grow gradually with the traffic requirements. It is different in India, where the country pierced is often rich and railway facilities are taken advantage of fully from the opening of the line. Much of the complaints about insufficient arrangements for traffic are due to this feature. The call on the new lines is so great that the older lines even become congested with the rapidly increased traffic. In new countries this would not happen; growth of traffic would be more gradual.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico $5.00
Canada 6.00
Foreign Countries (excepting daily editions) 8.40
Single Copies ..... 15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,288 copies were printed; that of those 8,229 copies, 6,771 were mailed to regular paid subscribers and 348 were provided for counter and news companies' sales; that the total copies printed this year to date were 51,076 copies—an average of 7,518 copies a week.

VOLUME 54. FEBRUARY 7, 1913. NUMBER 6.

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*Illustrated.

LIKE nearly all papers discussing the defects in current steel rail manufacture written recently, that by Bradley Stoughton, printed elsewhere in this issue, goes directly to the ingot. Metallurgists in general have realized for some time that the ingot is the source of most of the defects giving rise to the troubles with rails, and it is because of this that they are attaching so much importance to the ingot. Papers by Captain Hunt, Benjamin Talbott and others, published in these columns recently, also refer to the ingot problem. It is understood that the rail committee of the American Railway Engineering Association will this year report that the present specifications requiring that tests be made from three ingots of each heat is sufficient, giving little credence to the individuality of the ingot, and this in spite of the fact that more than half the defects in rail manufacture, and these the most serious, are defects in the ingots. Mr. Stoughton believes that to have sound rails it is necessary to have sound ingots, and his requirements for sound ingots are severe. It is not many years since if steel showed by analysis the desired chemical composition, and the ingot had been cropped to remove piping and pronounced segregation, it was readily accepted. In addition to these defects Mr. Stoughton calls attention to the danger of blow holes, and of sulphide of manganese and other impurities. Analyzing for oxygen or nitrogen was unheard of until recently; no consideration whatever was given to these elements. It is now known that they have a very injurious effect on the qualities of the steel. This entire discussion emphasizes the close scrutiny which every step in the process of steel making, as well as the final results given by the finished product in service, are receiving.

THAT pools to maintain the price of rails did exist is now an accepted fact. W. E. Corey, former president of the United States Steel Corporation in his testimony before the special examiner in the government's suit against the Steel Corporation, dispelled what doubts there had been. Mr. Corey said that the existence of this "arrangement" first came to his knowledge in 1901, when he was made president of the Carnegie Steel Company, before the organization of the Steel Corporation. This pool was broken up in 1904 or 1905, and since that time there has never been any agreement to advance, reduce or maintain the price of that product. The testimony showed that the agreement was not always strictly adhered to by the different manufacturers, and that in 1903 the Tennessee Coal & Iron Company was selling its open hearth rails at $2 above the agreed price. Since the breaking up of the pool certain independent companies have wanted to raise the price, but the officers of the Steel Corporation were decidedly against it, and their stand exerted a deterrent influence. The witness added that the corporation could make rails more cheaply than its competitors. His statements were straightforward and fair and, while a trifle vague at times, never evasive. They are considered damaging to the Steel Corporation, and it has even been said that they are typical of what is said by those who had been in the business but are now out of it. The testimony shows, however, that about one-fourth of Mr. Corey's fortune is invested in the securities of the corporation, and also that he is opposed to the government's suit; so the argument loses its force. Just what influence the testimony will have on the case is a matter of conjecture. The fact remains that it indicates that though the Steel Corporation was in the pool, the pool had been in existence before the corporation and that it was subsequently abolished; also, that if the corporation now indirectly fixes the price of rails, it keeps it down as well as up.

ALTHOUGH a part of a scheme of government the administration of which is controlled chiefly by political considerations, the Interstate Commerce Commission has remained a non-political body insofar as partisan politics are concerned. Except for the fact that the law provides that no more than four of the commissioners shall be of the same political party there has been no occasion for even recognizing their party membership. While the railways have frequently been the victims of party politics, as when one party or another has tried to make capital for itself by advancing some proposition for railway regulation as an issue, the principles of the republican, democratic or progressive parties have had little to do with the matter. Certainly, they have nothing to do with the determination of the reasonableness of rates. It is, therefore, peculiarly unfortunate that the leaders of the democratic party, now in power in Congress, should have allowed their zeal to recoup themselves from the patronage of the new administration for the long, lean years that have passed, to involve the appointment of an interstate commerce commissioner. E. E. Clark, whose term expired on December 31, was renominated by President Taft. Confirmation of the appointment has been held up along with a number of others which may be given to loyal democrats after March 4.

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Not only has Mr. Clark come to be regarded as one of the ablest and fairest members of the commission, but it has long been the consensus of opinion among those who have been most concerned with its work that the experience gained during service on the commission should argue most persuasively in favor of repeated reappointments. Membership on the Interstate Commerce Commission is not a sinecure to be used as a reward for political services. The commission's responsibilities are greater and its work more arduous than those of almost any other department of the government, while its duties are too important to be interfered with by considerations of political partisanship. If the appointments of the members of the commission are determined by partisan considerations, it will not be long before their acts are determined by similar considerations. The success of regulation of railways depends vitally on preventing this. By withholding confirmation of Mr. Clark's nomination the Senate is acting in a way that is unjust to him, disgraceful to it and fraught with public danger.

GOVERNMENTAL investigation of railway practices affecting safety, which, unhappily, is still a useful function in every state, seems lately to have been considerably improved; and this is true notwithstanding the fact that there is much lost motion in the machinery which is engineered from Washington. A fine piece of work done by the Albany (New York State) commission was noticed in these columns last week; an example of governmental regulation which may well serve as a model. The Illinois Railroad and Warehouse Commission pointed out the need last August (*Railway Age Gazette*, August 16, p. 290) in its report on the Western Springs collision, when it uttered the significant truth that investigations confined to one accident and its immediate causes produce no permanent good results; that "we should go much further, determine real causes and devise some plan to prevent" those accidents of which so many, due to the same class of causes, follow one another year after year. The Louisiana commission in its report on the collisions at Montz, and at Alexandria, brought out in lucid fashion important facts which have instructive bearings on accidents everywhere. The Connecticut commission silenced unreasonable public clamor about alleged unsafe tracks at Westport and Green's Farms. The Indiana commission, in its brief order concerning switch lights, exposed a weakness which exists, with great potential danger, in a thousand places. The Interstate Commerce Commission's report on the Indiana collision brought out a chain of facts of a kind which, though always instructive to railway men everywhere, are rarely printed for the general benefit except as the State unearths them. It will be noted that in all these reports the one most important thing, the improvement of discipline, is dealt with only in a general way. The governmental authorities see what needs to be done in this direction, but they do not tell us just what to do. This is significant. But this silence concerning details should be as loud an admonition as any multiplication of words could be. *The task is up to the railroads.* The writer of that Corning report plainly has a very definite idea of what ought to be done to make enginemen as highly efficient as possible, but he does not describe the procedure. And why should he? Every competent superintendent knows, also.

FROM 65 to 80 per cent. of the damage to freight cars is caused by defective draft gears. This is a statement made by a master car builder of a large road who has carefully checked the performance of freight cars of exactly the same capacities and design, but equipped with different types of draft gear, and in sufficient numbers to enable a fair comparison to be made. While it is true that these figures cover only the repairs which were made on the home road, the large number of cars considered insures the proportion being fairly accurate without taking into consideration the repairs which might have been made on foreign lines, and which it would not be possible to check. Some of the draft gears give very much better results than the others, but we are only at liberty to say that generally speaking the gears of the higher capacities and greatest travel gave the best results. The Master Car Builders' Association has made extensive draft gear tests in the past, including so called static tests in a testing machine which applied and released the load gradually, and drop tests, which allowed a weight or tup to fall and strike the gear at a comparatively high velocity. Neither of these tests approximate service conditions, and efforts have been made by both the railroads and the manufacturing interests to develop an apparatus for testing the draft gear, which would provide conditions more like those in actual service. While a fairly, close approximation may have been had to this, still it is true that the Master Car Builders' Association has never had any tests on such apparatus made under its supervision, and after all the behavior of the gears in actual service under the great variety of conditions encountered is what really counts; every effort should therefore be made to determine the service results as accurately as possible. Unlike a locomotive a car sometimes receives as great an amount of repairs on a foreign road as at home and this is what complicates the situation. However, there must be a number of roads which have just as favorable conditions as the one mentioned above and it should be possible for the association to secure and place on record more authentic data on this subject than now appears in its proceedings.

THE investigation by the Interstate Commerce Commission into the practices of the railways in the issuance of free transportation should be, and apparently is being, received by railway officers with gratification. The testimony of railway men at the hearing in Denver before Commissioner Harlan showed no reluctance to tell the facts. It was full and candid, and manifested a disposition to co-operate with the commission in abolishing a bad practice. It may be considered strange that the commission selected as the place for its first hearing a state in which the railways already had taken advantage of an indictment against them for giving state passes to interstate shippers to put a stop to a practice which had got beyond their control. But it is possible that the cumulative disclosures made in Colorado following the effort of the Department of Justice to have the issuance of state transportation to interstate shippers pronounced illegal may create a public sentiment that will result in the passage of a state anti-pass law. The railways have frequently advocated state anti-pass legislation, and would have been even more urgent but for their appreciation of the danger of offending the politicians who have used most of the passes. The public has failed to grasp the fact that railways as corporations have no inherent fondness for throwing away money in the form of free transportation and rebates, and that even the genial general passenger agent, who is popularly supposed to derive his greatest pleasure in life from handing out passes is more interested in presenting a good showing in the passenger revenue statement. Even the freight solicitor long ago discovered that the efficacy of the pass as a means of capturing carload shipments is diminished or destroyed when his rival also has passes to distribute. Whatever benefit railways may have derived from the issuance of passes has been largely the negative one of averting the ill will that might have followed their refusal, or of offsetting the effect of such extension of favors by a competitor. Even the good will that may have been gained by judicious pass distribution has been more than balanced by the disfavor created among those to whom passes have been denied. The pass that is refused always looks bigger than the one that is given. While the effect of the federal anti-pass law has undoubtedly been felt in an increase of anti-railway legislation, many a railway officer experienced a profound sense of relief when the privilege of indiscriminate pass-giving was taken away. It behooves the railways in the present case to aid the commission in its investigation to the best of their ability.

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THE new Grand Central Terminal, New York City, was opened last Sunday, and a seven years' task of the first magnitude was substantially completed, with great credit to all concerned. We do not mean by this that the station is finished, for there is much yet to be done; but the perplexing problems of construction and operation are out of the way, all of the most important features of the station are in use, and the architects' work is before the public for its judgment. The salient elements of this work are the arrangement of the rooms and the decorative design of the great upper concourse. New Yorkers naturally make their comparisons with the Pennsylvania station, about a mile away, which was finished two and a half years ago. As to arrangement, both designs have marked merits, and we shall not attempt to make a critical estimate of either. The only way to make an accurate comparison would be to measure the aggregate of the foot journeys of all the passengers for a day or a week—journeys necessarily long, as compared with those at a station of moderate size—which is hardly practicable. At the Grand Central a passenger entering at the main central front entrance, on Forty-second street, reaches the train level by three short and easy descents. Between these are long level stretches, making the journey in the opposite direction easy. From the lower level, used by the thousands of suburban passengers, the ascending journey is not so easy. But the inward stations, where the suburbanites will mentally formulate their criticisms each morning are not yet finished and the details of this feature are yet to be made known. The arrangement of the rooms, could not be more simple. The baggage room (on the level of Forty-fifth street) is seventeen feet higher than the ticket office floor, and is entered through the north gallery; but passengers have little or no occasion to go there (unless they go in their carriages to deliver trunks) for the baggage checkers are close to the ticket office and send and receive checks through pneumatic tubes. From an esthetic standpoint, the Grand Central headhouse will undoubtedly receive general commendation. The decorations, both outside and in, are not only beautiful but rich; yet no more so than is justified by the vast size of the structure, and by the perfection of its details as a mere building. The outstanding quality of the Pennsylvania station is dignity, with almost a suggestion of coldness; this is the main difference between the two structures. The design of the arched ceiling of the main concourse at the Grand Central, a hundred feet above the observer, is bold and unique; a blue sky over which are spread figures, in delicate gold tracery, showing the signs of the zodiac, with hundreds of other stars, some of which are made real by little electric lights placed behind them. This feature alone would make the station one of the sights of the city. From a figurative or mental standpoint (as well as physically) this decoration will be far above the heads of the great majority of the passengers, and their only sensations will be awe and wonder. But those who take an interest in stars and other celestial things will, no doubt, commend the astronomer and the mystic who, with the architect, have combined to produce a most striking effect; an effect as far removed from concrete bridges and coal burning freight engines as could possibly be imagined.

LOGAN G. McPHERSON has described, in the *North American Review* for January, the concerted movement of the railways to give the public correct information regarding their business which resulted in the establishment of the Bureau of Railway Economics, of which Mr. McPherson is director. The need for scientific gathering and analysis of railway data was shown by persistent and general misstatements regarding rates, capitalization, accidents, etc., over a long period of years, and the want of readily available material for refuting these misstatements. The railway managers felt confident that their business methods and the results would bear the most searching scrutiny and thorough discussion, if fairly done. They were aware that there were conditions existing and things done that could not be defended, but they were sure that the number of things done and conditions existing that could be defended and that merited public favor and commendation greatly preponderated. When the bureau was created the committee of six railway presidents supervising its work instructed it to get and print the facts, all the facts and nothing but the facts. This policy has been followed in the bureau's studies of valuation, capitalization, rates, wages, earnings, water transportation, etc. Its various bulletins have been valuable contributions to the scientific information regarding both our railways and those of other countries. There has been some complaint that, as has been said, they are rather dry reading, and therefore do not appeal to the popular reader. Cold facts are dull things, and it is a difficult art to make their accurate presentation interesting to the man in the street. Fortunately, in the long run, the process of educating public opinion begins, not with the man in the street, but with the man in the professor's library, the editor's sanctum, the business office and at the statesman's desk. Knowledge and ideas work, not upward from the man in the street, but downward to him from the classes mentioned, and the professor, the editor, the business man and the statesman will consume stronger meat and with less sensational seasoning than he will. The bureau's bulletins are adapted to consumption by these classes, although perhaps a little more seasoning would make them no less instructive and palatable to more people. The professor, the editor, the business man and the statesman may not transmit to others in detail the information they give, but they do afford material for thinking and discussion by these persons which are bound to influence public opinion, and thereby public action. The bulletins also furnish information that can be effectively used by railway men in the discussion of railway matters. Their greatest merits have been that the controversial tone has been absent and that so far as we know they have never contained a statement that could be refuted. That they have exerted influence is beyond question, for much of the data given has been widely published in the newspapers, and has been used by professors of economics in universities, etc. It was a wise inspiration that moved the railway presidents to provide for this work. The amount of it should be increased. The bureau is furnishing much good ammunition; there ought to be more railway people using it. The good of the railways and the good of the public demand that the truth about railway matters shall be stated with tireless iteration and reiteration in every part of the United States. When what is true is told as persistently and generally as what is false has been told over a long period of years, conditions will be much improved. The public means to act fairly. It has in many cases acted unfairly, because it has been misled as to what was fair. The only way to keep it from being misled in future is to keep on telling the facts, all the facts and nothing but the facts.

INDICTING COMMON SENSE.

THE grand jury that is investigating the New England railroad situation continues from time to time to indict President Mellen of the New Haven, and President Chamberlin of the Grand Trunk. Every time it indicts them it also indicts common sense. It indicts economy and efficiency in railway operation. It indicts the economic opinion of the age. Either that, or it indicts the Sherman anti-trust law, the Congress that passed it, the Congresses that have failed to amend it, and the public opinion that has elected and sustained these Congresses. The *Railway Age Gazette* has already commented on the relations of the New Haven and New England (December 20, 1912, page 1171). We are here concerned with the question of a competitive railroad system in New England versus a co-ordinated, unified one.

Competition was to be produced by the construction by the Grand Trunk of the Southern New England into a territory practically all of which was already well supplied with mileage. The new line for a long time would have been a bridge across

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New England. It would have been expensive to build. It would have lacked adequate feeders. It would have had few tracks into industries. Therefore, it would seem that it would long have been unprofitable. President Hays of the Grand Trunk thought it desirable to build it. President Chamberlin, who succeeded him, did not. He believed it better for the Grand Trunk to get in over the New Haven's tracks. If the Southern New England should be built, there would be a new railroad which the traffic of New England would have to support. It is fairly obvious that it costs more to support two railways than one. If a railroad opens new territory the traffic created, and which otherwise would not be developed, will support it. If it enters old territory already having a large mileage of railway it must live by attracting traffic already moving, or that would move, by the existing lines. In the former case it renders a public service. In the latter case it causes economic waste. The Grand Trunk extension seems in the main, to fall within the latter category.

There are some things that would be worse than excessive railroad competition and the economic waste that it causes. One of these would be an unregulated railroad monopoly which was inefficiently managed, was arbitrary with the public and gave it poor service for which it charged high rates. The New Haven is not inefficiently managed. Its rates are not excessive. It is non unregulated, and if the public interest requires further regulating of it, this can be done. Its management has been somewhat arbitrary, but regulation and public opinion can curb this. Its service has been good in most ways and deficient in others, but will not be improved by its dismemberment. On the contrary, the railway service of New England will not be made the best it can be, or, in the long run, improved at all, by breaking up the New Haven system and developing general competition. The best service can be secured at the least cost by completing the co-ordination and unification of the existing New England railroad system. These things would make it practicable to adapt the service of each community to its needs, to route traffic by the most direct lines, to develop terminals where most needed.

This kind of co-ordination, unification and development, while incompatible with competition in construction, is not incompatible with some competition in service. Mr. Mellen's theory is that the New Haven is a great terminal yard which all the railways that want to enter New England should be allowed to use with their trains. He would let the Grand Trunk and Canadian Pacific in from Canada on the same terms. He would let the railways of the United States in on the same terms. There would be no difficulty in carrying out this plan if Mr. Mellen's terms to the other railways should be reasonable; and the fact that the Grand Trunk shows willingness to accept them indicates that they are. The advantage of competition in service would be secured, while the disadvantage of economic waste by competitive construction would be avoided. This is not merely Mr. Mellen's plan. It is opposed by those who study and discuss the New England railroad situation as agitators, but endorsed by those who study and discuss it disinterestedly and with public spirit. One of these is Professor Bruce Wyman, of the Harvard Law school. Professor Wyman says in an article in the Boston *Transcript* of January 2: "Believing in unification of our railroads as I do, I am convinced that we can get better service from a single system than we could ever hope for from separate roads."

But whatever thoughtful men who devote their lives to the study of subjects such as this may believe, a large part of the public still believes that we should go on regulating railways, both by laws that aim to compel them to compete and by administrative bodies that make it hard or impossible for them to compete. The public still believes that it can perform the great equestrian feat of riding two horses running rapidly in opposite directions. Many public men still think so too. So long as the public and public men so think, doubtless we shall keep on our statute books utterly inconsistent laws for the regulation of the railroads. And so long as this is the case the grand juries will continue to grind out true bills indicting common sense.

THE LIMIT OF THE COMMISSION'S AUTHORITY.

THE decision of the Supreme Court of the United States in the Louisville & Nashville case (I. C. C. and U. S. vs. L. & N. R. R. Co.) destroys utterly the theory advanced by the Interstate Commerce Commission and its attorneys as to the authority of the commission. This theory was concisely stated by the commission in its annual report for 1911. The making of rates, it said, is a legislative function. "That being so, the discretionary power involved in reaching the conclusion that a particular rate is or is not reasonable for the future, or that a particular discrimination is or is not undue, is a legislative discretion which cannot be reviewed by the courts." Congress, it has been contended, has so completely delegated to the commission the legislative function of making rates that the courts can no more review and set aside one of its orders that is not confiscatory than they can set aside a non-confiscatory act of Congress. The commission, it has been maintained, may even base orders on information in its possession which has not been introduced at the hearing of the case before it, and of which the parties are not apprised.

Many lawyers, economists and public men have accepted this doctrine as having been established by the Supreme Court itself; and the Commerce Court has been severely criticized because it has reversed the commission in cases in which it has believed that the commission has not given a full hearing, or has ignored the evidence, or has made unreasonable orders. The Louisville & Nashville case is one of those in which the Commerce Court reversed the commission. The Supreme Court reverses the Commerce Court, disagreeing with its conclusion that the findings of the commission were not based on substantial evidence. But the Supreme Court completely upholds the principle laid down by the Commerce Court that the orders of the commission can be made only after a full hearing and must be based on substantial evidence and that the courts may inquire whether this has been done and reverse the commission if it has not been.

The law gives the right to a full hearing. "That," says the Supreme Court, "conferred the privilege of introducing testimony and at the same time imposed the duty of deciding in accordance with the facts proved. A finding without evidence is arbitrary and baseless. And if the government's contention is correct, it would mean that the commission had a power possessed by no other officer, administrative body, or tribunal under our government. It would mean that where rights depended upon facts, the commission could disregard all rules of evidence, and capriciously make findings by administrative fiat. Such authority, however beneficently exercised in one case, could be injuriously exerted in another; is inconsistent with rational justice, and comes under the Constitution's condemnation of all arbitrary exercise of power." "Under the statute," the court adds, "the carrier retains the primary right to make rates, but if, after hearing, they are shown to be unreasonable, the commission may set them aside and require the substitution of just for unjust charges. The commission's right to act depends upon the existence of this fact, and if there was no evidence to show that the rates were unreasonable, there was no jurisdiction to make the order. In a case like the present the courts will not review the commission's conclusions of fact by passing upon the credibility of witnesses, or conflicts in the testimony. But the legal effect of evidence is a question of law."

Commenting on the contention that the commission may use private information in its possession in deciding a case, the court says that "such a construction would nullify the right to a hearing, for manifestly there is no hearing when the party does not know what evidence is offered or considered and is not given an opportunity to test, explain, or refute." All the in-

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formation on which the order is based must appear in the record of the case, "for otherwise, even though it appeared that the order was without evidence, the manifest deficiency could always be explained on the theory that the commission had before it extraneous, unknown, but presumptively sufficient information to support the finding. . . . The question is whether there was substantial evidence to support the order." If there was, the courts cannot settle conflicts in the testimony nor put their judgment above that of the rate-making body.

When the bill to abolish the Commerce Court was pending, Attorney-General Wickersham suggested that if Congress considered it expedient to make the commission's findings of fact binding on the courts, it might do so by enacting a specific provision to this effect. The decision in the Louisville & Nashville case indicates that this could not constitutionally be done. As has been shown, the Supreme Court says that the exercise of such authority as the commission has claimed "comes under the Constitution's condemnation of all arbitrary exercise of power," and that "the legal effect of evidence is a question of law." It follows that whether the commission has given legal effect to the evidence or has acted arbitrarily is a question which the courts have a constitutional power to pass on, even though confiscation is not involved.

Those who believe it would be expedient for the commission to be the final judge of the facts, with uncontrolled authority to regulate rates and service according to its good judgment, so long as its orders were not confiscatory, will be disappointed by this decision. They will say that the commission is more fit to deal with these matters than the courts and that judicial interference will hamper its work. But any administrative body, however expert and impartial, is apt to make mistakes which a court, though less expert, may detect and correct. The principle of court control of the commission is similar to the principle of commission control of the traffic managers. No one in his senses doubts that the traffic managers of the railways know more about how rates ought ordinarily to be made than the commission does. But the traffic managers have at times acted unwisely or unjustly, and so the commission has been authorized to correct their errors. So the commission knows more in detail about how rates ought to be made than any court. But the commission may at times act unwisely or unfairly. It is not merely a judge of the railways, but it is required to act as a detective to shadow them, and as a prosecutor to prosecute them. As long as it has these functions, and its members are human, it will not be entirely impartial. How then can it be reasonably contended that the courts should not be allowed to inquire whether the commission has acted in disregard of evidence, or without any evidence at all, or issued orders that are palpably unjust.

The main principle on which the government of the United States rests is that it should be a government of laws and not of men; that no one should have his life, or liberty, or property taken without the right to be fully apprised of the reason and to appeal to the courts to determine if the taking is just. The doctrine that the Interstate Commerce Commission should be given arbitrary power is simply the doctrine that the property rights of the owners of railways should not be given the same protection as the property rights of other persons. It is a doctrine that is inherently wrong and unjust, and it is gratifying that the Supreme Court has repudiated and condemned it. Perhaps it may be desirable that administrative officers should be given the arbitrary authority over *all* forms of property that it has been contended that the commission has over railway property. There are some people who believe that the bureaucratic autocracy is the best form of government. But until the people of this country are prepared to come to that it cannot be rationally, consistently or equitably contended that arbitrary power over railway or public utility property alone should be given to administrative officials.

Letters to the Editor.

SAFETY APPLIANCE INSPECTORS.

CHICAGO, January 27, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Recently the equipment in the yards of a western railway was inspected by a government safety appliance inspector. The inspection occupied one hour, and was finished at 9 a. m. After it was completed the inspector was asked if he intended to inspect the equipment in the yards of another railway located in the same town, and about fifteen minutes' walk from the yards in which the inspection had just been made. He replied that the inspection of one yard was considered a day's work in government service, and that no inspector went over more than one yard in one day; he would, therefore, save the other yard for another day's work.

Government service is paid for by the public through the medium of taxation. The theory upon which government employees handle their work should be known, therefore, to all the public, and especially to the magazine muckrakers and all other reformers who are howling for government ownership of railways as the only means by which true economy and efficiency can finally be reached. Railroad men will not need more than one guess to decide how long a man who handled his work as outlined above would last in railroad service.

MASTER MECHANIC.

BASE FAILURES IN RAILS.

CHICAGO, Ill., October 29, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have read with a great deal of interest the report of the accident on the Wabash near Lebanon, Ind., on March 7, 1912, made to the Interstate Commerce Commission by the chief inspector of safety appliances and accompanied by a report by James E. Howard of the Bureau of Standards. While this is an exceedingly valuable and painstaking report it has some statements which, I believe, are misleading to those who are not already well informed regarding rail investigations. The initial cause of failure was a broken base due to unusual or seamy metal. The seam itself is not shown, although a good deal of space is given to a description of the manner in which the rail was subsequently broken into several pieces as the locomotive wheels passed over it. It is to be regretted that micro-photographs of the seam itself are not shown so that the reader may form an idea as to just what kind of a seam is referred to. On page 5 the statement is made, "Statistics show that a large majority of the broken rails reported are defective in much the same manner as this rail." If this means that broken rails due to seams predominate, then the statement is correct, but if it means that seams in the base or base failures predominate then it is incorrect, as the tabulation of rail failures of the American Railway Engineering Association on page 349 of Bulletin 147 of that association shows.

No one will question the statement that a large majority of rail failures are due to unsound metal, but the statements made as to means being taken to correct the trouble are misleading. On page 17 the following is found:

> Herein is exhibited a structural defect which is prevalent, to a marked degree, in many rails. It is a defect the presence of which is well recognized and admitted. It has been the cause of occasional wrecks and a large number of renewals of rails. Notwithstanding these circumstances, rails are accepted under specifications and tests in which this, the most common cause for breakage, is not guarded against. Revisions of specifications have gone on, still omitting reference to this prolific cause of rail failures.

Surely Mr. Howard must be aware of the extensive researches which are being made at the present time both by the

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railroads and by the manufacturers. The belief in well informed quarters at the present time seems to be that structural unsoundness is due to defects which originate in the ingot, and every feasible scheme to secure sound ingots will be tried as soon as its feasibility is demonstrated. There is a large variety of sizes and shapes of ingots all producing unsound metal at times, but no one has come forward with an ingot that will always turn out to be structurally sound. Mr. Howard also says:

> An overwhelming majority of rail failures is reported as due to base fractures, fractures which disclose the presence of streaks and seams in the steel. This seaminess of the metal can be revealed by crosswise bending of the flanges, and such a test for structural soundness is easily made. In fact such a method of examination has been employed in the past by the undersigned to show the prevalence of streaks in rails which had or had not displayed seamy fractures in the track. Tests governing the acceptance of a finished product should undoubtedly be directed to show the fitness of that product against its most common manner of failure in service.

The tabulation above referred to shows that an overwhelming majority of rail failures do not take place in the base. It must be admitted in fairness, however, that more failures are due to base failures than were formerly reported, but this may be due to the fact that at the present time everyone is on the lookout for that special item.

Base failures may be separated into two divisions: those with a rough fractured surface as though the metal had been torn apart, and those which show a smooth surface near the bottom of the base.

This smooth surface may be so narrow as to be hardly discernible, but is frequently a sixteenth of an inch wide. It is apparent that the causes cannot be the same in both instances, and much confusion has arisen in trying to assign reasons for these failures as though they were all of the same character.

Although our knowledge of the subject is far from complete, the following reasons have been assigned as causes of failures of the first type:

(1) Professor Fay believes that sulphide of manganese is the cause of the trouble. This produces structural unsoundness without apparent surface defects. When the rail is subjected to lateral strain the bottom of the base is in tension and as the sulphide of manganese is not able to withstand stress of this nature, the metal separates in a line parallel to the longitudinal axis.

(2) The T-rail now in use is not symmetrical with respect to either its horizontal or vertical axis. It is one of the peculiarities of steel that it does not spread much under pressure but elongates much more readily. In the process of rolling more pressure is apt to be placed on the base of the rail than on the web. The result of this is that the base will be elongated more than the web, thus setting up an internal stress at the junction of the web and base. With our present type of rail having a short radius at this point this stress is concentrated within a small area of the cross section.

(3) Another cause is cold straightening or "gagging" at the mills. It has been noticed that rails checked or made a snapping noise while being straightened in the presses, and the more recent specifications reject all such rails. It has always been difficult for me to see how this can happen in a rail otherwise sound. It would not appear to be probable that a vertical force would produce a vertical fracture in uniform material. Some inspectors also state that they do not hear this sound as frequently in open hearth as in Bessemer rails. However that may be, the sound is made by the release of some internal stress either by pulling apart a seam or breaking a thread of material which was weaker than that which surrounded it.

(4) Segregation, or the separation of the constituent elements of steel taking place in the ingot, reduces the transverse ductility, and if the separation is sufficiently marked, will make a plane of cleavage or separation when the portion affected is subjected to tensile or shearing stresses.

(5) Still another cause is lack of transverse ductility. It is a fact that when subjected to tensile stresses, rolled steel is stronger in the direction of its rolling than transversely. Just what difference should be expected is in some doubt at the present time as tests do not seem to have progressed far enough to be called a final demonstration. Also the transverse forces due to a moving train are not well established, as regards magnitude. Numerous investigations are being made along this line and our knowledge of the matter will be increased in time. From our present knowledge of the subject it appears to be a fact that a majority of the rails which fail from lateral pressure are structurally unsound. This unsoundness originates in the ingot and is generally local in character.

Under the second division we have: Seams due to pipe, inclusive of foreign matter, etc., and seams due to imperfect rolling conditions. Seams due to pipe may be almost any length up to the length of the rail or small seams scattered along at intervals. The seam cannot always be told when the rail is sawed unless it is discolored. The slag inclusions, etc., are discolored and are readily told if the rail is cut at the point, but may be found anywhere in small pockets. Seams due to rolling conditions, if on the surface, are easily seen and seldom are found in the tracks, as the rail is rejected at the mill.

Another reason for seams in the base has been brought forward by some writers. They claim that the skin which is first formed on the bloom in rolling becomes wrinkled, and as the section is reduced this skin is rolled into the rail base. This occurs after the rail has cooled below the point when welding will take place. This defect in mill practice seems to be well founded and will undoubtedly be eliminated as time progresses.

The present drop tests with the addition of the latest ductility tests and chemical requirements are intended to eliminate general defects in the manufacture of rail and are fairly successful in that respect. These specifications are progressive in character and changes will be made from time to time as particular points or betterments are demonstrated. But with regard to the defects described above which are local in character, the situation is different. Tests of sample pieces do not show the trouble. In order to eliminate this kind of trouble each rail must be tested separately in such a manner as to reveal it. Mr. Howard says he has such a test. Will it be practicable for him to test 4,000 rails a day, the output of the Gary mill, by the method he refers to?

I believe the study of rail steel and concurrent troubles arising from the use thereof is only in its infancy. The man who will know all about it is not yet born. In the meantime, general statements unaccompanied by a large number of qualifying adjectives are apt to mislead those who have no exact knowledge of the subject matter under discussion. However it must be borne in mind that specifications and tests of the kind now in use and those along the same general lines will largely eliminate the local defects as found in this particular instance when a critical inspection is made at the mills.

Paul M. La Bach,
Assistant Engineer, Chicago, Rock Island & Pacific.

Clearances in Australia.—For more than seven years the railway departments of the several states have agreed to a standard uniform clearance in connection with bridges and tunnels on both the 4 ft. 8½ in. and 5 ft. 3 in. gages. As the Commonwealth government has finally decided on the 4 ft. 8½ in. gage for the Transcontinental line, together with the possibility of 4 ft. 8½ in. being adopted as the standard gage throughout Australia, the question of the minimum clearance has been considered by a special conference of the railway commissioners of the several states and Tasmania. The new scale of clearances—the size of the locomotive being the governing factor—which have been agreed on provides for an increase from 14 ft. 6 in. to 15 ft. in the vertical height clearance from the center of the track, whilst an additional space of 6 in. has been allowed for on each side of the line as far as the width of the bridges and the distance of platforms from the center of the track are concerned.

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TRANSPORTATION OF FRUIT AND VEGETABLES.*

A Fast, Difficult, Expensive Service Rendered at Relatively Low Rates—Need for Co-operation Between Shipper and Carrier.

By E. D. Levy,
Assistant General Manager, St. Louis & San Francisco.

There are various kinds of refrigerator cars used for the transportation of fruits and vegetables, but when each of the various styles of cars is analyzed carefully it will be found they are all based on practically the same principle, i. e., an insulated box car, with insulated side doors and hatch plugs, containing ice bunkers. Briefly, the efficiency of the refrigerator, or the preservative features, is determined by the number of layers of insulation, its quality and thickness, and the character of workmanship in the construction of the car, side doors and hatch plugs. It is an old adage that a chain is only as strong as its weakest link. This applies to a refrigerator car because if the car is not uniformly air proof it will not protect perishable freight from heat or cold. It would be the height of folly to build an expensive refrigerator car, properly constructed and insulated, and apply ordinary box car doors. For that reason I think cars known as insulated box cars, having no ice tanks, which are insulated at the bottom, sides, top and ends, and are equipped with end and side doors similar in construction to those that are applied on common ordinary box cars, are no better for preserving freight or protecting freight from heat or cold than the ordinary box cars. The use of these so-called insulated box cars should be discouraged in the territories where the temperature falls below 32 deg. or the freezing point.

Refrigerator cars are the most expensive cars used by railroads in the transportation of freight. It costs more to build them and more to maintain them. The average weight of a modern 60,000 lb. capacity refrigerator is 46,000 lbs., or 23 tons. The average weight of a modern 60,000 lb. capacity box car is 34,000 lbs., or 17 tons. When perishable shipments are moved under ice, the average weight of the ice is about 8,000 lbs., or four tons, making the weight of the empty car and the ice 27 tons, as compared with 17 tons for a 60,000 lb. capacity box car. The average weight of fruit or vegetables in car lots is about 12 tons. The average weight of a carload of revenue freight on the road I represent, including perishable and all other carload shipments, is 26 tons. It follows, of course, to make the average of 26 tons, a great many commodities will run 40 or more tons and some as low as 10 or 12 tons. I mention these facts in order that you may understand that with a car of perishable freight, containing about 12 tons on which we collect revenue, we transport free of charge when under ice a dead weight of 27 tons, and when not under ice a dead weight of 23 tons, as compared with other carload commodities where the weight of the freight in most cases exceeds the weight of the car. To make an intelligent comparison, I will say that, with a car of fruit or vegetables under ice, we have approximately 12 tons of freight, and the dead weight of the car and ice is 27 tons, or 2¼ times the weight of the commodity transported and on which the carriers collect freight charges. With the average car of freight containing 26 tons of revenue freight, the modern 40 ft. box or ecal car will weigh 20 tons, or only 77 per cent. of the weight of the commodity transported.

Another feature that is very important and must not be lost sight of is that usually the refrigerator car must be moved empty from the point where it is made empty to the point where it is again required for the loading of perishable freight.

PROPER TRANSPORTATION.

For a number of years I have been connected with a railroad that handles a large amount of perishable freight of every character, and I have come to the conclusion that proper and reasonable service, that would be fair alike to shippers and consignees and to the carriers, is an average speed of 12½ miles an hour for less-than-trainload lots from origin to destination or junction point, and an average speed of 15 miles per hour for trainload lots of ten or more cars. The less-than-trainload lots should be moved on regular through freight trains scheduled at an average speed of approximately 12½ miles an hour from point of origin to destination or to the junction point with another line. There would, of course, be some delay at the junction point which would amount to about four hours at each junction point where the cars were delivered to a connecting carrier. The 12½ and 15 miles an hour schedule sounds slow for perishable freight. But if anyone will take the time to consider the average conditions under which fruit and vegetables in car lots are transported from producing territories to consuming centers, and give due consideration to the difficulties of transportation—the fact that usually in the producing territories the commodities must be gathered up from a number of stations and taken to a nearby point and re-iced, and must be re-iced not less than once every 24 hours; that division terminals where engines and crews are changed are located at about every 125 miles of the journey; that freight trains are subject to delays of various kind, including those caused by the elements, must take water and coal, must meet and pass passenger trains and other freight trains, and that there are other unavoidable delays too numerous to mention—he will agree that a speed of 12½ to 15 miles an hour maintained from point of origin to destination or to junction point with connecting carrier is an exceedingly good performance. An average of 12½ or 15 miles an hour each 24 hours will cover considerable distance.

DIFFICULTY OF MAKING FAST TIME.

When one stops to analyze he will find that it means very fast running for a freight train to maintain this average, and for the purpose of illustrating I will use a trip from New Orleans to Denver, using the Illinois Central to Memphis, the Frisco Lines from Memphis to Kansas City and the Rock Island Lines from Kansas City to Denver. We will first deal with the less-than-train lots which are handled on regular trains. Freight trains cannot be gotten through an average district terminal in less than one hour to one hour and thirty minutes, and more often it consumes one hour and thirty minutes than it does one hour. On the Illinois Central there are two district terminals between New Orleans and Memphis where engines and crews must be changed and loads switched in and out of the train. One hour and thirty minutes for each district terminal means three hours dead time. On the Frisco there are three district terminals between Memphis and Kansas City, one hour and thirty minutes at each of which makes four hours and thirty minutes dead time. On the Rock Island, between Kansas City and Denver, there are five district terminals, and one hour and thirty minutes at each means seven hours and thirty minutes dead time. Consequently, on this journey of 1,515 miles, New Orleans to Denver, there would be ten district terminals where crews and engines are changed and the train inspected and switched. The 15 hours should be deducted from the 121 hours, leaving 106 hours for running, which, divided into the distance of 1,515 miles, makes an average speed of 14.3 miles per hour. On the basis of 14.3 miles per hour as an average speed between district terminals the train would cover a 100-mile division in seven hours.

Now, take a train lot of ten cars or more at an average speed of 15 miles an hour, and at each district terminal allow one hour for changing engines and crews, inspecting train and nec-

*Abstract of an address delivered before the Western Fruit Jobbers' Association at New Orleans, La., on January 16, 1913.

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essary switching, which would make a delay of 10 hours to be deducted from the running time of 101 hours, leaving 91 hours running time, which would make an average speed of 16.6 miles per hour, and at this rate of speed the train would cover 100 miles in approximately six hours.

This average speed of 14.3 and 16.6 miles per hour is the average speed at which the train must move between district terminals, and does not take into consideration any delay for taking water and coal, meeting and passing passenger trains and other freight trains, and the countless other delays that a freight train must encounter on a single-track railroad. It is an actual fact that a perishable freight train on a busy single-track railroad does not cover a 100-mile district without encountering an average of two hours' delay. This would reduce the actual running time over each 100-mile district to five and four hours, respectively. At five hours it would mean an average speed of 20 miles an hour; at four hours an average speed of 25 miles an hour. In order to maintain this average speed of 20 or 25 miles per hour, the train must make a maximum speed of 35 to 45 miles per hour while moving. I do not mean to say that at all times when the train is in motion it will make 35 to 45 miles per hour, but I do say that to make an average speed of 20 and 25 miles an hour a train must, to offset the delays in slowing down for various reasons, run at times 35 to 45 miles an hour. When I say times I mean many times. I have known instances where freight trains ran 50 to 60 miles an hour. Anything over 40 miles an hour is very fast time for a freight train. If you have any doubt about 40 miles per hour being fast for a freight train, you would soon be convinced if you rode one at that speed over an average railroad.

THE REVENUE RECEIVED RELATIVELY LOW.

I maintain that it is to the advantage of the fruit trade as a whole that it shall not urge railroad companies to make excessively fast schedules, but that all railroads to adopt uniform schedules so that when connected up they will provide reasonable schedules from the point of origin to the point of destination. On a reasonable schedule railroads can handle the perishable freight with some degree of profit. This they cannot do when they handle it at an excessively fast speed. We have moved many a trainload of perishable freight over the railroad at an average speed of 20 miles an hour, including all delays. I am not saying this because I am proud of it. When a freight train moves at an average speed of 20 miles an hour, including all delays, the commodity transported must pay very high rates to make it profitable to the railroads.

It is an old saying that a railroad is a merchant, the raw material it buys is freight train miles, and the manufactured product it sells is ton miles of revenue freight.

We do not figure the cost of moving a single ton one mile, but, for convenience, figure the cost of moving 100 revenue tons one mile. Assuming for the sake of easy illustration that it costs an average of $2 to move a freight train one mile, it would mean each 100 revenue ton miles would cost one-tenth of $2 or 20 cents. If the train handled but 500 revenue tons 100 miles, it would produce 50,000 net revenue ton miles, and the cost would be 40 cents per 100 revenue ton miles. If the train handled 250 revenue tons 100 miles, it would produce 25,000 revenue ton miles and the cost would be 80 cents per 100 revenue ton miles.

These illustrations are given to make it very clear that the more tons of revenue freight are hauled in a train at the same expense the cheaper the cost of hauling one ton. Fast speed with a freight train can only be made by reducing the number of tons in the train. The cost of labor and materials of all kinds, and in fact every item of cost that enters into producing revenue ton miles, has increased and is increasing. Railroads must, to meet this increased cost, sell their revenue ton miles at a higher rate or produce them at a lower cost. It is a hard matter to raise rates and it is equally hard to reduce costs. A railroad must be operated economically the same as you must conduct your business economically. As an illustration of how the decreased purchasing power of a dollar in wages has prevented our increased loading of trains from reducing our cost of producing a revenue ton mile I will say that in the year 1912 our increased loading per train mile was 69 per cent., as compared with the year 1900; and the revenue ton miles produced per dollar of wages paid employees decreased 16.3 per cent. In other words, please remember that, notwithstanding an increased loading of 69 per cent., our cost per ton was actually increased 16.3 per cent. by reason of increased wages we were forced to pay. For fear this fact may not be clearly understood, I will add that the increase in trainload indicates increased efficiency in operation, which, great as it has been, has failed to overcome the effect of increased wage scales. The economical rating of a locomotive is to give it the tonnage it can move over the railroad at an average speed of approximately 10 miles per hour from terminal point to terminal point. To make a higher rate of speed than this there must be a reduction of tonnage.

A train of fruit or vegetables weighing an average of 12 tons of revenue freight per car would have to consist of 25 cars to produce 30,000 revenue ton miles over a 100-mile district; of 50 cars to produce 60,000 revenue ton miles over a 100-mile district; and of 100 cars to produce 120,000 revenue ton miles over a 100-mile district. Twenty-five cars of perishable freight, amounting to 300 revenue tons, is a big average trainload; in fact, the average revenue trainload of the railroad I represent at the present time is about 340 net tons. The gross tons in an average train, other than perishable freight trains, are about double the revenue tons. With a train of fruit or vegetables under ice, the tare weight of cars and ice in a train of 25 cars, which produces 300 revenue ton miles, would be 2¼ times the revenue tons, or approximately 700 gross tons. In other words, with a train of ordinary freight weighing 700 tons gross, we would collect freight on approximately 350 tons. With a train of fruit and vegetables, on which we would collect freight on 300 tons, we would have to haul approximately 1,000 tons gross.

I am not going to mention the liability from a loss and damage standpoint, because if a railroad will first decide upon a reasonable schedule and then maintain that schedule, and furnish proper refrigerator cars, there should be no claims. Where claims on a carload fruit and vegetable movement are excessive it is due, I believe, to the fact that the railroad has not provided the proper equipment and has provided a fast schedule it cannot maintain, or there is a lack of organization in the originating territory. The transportation of fruit and vegetables in carloads is only profitable when the commodities can be transported at a reasonable speed. As the rate of speed is increased, unless the rate of revenue increases proportionately, the freight becomes unprofitable. This is a general statement which, in the majority of cases, will be found true.

To remove the illusion the fruit men are under when they think fruit and vegetables are entitled to excessively fast schedules by reason of relatively higher rates, I give below a table of ten common commodities of the railroad I represent, showing the weight of the revenue freight, the weight of the car and the total weight; the average earnings per ton per mile of revenue freight, and the average earnings per ton of gross weight for the fiscal year ending June 30, 1912. It is fundamental that it costs as much to haul a ton of car as it does a ton of fruit or any other commodity. This being true, the average earnings per ton of gross weight transported must be considered and not the average earnings per ton of revenue freight.

Commodity.	Net Tonnage	Tare	Gross Tonnage	Average earnings per rev. ton mile (in cents)	Average earnings per gross ton per mile (in cents)
Live stock	11	17.6	28.6	1.491	0.521
Soft coal	40	18.5	58.5	0.603	0.412
Flour	17	17.6	34.6	0.834	0.410
Corn	28	17.6	45.6	0.635	0.390
Lumber	24	17.6	41.6	0.673	0.388
Cement, brick and lime	25	17.6	42.6	0.634	0.372
Fruit and vegetables, not iced	12	23.0	35.0	1.029	0.370
Iron (P. & B.)	34	17.6	51.6	0.517	0.367
Fruit and vegetables	12	27.0	39.0	1.079	0.332
Oats	22	17.6	39.6	0.536	0.298

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These figures prove conclusively that we earn less per gross ton per mile on fruits and vegetables than we do on corn, flour, coal, iron, cement, brick and lime and lumber, and the fruit and vegetables must be moved at fast speed at greater expense.

I mention these facts to drive home the argument that the carriers must either be permitted to transport the fruits and vegetables at a reasonable rate of speed, which enables them to protect their expenses, or, on the other hand, be compensated with a commensurate increased rate of freight.

DISTRIBUTION OF LESS-THAN-CAR LOTS.

It is only recently that railroads in the Middle West have inaugurated refrigerator car service to protect less-than-carload shipments of fruit and vegetables from heat and cold. The railroad I represent does not run any scheduled refrigerator cars from jobbing centers to protect less-than-carload shipments of fruit and vegetables from heat, but does run, from November to March, inclusive, scheduled refrigerator cars from the large jobbing centers on certain days of each week to protect less-than-carload shipments of fruit and vegetables and other perishable freight from damage by frost. I believe the carriers should provide this service from jobbing centers wherever there is a demand for it. It is much easier to provide scheduled refrigerator car service as protection against frost in the winter months than it is to provide similar service against heat in the summer months, because in the winter months if there is not sufficient tonnage of perishable freight to justify a scheduled car other miscellaneous freight can be loaded in the same car without damage to the ordinary merchandise or the perishable freight. In the summer months when the car is under ice, and is damp, there is more or less risk in loading in a refrigerator car, certain commodities being subject to damage from dampness.

It is more expensive to the carrier to run scheduled refrigerator cars for the distribution of less-than-carload perishable freight either in the summer or winter months, compared with the ordinary box car, because merchandise is a light commodity and you cannot load sufficient quantities of the freight in the car to give a capacity load. The cubic space available for loading in a refrigerator car is much less than in a box car. The refrigerator car weighs from three to six tons more than the box car, and there is the expense of icing it in the summer months and heating it in the winter months. Consequently, this scheduled refrigerator service from jobbing centers should be limited to the actual requirements and a scheduled car should not be run each day unless there is a sufficient volume of perishable freight moving to justify it. In most cases a scheduled refrigerator car moving from the jobbing centers two or three times a week will answer all requirements.

There does not seem to be any necessity for iced refrigerator cars for the distribution of perishable freight in the summer months as a protection against heat, because there does not seem to be any great demand for them. There must be considerable necessity for refrigerator car service in the winter months as a protection against frost because there is a great demand for it.

It is to the interest of the carriers, as well as the jobbers, that the railroads provide equipment and service that will enable the perishable freight to be shipped from points where it is produced to the distributing centers and from the distributing centers to the points of consumption in all kinds of weather. When, in the absence of proper scheduled refrigerator car service from the jobbing centers, the weather becomes so cold that the jobbers cannot ship and they purchase a smaller quantity, the growers lose the sale on account of the decreased demand and some of their products perish if not sold when ready for market and are a total loss. The railroads lose the revenue on the haul of carloads to the distributing centers and lose the revenue on less-than-carload shipments from the jobbing centers to the local points of consumption.

The railroad I represent had a very costly experience the past two years in attempting to provide scheduled refrigerator cars from the jobbing centers for the protection of less-than-carloads of perishable freight against frost. A large amount of perishable freight reached destination frozen. As a result of that experience, we have provided oil stoves to be placed in each scheduled frost-proof car, to remain in the car all day from the time loading is started until just a short time before the car is pulled from the merchandise platform. We have provided canvas curtains to be fastened on each side door, opening in the middle like the flap of a tent, which affords protection while the car is being loaded. During the two previous years, we did not provide the stoves and tarpaulins in the cars and considerable of the freight was no doubt damaged during the process of loading. There was some freight damaged during the time it was being transported from the jobbers' houses to the station. We now require the freight to be delivered at the station early in the afternoon, closing the frost-proof scheduled cars an hour or two before the ordinary merchandise cars are closed, so the cars may remain with the doors closed for an hour or two with the lighted stove until the temperature is raised to a reasonable point. We do not move any loaded cars with lighted stoves in them, and immediately before the cars are sealed the doors are opened and the stoves removed. We prohibit train crews, in distributing the freight, from leaving the doors open for the purpose of furnishing light. They must use a lighted hand lamp, enter the car, close the door behind them, move all the freight for that particular station to the doorway, open the door and unload the freight as quickly as they can and close the door. In very severe weather when the temperature of the car is in danger of reaching a point that will frost the contents, we set the car out and have the agent protect it with a stove.

NEED OF CO-OPERATION BETWEEN SHIPPERS AND CARRIERS.

It is of such vital interest to the carriers and the jobbers, to say nothing of the producer and consumer, that opportunity be afforded for the free distribution of perishable freight practically each day in the year, that it behooves both the carriers and the fruit jobbers to approach this subject as all similar subjects should be approached, i. e., in a spirit of mutual co-operation, and to build up an organization that will enable both to conduct their businesses every day in the year at a fair profit. The first step in this direction should, in my opinion, be a local organization of the fruit jobbers at each jobbing center, whether it be a local branch of the Western Fruit Jobbers of America or a local organization of the fruit jobbers independent of this or any other association. This association should then appoint a transportation committee, and this committee should work out with the carriers the problems of distribution of the perishable freight. It is very unsatisfactory now to handle with the various individuals the question of scheduled cars—you can secure as many opinions as you consult men. This transportation committee should study the distribution problems from all angles, meet with the railroads and work out a system of schedules, for both winter and summer, to meet the demands of the fruit jobbers and not to be an undue tax upon the carriers. I am quite sure all of the carriers would be willing to co-operate with the transportation committee of the fruit jobbers, and where the carriers did not show a proper spirit of co-operation the fruit jobbers could, acting as a unit, convince the railroad that it was to its interest to do so or perhaps incur the loss of other business. In other words, to be plain, roads that do not give proper service for the distribution of less-than-carload perishable freight should not be favored with the routing on the carloads into the distributing centers.

Carriers do not always use the proper means for protecting perishable freight and shippers do not always use sufficient care in protecting their shipments from their place of business to the railroad station. I am not undertaking to say that the fault is all with the shippers, nor am I willing to admit it is all with the carriers. We are both lax, and what we should do is co-operate along intelligent lines to improve the methods of both and bring the distribution of less than carload perishable freight from the uncertain state which it is in to a state of high perfection where its transportation will be as regular as the United States mails, even if not as fast, and its protection from the

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jobbing houses to the stores of the consumers absolutely insured.

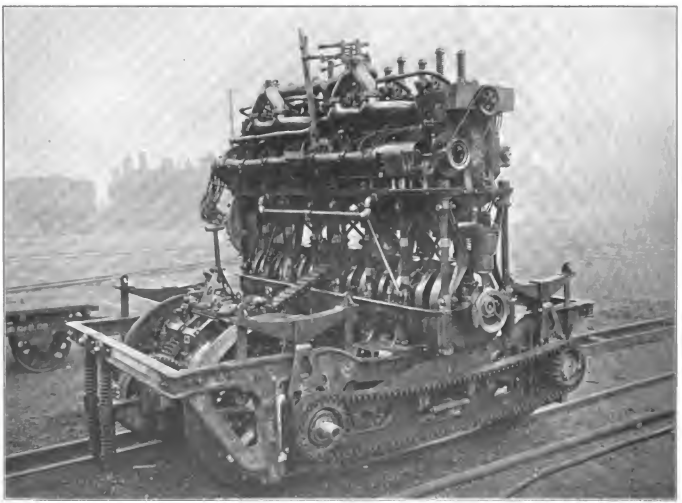
I believe that the perishable freight for the scheduled refrigerator cars should be delivered at the freight stations within a space of two hours, whichever two hours might be decided upon to be the best for all concerned, and in this way the car door would be open but a short time for loading freight, as compared with the present practice. In the winter months, the two hours that are usually the warmest should be selected and in the summer months the two hours that are usually the coolest. There is just as much liability that perishable freight will be damaged by frost in extreme temperatures in being moved from the houses of the jobbers to the freight station as after receipt at the freight station. Consequently, the jobbers should give the freight proper protection while in transit to the station, and the hours in which it is decided to deliver this perishable freight to the station should be hours that are not classed as rush hours, so the highly perishable commodity will not be held on the wagons awaiting its turn to reach the platform and after reaching the platform be held there awaiting to be handled into the cars. The wagons should be immediately received at the platform, another freight immediately unloaded and placed in the scheduled cars. It is not satisfactory to the fruit jobbers to have the freight reach destination in an unsalable condition, even though they are able to collect damages for the loss from the railroad. What the fruit jobbing interests want, and must have, is dependable service that will place these highly perishable commodities in the houses of the country merchants, if you please, in the same condition in which they left the jobbing houses, and I maintain it is possible to do this, and that it is only possible to do it by the carriers and the fruit jobbing interests working in a spirit of intelligent co-operation.

NARROW GAGE GASOLENE MOTOR CAR.

Five 30-ton, all-steel gasolene motor cars have recently been built for the Queensland government railways, Australia, by the McKeen Motor Car Company, Omaha, Neb. They have a gage of 3 ft. 6 in., and are 62 ft. 5¼ in. long over the bumpers. While in general they conform to the standard design and construction of the McKeen cars, there are some special features of interest. They are to be operated from the left side, have the side type of buffing gear and are provided with draw hooks and screw couplings in place of M. C. B. couplers. The entrance to the car is in the center and is so arranged that the passengers may board it from the ground, as well as from elevated platforms, a trap door being used as on Pullman equipment. Each car has a total seating capacity for 69 passengers, 55 in the main compartment and 14 in the smoker. The car bodies are 59 ft. over end sills and 8 ft. 9 in. wide over the sheathing. The height from the rail to the roof is 11 ft. 8½ in., and from the floor to the ceiling, 7 ft. 8½ in. The distance between the center plates is 34 ft. and the total wheel base is 40 ft.

The engine consists of six 10 in. x 12 in. cylinders with a rated capacity of 200 h. p. It is started by compressed air and is reversible. The car has two speeds, direct and geared, and is operated by a multiple disc clutch. A Morse silent chain drive transmits the power from the engine to the forward axle, and from axle to axle, as shown in the illustration.

The motor truck wheel base is limited to 6 ft., which, with a specially designed front bolster, allows the cars to operate on the sharpest curves of city railways. The motor truck side frame is of cast steel, being made in one piece, and is bolted and wedged against the bed plate. The truck is unusually light and



Six Cylinder Engine of 200 H. P. Capacity for McKeen Narrow Gage Motor Car.

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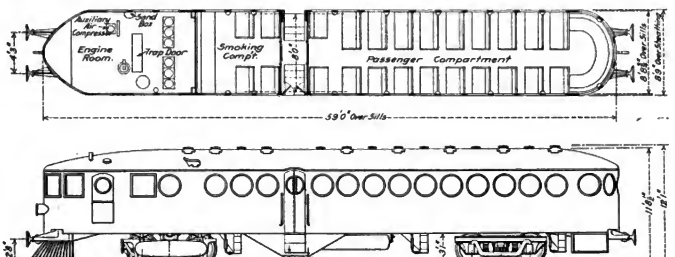
strong, and has four 36 in. steel tired wheels on 6 in. x 10 in. axles. The wheel centers are of cast steel. The weight on the front drivers of the forward truck is 17,900 lbs., on the rear drivers, 17,500 lbs., and on the rear truck is 24,600 lbs. These are the first narrow gage motor cars turned out by the McKeen



Narrow Gage McKeen Motor Car for the Queensland Government Railways.

Company, and will be shipped to Australia in a knocked down condition. The Stone electric system of lighting is used.

RESULTS OF PUBLIC OWNERSHIP IN FRANCE.*

BY YVES GUYOT,
Former Minister of Public Works, France.

I will speak here only of the latest results of the nationalization of railways in France, according to the reports submitted to the Chamber of Deputies for supplementary credits on the 1912 budget and to establish the 1913 railway budget.

The advocates of the acquisition cannot deny the progressive increase of State railroad expenditures, but, in order to attenuate the expenses of the State Western railway, they indicate as their starting point the figures of the Western company in 1908. Now the acquisition was voted by the Chamber of Deputies in December, 1906. The company had no longer any authority over its staff; its position was entirely abnormal. Moreover, it had during the year 1908 to bear expenses which, but for the acquisition, would have been nominally carried over to the 1909 accounts.

These unsatisfactory conditions of the Western company give yet stronger relief to the gravity of the increase in expenditure of the acquired railroad:

	1908. Francs.	1912. Francs.	Difference. Francs.
Gross receipts	217,645,100	244,335,000	+26,689,900
Working expenses	147,958,700	220,262,900	+72,304,200
Net revenue	69,686,400	24,072,900	—45,614,308
Capital expended	101,509,100	106,347,000	+ 4,837,900
Deficit	31,822,700	82,274,900	+50,452,200

And again it must be remembered that the real deficit for 1908 was only 28,522,675f. 68c., to which the general reporter for the budget, M. Chéron, adds 3,300,000f., an increase of expenditure resulting from the agreement which determined the acquisition annuity.

As regards the former state railroad, it can only be a question of the receipts and expenditure of its working, as the capital for the establishment of the system has not yet been determined. Since 1908 the net products of the working of this line have considerably diminished.

The receipts have therefore risen by $8,000,000, whereas the expenditure progressed by $15,000,000. Here we would make the same remark as for the Western railway.

	1908. Francs.	1912 Francs.	Difference. Francs.
Gross receipts	58,969,411	67,150,000	+ 8,180,588
Working expenses	47,583,176	63,009,900	+15,426,723
Net revenue	11,386,235	4,140,100	— 7,246,135

Mr. Chéron, having observed the annual increase of receipts to be 3 francs 50 centimes per 100 [3½ per cent.], which he considers "simply satisfactory," remarks:

"It is therefore solely on account of the very important progression of expenditure that the net product of working has fallen."

The government forecast for 1913 was:

	Francs.
RECEIPTS.	
State Western Railway	460,208,000
Old State Railway	111,911,000
	$72,119,000
EXPENSES.	
State Western Railway	530,079,000
Old State Railway	108,101,000
	658,180,000

—or an excess of expenditure of 86,000,000 francs.

The Budget Commission has made every possible effort to attenuate that deficit in the working. It has brought back the evaluations of receipts to 562,000,000, that of the expenditure to 642,000,000; and thus the forecast as regards receipt insufficiency is not greater than 80,000,000 instead of 86,000,000. Judging by experience, it is probable that at the end of 1913 the second figure will be greatly exceeded.

The reporters, Messrs. Chéron and Perrissoud, anxiously ask themselves: "What is the cause of this increase in receipts and decrease in net revenue?"

The answer is plain—expenditure increases more rapidly than receipts.

When the state purchased the Western railway, it was well known that it was unable to maintain order and efficiency in the navy arsenals. Nevertheless, it did not hesitate to add to the 10,000 employees which it already employed on the old line 50,000 other employees. It was easy to foresee that the strike would certainly occur, and it did occur in 1911.

The government reinstated all the strikers; it instituted delegates' councils, who naturally, before thinking about consignees and travelers, think of the interests of their mandataries and of their own.

Deputies, ministers, and, in consequence, directors, engineers,

*From the Annual Financial Review of the New York *Times*, January 5, 1913.

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controllers, station masters, and foremen of workshops all tremble before the workmen and the agents whom they are expected to supervise and to direct in their work. The increase in expenditure for the employees which has occurred since Jan. 1, 1909, is:

	Francs.
For the old line	12,171,000
For the Western line	58,306,000
Total	70,477,000

In the working expenditure, this is how the expenses have been apportioned for employees and stock, in 1904, 1908, and 1912, and forecast for 1913:

	For labor. Francs.	Other expenses. Francs.	Total. Francs.
OLD LINE.			
1904	20,554,000	17,232,000	37,786,000
1908	24,317,000	23,246,000	47,563,000
1912	35,655,000	27,354,000	63,009,000
1913	36,508,000	26,823,000	63,331,000
WESTERN LINE.			
1904	65,362,000	42,388,000	107,750,000
1908	79,076,000	68,917,000	147,993,000
1912	133,168,000	89,239,000	222,407,000
1913	137,382,000	88,355,000	225,737,000

On the old line the expenditure for labor increased by 4,000,000 for the period 1904-1908, and by 16,000,000 for the period 1904-1913; whereas the other expenses vary only in the proportions of 6,000,000 from 1904-1908 and 9,500,000 from 1904-1913. The proportion therefore reverses from 1908, at which date the line was increased, owing to the acquisition.

For the Western line the labor expenditure increased by 14,000,000 from 1904 to 1908, and the other expenses by 26,500,000. The line was run by the state in 1908. From that date until 1913 the staff expenditure increases by $58,000,000 and the other expenses only increase by 20,000,000. Consequently the working of the line is subordinated to the convenience of the employees. It is run only for the benefit of the employees, rather than for the shippers or for the travelers.

From 1907 to 1913 the receipts rose on the old line by 13,000,000, and the expenses of employees by 14,000,000; for the acquired Western line the receipts increased by 47,000,000, and the labor expenses by $63,000,000, i. e., a decrease in receipts of $1,000,000 for the old line and of $16,000,000 for the Western.

The efficiency of the labor is not in proportion to the increase in advantages in its favor; but illness frees an ever increasing number of men to rest, thus, in the offices and terminals:

	1909.	1910.	1911.
Number of employees	3,852	4,844	4,515
Number on sick leave	1,291	1,582	2,044
Per cent. on sick leave	34	36	45

Similar figures for the employees in the transportation and maintenance departments show as follows:

Men employed	56,743	58,800	63,452
On sick leave	25,924	27,974	34,272
Per cent. on sick leave	45	48	55

Thus, more than one-half of the employees of the state railroads suffered from ill-health. The explanation is very clear. In case of sickness, the men receive full pay. Laborophobia is an irresistible illness for a certain category of railway men. It is a contagious disease, the more so in that it appears to afford nothing but advantages.

This increase in expenditure and restriction of labor yielded the following result: The average receipts on the state line, per employee, is 4,000 francs, whereas on the other French lines it is 5,100 to 6,200 francs.

It is hardly probable that any effectual remedy will be invented for this state of affairs; for the budget reporters, instead of looking to the management to cure the situation, place all their trust in the men, who have, during the past years, manifested such strong prejudice in favor of higher wages and less work.

Commercial undertakings managed by the state constantly evade parliamentary control. The financial law of July 13, 1911, ruled that a financial controller should be appointed for state railroads.

But the management protested against such a measure, and the Budget Commission reporter appealed at one and the same time "for careful control of accounts, and liberty for the railroads to break away from hampering cutelage."

And, indeed, the railroad boards have already made good use of such freedom "without waiting for the appearance of a decree, they have made numerous purchases of land, and started a somewhat considerable number of undertakings." A portion of the 300,000,000 bonds which were issued was devoted to the payment of land purchases, and work commenced before any decree appeared or any credit had been voted.

The board of management of state railroads is busy with extensive projects. Instead of confining such plans within the limits of the means at their disposal, they rely on the power of the state to issue bonds. On March 12, 600,000 4 per cent. 500 franc bonds were issued. They were issued at 503 francs and the price realized by the state was 495. There had been some intention to issue a new lot of 200,000 bonds, but in the face of this result of the first issue it seemed too risky to make such an attempt.

Issuing the 4 per cent. bonds at par was equivalent to marking the 3 per cent. rente down to 75 francs, except that the state bonds (rente), being free from tax, to which, on the contrary, the railroad bonds are subject, and the said tax amounting to 12.50 per cent., the rate of the parity was in reality lowered to 87.50. It fell actually to 90 and the minister is doing all he can to raise it again; he makes use of every means of persuasion and pressure to induce the credit houses and bankers to purchase, although it was he himself who lowered the rate.

The results of the state purchase of railroads may be summed up as follows:

The working of state railroads is more costly for France than had even been foreseen by its adversaries. It has proved the powerlessness of Parliament to control such undertakings. It has set up a class of workmen and employees who consider that the line is run for their benefit and not for the convenience of shippers or travelers. It has dealt a hard blow to public credit in France.

BULGARIAN RAILWAYS.—Since 1878, when it first became independent, railway construction has steadily gone forward in Bulgaria. In the year mentioned only two lines were in existence, from Routschouk to Varna, built by Turkey for strategic purposes, and from Armanli to Bellovo, which links up Constantinople with western Europe. By the Treaty of Berlin, Bulgaria took up the financial obligations entered into by Turkey towards the company which had been granted the concession for the first line, which was subsequently taken over by the government. As the result of conferences with Austria-Hungary, Turkey and Servia, a detailed scheme was drawn up for the construction on Bulgarian territory of railways which should form useful links for international traffic, with the result that by 1889 the country was traversed by a line forming part of the important international route between Paris and Constantinople. In the same year there was also begun the construction of the line from Sofia, the capital, to the port of Varna. This line, passing through Tirnovo, is the most important so far as domestic traffic is concerned. On the completion of links now under construction or projected, the capital will also obtain direct communication, by means of a second line, with the port of Burgas, which is already connected with Constantinople, via Adrianople. All the Bulgarian railways are single track, which has hitherto sufficed for the needs of the traffic, and they are also not designed for high speed running. The whole system is operated by the government, and its length is at present about 750 miles, which will be increased to about 1,080 miles when the lines now under construction are finished. The aggregate capital expenditure will then have amounted to a little over $47,500,000, and it is of interest to record that most of the lines have been constructed by Bulgarian contractors. The total number of employees, apart from the staff of the Oriental lines, is just under 2,400.

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AN ANALYSIS OF STEEL INGOT MANUFACTURE.

The Influence of Common Defects on the Quality of Rails and Structural Material and Means for Correcting Them.

By Bradley Stoughton,
Consulting Engineer, New York.

Defects in steel ingots and castings may be the consequence of faulty manufacture previous to the ingot stage, of faulty manufacture during the ingot stage, or of prevailing circumstances which are not faults in manufacture; or they may result from a combination of all of these different conditions. Any one of the recognized defects may be so deleterious as to unfit otherwise excellent steel for safe use. The truth of this is being appreciated today to a greater extent than it ever has been before, as evidenced by the discussion at the conference between representatives of railroads and steel makers in New York City a year ago, the four notable papers on sound ingots before the British Iron and Steel Institute in May and in September last, the recent New York meeting of prominent railroad engineers and steel metallurgists to listen to Talbot's description of his process, the interesting discussions at international engineering congresses during the past year, and, finally, the exhaustive report of the committee on Rails and Equipment of the National Association of Railway Commissioners.

The situation, as it relates to steel for rails and structural shapes, has been stated by the president of the American Society for Testing Materials, as follows: "Without sound and homogeneous ingots it is impossible to produce sound and homogeneous rails." And the meaning of "soundness" is defined by the committee on Rails and Equipment, thus: "Sound ingots: Probably the main end to be secured by improvements in manufacture is the production of sound ingots. It has been proved that sound rails cannot be made except from sound ingots. Defective spots in the ingot due to slag, blowholes, piping, and segregation will not be removed in rolling."

In order to make complete the committee's catalog of defects, we should add the presence of combined gases, such as nitrogen and carbon monoxide. We should also divide the defect described as slag into its two normal parts, oxidized substances and sulphide enclosures. We then have the full list of six ingot defects, which, with phosphorus, comprise all the ills to which forging steel is ordinarily liable, up to the period when it is rolled or forged.

Phosphorus is taken care of by means which are beyond the scope of the present paper, and the same may be said of the special microstructural difficulties to which steel castings are subject. Solid oxidized enclosures, entrained sulphides, blowholes, combined gases, pipes and segregation, will sufficiently occupy all the attention we can give here. As it is evident from the discussions to which we have referred, and especially from the report of the committee of the National Association of Railway Commissioners that the harm done by these different defects and the means for their correction or prevention are not generally understood, this study was undertaken with the object of placing on record what information is already available, and, if necessary, amplifying the data collected. As an example of the need of this, we note that Talbot, ignoring all ingot defects except pipes and blowholes, writes as follows, in his address before the American Institute of Mining Engineers: "The cost of the aluminum addition is very small; with silicon it is considerable, and with ferro-titanium it is large, to obtain the same result. . . . . All these de-oxidizers have the same effect, when used in the necessary varying quantities to produce this."

We propose to show that the prevention of blowholes is not the only purpose of adding aluminum, silicon, ferro-titanium, and other "physics" or "cleansers," that widely-different effects are produced by them severally, and that their relative effectiveness in each respect also varies greatly.

SLAG ENCLOSURES.

The chemical analysis of slag enclosures shows that they originate either directly or indirectly from the oxidation of iron and its constituents during the process of conversion into steel. Ziegler suggests that the oxides may be soluble in the liquid steel, but this view is not favored by Heyn and Rosenhain*, who have considered it at length. It seems more probable that the oxides of iron, silicon, manganese, aluminum, phosphorus, and calcium are in the liquid bath in the form of emulsified particles which will be held in suspension for a long time unless coagulated and removed by gravity. A hindrance to their elimination by natural means is the existence of a strong surface tension between the liquid steel and the solid oxide enclosures. That gravity tends to remove them is indicated by their presence in greater proportion at the top of ingots than elsewhere. This distribution seems indeed to argue against the solubility theory without, however, being entirely conclusive. Perhaps the oxide of iron at least may be soluble, and the other oxides, which originate chiefly because silicon, manganese, aluminum, etc., is added to decompose iron oxide, are themselves entangled before they have a chance to escape. It is the generally-accepted opinion, based on chemical analysis and other data which are summarized by Hibbard*, that most of the slag enclosures arise during the recarburizing of the steel. That some arise at other times is indicated by the occasional presence of calcium oxide.

The prevalence of slag enclosures is much more universal than is usually supposed, and all authorities who have expressed themselves on the subject, seem to take a certain amount of such inclusions for granted. The presidents of the two largest rail producing companies in America include this defect as among "unavoidable contingencies of manufacture," and the president of the third largest producer gives a list of physical defects, including: "Pipe, *abnormal* slag inclusion, etc." (The italics are mine.) Acid steel seems to be less liable to the defect than basic steel, but even electric steel is adversely affected, according to Arnou, Girod and others. In short, slag inclusion is an impurity which must be reckoned with in all steel which has been purified by oxidation, and especially in all steel which has been recarburized.

More than 20 years ago, Kreutzpointer called attention to the bad effect of slag enclosures on the resistance of steel to "fatigue," while the investigations of Rosenhain, Heyn, Wedding and Law, and those of Howorth, Bannister, Oberhoffer, Job, Primrose, Fay, Matweieff, Wickhorst, Dudley, Packer, Masselon and Mars, prove beyond question the dangerous influence of these foreign bodies, not only in causing steel to be frequently brittle and unreliable, but more especially in creating microscopic fissures and flaws (generally in the interior of the steel) which continuously develop under the strains of service and often cause the sudden rupture of steel which withstood a severe test for acceptance. This ill effect of the foreign oxides is dependent not so much on their size or amount, as on their mode of occurrence between the pearlite

*International Congress for Testing Materials, New York, 1912.

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crystals of the steel, where they lessen the toughness of hypo-eutectic steel by interfering with the intercrystalline ferrite upon which this toughness so largely depends, and where they increase the fragility of hyper-eutectic steel due to the intercrystalline cementite. This mode of occurrence is probably the reason why slag enclosures are more dangerous to steel containing from about 0.50 to 0.75 per cent. and more of carbon (rail steel, spring steel, etc.), because the ferrite envelope in these steels is so thin that a slag enclosure may entirely break up its continuity. In steel of lower carbon, the slag bodies may be wholly enclosed in ferrite grains which will therefore act to some extent as a cushion to their brittleness. When it becomes generally recognized that the mode of occurrence of the slag, rather than the presence of an abnormal amount of slag, may be the cause of a "slag-fracture," and when engineers have learned to know the effect of slag in causing "seams," "streaks," and "laminations," we shall have a great deal more data on the ill effects of this impurity. James E. Howard, engineer-physicist of the Bureau of Standards, writes as follows, after referring to stresses which rails must bear in service:

To meet these conditions the metal of the rail should be structurally sound, but to attain structural soundness and uniformity in the finished rail certain conditions must prevail in the ingot and during the reductions in the rail mill. Chief among these is the elimination of slag inclusions in the ingot, which, starting in a globular form, become acicular in the rail and oriented parallel to its axis.

Mr. Howard and other engineers have also laid special emphasis upon the observation that interior fissures are more liable to develop in chemically hard steel than in softer steel, and are oftener met with in open hearth steel (basic) than in Bessemer steel (acid). The committee of the Association of Railway Commissioners assign as one cause of broken rails: "Internal transverse fissures which develop without outside evidence until the final break occurs." . . . "The most dangerous form of rail failure."

Engineers Cushing and Young, of the Pennsylvania Lines, assign the presence of entrained slag in 19 defective open hearth rails which showed these transverse fissures, as the "principal" and "fundamental" cause of the defect, and Dr. Dudley, of the New York Central Lines, is a prominent advocate of the necessity for eliminating slag as one of the chief means of obtaining good rail and structural steel. The engineers of the Harriman Lines, whose reports on rails are among the most thorough and authoritative available, class slag seams with pipes, as follows:

All rails are classed as "piped" which show in the fracture a seam or lamination; while this may not always be due to pipe, but may be due to slag or gas in the lower part of the ingot, the effect is the same.

And W. H. Wickhorst writes as follows:

The split head failure consists of an internal crack in the interior of the head running lengthwise of the rail anywhere from a foot or two to several yards in length. This type of failure is confined almost entirely to metal showing considerable internal segregation of carbon and phosphorus, attended more or less with laminations and slag seams.

Many rail and structural steel failures have been traced directly to defective metal due to slag seams, and many other failures, to metal showing streaks, seams, and laminations. J. E. Howard says: "An overwhelming majority of rail failures is reported as due to base fractures—fractures which disclose the presence of streaks and seams in the steel." One engineer ascribes this type of defect to rolling rails at too low a temperature, but let us hope that this opinion will not cause an increase of the already dangerously high rolling temperature, especially as the weight of evidence seems rather to indicate slag seams as the cause of these laminations—if not directly, then partly by direct influence and partly by the effect of red-shortness which slag enclosures produce. Hibbard thinks that the hot-shortness caused by slag enclosures is even greater than the cold-shortness so produced, while Stead, Campbell, Rosenhain, and others have shown that these foreign bodies also have the bad effect of hindering the refining of steel by annealing. Heyn has shown that enclosures of Al_2O_3 in mild steel, due to deoxidation by means of aluminum, can produce extraordinary red-shortness, and I have traced the failure of a high-carbon, heat-treated steel to the same cause, the alumina in this case being spread out in the form of a web, or thin cloud, made of microscopic specks, through which the fracture extended.

The commonest oxide enclosure is the silicate of manganese, and this seems to be often combined with the sulphide of manganese in a sort of double compound. Besides these bodies, the silicate of iron, and more complex slag compounds containing silicates of iron, manganese and lime, with alumina, sulphur and phosphorus frequently occur. Finally, the simple oxides of iron, manganese, silicon, aluminum and other elements occur separately, or combined together in various combinations which have been analyzed. Several such analyses are given in Table I, but it is not certain that these represent anything more than the composite analysis of several different enclosures occurring in the same steel, because all the bodies are usually distributed in such minute particles that chemical analysis of any one of them would be impossible. Indeed, they vary all the way from specks scarcely visible under the microscope to pieces easily discernible by the naked eye. Methods have recently been studied, however, for testing some of the commonest enclosures under the microscope, in order to identify them, as to whether they may be oxides or silicates of iron or manganese, etc. A very important property of these oxide enclosures is their melting-point in relation to the melting-point of steel, because, if the enclosures become solid before the steel is frozen, they will not only fail to coalesce into larger globules which more readily escape from the bath, but also they are not wet by the liquid steel, and the consequent strong surface tension makes their upward passage through the metal slower and more difficult. Since silica and some of the silicates, especially if made less fusible by the presence of alumina, have a higher melting-point than mild steel, we can readily understand why they often become entangled therein, and also why any agent which lowers their melting-point will greatly assist in their elimination.

It would therefore seem to be the fluxing property of titanium oxide on silicates and other oxides which is the cause of its well-known effect in eliminating slag enclosures from steel ingots. Rossi has shown that titanium oxide, when properly proportioned, lowers the melting point of silicates, and its fluxing effect on clays and other minerals has been noted by many observers. The effect of a "cleansing" addition of titanium to steel ingots is shown in the accompanying photographs. In order for this effect to be realized, the titanium first attacks oxides of other elements present in the ingot—for example, protoxide of iron, manganese and carbon—and, by reducing them, deoxidizes the bath and forms titanium dioxide, TiO_2. This dioxide then

TABLE I.
ANALYSES OF OXIDE ENCLOSURES.

	Al_2O_3	MnO	SiO_2	FeO	Fe_2O_3	CaO	P_2O_5	S
By Jaeger, S. & E. XXXIII	.....	45.90	36.75	18.27	.....	.....	.....	.....
By Jaeger, S. & E. XXXIII	.....	43.40	37.70	18.36	.....	.....	.....	.....
By Neu, S. & E. XXXIII (Added Al. in ingots)	37.50	29.15	28.80	.....	.....	.....	0.25	.....
Hibbard (1), (Bessemer, pipe steel)*	?	38.66 (Mn)	7.95	.....	.....	.....	0.043 (P)	2.51
Hibbard (1), (Acid o. h. boiler steel)*	4.00	48.50 (Mn)	20.98	15.96 (Fe)		....	Trace	0.39
Hibbard (1), (Basic o. h. boiler steel)*	15.04	36.00 (Mn)	17.14	15.35 (Fe)		2.04	0.03 (P)	0.16

*Scum of oxide enclosures from ingot tops.

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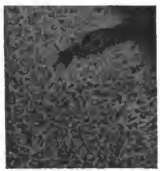
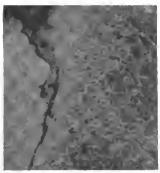
fluxes any oxides or slags existing in the metal, assists them to coalesce and thus removes them from the steel. The steel bath should be left for at least three minutes in Bessemer steel and eight minutes in open hearth steel, after the titanium addition, in order that this "washing out" of the enclosures may be completed. Between half a million and a million tons of steel were treated in this way in America during the year 1912.

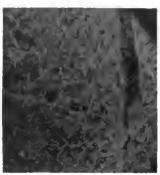
Hibbard proposes another method of removing the slag



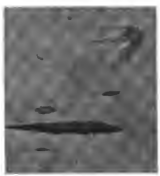
Top of Head of Bessemer Rail.



Edge of Flange of Open Hearth Rail.



Top of Head of Open Hearth Rail.



Web of Open Hearth Rail.

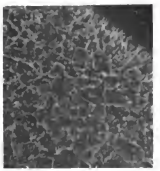
Photomicrographs of Slag Inclusions in "Uncleansed" Steel.

enclosures, but describes the results as only "tolerable." This method is to precipitate and coalesce the solid bodies—Hibbard calls them "sonims"—by means of a sufficiently large manganese addition, and then allow time for them to rise to the surface. Agitation, "working out," "shaking down," and similar practices aid this removal, he says. Furthermore, he

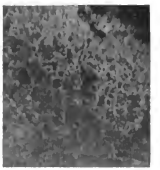
"Uncleansed." "Cleansed."

Sulphur Prints of Open Hearth Rail "Cleansed" and "Uncleansed."

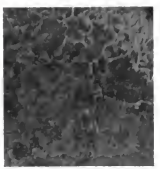
finds that sonims are removed better if the steel is recarburized in the furnace, than if it is recarburized in the ladle. While the fluxing effect of manganese oxide on silica and silicates is undoubted, nevertheless all our evidence goes to show that manganese oxide, manganese silicate, and manganese sulphide, are the commonest of the solid enclosures, and, as such, are deleterious to the steel. To deliberately increase the amount of this "sonim-forming" body would seem to be working in the wrong direction, unless the results are more efficacious than Hibbard describes them to be.



Top of Head of Bessemer Rail.



Edge of Flange of Open Hearth Rail.



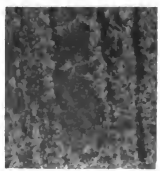
Top of Head of Open Hearth Rail.

Web of Open Hearth Rail.

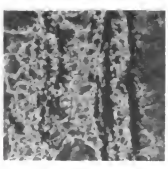
Photomicrographs of Steel "Cleansed" with Titanium.

Likewise, the addition of aluminum for recarburizing is seen to be dangerous practice, because aluminum not only forms a deleterious enclosure by itself, but it increases the viscosity of other solid enclosures and thus hinders or pre-

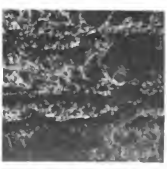
Magnification 200 Diameters, Unetched.



Magnification 200 Diameters, Etched with Picric Acid.



Magnification 200 Diameters, Etched with Picric Acid.



Magnification 200 Diameters, Etched with Picric Acid.

Photomicrographs of Alumina in Forged Steel.

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vents their coalescence and removal, besides making the "sonims" freeze more quickly and thus increasing their surface tension against the liquid bath. To add aluminum in the ladle is worse than adding it in the furnace, and its addition in the ingot may be followed by grave consequences. Deoxidation by aluminum in ingots is a practice which can only be required when the previous manufacture of the steel was improperly or neglectfully performed; such addition is wrong and is now forbidden by specifications of several large consumers.

SULPHIDE ENCLOSURES.

Sulphides entrained in steel ingots or castings produce an effect like in kind to that already discussed under the head of oxide enclosures. The sulphide inclusions are, however, more difficult to remove from the finished steel, but their ill effects are easier to mitigate. Manganese sulphide is much less injurious to hoth the hot—and the cold—properties of steel than is iron sulphide, so that the addition of sufficient manganese to liquid steel will lessen the evil, and will also, to a limited degree, bodily remove some of the entrained sulphide if the bath is left in a quiescent state for a short space of time. The compound so formed is the sulphide of manganese, MnS, and also, according to the recent research of Roehl, a double sulphide of iron and manganese, $Fe_4Mn_3S_8$. Both the sulphide of manganese and the double sulphide freeze at a much higher temperature than the iron-sulphur eutectic, so that the addition of manganese also moderates the segregation. Nevertheless, manganese sulphide itself segregates to some extent, and forms globules which, while reckoned as a lesser evil than iron sulphide, is still an evil. It makes steel somewhat red-short, has been known to cause serious failures and to initiate fissures and cracks, and has a bad effect on the corrosion of steel by producing local differences of electric potential. The basic processes of steel manufacture have been the greatest remedy for sulphide evils by removing sulphur almost to harmless traces. It is of great importance, however, that the resulting basic steel be thoroughly deoxidized and quieted, in order to limit the segregation and thus keep the sulphide down to moderate proportions at all parts of the steel ingot, especially as Stead has recently shown that sulphide of manganese is a special danger to steel which has not been deoxidized, because it prevents the perfect welding of blowholes which would otherwise be entirely eliminated.

BLOWHOLE PREVENTION.

A lengthy discussion of the cause and prevention of blowholes seems scarcely warranted here, since it is now well established that blowholes may be entirely prevented by a thorough deoxidation of steel by means of aluminum or titanium. Stead says that these two metals not only prevent blowholes, but also absolutely prevent the evolution of gas. Vanadium and silicon likewise react effectively in these respects, and manganese and carbon, by deoxidizing the metal, greatly lessen the tendency to form blowholes. The gases ordinarily found in blowholes are: carbon dioxide, carbon monoxide, hydrogen, nitrogen and hydro-carbons. To prevent these gases forming blowholes, we must either eliminate them from the steel entirely and also eliminate the agents which form them anew, or else we must partially eliminate and partially cause to dissolve by increasing the solvent power of the steel for them. Iron oxide is the agent which chiefly forms blowhole gases anew, because this compound reacts with carbon when the temperature falls, and particularly when the metal is so viscous that the gas bubbles cannot escape from it. When the oxides of carbon begin to pass off, they carry with them hydrogen and nitrogen which might otherwise have remained dissolved in the steel without producing a blowhole. Thus the complete elimination of iron oxide is the secret of blowhole prevention. Doubtless this is what Talbot intends by his statement that aluminum, silicon and ferro-titanium all have the same effect when used in the necessary varying quantities. However, aluminum and titanium are admittedly more powerful in proportion than silicon, and the latter element has the disadvantage, when used in connection with a basic process, that the first ingots may be quite free from blowholes, while the later ones may be porous on account of the absorption of the silicon in the interyal, by the basic slag.

If steel is so thoroughly deoxidized that no blowholes form, the volume of the pipe will be correspondingly increased, and, conversely, if we allow a sufficient number of blowholes to form, the pipe may be almost entirely avoided. For this reason, many manufacturers desire a small number of blowholes to form, so that a deep pipe will not necessitate a heavy discard from the ingot. This practice is open to certain difficulties and dangers, because the resulting blowholes are not always welded up in the subsequent rolling or forging of the steel. It is well known that a slight difference of temperature of the steel when cast, the spattering of steel against the sides of the ingot-mold during teeming, a slight over-oxidation of the steel during conversion, or error in adjusting the recarburizer, may upset the calculations to such an extent as to produce an excessive number of blowholes, or bring the blowholes so near to the skin of the ingot that they will form "fish tails" on the rolled piece, or will become oxidized so as, at the best, to weld up only in small degree. And, even if the blowholes are all well below the surface, the presence of manganese sulphide may prevent complete welding, as already noted, and thus may render the steel doubly liable to corrosion.

GASES IN STEEL.

The same gases found in blowholes are also found occluded in the steel, or combined with it, where they reduce both the strength and ductility. This is specially true of hydrogen and nitrogen, as well as oxygen, although whether this latter element produces its ill effects in all its different forms,—i. e., as solid oxide enclosures, as occluded gas, and as oxides of carbon,—or only in the first form, is not yet known, because chemical analysis has not kept pace with practice so as to enable us to differentiate between the different combinations. Titanium and vanadium both seem able to get rid of it in both of its gaseous forms, and the same result is obtained by a super-refining in an electric furnace. Hydrogen is still an unconquered impurity; it may be removed by repeated heatings in vacuo, but does not seem to be effected by the usual remedies applied during the ingot-stage of steel manufacture, further than that silicon, aluminum and titanium cause it to remain dissolved in the steel instead of forming a blowhole. Nitrogen is removed in large part by titanium, which has a greater affinity for this inert element than any other known substance. Vanadium, too, perhaps, causes a partial elimination of this gas, whose effect on the steel is embrittling and harmful.

PIPES.

Titanium, vanadium, aluminum, silicon, and any other ele ment which decreases blowholes, will increase the volume and depth of pipe. It is therefore often stated as an axiom that the purer the steel the larger will be the pipe, and many engineers prefer to see the pipe comparatively large, with the implied assurance that all the impurities are located in one part of the ingot and that this part can be cropped off. It is important, however, that we consider not only the volume of the pipe, but also the depth to which it extends. That is to say, we may have a large pipe which is located at a high point in the ingot as shown at the left, or we may have a pipe which is no larger, but which extends to a greater depth as shown at the right. The deep pipe is correspondingly dangerous because it requires so much more steel to be cut off before it will be eliminated and because it will not be so easily noticed in cropping and may thus remain as a perma-

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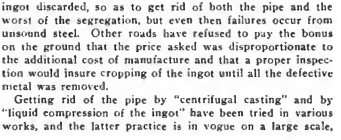
nent defect in the steel. Aluminum and silicon have a special influence in increasing the depth of piping, on account of their causing the steel to pass quickly from the liquid to the solid state, while titanium and vanadium tend to lengthen the period of solidification and thus decrease the depth of the pipe in relation to its volume. Aluminum has a further ill-effect on the depth of the pipe, in that, if added in too large proportions, it segregates and may produce a pipe extending even from top to bottom of the ingot. In recent years many railroads have paid a bonus on rails in order to secure greater safety by having the upper 20 per cent. of the ingot discarded, so as to get rid of both the pipe and the worst of the segregation, but even then failures occur from unsound steel. Other roads have refused to pay the bonus on the ground that the price asked was disproportionate to the additional cost of manufacture and that a proper inspection would insure cropping of the ingot until all the defective metal was removed.

Getting rid of the pipe by "centrifugal casting" and by "liquid compression of the ingot" have been tried in various works, and the latter practice is in vogue on a large scale,



Two Types of Pipes in Ingots.

particularly for ordnance steel, both in Europe and America This "liquid compression" is too slow and too costly of installation for use in connection with the manufacture of steel on a large scale, such as structural steel and railroad steels, but much interest has been shown recently in processes for the production of "pipeless ingots," and three new devices have been made public: heating the top of the ingot, by Sir Robert Hadfield; semi-liquid compression in a rolling mill, by P. H. Dudley and Benjamin Talbot, and heating and stirring by thermit, by Dr. Goldschmidt. The procedure in all these processes should be, and is, to concentrate all the impurities in the pipe as far as possible, and then to eliminate this pipe by one of the devices mentioned.

SEGREGATION.

This subject is also too well known to require extended discussion here. That segregation is an evil in boiler plates and pipes, and all material which is subjected to corrosion, as well as in rails and structural steel, wire, and castings, and in 90 per cent. of all other steel made, is no longer doubted by any one. It is also an evil met with more often now-a-days, when the open hearth process, with its larger size of ingots, is predominant, than when ingots were much smaller in section. The most beneficial remedy for segregation is to deoxidize and quiet the steel, and researches have proved that aluminum and titanium are especially effective in this respect. Manganese and silicon themselves segregate and therefore are more of a detriment than a remedy. Vanadium is quieting to steel, and, for this reason, is probably a preventive of segregation.

COMPARATIVE INFLUENCE OF DIFFERENT "CORRECTIVE AGENTS" ON INGOT DEFECTS.

In Table II, I have given a summary statement of the different ingot defects that have been discussed and the relative effectiveness in preventing or remedying each one, of aluminum, silicon, manganese, titanium and vanadium. This table brings out very strongly the variation that exists in these different "corrective agents" or "physics." The role of manganese is shown up with especial clearness, and many will be surprised to see how much evil has to be redeemed by the influence of manganese in counteracting the bad effect of sulphur and oxygen. With the new agents which take care of oxygen even better than manganese can, it is possible that manganese might be relegated to the side-lines if it were not for the necessity of remedying the effect of sulphur, especially in view of the ill effect of manganese in increasing brittleness and liability to corrosion.

TERMINAL SERVICE.*

By W. M. Prall,
Superintendent of Car Service of the Pennsylvania Lines West of Pittsburgh.

The first problem at the terminal is the organization of a system of records that will in no way delay the car in its movement, but will convey the necessary information to the end of a check, so that the agent can instruct for, and later establish delivery. The agent must be held to responsibility for the conveyance of all necessary information to the yard master and his subordinates, with one object in view—the continuation of service to the end of the fulfillment of the railroad's obligation for transportation.

In road service, there is a complete system of reporting. In terminal service the system of reporting is incomplete, and as a rule the reports are made to, or through the road official. It has been demonstrated that by the introduction of a proper record book at terminals, in which are entered each and every day every car received for local delivery, and every car received with the privilege of distribution, or reconsignment, or reshipment, with the proper checking and reporting, that if salaries are established to the end of the employment of intelligent car service clerks and delivery clerks, an ever-present supervision can be maintained over the movement of the car. And there is no reason why a system could not be established where every car in through service, handled in the terminal, and every car handled through divisional points, could be recorded and checked, so that any car delayed beyond 24 hours will be reported delayed, with an addi-

*From a paper read before the Railway Club of Pittsburgh, January 24.

TABLE II.

INFLUENCE OF CERTAIN "CORRECTIVE AGENTS" ON DEFECTS IN STEEL INGOTS;

IN THE RELATIVE ORDER OF THEIR EFFECTIVENESS.

Prevents Blowholes	Removes Oxides of Iron and Manganese	Removes All Oxides and Slag Enclosures	Removes Nitrogen	Breaks Up and Removes Sulphide of Iron	*Causes a Pipe*	Hinders Segregation
1. Aluminum	1. Titanium	1. Titanium	1. Titanium	1. Manganese	1. *Aluminum*	Aluminum
2. Titanium	2. Silicon (Weakly)	*Hinders*	2. Vanadium	2. Titanium	2. *Silicon*	Titanium
3. Silicon	*Hinders This*	*Removal of All*	(?)	(?)	3. *Titanium*	Vanadium
	Removal	*These Enclosures*			4. *Vanadium*	*Promotes Segregation*
4. Vanadium	1. *Aluminum*	1. *Aluminum*			5. *Manganese*	1. *Manganese*
5. Manganese	2. *Manganese*					2. *Silicon (Sometimes)*

FOOTNOTE.—Words printed in *italics* indicate a detriment to the steel.

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tional report of all cars delayed beyond 48 hours, to be made to the central offices.

A proper check of cars materially reduces the expense of the switching service. Engine delay amounting to 30 minutes a day justifies a sixty dollar clerk to make the necessary check and convey necessary information. As the delivery clerks can not be constantly supervised, it is necessary, to the end of conservation of switching expense, to employ intelligent clerks and pay them a proper salary.

During the last twenty years there has been a gradual improvement in the understanding of terminal necessities, and here and there throughout the country we find terminals in charge of a general agent, or in charge of a superintendent of terminals, they having authority over the entire terminal. But we do not find a uniform understanding of the possibilities of improved service through demurrage rules. The railroads fail to understand the benefits that can be derived in improved service by the constructive placement of cars. It is the pressure on the car already placed, to the end of that car's unloading, that results in continuous movement. The railroads are badly handicapped because consignees are protected by present laws, and by officials in many states, in their insistence that all the obligation for service is with the railroad. A car moves on a private siding just as well as it moves in the terminal or on the main line, and the car cannot move properly on the siding unless the siding is properly organized; unless the consignee has prepared his siding with roadways, runways, warehouses, etc., to unload the car within the time proper for its unloading. Consignees should not be protected in their demands for supplementary service that was not contemplated in the original contract; they should realize that unless a car can be immediately placed, there must be one or two additional switches, and that the general public bears the expense of those additional switches. A business that increases its output 20, 40, 50 or 100 per cent. without an increase in the facilities for loading and unloading, is adding a burden to service; a burden that should be accepted by themselves, and if accepted by themselves would result in benefits to themselves. The old idea that because of the volume of business being of importance to the railroad, the railroad should perform additional and unwarranted service, should be exploded.

It seems as if rebating has been eliminated, excepting in the shape of unwarranted and supplementary additional service; it should be as well eliminated in additional service as in repayment of moneys. The Interstate Commerce Commission, in its later rulings, has exhibited a knowledge of certain conditions surrounding terminal service that is most gratifying. Witness the decision in the Detroit reconsigning case. Witness the decision in the California case. Witness the decision which applied purely to the interchange of cars between railroads, in which a railroad is obliged to perform its service in accord with the contract, making deliveries to connecting lines even where the connecting line fails in an appreciation of the rights of ownership in the car, and notifying the railroads that they must formulate some rule or regulation to the end of re-taking their cars.

Many terminal engines are delayed from two to six hours because of the failure of the connecting line to so arrange that when the delivering line runs through the connection with a view to placement of cars on the tracks of the receiving line, there are no tracks on the receiving line on which the cars can be immediately placed.

A prolific source of car delay, is the method of commission men handling perishable freights, who assume the right to withhold cars from the market, always provided the car is held on a rising market, there being authentic cases of delays of 10, 20, 30, 40 and 50 days. If the shipper were relieved from responsibility excepting for the gathering, draying and loading, and if the consignee were held to responsibility for the immediate payment of freight charges, and in case of failure to pay that the railroad should be held to responsibility for the sale of the lading for whomever it might concern, the result would be a larger consumption of fruits and vegetables, to the benefit of the health of the general public, and it would conserve the interest of the shipper—because his consignments would be sold while they were still marketable.

In the early days of railroading, when the railroad transported a car from station A to station B, if the freight was not immediately unloaded from the car by the consignee, the railroad unloaded it on the ground and threw a tarpaulin over it and took the car for the service for which it was built. That was the old Drayage or Cartage law. The contract was clean-cut. The railroad was protected in confining itself to transportation. Later, for reasons best known to the railroad officers of 30 or 40 years ago, special privileges were granted to consignees, and among the special privileges it was conceded that the consignee could hold the car for his convenient unloading. In 1888, the conditions were so disastrous to everybody that the railroads, in fear and trembling, introduced demurrage.

A survey of the present situation is encouraging. There has been a gradual improvement in the understanding of the patrons of the railroads of their own necessities for service, together with a gradual understanding that the service to them individually is entirely dependent upon their organization.

The Interstate Commerce Commission is gradually attaining to an understanding of some of the terminal evils, and many of the present evils will be eradicated. The practice of reconsigning, distributing and billing of cars for a market are present necessities in order to properly conduct the business of the country, but the time allowances and the privileges should be in accord with the needs of business. The great difficulty in administration is in determining what should be allowed, and what is an unnecessary allowance. Supplementary service can never be performed at no expense. No conveyance of property rights can be made without an equivalent. And the courts have invariably maintained, in giving consideration to transportation obligations, that individual convenience is subservient to the public good.

As the demurrage charge is in the nature of a penalty for breach of contract, it partakes of the nature of a police law, and, consequently, consideration should be given to mitigating circumstances under untoward conditions. In regard to the average rule, I have always maintained that it is a step backward. That is a rule that can be, and is used to effect unnecessary detention to certain specified cars, that detention being entirely within the control of the consignee or consignor. Under the average rule, car efficiency is not maintained, and cars are abused by certain patrons of the railroads in service, without compensation. The average rule is a special contract, and is in contravention of the decision of the Supreme Court of the United States, as rendered by said court in Opinion 215, in relation to the Carmack Amendment.

ACCIDENTS IN ENGLAND.—For the three months ending June 30, 1912, the accident record of the railways of the United Kingdom is in some important respects more satisfactory than that for the corresponding period of 1911. The number of fatalities to employees from accidents other than train accidents shows a diminution from 90 to 50. Especially noteworthy is the fact that there were no coupling fatalities, while the total number of switching fatalities declined from 23 to 4, and there was a decline from 31 to 11 in the number of fatalities to men working on the permanent way. On the other hand, 24—as against 15—were killed while walking, crossing or standing on the line, of whom 11 met their death while walking to or from work. As in the corresponding period, no employees were killed in accidents to trains, although 24, as against 18, received injuries. Four passengers were, however, killed in one train accident during the second quarter of 1912, compared with one passenger in the corresponding quarter of 1911. Comparing the number of accidents, it will be found that there were 13 against 15 collisions in which passenger trains were concerned, 14 freight train collisions, 6, as against 7 buffer-stop collisions, 16 against 23 passenger-train derailments, and 37 against 49 derailments of freight trains or light engines.

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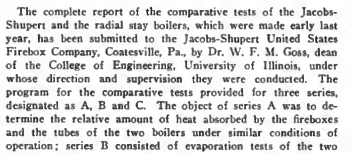
RESULTS OF COMPARATIVE FIREBOX TESTS.

Summary of the Report of Those Recently Conducted at Coatesville, Pa., with a Brief Reference to Methods Employed.

The complete report of the comparative tests of the Jacobs-Shupert and the radial stay boilers, which were made early last year, has been submitted to the Jacobs-Shupert United States Firebox Company, Coatesville, Pa., by Dr. W. F. M. Goss, dean of the College of Engineering, University of Illinois, under whose direction and supervision they were conducted. The program for the comparative tests provided for three series, designated as A, B and C. The object of series A was to determine the relative amount of heat absorbed by the fireboxes and the tubes of the two boilers under similar conditions of operation; series B consisted of evaporation tests of the two boilers; and series C was intended to determine their relative



Ratio of Evaporation in Fireboxes to Coal Burned per Hour.

strength under low water conditions. A report of the latter was given in the *Railway Age Gazette*, June 28, 1912, page 1595.

The two boilers, both of the extended wagon top type, were constructed under the supervision of Dr. Goss and were as nearly as possible identical. The following are the principal dimensions:

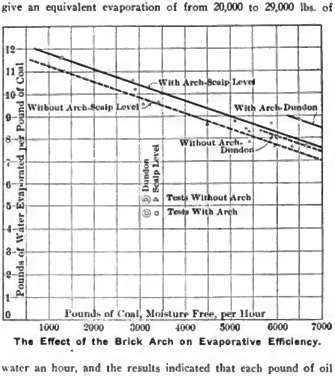
	Jacobs-Shupert.	Radial stay.
Diameter at front end, in.	70	70
Diameter at throat, in.	83⅜	83⅜
Tubes.		
Number	290	290
Length, ft. and in.	18—2	18—2
Diameter, in.	2¼	2¼
Firebox.		
Length, inside, ft. and in.	9—1⅛	9—1⅛
Width, inside, ft. and in.	6—4⅛	6—4⅛
Depth, inside, ft. and in.	6—1⅛	6—2⅛
Grate area, sq. ft.	58.14	58.07
Heating Surface.		
Side and crown sheets, projected area, sq. ft.	146.2	146.6
Side and crown sheets, developed area, used in all computations, sq. ft.	168.0	146.6
Total firebox, sq. ft.	230.8	206.7
Tubes, sq. ft.	2,759.0	2,759.0
Total barrel, sq. ft.	2,777.6	2,777.6
Total boiler, sq. ft.	3,008.4	2,984.3

In series A both the Jacobs-Shupert and the radial stay boilers were divided into two compartments by an extension of the back tube sheet to the outside shell. These compartments were connected only through the medium of the steam piping, the arrangement of which was similar to that of two boilers connected to a common steam header. Both compartments received heat from the firebox, but each was fed from a separate supply of weighed water and its output of steam was dealt with as though it were a separate boiler. The location of the partition was such that the heat transmitted by the back tube sheet was delivered to the barrel portion of the boiler and the evaporation from this portion of the firebox was weighed in with that of the tubes. Regarding this Dr. Goss says: "The observed data give the actual weighings of water fed to each portion of the boiler, and all items involving water evaporated, are deduced from these values, being based upon the observed results referred to the actual surface which was effective in bringing about the result. The deduced values covering the firebox performance have been obtained by multiplying the evaporation actually obtained by the ratio of the total firebox surface to the firebox surface effective in producing vaporization in the firebox-end of this boiler. The small increment, which by this correction is added to the observed evaporation of the firebox, is in the deduced results, subtracted from the observed evaporation of the barrel. The effect of this correction is merely to credit to the firebox and debit to the barrel the heat transmitted by the back tubesheet. These statements are, of course, applicable to both boilers."

Trouble was experienced, while the boilers were heating up, by the firebox end beginning to make steam much sooner than the barrel end. This steam passed over to the barrel, where much of it condensed. It was finally necessary to supply means of circulation between the compartments while heating up, which was done by connecting two washout plug holes by a pipe. Valves were provided to stop the circulation after both parts of the boiler were in action. In considering the results of this series, given further on, it would be well to bear in mind that the boilers were not working under service conditions.

In series A nine tests were made using oil as fuel and twelve using coal. There was considerable difficulty experienced in firing the oil so as to prevent deposits of soot on the heating surface. On this account Dr. Goss states that the results cannot be accepted as constituting a basis of comparison which admits of a high degree of refinement and for this reason no attempt was made to elaborate, through a complete heat balance, the computations of the oil-fired tests.

In the tests using oil as fuel the boilers were so operated as to give an equivalent evaporation of from 20,000 to 29,000 lbs. of



The Effect of the Brick Arch on Evaporative Efficiency.

water an hour, and the results indicated that each pound of oil produced an evaporation of 15.9 lbs. to 13.2 lbs. of water in the Jacobs-Shupert boiler, the amount diminishing as the rate of power increased. When 800 lbs. of oil were fired an hour, the tests showed 54 per cent. of the total evaporation as being due to the firebox heating surface; and with 2,200 lbs. of oil an hour, 40 per cent. of the total evaporation was from the firebox. When there was an equivalent evaporation of 40,000 lbs. of water an hour for the whole boiler, the evaporation per square foot of heating surface per hour was, for the barrel, 6.47 lbs.

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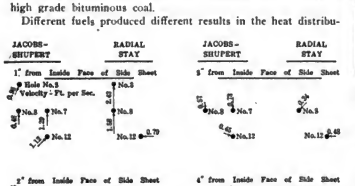
and for the firebox 49.59 lbs. The ratio of heat absorbed per square foot of heating surface by the firebox, to that absorbed by the tube heating surface, was thus 7.6 to 1.

In the tests with coal, at low rates of power either boiler gave an equivalent evaporation per pound of coal of over 10 lbs. of water; and the evaporation was normally above 8 lbs. of water per lb. of coal for the entire series. This indicates a thermal efficiency from 8 to 10 per cent. less for coal than for oil. However, the brick arch was not used in this series. One of the diagrams shows the ratio of the total heat absorbed by the boiler to that absorbed by the firebox when coal was fired. Using Dundon (long flame) coal at a rate of 4,341 lbs. per hour, the equivalent evaporation of the Jacobs-Shupert boiler was 35,405 lbs., 11,982 lbs. being evaporated by the firebox and 23,423 lbs. by the tubes. The firebox developed 304 horse power, while the entire boiler developed 1,026 horse power. For the whole boiler, the average rate of equivalent evaporation per square foot of heating surface per hour was 11.77 lbs.; for the firebox alone 51.92 lbs. and for the barrel 8.43 lbs. The ratio of heat absorbed by the firebox to that absorbed by the tubes was as 6.15 to 1. The later tests with Dundon coal showed that when giving an equivalent evaporation of 20,000 lbs. of water an hour the Jacobs-Shupert boiler generated 8.3 lbs. of steam per pound of coal. Comparing this with 14.14, the weight of steam per pound of oil at the same rate, indicates that one pound of oil is equivalent to 1.7 lbs. of high grade bituminous coal.

Different fuels produced different results in the heat distribu-



Direction of Flow of Circulation and Velocity in Feet per Second.

tion, and Dr. Goss concludes that when giving an equivalent evaporation of 20,000 lbs. of water an hour, the proportion of the whole quantity of heat absorbed, which is taken up by the firebox of a Jacobs-Shupert boiler, is for oil 42 per cent., for long flame bituminous coal 42 per cent., and for short flame bituminous coal 35 per cent.

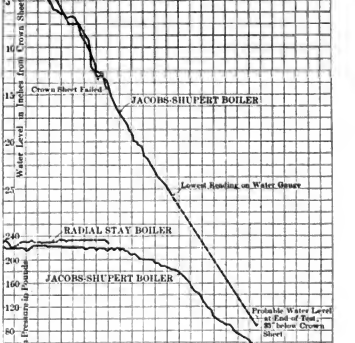
In retubing the boilers after the reconstruction of their fireboxes, preparatory to conducting the series B tests, the tubes were welded into the firebox tube sheet. This was done to prevent a tube sheet failure during the low water tests, series C.

Eleven tests were made on the two boilers in series B without a brick arch and eight with a brick arch. One test using Dundon coal was run on the Jacobs-Shupert boiler with the arch installed, the others being made with Scalp Level (short flame) coal. The diagram shows the equivalent evaporation with and without a brick arch.

Throughout the series the boiler efficiency was always highest when the least power was being developed. When burning 1,389 lbs. of dry coal an hour the efficiency of the Jacobs-Shupert boiler was 71.86 per cent., and excluding the grate, 79.75 per cent. When burning 6,314 lbs. of dry coal an hour, the efficiencies were 50.41 and 55.36 per cent. respectively. In the former case the boiler horse power was 443 and in the latter 1,393, while the equivalent evaporation per square foot of heating surface per hour was 5.08 and 15.98. The following table, which gives figures for the Jacobs-Shupert boiler, indicates the effect produced by increasing the rate of working of a boiler:

Pounds of coal fired per hour	1,389	3,419	5,930	6,314
Thermal units for each pound of coal:				
Absorbed by water in boiler	10,687	9,327	7,532	7,386
Lost by moisture in coal	48	34	37	33
Lost by moisture in air	49	53	114	54
Lost by hydrogen in coal	486	497	500	514
Lost by smokebox gases	1,979	2,731	3,992	4,675
Lost by incomplete combustion	78	...	...	...
Lost by cinders passing up stack	153	851	1,078	1,012
Lost by combustion in ash	1,167	679	291	185
Lost by radiation and unaccounted for	205	547	881	783
Total B. t. u. per pound of coal	14,872	14,719	14,425	14,654

The report states that the brick arch as a factor in boiler performance is always beneficial, its effect depending on the characteristics of the fuel. When the short flame coal was used, the use of an arch in either boiler increased the amount of water



Water Levels and Steam Pressures During the Low Water Tests.

evaporated per pound of coal 0.6 lb. Assuming either boiler to be fired with 6,500 lbs. of Scalp Level coal an hour, it would evaporate 7.35 lbs. of water per pound of coal without an arch and 7.95 lbs. with an arch, a gain of 8 per cent. in favor of the arch. With long flame coal the evaporation would be 7.7 lbs. of water per pound of coal without an arch and 8.7 lbs. with an arch, a gain of 12 per cent.

During the progress of the series A and B of tests, George L. Fowler conducted experiments on both boilers to determine the velocity and direction of flow, as well as the quality of the mass of the liquid at different points. For this purpose the water legs of the boilers were drilled with 15 holes. The principle of the operation was that of measuring the impact of the flow of the mass in the water leg on the mouth of a Pitot tube, by means of

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the elevation of a liquid heavier than water in a U-tube. The proportions of contained water and steam were afterward determined by samples led off into a barrel calorimeter. The Pitot tubes were inserted in the firebox at the points where it was desired to make the measurements and could be moved through suitable stuffing boxes so that the opening in the tube could be placed in any desired position. The results of the investigation are shown in the diagram, the arrows indicating the direction of flow of the currents. Regarding the circulation tests, Dr. Goss says that in spite of the limitations which must be placed upon them, they are of great significance. Lack of time prevented these tests being carried as far as it was desired, but they indicated an almost complete absence of fore and aft movement of the water and that only enough water passes back to the water legs from the barrel to replace what the firebox evaporates.

In the low water tests, the water in the Jacobs-Shupert boiler dropped to the bottom of a special water-glass 25½ in. below the level of the crown sheet in 34 minutes after it had passed the crown sheet level. The test was ended 53 minutes after the water had fallen to the level of the crown sheet and when it was 40 in. below it, no failure having occurred. An inspection of the boiler showed all the effects of overheating except that the firebox was intact. In the case of the radial stay boiler, the crown sheet failed 17¾ minutes after the water passed the crown sheet level and when it was 14½ in. below it.

The principal conclusions drawn by Dr. Goss from the three series of tests are that the evaporative efficiency is the same for the two types of boiler; that in general their steaming capacity is the same but that the Jacobs-Shupert may be forced to higher power without danger of injury; and that the superior strength of the Jacobs-Shupert boiler under low water conditions permits it to endure overheating for long periods of time without failure, where the normal radial stay boiler quickly fails.

REGULATION OF RAILWAYS.*

By W. W. FINLEY,
President, Southern Railway.

Our railway system has been constructed without any cost to the public treasury, except as to some of the earlier lines and the land grant roads, as to which the ultimate public benefits in the settlement of the country which they made possible were far in excess of the cost. We think of the cost of the Panama canal as a large amount of money, but it is only about one-fortieth of the amount of private capital that is invested in the railway systems of the United States without taking account of the large amounts that have been wiped out by civil war, bankruptcies, and reorganizations, and the other large amounts of earnings that have been put into improvements and betterments and have not been capitalized. It is not detracting from the importance of the canal to point out that an estimate made by a distinguished authority of the annual requirements of the railways of the United States for additional capital expenditures to enable them to keep pace with the growing demands for their service are from two to three times the total cost of the canal; that a single railway company distinguished for conservative and able management has invested in its property earnings that it might have distributed to its stockholders in an amount approximately sufficient to have built the canal; that the operating expenses of the railways would pay for the construction of five Panama canals in a year and leave a sufficient margin to fortify them and build a few battleships for their defense, and that the taxes paid by the railways in three years, if all paid into the United States treasury, would more than reimburse it for the entire cost of the canal.

State and federal governments have enacted legislation and provided administrative and judicial tribunals for the correction of wrongs that may grow up in the business of transportation by rail. This is a proper and salutary exercise of the authority of government growing out of the nature of the business of a railway company in carrying persons and property over a privately-owned highway devoted to public purposes.

With this regulation by the government which has had the effect of eliminating abuses, and, with the power in the government to search out and correct any abuses still remaining or that may develop, I feel sure that there cannot be anything wrong in the proposition that conditions shall be made such as to permit the fullest development of the transportation service of the country. On account of the public interest in efficient railway service this is as important to the public as to the railways.

A FAIR CHARGE FOR EVERY SERVICE RENDERED.

The first requisite, in my opinion, to the maintenance of this condition is that those tribunals that have been established to regulate charges shall recognize the right of the railway to make a charge for each service that shall be reasonable as measured by that service having fair reference to its value. This is a very different matter from fixing charges for service so as to yield a predetermined rate of net income—a thing which a full knowledge of the problem will, I am sure, demonstrate to be uneconomic and impossible. That the application of this standard, in specific instances, may be difficult should not excuse failure to apply it. It is being applied with more or less exactness in the practical every-day fixing of charges by the railways and in the cases before the commission and the courts involving the reasonableness of specific charges. Capitalization and other conditions on different railways differ so widely that a strict enforcement of the principle of a predetermined rate of income, even if it were possible, must necessarily lead to discriminations, territorially and otherwise. If the aggregate of charges on the basis of their reasonableness as measured by the service performed is such as to leave little to the owners of the property after the payment of operating expenses and taxes, that is their misfortune. If it is such as to leave them a larger profit, that is their good fortune. Small net income for the owners of a railway, whether the result of poor location, inefficient management, or other cause, will not justify charges that are exorbitant or unreasonable as measured by the service performed. Neither will large net income, due to fortunate location, efficient management, or other cause, justify a reduction of charges that are reasonably low as measured by that standard.

OPERATING EXPENSES AND RATES.

Various elements enter into the reasonableness of a transportation charge. I am not now endeavoring to cover the whole subject as to the proper bases of a transportation charge. I shall mention one of them this evening because it is one which is dependent in no small measure upon public opinion. This is expense of operation. On superficial thought this might seem to be a matter with which the public has nothing to do, but it is coming to be more and more controlled directly and indirectly by the public. One of the most serious problems confronting railway management in the United States and entering into the cost of service is that of constantly increasing taxes imposed by public authority. The aggregate payments for the past fiscal year amounted to more than $120,000,000. The rate of taxation per mile has increased fully 150 per cent. since 1890, and each year sees it mounting ever higher. Then there are requirements under the exercise of public authority in other ways that tend to increase operating costs.

The largest single item of railway expenditure, and one in which the public is concerned as bearing on cost of service and the reasonableness of an adjustment of charges for railway service, is that of wages. Railway service, in many of its branches, is most exacting, requiring a high type of manhood. Without men of this kind the American railway system could never have become the efficient transportation agency that it is today. It is

*Abstract of an address delivered at a dinner given by the Chamber of Commerce, New Haven, Conn., January 23, 1913.

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right that such men should be fairly paid, and American railway employees receive wages much higher than those paid to railway employees in any other country and generally higher than are paid in any other employments in the United States calling for similar measures of skill and reliability.

In the adjustment of questions as to rates of wages and conditions of employment it is inevitable that differences should be developed between the railway companies and their employees. Such differences concern not only the railways and their employees, but the public as well, for the reason that a strike or lockout which would interrupt, or seriously impair, the efficiency of railway service would cause great inconvenience if not actual suffering to many persons.

The public interest in controversies between the railways and their employees has already been recognized by Congress in the enactment of the so-called Erdman law, which applies to those classes of railway labor having to do with actual train operation. In a controversy involving any one or more of these classes either the employing company or the employees may apply to the presiding judge of the commerce court and the commissioner of labor for mediation. If mediation is accepted by the other side the mediators then endeavor to bring them together in an amicable agreement. Failing in this, arbitration may be resorted to if both sides agree. There is nothing compulsory about the Erdman law at any stage of the proceedings until a controversy has been finally and voluntarily submitted to arbitration. Yet it has been the means of the amicable adjustment of a large number of controversies which, but for the proceedings under it, might have resulted in strikes.

But since the Erdman law has been on the statute books cases have arisen in which it was not availed of and strikes have resulted. Although the settlements arrived at in the cases in which it has been invoked have not always been entirely satisfactory to both sides, they have always been in the public interest to the extent that they have kept traffic moving, and I believe that the time has now come when we should go a step farther and make it still more improbable that a strike or lockout shall affect the transportation service of the country. Among those who favor further action there are differences of opinion as to the form which it should take, but even now the experiment of special boards, not provided for by the Erdman act, is being tried, and I venture to suggest that this may point the way to a final solution that will safeguard the interest of employers, employees, and the public.

THE PUBLIC'S RIGHT TO ARBITRATION OF LABOR DISPUTES.

On account of the inconvenience, and, in some cases, hardship, that would result to the public from an interruption of railway service, I believe that, if any such interruption shall occur as a result of a difference between employers and employees, the public has a right to such full information as may serve as a basis for an intelligent opinion as to the merits of the controversy. This is most effectually accomplished by the Canadian Industrial Pursuits Investigation Law which provides that where a strike or lockout is threatened involving any agency of transportation or communication, or other public service utility, before such strike or lockout can legally take place the parties must refer their differences to a special board which exercises substantially the powers of a court in hearing a case. The first efforts of the board are to bring about a settlement by conciliation. Failing in this, it prepares and publishes a report setting forth what, in the board's opinion, ought or ought not to be done by the respective parties concerned. The essential difference between this Canadian law and the Erdman law is that resort to the Erdman law is altogether voluntary, but, under the Canadian law, while resort to it is compulsory, the finding of the board is not binding on either party. For effectiveness the Canadian law relies largely upon the force of enlightened public opinion. If, after publication of the finding of a board, a strike or lockout occurs, the public knows what it is all about and what the board has recommended should be done in the matter. It amounts in substance to the very reasonable provision that before the service of a public utility agency on which the public is dependent shall be interrupted by a strike or lockout the public shall be fully enlightened as to the merits of the controversy.

Each special board under the Canadian law consists of three members. One is named by each party to the controversy and they select the third, who acts as chairman, or, if they shall fail, within five days, to agree upon the third member, he is appointed by the minister of labor. The fault of a board thus constituted, in my opinion, is that, two of its members being partisans, its decisions are essentially one-man decisions and the questions presented are not considered as broadly as might be expected with a larger board. I venture to suggest, therefore, that the provisions of the Canadian law shall be adopted, except that, instead of three members, each special board shall consist of five members; that one be named by each party to the controversy; that these two jointly select two others, or, in the event of their failure to agree, that the two others be named by the commissioner of labor and the presiding judge of the commerce court, or, if there be no commerce court, the chairman of the Interstate Commerce Commission, and that the two last named shall select the fifth member, or, in the event of their failure to agree upon the fifth member, that he be appointed by the senior United States Circuit Judge in the territory affected. I believe the result would be broader consideration of the questions at issue and findings that would command, in fuller measure, the support of public opinion and the confidence of the parties in interest.

GOOD SERVICE THE PARAMOUNT NEED.

While the discussion of the relations between the public and the railways has been concentrated largely upon charges for transportation, the public has a vital interest in service as well as charges. In fact, if charges are not exorbitant or unreasonably high as measured by the service performed, the paramount interest of the public is in service.

It is the aim of the far-sighted railway manager to maintain a margin of carrying capacity over the normal demand on his lines in order that he may be able to handle any sudden increase in the volume of traffic. The difficulties that must be encountered in doing this can hardly be appreciated by those not engaged in railway work. James J. Hill, the highest authority on such matters in the United States, emphasizes the need of additional trackage and enlarged terminals, but large expenditures are required for their provision. Future growth of business is always problematical, and it requires a high degree of courage, in dull times when an existing railway plant is working far below its capacity, to enter upon projects for building additional main tracks or for enlarging terminals. It requires courage to contract for additional equipment when side-tracks are full of idle cars and roundhouses are crowded with cold locomotives. The railway manager may believe there is every reason to expect a large increase in business, but if his judgment shall be at fault he will have trackage in excess of his needs and will see his new cars and locomotives standing idle and depreciating without having had a chance to earn a dollar, while all of the time interest charges are accruing on the additional investment. Yet, so far as his resources will permit, this is the policy that the railway manager must carry out. He cannot wait until the crisis is upon him for the inauguration of constructive policies.

The same is true as to maintenance, and it is to the public interest that the railways shall not have to postpone repairs and catch up with maintenance work in times of heavy traffic. This is a matter that cannot be unduly neglected at any time, for there is probably no class of property subject to such rapid depreciation as a railway. Conditions of railway operation are such as to subject roadway and equipment to great wear, and as very little railway property is under shelter, it is subjected to constant depreciation from exposure even if it is standing idle, and a considerable proportion of expenditures for the

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maintenance of both roadway and equipment must be made irrespective of the volume of traffic being moved.

There is probably no other form of industry that suffers so much in times of business depression as does a railway. When the business of a manufacturing plant falls off it can run on short time or stop running altogether. No matter, however, to what extent the business of a railway may fall off, there is a minimum of service that it must continue to perform and all of the time its plant is subject to just as much depreciation from exposure as though it were working at full capacity. I may say further that there is probably no other industry in which, from the nature of the business, such a large proportion of the plant must at all times be idle. This may be illustrated by the fact that it has been estimated that the average movement of freight cars in the United States is only twenty-five miles per day, yet while the car is actually under way its movement is at a very much higher rate than this. The reason for the low average rate is that it is figured on all of the freight car equipment of the railways of the United States and includes not only the cars that are in transit but surplus cars that are standing idle on side tracks at times when the demand of the country is not sufficient to employ them, the cars that are being held by shippers for loading and unloading and the cars that are in shops for repairs. Under the latter head alone, owing to the high rate of depreciation from use and exposure, an average of approximately 6 per cent. of the freight cars of the United States and about 10 per cent. of the locomotives will be found in the shops at any given time.

One of the strongest arguments against the policy of attempting so to regulate railway charges that they shall yield a predetermined rate of income rather than allowing them to be so adjusted as to be reasonable as measured by the service performed is that it may, by its arbitrary enforcement, tend greatly to hamper the railways in the provision of additional and improved facilities and in the proper maintenance of their present plant. One of the distinguishing features of American railway management as contrasted with that of other countries is that, so far as earnings would permit, the owners of American railway properties have, in many cases, abstained from taking to themselves the full amount of net income, but have turned greater or less proportions of it back into the property in the provision of improvements that have not been capitalized, in contrast with the prevailing custom in other countries of capitalizing all improvements. It is largely because of this that the average net capitalization of the railways of the United States is only approximately $60,000 per mile as compared with $314,000 per mile in England, $109,788 per mile in Germany, and $139,237 per mile in France. It is to the public interest that this policy be continued.

As railway operation must be continued in times of business depression, and as floods or other disasters may at times do enormous damage to railway property, the railways should be able, in times of prosperity, to accumulate a sufficient surplus to enable them to meet their requirements in lean years.

Even under the most favorable circumstances, however, the railways cannot return earnings to the property in amounts sufficient to enable them to meet the increasing demands for service. To a large extent additional carrying capacity will have to be provided through the investment of new capital. Ability to obtain new capital is dependent upon credit, and credit, in turn, is dependent, not on gross earnings, but on the proportion of gross earnings that can be saved as net income. It should be borne in mind that the natural tendency of capital is toward those investments promising the largest income in proportion to the safety of the principal.

PROSPERITY OF RAILWAYS DEPENDS ON THE PUBLIC.

Under the present system of governmental regulation in the United States the prosperity of the railways and their ability adequately to perform the transportation service of the country is dependent in very large measure upon the state of the public mind toward them. It is to the public interest no less than to that of the railways that, while laws for the prevention of abuses shall be enforced and, if necessary, amplified and strengthened, the attitude of the government should be such as to instill into the public mind confidence in the railways, for, under the present system of governmental regulation of the fundamental business of transportation there is attached to the government, as well as to railway management, responsibility for the success of a business so closely related to all the business activities of the country.

This thought was admirably expressed by that sound economist—President Hadley—when, in a recent address, he said: "We must lend a hand to the men who are getting things done. We shall deal with the problems of corporate regulation and with the abuses of corporate management more effectively if we are willing to appreciate efficient service."

If the railways are to have the character of support of which President Hadley has spoken, they must justify it. The obligation rests upon them to give the most efficient transportation service in their power without unjust discrimination, and at rates that are not unreasonable as measured by the service performed. Seeking exemption from unjust political attack, they should themselves abstain from political activities. There was a time when their support of policies deemed essential to the preservation of our civilization was urged upon them as a patriotic duty. I think we may all rejoice in the awakening of public conscience and the elevation of public standards which would condemn any return to those conditions.

But, in advocating abstention by the railways from such activities, I should not be understood as implying that they should surrender any of the fundamental political rights to which they are entitled in as full measure as any other business enterprise or individual citizen. These rights include the sacred right of petition—the right to be heard in argument and in protest before legislative bodies, the courts of the land, administrative tribunals, and before the bar of public opinion.

A PILOT SNOW PLOW.

By E. R. LEWIS,
Assistant to General Manager, Duluth, South Shore & Atlantic, Duluth, Minn.

No locomotive, however powerful on a dry rail, can make satisfactory progress during severe blizzards in freezing weather, unless it is well supplied with snow handling attachments. It is by no means sufficient to provide engines, pushing snow plows and flangers, to run ahead of trains drawn by locomotives which have no such equipment. During exceptional winter storms, snow will drift in behind a snow plow and obstruct the track in a very few minutes after the plow has passed.

Every locomotive which is expected to make a trip in such weather should carry its own protection against drifting snow. The ideal equipment is the combined pilot plow and flanger, one style of which is shown in the accompanying illustration. These plows should be attached to the locomotives at the beginning of the season of severe winter storms, and removed only after danger of such weather is past. They will handle snow in drifts 6 to 10 ft. deep. The flangers are of course of service in cleaning snow from the rails and away from the flanges. By cutting loose from the train and flanging the track for a car length or two, the rail can be cleared of snow and ice so that the driving wheels will not slip or skid and the engine will gain sufficient headway to push through the drift. Care must of course be taken not to get so far from the train while flanging that the locomotive cannot recouple to the train, which would then freeze up.

The plow here described is believed to be built on the lines of maximum efficiency. The nose is set at an angle of 40 deg. from the vertical. The spread of the wings includes a total horizontal angle of 72 deg. 30 min. The rise and flare of the wings from nose to heel are such as to give the best results

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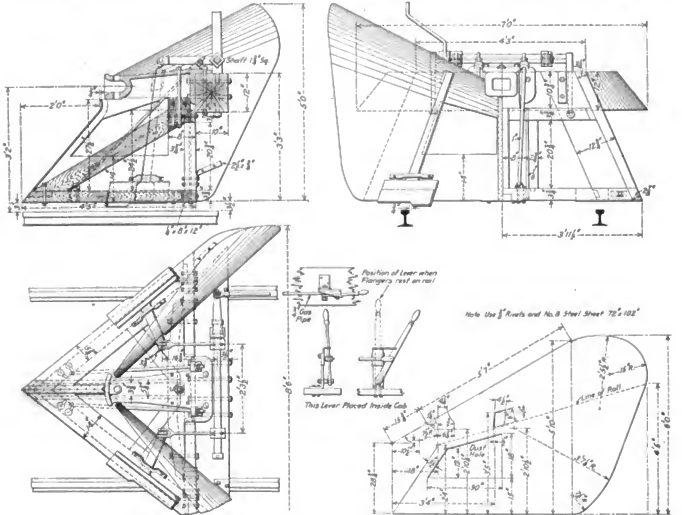
in lifting and clearing snow from the tracks. A distinct advantage over most pilot plows is the position in which it is placed, close to the front of the locomotive. The pilot and pilot beam may be removed, and the snow plow with its beam put in place by 4 men in about 4 hours.

Locomotive pilot plows should be provided with dust doors, which when opened, allow dust from the ballast, which gathers under a plow on bare, dry track, to escape. The No. 8 steel sheets which form the plow armor are provided with square sliding doors of the same material, on each side of the nose, so fashioned as to cover or uncover a square space in the sheet a trifle smaller than the door, which works in grooves on the outside of the plow, and which may be fastened open or shut. The flangers are operated by a lever in the locomotive cab. The bottom leaves or shoes are of spring steel. If a flanger is broken, a spare shoe may be readily applied by means of four bolts without going into the repair shop. The pilot plow and flanger combined costs $150. The plow and flanger here described were designed and constructed under the supervision of J. J. Conolly, superintendent of motive power and machinery, Duluth, South Shore & Atlantic, on which road it has been in use for more than 20 years with the most satisfactory results.



Combined Pilot Snow Plow and Flanger; Duluth, South Shore & Atlantic.

FUEL IN ROUMANIA.—In Roumania a few locomotives were converted into oil-burners as long ago as 1887. In 1911, out of a total of 595 locomotives, 499 used oil for fuel. About five-eighths of fuel used is petroleum, one-eighth is coal from Cardiff and Westphalia; more than a seventh, lignite; and one-tenth, wood.

ACCIDENT STATISTICS FOR 1910.

The annual statistical report of the Interstate Commerce Commission for the year 1910 contains no information concerning casualties on railroads, the carriers having been relieved from furnishing this in their annual reports, and the law providing this exemption, and transferring the accident records to another department, having failed to provide for beginning the new records immediately on the cessation of the old. Therefore, one whole year was left out of the annual records. This omission is not important except as concerns accidents to persons at highway crossings, to employees not on duty, and to trespassers, as other accidents had already been provided for in the records published in the quarterly bulletins.

The commission, however, issued a circular calling for a special report on the year 1910, and now publishes a statement showing the totals for that year, made up on the basis of the classification which had been used in the annual statistical report. The total number of persons killed on the railroads of the country in the year under review, ending June 30, 1910, was 9,682, and of injured 119,507. The number of passengers killed was 324; employees 3,382, and other persons 5,976; passengers injured, 12,451; employees 95,671, and other persons 11,385. At highway crossings 835 persons were killed and 1,932 injured. The total number of trespassers killed, all causes, was 4,864; and injured 5,348. These trespassers are included in the "other persons" mentioned above. The regular accident-bulletin statistics for the year ending June 30, 1910, were given in the *Railway Age Gazette* of November 11, 1910, page 925.

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General News.

In the federal court at Boston, February 4, the Central Vermont and the New York, New Haven & Hartford were fined each $300 for violations of the safety appliance laws.

Alfred Knight Chittenden, forester of the United States Indian service, Department of the Interior, has been appointed assistant to the director of the engineering experiment station of the University of Illinois, and lecturer on timber and timber resources in the college of engineering.

Suit has been begun by the government in the federal court at Philadelphia against the Philadelphia & Reading for violation of the 28-hour law regulating the transportation of cattle. It is alleged that two carloads of cattle from Buffalo were kept in cars from 38 to 46 hours without food or water.

The Great Northern on January 29 opened its road over the Cascade mountains after a blockade which had lasted six days. The fall of snow has been the heaviest in many years. Many tons of dynamite were used in clearing away masses of fallen timber, rocks and earth which had been swept on to the roadway by avalanches.

The Chicago, Milwaukee & St. Paul has recently received from the builders seven gasoline-electric motor cars built by the General Electric Company, which are to be placed in service shortly for branch line service. Two of the cars will be used on the Puget Sound lines. Five of these cars each weigh 49 tons and are designed for a seating capacity of 80; two weigh 50 tons and have seats for 77 passengers.

A special train on the Pennsylvania lines used to carry cash each evening from the Stock Yards to the Union station in Chicago, was robbed early in the evening of January 31 by one man, who boarded the train as it was passing through the yards before entering the station, and forced the express messenger to open the safe for him. After taking the money and checks from the safe he jumped from the train and escaped pursuers.

Presidents Mellen, of the New Haven, and Chamberlin, of the Grand Trunk, together with A. W. Smithers, chairman of the Grand Trunk, were again indicted in New York City, January 30, for alleged violation of the anti-trust law in connection with the cessation of work on the Grand Trunk line to Providence last autumn. The indictments are substantially the same as those which were found a few weeks ago and which were invalidated on a technicality.

A contract has been signed by the Minneapolis, St. Paul & Sault Ste. Marie and the Baltimore & Ohio, whereby the Soo line will use the tracks of the Baltimore & Ohio Chicago Terminal into the Grand Central station as the entrance into the city of Chicago for its passenger trains. The change will not go into effect until about July, 1914. The Soo line is now using the tracks of the Illinois Central. The Grand Central station was formerly owned and used by the Wisconsin Central, which is now the Chicago division of the Minneapolis, St. Paul & Sault Ste. Marie.

The Pennsylvania Railroad reports the smallest loss from fire experienced by the company in thirty-four years. In 1908 the company's employees extinguished 274 fires out of a total of 1,397 which occurred on railroad property, and in 1912 454 out of a total of 905. The steady increase in the efficiency of the fire fighting brigade was further developed last year by special training of employees and equipping additional locomotives in yard service with pumps. Including the fires to which city fire departments were called, the total loss was only $219,892 from the 905 fires.

The frauds connected with forged bills of lading for cotton which made such a sensation in the southern states a couple of years ago, have again come into notice by the commencement of a suit in the United States Court at New York City by A. Hannay & Co., of Liverpool, against a New York bank, for losses on drafts drawn in connection with worthless bills of lading. The drafts had been discounted for Knight, Yancy & Company and Steele Miller & Company shortly before the failure of those firms. If this suit against the New York bank should succeed, it would open the way to the prosecution of similar suits for sums aggregating $4,500,000.

G. A. Ogline, superintendent of police of the Baltimore & Ohio, in his annual report, which has just been made, and in which he reports a total of 10,417 arrests made during the year, says that from his observation during travels over American railroads during the past year he believes that the trespassing evil is growing rapidly. During the year 289 persons were killed and 298 injured while trespassing on Baltimore & Ohio property. Mr. Ogline suggests that a good cure for vagrancy would be the maintenance of a stone pile. There is nothing which the tramp so dislikes as the labor of splitting stones.

The *Railroad Telegrapher*, the organ of the Order of Railroad Telegraphers, in its January issue reports that in the month of December the number of new members initiated into the order was one thousand nine hundred and twelve, the largest on record for a single month; and in the twelve months of the year one thousand nine hundred and twelve the total number of new members was 10,339. The total present number of members is not given. A list is given of the names of 58 railroads on which new and revised schedules of wages for telegraphers were made during the year 1912. The Grand Lodge gives prizes to members who secure new members; one bringing in twenty-five or more being offered a gold watch.

The Bangor & Aroostook has nearly or quite won its contest with the striking enginemen and firemen. It now has enough firemen for all trains and is short only twenty of its full complement of enginemen, though it is said that some of the enginemen have not yet fully learned the road. The leaders of the conductors' and trainmen's unions demanded last week a large increase in pay, but as yet they have not struck, and it is believed that probably the rank and file did not vote to sustain the leaders. It is said now that the track repair men, or some of them, are threatening to strike. The governor of the state of Maine sent to the legislature a message recommending arbitration or other measures to settle the strike, but both houses of the legislature laid the message on the table.

The Western Union and Postal Telegraph companies have filed with the New York Public Service Commission, Second district, new rates for money transfer service, effective March 1, 1913, as follows: Transfer premiums for $25 or less, 25 cents; over $25 and not exceeding $50, 35 cents; over $50 and not exceeding $75, 60 cents; over $75 and not exceeding $100, 85 cents; for each additional $100 or fraction thereof up to and including $3,000, 25 cents; for each additional $100 or fraction thereof over $3,000, 20 cents. In addition to the premium there will be a charge for telegraph service equal to the price of one fifteen word message from the office of deposit to the office of payment. The new rates greatly reduce the present charges which are as follows: Premium 25 cents for $25 or less, and 1 per cent. on all sums of more than $25 and not exceeding $1,000. For amounts over $1,000 1 per cent. for $1,000, and one-half of 1 per cent. for any excess over $1,000, fractional part of a dollar counted as a dollar, and in addition charge for telegraph service equal to twice the toll on a ten word message from the depositing office to the paying office.

The Purchasing Power of Money.

A leading financial paper says that the Atlantic Coast Line will use $40,500 from the proceeds of the sale of stock for the following purposes: Additional equipment, new construction, bridges, trestles, yards, terminals, shops, double track, creosote and rock crushing plants, block signals, telephone circuits and other additions and betterments.

Guilty on All Counts, But Unashamed.

The connection between the retail tobacco business and steel manufacturing and railroading may not be visible to the naked eye, but it is there, just the same. That is to say, it was there. Because the connection no longer exists a certain cigar dealer mourns the loss of $3,000 worth of business. In these uncertain times one can feel real badly over the loss of $3,000. But to explain: You see in the good old days sundry manufacturers of steel products were in the habit of making through their salesmen little Christmas gifts to the purchasing agents of railroads with which they did business, or hoped to do business. The cigars never did any one harm, because they were good

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cigars. They merely helped to promote the entente cordiale between the salesman and the purchasing agent. The *Railway Age Gazette* heard about it and straightway became exercised over what it declared was a pernicious practice. The *Gazette* raised such a hullabaloo that presently the railroad men up at the top and the steel men in the same relative position concluded that perhaps the entente cordiale did not need any promoting, after all. So when Christmas came this time three or four steel representatives who had been making Christmas purchases aggregating $3,000 of the cigar dealer aforesaid did not buy so much as a package of cigarettes. It would have been bad enough if they had transferred their patronage elsewhere; but they did much worse; they simply kept their money in their pockets. No doubt the railroad men who have been having one on the steel salesmen will continue to smoke; but when one purchases one's own cigars one is likely to smoke less expensive cigars and fewer of them. Besides, their custom will be scattered, so that no one will reap any appreciable benefit. Shame on the *Railway Age Gazette.—United States Tobacco Journal.*

Railway Bills in the Legislatures.

Both houses of the Michigan legislature have passed a resolution providing for an investigation by a state commission of the financial and physical affairs of the Pere Marquette.

A bill has been introduced into the Minnesota legislature proposing an increase in the railroad gross earnings tax rate from five to six per cent. The last legislature increased the rate from four per cent to five.

A bill has been introduced in the Colorado senate, which would make trespassing on railroad tracks a misdemeanor punishable by fine, or imprisonment, or both. During the fiscal year 1912, out of 95 people killed on the railways of Colorado, 52 were trespassers.

Bills have been introduced into the Michigan legislature providing for a semi-monthly pay-day, requiring that all cabooses be built according to a standard plan, and providing for a ten-cent additional charge where fares are paid in cash on passenger trains. A full crew bill also has been presented.

A bill has been introduced in the legislature of New York at Albany, to empower the public service commissions to suspend railroad tariffs which propose increases of rates, in the same manner that such tariffs are suspended by the Interstate Commerce Commission. A similar bill was passed last year, but was vetoed by Governor Dix.

A full-crew bill has been introduced in the legislature of Colorado. Committees representing the brotherhoods of trainmen are endeavoring to have the bill made even more sweeping than are the laws on this subject now in force in other states; while arguments have been presented on behalf of the railway companies showing the unreasonable character of the bill.

A bill has been introduced into the Kansas senate requiring railways to pay their employees twice a month. At a hearing before the railroad committee recently, E. L. Copeland, secretary and treasurer of the Atchison, Topeka & Santa Fe, offered documentary evidence showing that if the bill were passed it would increase the expenses of the Santa Fe by about $24,000 a year.

A bill has been introduced in the Illinois legislature providing for the creation of two public utilities commissions, one for Chicago, and one for the state at large, to replace the present railroad and warehouse commission. The Chicago commission is to be appointed by the mayor, and the state commission by the governor. Each is to consist of five members at a salary of $10,000 each, yearly, with a secretary for each commission at a salary of $6,000.

Representative Hughes, of West Virginia, has introduced in Congress a bill providing that after January 1, 1915, all passenger, express and baggage cars used in interstate traffic shall be made of steel, with vestibuled platforms; the Interstate Commerce Commission to have authority, however, to extend the period of time within which any carrier shall comply with the law.

Representative Dent of Alabama has introduced in Congress, a bill making it unlawful five years after date for any common carrier to use any locomotive or car for passenger traffic not equipped with some safety device for the prevention of derailments resulting from broken flanges, broken wheels, etc. Mr. Dent evidently has in mind the virtues of somebody's patent for causing cars which have jumped the track to immediately jump back on the rails again.

Illustrated Lectures for Central of Georgia Employees.

The farmers are not the only beneficiaries of the traveling lecturer. The Central of Georgia has just started a lecture car for the benefit of its employees, and moving pictures constitute one of its main features. It is managed by the Educational Bureau of the road, in charge of D. C. Boy, assistant chief. The lecturers are E. H. Daniel, transportation inspector, and A. D. Prendergast, road foreman of engines. The lectures were begun at Albany, January 28, and they are in substance as follows:

First: "Fuel Economy, or Proper and Improper Locomotive Firing," by Mr. Prendergast. This lecture is illustrated with fuel tests, colored slides showing condition of fuel in fire box, and by moving pictures showing proper and improper methods of handling scoop-shovel, firing a pusher engine up hill, result of good and bad firing as seen from rear of train by the passenger, coaling engines, etc. A double-header is shown going up hill, the front engine being fired properly and the second engine fired improperly, as evidenced by the light smoke coming from the stack of the first engine, and the dense black smoke from the second engine. These moving pictures were taken on the Central of Georgia in and around Macon.

The second lecture, by Mr. Daniel, is on train rules. "Always Safety First" is the first and the last stereopticon slide shown. Following this many of the train rules are shown and explained. Pictures are shown illustrating the violation of rules and bad practice of trainmen, such as adjusting couplers, jumping on moving cars, etc.

The third lecture takes up loss and damage freight. There are several slides calling attention to the cost to the company of loss of and damage to freight. Following these are pictures showing loading and handling of freight at stations and in trains.

Opening of the New Grand Central Terminal, New York.

The new headhouse of the Grand Central Terminal, Forty-second street, New York City, was opened for business at midnight on Saturday, February 1, and all day on Sunday the station was crowded with sightseers. The concourse for the lower level was opened several weeks ago, and the principal rooms now opened are the main waiting-room, the men's and women's waiting-rooms adjacent, the upper concourse, and the restaurant. The concourse, ramps and tracks which will eventually serve for incoming trains and passengers are yet to be built, and the exterior of the station is not entirely finished; but in its main functions, the new station is now in service and the old "Grand Central Palace," in which was the temporary main waiting-room during the construction of the new building, has been vacated and the workers have already begun to tear it down. The hospital at the corner of Forty-second street and Lexington avenue, on which site the New York Central proposes to erect a hotel, is also being torn down.

Warren & Wetmore, the architects of the new station, gave a dinner in the restaurant of the station on Saturday evening to A. Whaley, and about 100 guests. Mr. Whaley, who has just resigned, has been general manager of the Terminal for several years past. About two thousand guests of the architects inspected the station Saturday afternoon and evening. Preparatory to opening, at midnight, the company had decorated the principal rooms with palms, and there was a band of music on hand; and when the doors were opened at 12 o'clock about three thousand persons, who had been waiting outside, rushed in.

The progress of the work on this station has been recorded from time to time in the *Railway Age Gazette*, the last article having been published on November 22 last, page 981. Photographs of the interior of the new station have not yet been taken.

Among the accounts of the opening published by the New York City papers, that of the *Evening Post*, which embraced a

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large number of illustrations made from architects' drawings, is of interest historically by reason of several views which it shows, illustrating the New York terminals of the Harlem, the New Haven and the Hudson River railroads in early years. The *Evening Post* also prints a short article written by John N. Golding, the real estate agent who, in behalf of the New York Central, bought lands and buildings for the new terminal. From this we quote:

"Securing such a site as is embraced in the Grand Central Terminal necessitated buying two large hospitals, two large warehouses, orphan asylums, churches, rows of flats, house after house, vacant land, stables, express buildings, etc. In no instance was a property purchased from other than the original owner of record. This part it was my privilege to be engaged in accomplishing. No profits to speculators.

"The city of New York has every reason to be proud of the Grand Central Terminal and all that pertains to it. Each man from the president down had to do his share and do it well to make the undertaking go, and they did not fail.

"The gathering of the big financial men of the country, composing this board, was the primary authority. Trusting the operation to selected individuals in their line, the board controlled the adjustment of all legal difficulties, the rearranging of grades, new streets, exchanging of one part of a street for another part; conference after conference, public hearings, some pleasant and others a little unpleasant, everybody keeping his temper, all with a fixed purpose, and the undertaking was completed. Ideas advanced, turned over, looked into, followed, the brains of the whole system worked together.

"Property owners demanded that the streets be made from Lexington to Madison avenue; month after month conferences were held with representatives of the city, necessitating a great deal of thought on the part of the head of the legal department, Ira A. Place, and his associates; and the whole proposition was directed by the masterful mind of the railroad's late president, William H. Newman, who has made it a lifework, bringing about this wonderful result.

"With the 26-story Biltmore Hotel, the Yale Club, the Grand Central Palace, the Y. M. C. A.'s new building and stores and apartment houses, new hotels and other buildings now talked of, the tract from Forty-second to Fiftieth street, embraced in this terminal, will be the greatest business, club, amusement and apartment house center in the city. There are many wonders in this great city, and this terminal is one of them. But to my mind there is a greater wonder, and that is, *how they had the hardihood to do it.*"

Harriman Lines' Dissolution Plan.

Though the Harriman Lines' committees and the government have not yet reached a definite decision in regard to the plan for the dissolution of the Union Pacific-Southern Pacific system, it is believed that the plan is crystallizing rapidly and will probably be announced this week. It is expected that this plan will call for the sale of the Central Pacific to the Union Pacific for cash. It was the desire of both the railroads and the government that the Central Pacific should be paid for partly with Southern Pacific stock, but this is impossible because of a Kentucky statute prohibiting the Southern Pacific from purchasing its own stock. It is estimated that the price to be paid for the Central Pacific will be in the neighborhood of $100,000,000. The $126,000,000 Southern Pacific stock owned by the Union Pacific will probably be offered at about par to Union Pacific and Southern Pacific stockholders. The exact proportion to be offered to stockholders of the Union Pacific is not yet known. The offering of this Southern Pacific stock will be underwritten by a syndicate. This plan is merely the agreement expected to be reached between the directors of the two roads and the attorney general. The plan will then go to the circuit court of the Eighth district for final approval.

R. S. Lovett, chairman of the executive committee of the Union Pacific is quoted as saying, in part:

"The operating organizations of the Union Pacific and Southern Pacific in the West were separated a year ago last October, from the president down. The only joint offices and officials left after that reorganization and at the time of the decision of the Supreme Court in December were the directors, chairman of the executive committee, directors of maintenance and traffic and other officers in New York and the commercial and soliciting agents.

"When the attorney general's position respecting the disposition of the Central Pacific was made known, thereby showing a possible conflict of interest with respect to that property, the chairman and directors of the Union Pacific informed him that of course they could not further act for the Southern Pacific and immediately resigned from the Southern Pacific so that the latter board could be composed of directors not interested in the Union Pacific. This occurred on January 13."

Firemen's Wages.

Elisha Lee, chairman of the committee representing the eastern railroads, which committee expects to hold next Tuesday another conference with the representatives of the firemen, has issued during the past week a number of statements to the public. Commenting on the published statement of the leader of the firemen, relative to the delay in settling the case of the locomotive enginemen, he calls attention to the fact that the delay caused the enginemen no loss; for though the increase in pay which was voted was not announced until November 26, it was made to take effect on May 1. The men received back pay amounting to about $1,000,000. Mr. Lee says that the total annual increase in the pay rolls of the enginemen will be about $2,000,000, or approximately 5 per cent. In other statements he says:

"This strike vote of the firemen was taken in the face of the railroads' offer to submit all matters in controversy to an unbiased arbitration commission of five, seven or nine men. The firemen will endeavor to gain the support of public opinion. General chairmen are directed to make arrangements whereby publicity can be given to all matters in connection with this movement 'whenever it becomes evident that no settlement can be reached.'

"The railroad managers have learned with considerable surprise that the firemen are also polling the engineers who belong to the brotherhood. These same engineers have had their wages increased by the arbitration board recently announced and intended to continue until June 1.

"The attitude of the firemen's brotherhood towards the form of arbitration followed in the engineers' case may be gained from a letter addressed by President Carter to the railroads, in which he says:

"'It is noted that in your objections to the federal arbitration law that you believe its most fundamental defect is that the interests of the public are not guarded by it. Our committee instructs me to compliment the conference committee of managers upon their solicitude for the interests of the public. . . . We hold that an arbitration of a wage dispute should not be used for the purpose of molding public opinion as to the necessity of enacting laws to forbid railway employees engaging in strikes, or to secure legislation that will deprive workingmen of their constitutional rights, which seems to have been the purpose of the railroads' plan of arbitration. In any arbitration of wage matters social or legislative problems should not thus be injected. It is evident that the wish of certain prominent railroad officials has found expression in the report of this arbitration, under the railroads' plan, that national and state wage commissions be established, with power to enforce decrees. Advantage should not be taken of wage disputes to mold public sentiment concerning the proper returns upon capital invested by railroads or the necessity for increase in freight rates.' . . .

"The railroads still offer arbitration by a board representing the public. The railroads base their case upon the recent conclusions of the board appointed to adjudicate the claims of the engineers. That board, after examining the record of the operation of the Erdman act, stated that its results were 'accomplished by splitting differences, and the case may be adjusted without adequate investigation of the facts involved, in consequence of which the award may not rest upon a basis of equity. This method of splitting differences is very unsatisfactory, but it is an inevitable result of mediation or arbitration under the Erdman act. Feeling in advance that a mediation or arbitration will result in giving only a part of what they ask, the men make maximum demands, with the expectation that these demands will not be fully awarded. The railroad officers, appreciating

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the tendency of mediators and arbitrators to split differences, make only minimum concessions or none at all."

"The railroads have offered to grant concessions to the firemen. They have offered them what is tantamount to an increase of 5 per cent. in their total payroll. . . . The railroad managers are only too glad to pay their men high and increasing wages. It is only from a feeling that such increases as have been demanded are not justified by the conditions, that railroad managers are moved to resistance.

"The companies would regard a strike with dismay. Such an outcome of this situation must be prevented, in the public interest. If the public can insist that there be no strike and that there be arbitration properly guarding the interests of the public, the railroads and the employees, a most important result will have been achieved.

"The railroads have offered their men a minimum wage of $2.40 a day in passenger service. The present minimum is $1.75, though this minimum is paid on but few roads. In through freight service the railroads have offered a minimum of $2.75 per day. They have also offered increases of 10 and 15 cents per day on certain freight engines. All firemen working on freight engines now receive at least $2.45 a day. The Boston & Albany now pays $3 per day; the Baltimore & Ohio $2.75, $3 and $3.10; the Delaware, Lackawanna & Western, $2.90; the New York, New Haven & Hartford pays $2.60 and $2.80 per day; and the Pennsylvania Railroad and the New York Central pay $2.85 and $3. These are through freight rates.

"According to the recent arbitration commission in the engineers' case, the average wages of firemen in the district affected by the present strike vote are $2.88 per day. Ten years ago the average was about $2.05, so that the average wages of the firemen who are now threatening to strike have been increased more than 35 per cent. in the past ten years. Railroad managers are willing and eager to pay all classes of employees as high wages as conditions will permit. It is indeed recognized that the firemen at this moment deserve special consideration. But, it is obvious that the public must pay the bill in the end, and the question the public has to answer is: How long shall this process of increases be allowed to continue?

"Chief among the propositions which the men have voted on, and which the railroads already have offered to arbitrate, is a demand that there shall be two full-paid firemen on about 2,000 out of the 14,000 freight locomotives in the territory affected; that is, on all engines of more than 200,000 lbs. weight on the drivers. The railroads concede that there are cases deserving relief. On the Pennsylvania, for instance, where under the Pennsylvania state extra-crew law an additional brakeman is employed, he is required to assist the fireman in shoveling coal on a hard run. On other roads in some cases two firemen are employed for a full run. The railroads propose to the men to refer each case back to the local officers and men to settle; where it cannot be settled satisfactorily, to appoint a permanent committee of appeal for all the 54 railroads which shall have power to inquire into the case and settle it fairly.

"An arbitrary rule would unduly burden the railroads and would cause the companies to employ a large number of unnecessary firemen. But even this proposition the companies are prepared to leave to the judgment of a committee of citizens sufficiently large and representative, to consider and settle fairly the subject on behalf of the public, the railroads and the employees."

"The firemen have notified the managers that if the railroads do not grant two firemen on locomotives they will get the equivalent through federal legislation. At a conference on December 20, President Carter said 'if they could not get relief across the table they would have to get it at Washington. We are trying to get it across the table. If we don't get it here, you can depend upon it they will get it at Washington. I mean they will get the ten or twelve-hour day, and they will not get it through this organization, but they will get it through the individual members of Congress.' The railroads concede that the strain upon firemen has increased. All the railroads have given serious and sympathetic attention to this subject. Many factors besides weight enter into this question. An engine may be heavy, but the run very short. Many railroads are trying automatic stokers, so that all the fireman has to do is to stand by and see to it that the stoker works properly. But even on such engines the brotherhood demands two firemen."

Western Economic Society.

The Western Economic Society will present at its conference a thorough discussion of the modern ideals of organization, efficiency and scientific management. A number of prominent advocates of scientific management will present the fundamental features of their plans and an opportunity will then be given for discussions, questions and criticisms. The conference will be held on March 14 and 15, at Chicago.

Papers will be presented on such topics as the following: The Spirit of Scientific Management; Scientific Management from the Manufacturers' Point of View; Scientific Management versus System; Scientific Time Study and a Proper Task; Wage Systems and their Consequences; Planning Rooms and Functional Foremanship; the Importance of Standardization; Organization and Personnel; the Selection of Employees; Scientific Management in Commercial Enterprises; the Social Significance of Scientific Management; Scientific Management and the Laborer; Some Object Lessons in Scientific Management; and the Taylor Sysetm.

The following have accepted invitations to present papers on these subjects: Carl G. Barth, consulting engineer; Dr. K. M. Blackford; the M. Rumeley Co., La Porte, Ind.; M. L. Cooke, consulting engineer; Harrington Emerson, consulting engineer and author of the "Twelve Principles of Efficiency"; E. M. Feiker, the System Company; Hollis Godfrey, consulting engineer; H. K. Hathaway, vice-president of the Tabor Manufacturing Co., Philadelphia, Pa.; H. B. Kendall, the Plimpton Press, Norwood, Mass.; F. W. Taylor, founder of the Taylor system of scientific management; C. B. Thompson, in charge of work on industrial organization of Harvard Graduate School of Business Administration; S. E. Thompson, consulting engineer; Amasa Walker, Longmans, Green & Company; and William B. Wilson, chairman of the committee on labor of the United States House of Representatives. A number of papers will probably be presented by others. All sessions are open for general discussion. The officers of the company are as follows: President, Shailer Mathews; vice-presidents, Franklin MacVeagh and George E. Vincent; treasurer, Charles L. Hutchinson; and secretary, Leon C. Marshall, dean of the College of Commerce and Administration of the University of Chicago.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W. Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemmingen, 13 Park Row, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CANAL ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

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BRIDGE AND BUILDING SUPPLY MAN'S ASSOCIATION.—R. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLTANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1913, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. B. Hall, 922 McCormick building, Chicago. Annual meeting, May, 1913, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—Robert Job Dunne, B. & M. R. Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES' ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 3d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—Secretary, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY MASTER MECHANICS' ASSOCIATION.—S. Burnett, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 18, Atlantic City, in conventions, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meeting with Ry. Signal Assoc. of Dec. 1913.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 9-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—Walter D. Nesbit, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—W. Edmonds, 2668 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Tuesday in month, except July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Rumapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7842 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. K. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & R. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The Pittsburgh & Lake Erie and the Western Maryland have made a reduction of 15 cents a ton in the freight rate on coal destined to points beyond, by water, from the Pittsburgh district to Baltimore, and the reduction has been followed by a similar reduction over the Baltimore & Ohio. It is expected that the Pennsylvania will meet the new rates in the tariffs from the coal mines adjacent to its lines in western Pennsylvania.

At a meeting of the Western Passenger Association in Chicago, last week, summer tourist rates for this year were decided upon, and will be on approximately the same basis that has been in effect in previous years. From Chicago to Colorado common points the round trip fare will be $30, and to Utah points the round trip rate will be $43. Summer tourist tickets will be on sale from June 1 to September 30, with the return limit on October 31.

At a meeting of traffic officers of the New Orleans railway lines and agents of the steamship lines last week, an agreement was reached by which the steamship lines will pay demurrage charges on shipments of cotton and forest products exported through New Orleans on through bills of lading, after ten days' free time. It is understood that this agreement will end a controversy regarding the issuance of bills of lading which has been in progress for the past year.

INTERSTATE COMMERCE COMMISSION.

Reparation Awarded.

Dewey Brothers Company v. Louisville, Henderson & St. Louis et al. Opinion by the commission:

The rate of 21 cents per 100 lbs. for the transportation of distillers' dried grains in carloads from Stanley, Ky., to Akron, Ohio, was found to have been unreasonable to the extent that it exceeded 15 cents per 100 lbs. (25 I. C. C., 700.)

In re rates on empty beer packages returned.

Pabst Brewing Company v. Chicago, Milwaukee & St. Paul et al. Opinion by the commission:

In this case reparation was sought on certain shipments of empty beer packages on which the commission previously refused to grant reparation. The commission upheld its former decision, with the exception of that in the case of shipments from Hutchinson, Kan., to Milwaukee, Wis., made by the Pabst Brewing Company in 1908 and 1909. The commission found that rates of 29½ cents were applied on five of the shipments in question and 34½ cents on the remaining shipments. The commission found that these rates were unreasonable to the extent that they exceeded 24 cents per 100 lbs., with a minimum of 15,000 lbs. in refrigerator cars and 20,000 lbs. in ordinary box cars. As the present rate is now 22 cents per 100 lbs., no order as to a rate for the future was entered. (26 I. C. C., 4.)

Live Stock Rates.

American National Live Stock Association et al. v. Southern Pacific et al. Opinion by Chairman Prouty:

The commission established reasonable maximum rates for the transportation of live stock from stations in Arizona to Los Angeles and other California points. The rates were prescribed for 36 ft. cars; and to obtain rates for cars of different lengths 3 per cent. per foot should be added or subtracted. To those rates $5 per car should be added for a two-line haul for 500 miles or less; for branch-line hauls $2.50 per car should be added. The rate on stock cattle or on sheep for feeding should be 85 per cent. of the rate prescribed for fat sheep and cattle since in the case of stock cattle the carrier will get a second haul. Through routes were established from points on the Arizona Eastern, via the Southern Pacific, to Los Angeles and California feed lots. (26 I. C. C., 37.)

Rates on Manganese Ore Increased.

In re import rate on manganese ore. Opinion by the commission:

The cancellation of a tariff provision by the Central of New Jersey providing for application of the import rate on ground

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manganese ore, ground at Elizabethport, N. J., was suspended. The commission found that the tariff provision in question enabled the complainant to deliver manganese ore to western markets at a considerably lower rate than its competitors, which were compelled to pay the regular rate. The commission therefore decided that the tariff provision was discriminatory in favor of the complainant and directed that the order of suspension be vacated. (25 I. C. C., 663.)

Rates on Porch Work Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of porch work from Beaumont and East Beaumont, Tex., to various interstate points. Opinion by Commissioner Meyer:

The commission suspended the tariffs of the defendant which proposed to cancel joint rates on porch work from Beaumont and East Beaumont, Tex., to various points east of the Mississippi river and to substitute combination rates which are from 8 to 12 cents higher than the present rates. At the hearing no one appeared for the complainant. The main argument for the defense was that the Texas & New Orleans did not receive a fair division of the present through rate. The witness for the defendant said that the rates on porch work should be at least three cents higher per 100 lbs. than the rates on lumber. The commission found that porch work took an arbitrary of three cents per 100 lbs. over lumber from producing points in several other states. The present rates on porch work from Beaumont and East Beaumont are only one cent per 100 lbs. lower than the rates on lumber from those points. The commission decided that the proposed advances are unreasonable, but that the defendants should establish from Beaumont and East Beaumont to eastern destinations to which joint rates on porch work now apply, joint rates which are not more than three cents per 100 lbs. higher than the current rates on lumber between those points. (26 I. C. C., 1.)

News Print Paper Rates Reduced.

In re investigation and suspension of advances in rates by carriers for the transportation of news print paper from Sault Ste. Marie, Ontario, to various points in the United States. Opinion by Commissioner Meyer.

The tariffs under suspension name rates on news print paper in carloads from Sault Ste. Marie, Ont., to points on the Missouri river and in central freight association territory. With two exceptions, the proposed rates are reductions under the current rates. The advances are only 1¼ cents and the reductions range from 1 to 13 cents. The complainant seeks to have the commission, in this proceeding, not only find that the proposed rates are unreasonable, but also to order the defendants to establish rates lower than those now proposed. The main argument of the complainants was based on a comparison with rates in other districts. The commission found that the complainant failed to show that the rates assailed were unreasonable or unjustly discriminatory; and that the defendants had justified the propriety of the rates proposed by them.

The formation of Sault Ste. Marie, Ontario, Sault Ste. Marie, Petoskey, and Cheboygan, Mich., into a single group for rate-making purposes, similar to groups established elsewhere, will largely obviate the difficulties and the seeming inconsistencies dwelt upon by the complainant with respect to the rates on news print paper from such points. (26 I. C. C., 13.)

Rates on Hay Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of hay in carloads from points in Wisconsin to Chicago, Ill., and between other points. Opinion by Commissioner McChord.

The increases in the proposed rates on hay from points in the Northwest to Chicago range from 1½ cents to 5½ cents per 100 lbs. and average about two cents per 100 lbs. Under Western classification hay takes the class C rate, but to Chicago and other terminal markets commodity rates lower than class C have generally obtained. The advances in question bring the rate up to the class C basis in most instances. The commission found that it would have to determine upon the reasonableness of the proposed rate without reference to the classification. The defendant argued that one of the chief reasons for raising the rates on hay was the excessive terminal charges incident to delays in unloading hay. The commission decided that as some consignees were more delinquent than others, these terminal charges should not be included in the rate. It was shown that the proposed rates would yield more per car revenue than the rates on the same commodity in other districts. The commission found that the proposed rates were not unreasonable and they will be permitted to become effective. It was also contended by the complainant that the proposed rates were discriminatory, but as no evidence was introduced in support of this allegation, the commission made no decision in regard to it. (25 I. C. C., 680.)

Rates on Drain Tile and Sewer Pipe.

In re investigation and suspension of advances in rates by carriers for the transportation of drain tile and other articles from points in Central freight association territory to various destinations. Opinion by Commissioner Clements:

By the suspended tariffs the carriers proposed to advance their rates on drain tile and sewer pipe about 20 per cent. The purpose of this advance is to simplify the tariff by making one rate on all tile not classed as sewer pipe. The complainant contends that the cheaper grade of tile should continue to enjoy its lower rate as at present. The commission found that the proposed advances on drain tile were excessive and ordered the defendant to cancel them. The commission intimated that although the present advances are unreasonable, smaller advances might be permitted if it could be shown that they would simplify the tariff and also be reasonable.

In regard to sewer pipe, the testimony was with particular reference to the rate from Mecca, Ind., to Chicago, Ill., which the carriers proposed to advance from 6 to 8 cents per 100 lbs. The complainant contended that the rate of 12 cents per 100 lbs. from Akron, Ohio, to Chicago was not advanced, therefore it would not be fair to advance the rate from Mecca. The rate from Akron is on the basis of sixth class, and the proposed increased rate from Mecca is one cent less than sixth class. The commission found that the proposed increases in rates on sewer pipe were reasonable and as far as they are concerned the order of suspension will be vacated. (26 I. C. C., 88.)

STATE COMMISSIONS.

The Railroad Commission of Indiana has issued a code of rules, regulations and charges for the storage of freight, to go into effect February 15.

The Public Service Commission of Ohio has issued a code of demurrage regulations for freight cars and has directed all of the roads in the state to put them in force on April 1, next.

The Nevada railway commission has ordered the Southern Pacific to reduce its present local one-way passenger fares between all points on its standard gage main and branch lines in the state from 4 and 5 cents a mile to 3 cents a mile. The chairman of the commission dissented from the majority, stating that while he is favorable to the reduction on the main line, he is opposed to any reduction on the branches.

The New Mexico corporation commission has filed with the Interstate Commerce Commission a complaint attacking all the interstate rates from the Missouri river and Pacific coast points to New Mexico as unreasonable and discriminatory as compared with the rates to Texas and other points. The commission requests that hearings be held before the entire membership of the Interstate Commerce Commission.

The governor of New York has appointed Edward E. McCall, hitherto a justice of the Supreme Court, to the position of chairman of the Public Service Commission, First district (New York City), in place of William R. Wilcox, whose term has expired. Political influences and the interests of the democratic party seem to have been the controlling factors in this appointment. The governor on the same day, February 3, appointed Devoe P. Hodsen, of Buffalo, to succeed John B. Olmsted, as a member of the Public Service Commission for the Second district.

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1912.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Operating expenses—Maintenance—Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Denver & Rio Grande	2,560a	$1,782,886	$443,059	$2,322,695	$239,231	$370,000	$45,437	$730,368	$54,374	$1,439,410	$883,285	—$4,620	$93,750	$784,912	$282,026
Oahu Railway and Land Co	101b	47,049	21,931	73,657	11,004	5,743	650	18,840	2,820	39,057	34,600	—7,702	6,500	20,398	1,652
Pere Marquette	2,330c	1,126,974	303,523	1,548,917	210,797	347,811	33,748	659,581	34,009	1,385,946	162,971	—2,240	56,933	103,798	—197,080
FIVE MONTHS OF FISCAL YEAR, 1913.															
Denver & Rio Grande	2,560a	$8,413,622	$2,598,974	$11,522,007	$1,631,150	$1,920,551	$246,511	$3,537,815	$288,980	$7,625,007	$3,897,000	$21,718	$368,750	$3,529,968	$693,356
Oahu Railway and Land Co	101b	362,521	110,803	506,073	45,719	30,847	2,631	103,371	20,230	202,788	303,285	—14,571	32,500	256,214	53,488
Pere Marquette	2,330c	5,038,155	1,994,491	7,683,203	1,142,903	1,401,791	174,657	3,040,825	182,486	5,848,862	1,834,341	24,011	285,084	1,573,868	—184,299
MONTH OF DECEMBER, 1912.															
Alabama & Vicksburg	141	$109,193	$51,494	$171,485	$22,978	$25,854	$3,757	$59,722	$5,671	$117,982	$53,503	$25	$6,737	$46,791	$7,437
Atchison, Topeka & Santa Fe	8,202d	5,637,552	2,291,158	8,607,535	1,415,626	1,418,039	185,147	2,328,738	163,735	5,711,275	2,896,260	.....	355,011	2,541,249	356,452
Atlanta & West Point	93	55,144	44,147	110,990	10,943	15,059	5,190	15,093	5,478	74,271	36,719	720	8,010	28,709	—1,073
Atlantic Coast Line	4,612e	2,360,026	884,467	3,512,375	393,955	446,547	53,225	1,109,506	79,317	2,082,550	1,429,825	.....	125,000	1,304,825	72,467
Baltimore & Ohio—System	4,453f	6,308,113	1,290,574	8,303,097	947,218	1,481,189	154,734	3,233,326	162,151	5,978,618	2,324,479	—98,997	238,137	1,987,345	163,634
Bangor & Aroostonic	631g	204,195	50,448	269,100	38,827	34,784	2,415	80,579	15,048	171,653	97,447	.....	10,500	86,947	17,221
Bessemer & Lake Erie	204	409,603	25,995	449,035	82,933	114,005	9,701	149,050	10,244	400,790	47,335	.....	15,000	32,335	3,212
Buffalo, Rochester & Pittsburgh	574h	696,041	94,166	816,563	83,221	168,188	11,826	300,001	19,400	582,636	233,927	—279	17,000	216,648	—14,759
Carolina, Clinchfield & Ohio	238	120,046	15,292	189,076	11,973	17,700	6,362	35,427	7,561	79,025	110,051	.....	8,000	102,051	16,615
Carolina, Clinch. & Ohio Ry. Co. et S. C.	18	15,003	2,080	17,330	731	80	1,031	2,552	458	4,852	12,478	.....	500	11,978	6,166
Central of New Jersey	660i	1,713,340	408,537	2,238,875	189,101	334,076	27,928	718,592	47,909	1,317,606	921,269	—17,483	84,466	819,320	—11,400
Central New England	277	259,645	27,406	303,050	35,848	30,819	1,052	71,827	3,884	143,430	159,620	—56	10,000	149,564	13,229
Chesapeake & Ohio Lines	2,134f	2,321,710	496,723	2,976,993	291,761	484,925	59,867	989,084	67,681	2,093,940	884,153	13,346	102,155	795,344	—160,819
Chicago & Alton	1,026	810,026	363,218	1,261,566	229,619	365,410	45,438	517,983	33,285	1,191,735	69,831	—2,428	39,700	29,703	—170,418
Chicago & Northwestern	7,976j	4,345,245	1,714,698	6,748,996	737,262	978,261	111,398	2,691,894	128,372	4,647,187	2,101,809	—2,339	303,000	1,796,470	626,251
Chicago, Burlington & Quincy	9,129k	5,553,960	1,846,460	8,128,415	645,395	1,380,394	130,685	2,733,898	200,379	5,090,751	3,037,664	—13,715	274,587	2,749,362	459,003
Chicago Great Western	1,406	842,096	263,007	1,192,351	114,948	110,108	14,853	485,536	17,237	845,682	346,633	—60	41,000	305,533	61,680
Chicago, Indianapolis & Louisville	617	400,519	138,184	592,912	71,923	82,171	19,948	227,148	17,521	418,711	174,201	.....	22,640	151,561	70,979
Chicago Junction	22	.....	.....	169,714	15,083	21,241	1,119	81,402	3,438	156,207	55,452	320	.....	55,112	12,795
Chicago, Milwaukee & Puget Sound	2,081m	1,618,018	273,216	1,951,920	133,825	236,197	44,045	628,966	27,830	1,070,863	881,057	11,099	75,000	817,156	353,581
Chicago, Milwaukee & St. Paul	7,511	4,456,117	1,312,251	6,361,374	568,255	963,240	127,668	2,601,942	86,451	4,346,556	2,014,818	6,195	254,360	1,766,553	319,081
Chicago, Rock Island & Gulf	477	224,680	69,384	311,274	26,874	23,454	9,070	117,865	8,467	185,730	125,544	—253	5,581	119,210	51,875
Chicago, Rock Island & Pacific	7,366n	3,744,973	1,717,263	5,803,345	804,794	834,653	161,379	2,418,299	129,243	4,358,368	1,444,977	—18,196	248,413	1,178,428	20,214
Chicago, St. Paul, Minneapolis & Omaha	1,744	872,899	435,281	1,412,322	108,776	184,668	33,838	597,928	30,196	955,406	456,916	—1,657	70,857	384,402	9,163
Cincinnati, Hamilton & Dayton	1,015	647,211	131,061	860,399	86,378	149,536	21,227	404,590	20,568	682,299	178,190	.....	39,113	139,077	—5,882
Cumberland Valley	162	219,299	55,021	278,602	54,115	38,980	4,134	106,739	12,430	216,398	62,204	53	8,969	53,288	—7,132
Delaware, Lackawanna & Western	959	2,536,821	673,337	3,458,977	262,800	520,011	74,163	1,112,964	72,697	2,055,635	1,383,342	68,061	.....	1,451,403	142,715
Detroit & Mackinac	413o	59,231	29,689	96,726	11,767	15,967	2,118	35,325	2,878	68,055	28,671	—61	8,916	19,694	6,194
Duluth & Iron Range	274p	80,457	25,027	114,749	32,616	24,196	768	72,843	29,490	160,913	—46,164	—2,060	13,267	—61,491	—38,440
Duluth, Missabe & Northern	356q	84,005	47,675	136,857	72,579	67,654	2,357	80,577	26,134	249,301	—112,444	—5,527	9,909	—127,880	—78,436
El Paso & Southwestern Co	968r	640,975	109,610	776,953	83,930	90,794	14,019	214,087	28,579	431,409	345,543	—3,998	43,215	298,330	49,790
Elgin, Joliet & Eastern	80.2s	1,036,072	11	1,111,871	121,317	170,575	5,531	341,420	32,936	671,779	446,092	.....	29,335	416,757	164,268
Florida East Coast	645t	174,022	148,496	423,349	58,452	55,845	15,728	140,940	11,382	282,347	141,002	—1,454	15,500	124,048	17,114
Fort Worth & Denver City	454	344,834	156,679	524,356	62,138	85,618	6,498	164,614	16,073	334,941	189,415	—727	11,700	176,988	31,907
Grand Trunk	4,777u	4,819,806	1,263,552	6,548,454	643,667	1,290,307	160,723	1,794,093	112,337	3,446,327	3,100,127	4,366	286,833	2,777,660	748,187
Gulf & Ship Island	308	116,466	38,653	166,849	21,583	27,998	2,083	44,462	8,214	104,340	62,509	.....	9,019	53,490	—3,750
Illinois Central	4,763	3,752,987	1,238,358	5,658,190	586,077	1,035,575	117,809	2,224,971	121,449	4,085,881	1,572,309	—8,833	237,750	1,325,727	708,233
International & Great Northern	1,159	690,039	232,245	982,660	147,282	134,725	23,768	446,432	32,445	774,652	208,008	—1,941	30,000	176,067	—186,502
Lake Erie & Western	566	423,271	157,092	630,439	79,742	99,366	11,105	218,236	17,646	426,227	112,212	—1,773	20,548	91,664	3,518
Lake Shore & Michigan Southern	1,873w	3,387,545	1,030,443	5,019,375	467,105	911,793	79,499	1,739,973	83,694	3,282,064	1,737,311	—4,897	201,099	1,531,316	559,225
Lehigh & Hudson River	92	145,394	3,668	157,242	11,743	24,017	1,553	61,992	5,617	104,922	52,320	.....	4,000	48,320	4,798
Lehigh Valley	1,145x	2,948,472	393,786	3,461,356	494,824	558,678	73,585	1,247,908	94,746	2,446,845	1,000,510	—18,933	117,500	864,077	90,222
Long Island	399	270,270	477,568	793,223	111,745	93,936	16,307	406,704	29,017	654,629	138,593	53,326	62,124	129,795	33,946
Louisville & Nashville	4,723z	3,570,903	1,142,838	5,054,306	821,898	921,172	101,697	1,688,335	124,060	3,667,162	1,387,144	—441	159,242	1,227,461	—95,382
Louisville, Henderson & St. Louis	200	65,015	30,805	102,877	23,665	11,283	3,727	41,103	3,845	83,623	19,254	—445	3,000	16,699	—1,092
Maine Central	1,264aa	559,296	252,592	868,499	108,736	126,039	8,011	352,130	28,166	623,082	245,417	—22,354	42,900	180,163	—9,353
Michigan Central	1,817ab	1,999,728	726,335	3,050,834	295,884	458,846	75,187	1,266,767	73,343	2,170,027	880,807	3,688	100,985	783,510	210,728
Midland Valley	373	78,046	46,425	130,694	31,660	21,491	3,009	42,882	6,010	104,972	25,722	278	8,473	17,527	—18,798

Average mileage operated during previous period—a 2,556; b 90; c 2,331; d 7,613; e 4,524; f 4,434; g 628; h 572; i 672; j 2,242; k 7,860; l 9,074; m 2,059; n 7,551; o 358; p 263; q 342; r 902; s 842; t 583; u 7,345; v 1,776; w 1,434; x 4,705; y 1,180; z 4,805. —Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1912—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Maintenance		Operating expenses				Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Minneapolis & St. Louis	1,586	$630,695	$157,652	$840,781	$114,537	$96,697	$18,552	$384,477	$21,840	$588,103	$252,178	—$27	$32,236	$219,915	$98,753
Missouri Pacific	3,319[a]	1,747,099	442,669	2,373,474	282,232	407,633	63,359	1,033,030	65,492	1,872,876	500,598	—2,567	98,190	399,841	257,272
Monongahela	65	137,065	2,748	141,780	11,033	6,881	257	27,908	2,044	48,123	93,657	.....	3,043	90,614	31,277
Nevada Northern	165	119,753	17,466	141,281	12,705	16,013	610	31,819	3,226	63,173	78,108	.....	5,960	72,148	25,946
New Orleans & North Eastern	196	212,587	59,444	294,987	28,321	58,464	10,014	118,900	13,237	228,936	66,051	201	13,832	52,420	—34,716
New Orleans, Mobile & Chicago	347[b]	195,581	34,557	241,300	30,306	21,159	3,190	82,747	9,953	147,355	93,945	33	4,161	89,817	22,982
New York Central & Hudson River	3,597[m]	5,746,048	2,688,348	9,481,298	1,025,577	1,717,119	196,997	3,713,137	223,053	6,153,066	3,328,232	2,536,015	61,517	730,700	488,972
New York, New Haven & Hartford	2,091	2,822,638	2,193,046	5,581,601	673,724	779,935	30,184	2,446,190	123,453	4,153,066	1,428,535	137,633	320,000	1,246,168	—529,563
New York, Philadelphia & Norfolk	112	319,756	45,274	388,236	19,586	49,934	4,616	129,956	13,655	217,747	70,489	.....	8,900	61,589	9,841
Norfolk & Western	2,219[m]	3,027,357	457,476	3,566,309	360,267	611,833	56,122	1,004,086	64,785	2,197,614	1,368,878	—1,380	120,000	1,247,948	81,901
Norfolk Southern	562	178,366	80,474	282,118	34,821	35,808	4,081	89,992	15,878	180,580	101,533	—603	7,510	93,420	1,060
Northern Central	472[m]	873,456	192,647	1,139,280	70,679	211,367	14,835	547,286	30,700	874,867	264,413	368	9,504	255,277	138,149
Northern Pacific	6,241[m]	4,663,590	1,289,135	6,355,776	513,676	709,020	102,181	2,083,459	85,841	3,493,177	2,862,599	51,610	340,550	2,574,659	503,278
Pennsylvania Co.	1,751[m]	3,988,070	834,446	5,300,813	820,267	1,330,946	80,504	1,976,069	103,180	4,119,066	1,181,747	—4,558	284,925	892,264	188,528
Pennsylvania Railroad	4,015[m]	10,970,055	2,972,315	14,993,391	2,019,063	3,409,161	215,269	5,665,818	382,698	11,692,009	3,301,382	—137,643	750,130	2,413,609	—320,178
Philadelphia, Baltimore & Washington	713	776,849	702,038	1,664,946	227,875	316,091	30,505	734,029	51,208	1,409,708	255,238	.....	60,984	194,254	—42,690
Pittsburgh, Cincinnati, Chic. & St. Louis	1,467	2,709,817	764,609	3,882,287	574,490	779,544	64,910	1,467,557	57,511	2,972,011	910,436	.....	9924	141,652	767,820
Pittsburgh, Shawmut & Northern	279[m]	262,799	9,831	275,853	22,197	36,135	1,159	58,285	3,566	121,342	54,511	.....	1,595	52,916	12,381
Richmond, Fredericksburg & Potomac	88[m]	137,347	83,639	250,925	17,660	23,840	3,332	92,100	6,927	142,909	107,016	—687	805	105,524	22,783
St. Louis & San Francisco	4,742[m]	3,235,471	1,015,407	3,840,971	448,899	79,500	1,240,271		100,386	2,414,422	1,426,549	.....	172,432	1,259,937	243,966
St. Louis, Iron Mountain & Southern	2,318[m]	2,187,973	639,131	3,004,396	499,777	401,031	57,120	941,768	65,862	1,965,558	1,038,838	—3,752	88,695	946,391	43,565
St. Louis Merchants' Bridge Terminal	9	.....	334	195,202	30,622	12,979	586	97,857	5,264	147,308	47,894	.....	5,150	62,744	39,333
St. Louis, San Francisco & Texas	316	158,106	32,868	147,044	22,044	15,158	2,346	59,108	6,256	104,912	42,975	.....	4,796	38,179	8,630
Seaboard	3,070[m]	1,467,338	492,447	2,165,596	285,904	288,512	65,638	769,458	62,908	1,472,420	693,176	—3,090	81,000	609,086	67,665
Southern	7,036[m]	3,972,207	1,757,015	6,223,385	758,817	938,941	169,371	2,060,318	185,295	4,112,742	2,110,643	5,037	227,263	1,888,417	107,223
Terminal R. R. Ass'n of St. Louis	34[m]	.....	278	259,659	38,958	22,542	905	99,475	5,563	167,448	92,211	7,772	21,988	77,995	32,481
Union Pacific	3,527[m]	3,080,693	894,870	4,251,319	440,859	545,622	83,596	1,251,150	110,181	2,406,326	1,969,193	—4,252	211,398	1,753,135	429,439
Union R. R. of Baltimore	9	133,340	21,841	157,006	7,628	.....	884	5,486	2,788	16,786	140,220	.....	7,616	132,604	40,162
Union R. R. of Pennsylvania	31	.....	.....	125,503	13,366	89,066	100	11,096	1,355	125,083	2,420	.....	6,000	1,964	18,577
Vicksburg, Shreveport & Pacific	171	85,253	59,411	158,313	26,269	22,738	3,259	49,723	5,123	107,110	51,203	—176	4,335	46,692	8,678
Virginian	503[m]	412,640	29,839	456,195	56,879	85,394	4,916	121,448	8,769	277,406	178,789	6,333	17,600	167,522	43,507
Washington Southern	36	42,174	40,653	113,492	10,582	13,243	1,358	44,357	2,956	72,496	41,001	—1,410	4,041	35,550	4,218
West Jersey & Seashore	356	183,204	202,446	426,161	29,174	29,942	23,022	205,432	14,828	350,603	12,178	—669	8,014	3,495	—14,708
Western Ry. of Alabama	133	64,252	53,602	127,277	16,125	19,336	6,292	32,998	6,695	81,446	46,331	26	5,184	41,173	650

SIX MONTHS OF FISCAL YEAR, 1913.

Alabama & Vicksburg	143	$616,034	$265,176	$942,763	$135,369	$158,417	$21,913	$321,419	$34,140	$671,258	$271,505	—$1,032	$37,861	$232,612	$35,420
Atchison, Topeka & Santa Fe	8,202[l]	34,206,595	12,914,245	50,899,616	8,432,827	8,422,357	1,002,864	14,182,231	978,576	33,030,405	17,879,211	.....	2,030,754	15,840,457	1,850,270
Atlanta & West Point	93	522,084	259,742	842,778	111,555	31,766	295,784	30,559	459,982	182,796	776	38,064	145,508	—23,014	
Atlantic Coast Line	4,612[l]	11,447,554	4,277,170	16,978,452	2,409,631	2,725,893	294,568	6,054,418	452,248	11,936,758	5,041,694	.....	750,000	4,291,694	—367,216
Baltimore & Ohio—System	4,459[l]	21,017,583	4,940,714	25,440,437	3,750,617	3,995,153	971,716	10,195,814	992,809	20,425,109	16,024,228	—452,481	1,185,387	14,386,360	
Bangor & Aroostook	631[l]	1,139,014	364,626	1,596,751	286,285	186,283	21,287	477,734	73,222	1,043,811	552,940	.....	63,000	489,940	—61,294
Bessemer & Lake Erie	204	4,753,346	210,400	5,030,864	500,137	801,228	52,730	1,149,976	71,138	2,580,209	2,450,655	.....	66,000	2,384,655	117,430
Buffalo, Rochester & Pittsburgh	574[l]	4,811,332	600,021	5,655,599	853,153	1,109,546	70,807	1,773,461	111,203	3,918,565	1,737,034	—4,298	102,000	1,633,736	138,540
Carolina, Clinchfield & Ohio	298	1,109,060	90,154	1,232,482	144,898	124,504	40,351	210,013	42,902	458,907	773,576	.....	48,000	685,576	161,843
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	66,404	10,625	78,448	4,467	546	6,194	14,709	2,418	28,334	50,114	.....	3,000	47,114	13,942
Central of New Jersey	669[l]	11,130,321	2,992,396	14,915,071	1,260,871	2,042,764	189,157	4,337,230	255,373	8,085,895	6,829,176	66,334	690,702	6,204,808	693,865
Central New England	272	1,630,674	776,861	2,520,421	272,889	313,525	7,453	444,060	19,149	1,057,076	1,463,345	-12	60,000	918,334	134,838
Chesapeake & Ohio Lines	2,324[l]	13,924,854	3,165,275	17,964,632	2,151,974	3,738,690	332,453	5,439,925	395,267	12,063,309	5,901,323	31,312	612,930	5,319,705	—200,401
Chicago & Alton	1,026	5,343,578	1,286,211	8,204,883	1,195,658	1,784,977	252,275	2,839,529	193,518	6,270,960	1,933,924	14,064	229,700	1,690,160	—193,609
Chicago & Northwestern	7,769[l]	25,712,503	11,191,727	43,454,869	5,855,869	7,045,527	643,527	13,788,710	824,125	28,525,134	14,660,244	15,993	1,815,000	12,861,237	2,097,979
Chicago, Burlington & Quincy	9,129[l]	34,261,337	12,109,961	50,713,686	5,452,485	8,061,261	807,541	15,064,633	1,286,422	30,672,342	20,041,344	—61,584	1,662,192	18,317,568	3,215,131
Chicago Great Western	1,496	5,017,688	1,719,855	7,280,788	876,893	990,648	275,962	2,754,515	206,856	5,104,874	2,175,914	—287	210,582	1,965,045	246,174
Chicago, Indianapolis & Louisville	617	2,436,375	908,245	3,666,189	511,391	458,565	110,407	1,322,644	92,400	2,495,407	1,170,782	.....	138,873	1,031,909	78,714
Chicago Junction	12	.....	.....	1,016,806	117,403	69,012	7,243	463,582	21,690	678,930	337,876	.....	9,377	328,499	51,099
Chicago, Milwaukee & Puget Sound	2,081[l]	9,424,070	1,699,007	11,498,592	941,399	1,230,021	284,080	3,389,736	139,108	5,984,344	5,514,248	85,364	450,000	5,149,612	1,886,149
Chicago, Milwaukee & St. Paul	7,511	26,903,520	8,566,024	39,004,166	4,730,194	5,266,772	705,436	14,132,361	459,136	25,293,899	13,710,267	63,118	1,432,773	12,340,612	4,418,585
Chicago, Rock Island & Pacific	427	1,299,997	365,085	1,770,900	212,971	164,410	60,720	581,181	47,902	1,047,066	723,924	—3,813	41,136	678,975	48,088
Chicago, Rock Island & Pacific	7,566[l]	23,881,550	10,449,367	36,450,934	5,486,031	4,995,749	939,327	13,785,710	828,106	26,034,923	10,416,011	—92,668	1,435,459	8,887,884	1,239,091

Average mileage operated during previous period—[a] 3,915; [b] 404; [l] 3,591; [m] 2,005; [n] 473; [o] 6,019; [p] 1,416; [q] 3,981; [r] 240; [s] 83; [t] 4,732; [u] 3,314; [v] 3,054; [w] 7,089; [x] 35; [y] 3,537; [z] 475; [1] 7,613; [2] 4,524; [3] 4,434; [4] 628; [5] 372; [6] 2,242; [7] 7,860; [8] 9,074; [9] 2,039; [10] 7,551. — Indicates Deficits. Losses and Decreases.

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REVENUES AND EXPENSES OF RAILWAYS.

SIX MONTHS OF FISCAL YEAR, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total. Inc. misc.	Maintenance—Way and structures.	Maintenance—Of equipment.	Operating expenses—Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Chicago, St. Paul, Minneapolis & Omaha	1,744	$5,828,104	$2,740,697	$9,163,495	$1,271,480	$1,118,516	$175,328	$3,417,282	$190,835	$6,173,441	$2,990,054	$2,919	$422,428	$2,570,545	$289,928
Cincinnati, Hamilton & Dayton	1,015	4,109,941	899,060	5,279,335	620,130	916,747	121,364	2,202,737	116,420	3,977,398	1,601,937	.....	216,090	1,385,847	61,715
Cumberland Valley	162	1,296,912	381,123	1,757,056	320,924	207,467	27,034	555,117	49,939	1,160,481	596,575	1,237	37,027	561,285	85,888
Delaware, Lackawanna & Western	989	15,534,493	4,317,271	21,246,299	2,585,426	3,056,004	450,222	6,304,630	389,757	12,736,075	8,510,224	349,610	758,345	8,101,494	1,272,640
Detroit & Mackinac	411[12]	398,538	191,082	634,086	100,580	82,617	13,410	219,653	17,646	433,906	200,180	1,959	52,968	149,171	22,673
Duluth & Iron Range	274[13]	4,351,944	128,680	4,536,786	429,397	361,672	6,157	911,474	82,135	1,842,835	2,693,951	23,981	218,745	2,499,187	—7,780
Duluth, Missabe & Northern	356[14]	5,016,915	237,284	5,304,869	496,272	409,915	12,332	955,072	83,418	2,040,009	3,255,860	28,947	252,206	3,024,601	529,468
El Paso & Southwestern Co	968[15]	351,184	513,454	1,220,916	427,452	546,672	27,571	1,095,292	153,409	2,300,396	1,920,520	—12,806	175,606	1,732,108	476,718
Elgin, Joliet & Eastern	802[16]	6,140,491	39	6,647,238	700,272	977,488	28,784	1,744,612	113,216	3,563,372	3,084,366	.....	137,800	2,947,366	1,021,674
Florida East Coast	644[17]	1,032,188	627,702	1,899,750	390,027	317,106	84,952	477,149	67,136	1,552,840	346,696	—6,983	93,000	246,713	57,264
Fort Worth & Denver City	454	1,906,444	885,622	2,924,599	253,951	465,038	43,809	903,279	87,802	1,753,879	1,170,720	—2,964	70,200	1,097,556	43,422
Great Northern	7,774[18]	33,179,393	8,250,037	44,110,728	5,670,991	4,661,338	597,178	10,941,667	645,203	22,518,377	21,592,351	138,227	2,005,173	19,725,455	2,746,294
Gulf & Ship Island	308	715,217	179,542	1,007,413	145,853	184,119	16,016	352,135	50,223	668,936	338,475	.....	34,321	304,154	39,171
Illinois Central	4,763	21,808,136	7,184,640	33,185,040	4,619,097	7,094,930	697,956	12,513,485	762,742	25,697,210	7,487,830	—61,078	1,426,580	6,000,252	1,487,276
International & Great Northern	1,159	4,671,428	1,432,262	6,466,505	814,902	789,694	153,371	2,435,968	194,308	4,388,243	2,078,262	—12,764	180,000	1,885,498	.....
Lake Erie & Western	886	2,521,946	491,004	3,186,070	450,401	553,948	73,744	1,157,293	67,731	2,283,207	902,863	.....	123,131	779,732	117,279
Lake Shore & Michigan Southern	1,857[19]	19,455,480	6,592,710	29,237,697	3,543,389	4,306,280	499,879	8,911,967	471,301	18,232,126	11,005,571	112,799	931,098	10,187,072	794,765
Lehigh & Hudson River	97	866,240	26,635	919,128	130,201	131,244	7,885	317,565	26,185	613,080	306,048	.....	24,000	282,048	16,526
Lehigh Valley	1,458[20]	19,127,315	2,672,562	22,547,279	3,110,918	3,589,863	484,914	6,960,408	414,587	14,360,680	7,981,999	—68,912	705,000	7,208,067	1,121,512
Long Island	399	1,851,709	4,115,748	6,268,359	780,621	776,454	95,244	2,521,604	136,852	4,172,915	2,084,674	398,836	344,374	2,149,136	281,747
Louisville & Nashville	4,723[21]	21,407,935	6,646,180	29,936,315	4,859,571	5,653,469	623,082	9,561,388	658,828	21,356,338	8,569,977	—12,876	925,450	7,631,651	—713,819
Louisville, Henderson & St. Louis	200	390,124	202,045	637,872	172,433	82,773	26,325	233,441	18,961	533,083	103,889	1,707	18,000	87,596	—68,353
Maine Central	1,204[22]	3,360,217	2,020,083	5,912,810	1,019,658	723,874	96,450	2,092,916	148,462	4,106,360	1,806,458	—13,107	257,345	1,536,006	20,231
Michigan Central	1,817[23]	11,217,229	4,660,381	17,674,360	2,087,622	2,471,721	397,246	6,713,091	392,260	11,976,940	5,697,420	26,667	670,985	5,053,102	10,875
Midland Valley	373	529,492	256,964	827,177	201,392	125,008	15,782	257,185	33,734	633,101	194,076	1,957	35,182	160,221	—6,687
Minneapolis & St. Louis	1,586	3,843,115	1,021,196	5,151,037	672,342	635,587	105,138	1,935,881	126,390	3,475,538	1,675,489	—189	185,761	1,489,539	564,181
Minneapolis & St. Louis	1,319[24]	1,384,163	276,927	1,740,002	242,153	249,892	34,357	696,017	49,882	1,197,902	542,100	—17,049	56,400	485,700	1,821,702
Moonogahela	65	793,288	14,920	818,307	100,657	55,922	2,032	155,205	11,932	325,798	492,509	.....	14,044	478,465	168,165
Nevada Northern	165	672,992	96,539	791,876	92,571	86,880	7,484	164,153	29,755	367,043	424,833	.....	36,706	388,127	66,249
New Orleans & North Eastern	196	1,353,963	330,757	1,818,230	195,654	357,032	59,339	714,109	73,260	1,399,394	418,836	446	77,332	341,950	—146,683
New Orleans, Mobile & Chicago	547[25]	1,016,707	190,804	1,280,775	196,382	124,721	19,983	434,994	47,115	823,195	457,580	—357	24,936	432,287	94,678
New York Central & Hudson River	3,592[26]	34,662,429	18,063,284	58,740,933	7,914,913	10,633,812	1,137,970	20,328,544	1,356,610	41,371,846	17,369,087	269,215	2,995,635	14,642,667	594,467
New York, New Haven & Hartford	2,001	17,726,781	14,243,183	34,179,171	4,240,642	5,180,363	1,023,294	13,228,472	919,927	25,592,697	8,586,474	764,199	1,961,000	12,256,708	1,003,032
New York, Philadelphia & Norfolk	112	1,450,135	275,035	1,870,046	149,643	320,894	25,044	783,670	76,383	1,355,634	514,412	.....	47,400	467,012	28,518
Norfolk & Western	2,019[27]	18,879,737	2,556,748	23,138,936	2,912,723	3,979,397	332,182	6,344,876	406,264	3,975,442	8,163,494	—17,418	720,000	7,426,076	1,949,439
Norfolk Southern	562	1,035,409	432,942	1,616,302	189,592	217,872	28,871	500,746	82,791	1,024,866	591,436	—8,852	45,059	538,025	21,273
Northern Central	372[28]	3,109,732	1,290,143	4,841,113	749,008	1,049,687	96,711	1,141,277	158,432	3,195,115	1,440,961	4,877	245,000	1,199,040	246,427
Northern Pacific	6,241[29]	28,742,233	8,649,849	39,731,237	5,095,396	4,300,503	612,638	11,942,929	593,547	22,460,013	17,261,724	258,881	1,899,717	15,620,888	1,945,413
Pennsylvania Co.	1,251[30]	26,240,813	5,216,329	35,450,720	3,393,864	6,082,209	1,141,417	11,592,141	584,774	24,894,705	11,355,998	—18,913	1,473,035	9,864,050	1,867,483
Pennsylvania *Railroad*	4,025[31]	67,212,649	19,267,716	92,577,483	11,640,938	19,260,937	1,167,833	31,935,647	2,097,273	66,103,628	26,474,855	—442,746	3,776,436	22,250,673	1,913,328
Philadelphia, Baltimore & Washington	713	5,429,330	4,297,506	10,777,445	1,727,585	1,834,310	165,418	4,326,831	267,287	8,321,431	2,456,014	.....	335,588	2,120,426	—188,681
Pittsburgh, Cincinnati, Chic. & St. Louis	1,467	16,573,602	4,394,865	23,345,702	3,554,258	4,268,792	423,374	8,041,722	422,385	16,710,531	6,635,171	—4,680	852,145	5,778,346	516,751
Pittsburgh, Shawmut & Northern	279	860,851	59,952	937,184	125,856	203,643	7,041	286,365	.....	647,990	289,194	.....	9,600	279,594	52,023
Richmond, Fredericksburg & Potomac	88[32]	720,271	458,387	1,350,573	156,514	162,561	17,631	289,295	40,559	666,560	484,013	—687	4,467	478,859	74,756
St. Louis & San Francisco	4,276	15,307,396	5,911,712	22,722,205	2,967,597	2,891,990	482,412	5,911,690	611,201	14,220,000	7,990,200	.....	1,026,663	6,963,359	1,597,009
St. Louis, Iron Mountain & Southern	3,318[33]	13,019,243	3,421,593	17,680,644	3,227,422	2,625,716	322,748	5,422,811	410,922	12,009,439	5,671,005	—27,263	542,670	5,101,072	824,745
St. Louis Merchants' Bridge Terminal	9	.....	2,170	1,091,777	376,519	46,079	3,948	528,665	38,185	792,396	299,381	.....	35,651	263,730	148,712
St. Louis, San Francisco & Texas	244	578,123	198,500	822,472	144,471	92,951	15,172	315,400	22,615	605,609	216,863	.....	5,988	210,875	27,295
Seaboard	3,070[34]	12,910,572	4,252,541	18,345,269	1,642,092	1,610,556	156,331	3,389,494	351,451	6,549,923	3,247,384	—15,934	486,000	2,775,450	1,103,303
Southern	7,036[35]	22,849,155	9,699,490	35,250,019	4,519,869	5,730,422	991,940	11,495,028	997,545	23,734,904	11,515,115	24,272	1,238,973	10,300,414	513,109
Terminal R. R. Ass'n of St. Louis	34[36]	.....	1,702	1,551,360	233,732	95,685	5,476	551,944	42,521	928,558	622,802	66,651	165,489	523,964	156,678
Union Pacific	8,151[37]	20,455,762	8,252,541	28,629,184	2,870,046	3,100,364	517,005	7,193,948	649,393	14,379,844	14,249,340	—5,783	1,117,778	13,125,671	1,020,633
Union R. R. of Baltimore	9	718,066	139,142	867,028	60,198	.....	4,808	31,596	16,326	112,858	754,200	.....	33,841	720,359	100,691
Union R. R. of Pennsylvania	31	.....	.....	2,530,205	174,067	509,001	704	859,536	76,396	1,569,704	961,001	14,200	34,750	940,951	99,532
Vicksburg, Shreveport & Pacific	171	517,747	286,195	873,288	178,173	146,810	19,456	257,995	30,324	632,768	241,026	—2,954	33,834	204,238	38,974
Virginian	503[38]	2,441,593	160,876	2,677,106	357,315	511,565	32,051	649,909	52,468	1,603,308	1,073,798	37,397	105,580	1,005,695	124,446
Washington Southern	36	229,234	224,241	613,841	79,873	71,052	7,703	236,224	16,959	411,311	202,530	—1,409	20,774	180,347	11,698
West Jersey & Seashore	356	963,550	2,474,760	3,794,420	468,297	534,088	96,033	1,373,153	78,316	2,551,898	1,152,522	—20,317	120,580	1,011,605	238,128
Western Ry. of Alabama	133	363,809	289,113	708,260	115,218	127,030	34,513	196,257	34,109	507,125	201,133	68	28,775	172,428	—18,105

Average mileage operated during previous period: [12] 358; [13] 263; [14] 342; [15] 902; [16] 842; [17] 583; [18] 7,345; [19] 1,776; [20] 1,434; [21] 4,705; [22] 1,180; [23] 1,805; [24] 3,915; [25] 404; [26] 3,591; [27] 2,005; [28] 473; [29] 6,019; [30] 1,416; [31] 3,981; [32] 240; [33] 3,472; [34] 3,314; [35] 7,089; [36] 35; [37] 8,337; [38] 475. —Indicates Deficits. Losses and Decreases.

Railway Officers.

Executive, Financial and Legal Officers.

George O. Lilley has been elected treasurer of the Louisiana Railway & Navigation Company, with headquarters at Shreveport, La.

Charles H. Morey, vice-president of the Manistee & Grand Rapids at Manistee, Mich., has been appointed receiver of that company.

R. Lancaster Williams, of Middendorf, Williams & Company, has been elected president of the Georgia & Florida, succeeding his brother John Skelton Williams, of Richmond, Va.

W. M. Baugh has been appointed auditor of the Liberty-White in charge of accounting and freight claim departments, with office at McComb City, Miss., succeeding L. B. Sedgwick, resigned.

F. P. Johnson, auditor of disbursements of the Missouri Pacific and the St. Louis, Iron Mountain & Southern at St. Louis, Mo., has been appointed assistant general auditor, and T. M. Niven succeeds Mr. Johnson.

W. E. Higgins, assistant to general manager of the Lackawanna & Wyoming Valley, at Scranton, Pa., has been appointed acting vice-president and general manager, succeeding Charles F. Conn, vice-president and general manager, resigned to accept service elsewhere.

The following appointments went into effect January 31 on the Southern Pacific: A. D. McDonald, auditor, with headquarters at San Francisco, Cal., was appointed deputy comptroller, succeeding C. B. Seger, resigned; and T. O. Edwards succeeds Mr. McDonald. Hugh Neill was appointed clerk and secretary, succeeding Alex. Millar, resigned. The resignation of William Rockefeller as director and member of the executive committee was accepted, but his place on the Board was not filled. A. D. McDonald, T. O. Edwards and Hugh Neill have been appointed to the same positions on the Southern Pacific of Mexico, as they will hold on the Southern Pacific.

W. H. Penfield, assistant chief engineer of the Chicago, Milwaukee & St. Paul, at Chicago, has been appointed assistant to Vice-President David L. Bush, at Chicago. Mr. Penfield was born in 1874 at Foxburg, Pa., and began railway work in a surveying party on the Buffalo, Rochester & Pittsburgh, in Clearfield County, Penn., and was later resident engineer of the same road to 1899. From August, 1899, to March, 1902, he was resident engineer and locating engineer on the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, and from March, 1902, to December, 1905, he was locating engineer on the Western Pacific in California. From December, 1905, to June, 1911, he was an engineer engaged in the construction of the Puget Sound extension of the Chicago, Milwaukee & St. Paul, with headquarters at Butte, Mont., and in June, 1911, was made assistant chief engineer of the Chicago, Milwaukee & St. Paul, with office at Chicago, which position he held at the time of his appointment on February 1, as assistant to vice-president of the same road as above noted.

Operating Officers.

C. Ludolph, purchasing agent of the Texas & Pacific, has been appointed assistant to the general superintendent with headquarters at Dallas, Tex.

C. B. Carpenter, chief clerk to the assistant general manager of the Denver & Rio Grande, has been appointed inspector of transportation, with headquarters at Denver, Colo., effective February 1.

H. J. Mickssch has been appointed assistant superintendent of the Texas & New Orleans and the Galveston, Harrisburg & San Antonio, with headquarters at Jacksonville, Tex., in place of A. L. Kuykendall, resigned.

J. McCraw has been appointed acting superintendent of the Southern division of the Central Vermont, with office at New London, Conn., succeeding W. E. Costello, superintendent at New London, who has resigned.

W. E. Costello has been appointed superintendent of the First division of the Houston & Texas Central, with headquarters at Ennis, Tex., to succeed D. S. Gallagher, who has been granted indefinite leave of absence on account of ill health.

N. W. Jones, trainmaster of the Philadelphia & Reading at Tamaqua, Pa., has been appointed inspector of transportation of the Philadelphia & Reading and subsidiary companies, reporting to the vice-president and general manager, at Reading.

C. S. Wilkins, trainmaster of the Coal & Coke at Gassaway, W. Va., has been promoted to superintendent, succeeding to the duties of J. A. Emmart, assistant general manager at Gassaway, who has resigned to go into other business, and his former position has been abolished. J. W. Morrow, chief train despatcher, succeeds Mr. Wilkins, and J. C. Kinton succeeds Mr. Morrow.

R. M. Johnson has been appointed inspector of transportation of the Western Maryland, with headquarters at Baltimore, Md. H. W. Shank, trainmaster of the Third district, West Virginia division, has been transferred to Cumberland as trainmaster in charge of terminal operation. J. W. Griffey, trainmaster at Elkins, W. Va., of the Second district, West Virginia division, has been transferred to the Third district, succeeding Mr. Shank, and W. D. Peddicord, chief clerk to the superintendent at Cumberland, has been promoted to trainmaster, with headquarters at Elkins, succeeding Mr. Griffey.

H. E. Whittenberger, whose appointment as general superintendent of the Grand Trunk, with headquarters at Toronto, Ont., has been announced in these columns, was born on November 9, 1864, at Peru, Ind., and was educated in the common schools. He began railway work in 1885, with the Wabash as a brakeman and was later conductor in both freight and passenger service until February, 1898, when he went to the Grand Trunk as trainmaster at Stratford, Ont., and later was transferred to London. From May 15, 1902, to October, 1904, he was superintendent of the Denver & Rio Grande at Alamosa, Colo., and at Pueblo. He went to the Cincinnati, Hamilton & Dayton in November, 1904, as superintendent at Indianapolis, Ind., remaining in that position until his appointment on January 1, 1906, as superintendent of the Kansas City Southern, at Pittsburg, Kan. In October, 1907, he returned to the service of the Grand Trunk as superintendent, which position he held at the time of his recent appointment as general superintendent of the Ontario lines of the same road, as above noted.

H. E. Whittenberger.

P. C. Hart, general superintendent of the Chicago, Milwaukee & Puget Sound at Seattle, Wash., has been appointed general manager of the Chicago, Milwaukee & St. Paul lines East of the Missouri river, with headquarters at Chicago. J. T. Gillick, superintendent at Aberdeen, S. D., has been appointed assistant to general manager, with office at Chicago. G. E. Simpson, superintendent of transportation, has been appointed general supervisor of transportation, and C. L. Whipple, heretofore assistant superintendent of transportation, has been appointed superintendent of transportation, both with offices at Chicago, effective February 1.

C. G. Bowker, whose appointment as general superintendent of the Eastern lines of the Grand Trunk, with headquarters at Montreal, Que., has been announced in these columns, was born on April 21, 1871, at Medford, N. J., and was educated in the public schools of Philadelphia, Pa. He began railway work in May, 1888, with the Philadelphia & Reading as a telegraph operator and was subsequently agent and division operator on that road. From 1892 to 1900 he was first a telegraph operator and then train despatcher on the Lehigh Valley, and since that time has

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held the positions of train despatcher, chief despatcher, trainmaster, assistant superintendent and superintendent on the Grand Trunk.

Frank E. Clarity, whose appointment as superintendent of transportation of the Denver & Rio Grande, has already been announced in these columns, was born September 10, 1877, at Sauk Centre, Minn. He was educated in the common schools of Minnesota and began railway work in September, 1894, as a car checker for the Great Northern at Superior, Wis. He remained with that road for eight years, filling various positions in the local freight office including that of local car accountant. He was then for two years car distributer for the Lake district and from November, 1904, to August, 1907, was assistant chief clerk and chief clerk to the general superintendent of transportation with headquarters at St. Paul, Minn. He was made traveling car agent on the latter date and in April, 1911, became chief clerk to the general superintendent of the Western district, with office at Seattle, Wash. He went to the Denver & Rio Grande in March, 1912, as inspector of transportation, which position he held until January 1 this year, when he was promoted to superintendent of transportation, with headquarters at Denver, Colo.

F. E. Clarity.

T. Cushing has been appointed trainmaster of the Third district of the Grand Trunk, with headquarters at Richmond, Que., succeeding R. P. Smallhorn, assigned to other duties; S. L. Trusler, passenger trainmaster at Toronto, has been appointed passenger trainmaster of the Ontario lines, with headquarters at Toronto; W. J. Piggott, trainmaster at Allandale, has been appointed trainmaster of the 11th and 14th districts, including Allandale yard, and W. J. Little, passenger trainmaster at Allandale, has been appointed trainmaster of the 12th district, both with offices at Allandale. The position of passenger trainmaster, Northern division, has been abolished. W. J. Hogan, master of transportation at Durand, Mich., has been appointed trainmaster of the P. O. & N. Railway and district 29 (exclusive of Detroit and Port Huron terminals), with headquarters at Pontiac, and H. W. Matthews, trainmaster at Battle Creek, has been appointed passenger trainmaster of the Western lines, including districts 25, 26, 27, 28, 29 and P. O. & N. Railway, with headquarters at Durand.

Benjamin McKeen, who recently became general manager of the Pennsylvania Lines West of Pittsburgh, with office at Pittsburgh, Pa., was born at Terre Haute, Ind., on January 23, 1864. He attended Worcester Polytechnic at Worcester, Mass., during 1881 and 1882, and was graduated from Rose Polytechnic Institute in 1885 as a mechanical engineer. He began railway work in September, 1885, as a draftsman in the office of superintendent of motive power and machinery of the Terre Haute & Indianapolis, now a part of the Vandalia Railroad, at Terre Haute. He held various minor positions in the motive power and engineering departments until January 1, 1887, when he was appointed engineer maintenance of way of the Terre Haute & Logansport, now also a part of the Vandalia Railroad. On August 1, 1892, he was transferred to the Peoria division in a similar capacity, and was promoted to superintendent of that division January 5, 1894. He was made superintendent of the main line division in June, 1901, and on April 1, 1902, became superintendent of the Chicago Terminal division of the Pennsylvania Lines West of Pittsburgh, with office at Chicago. In December of the following year he returned to the Vandalia as general manager, with headquarters at St. Louis, Mo., which position he held until his recent appointment as general manager of the Pennsylvania Lines West, as above noted.

H. F. Coyle, assistant superintendent of the Grand Trunk, Eastern lines at Bellevue, Ont., has been appointed superintendent of the Belleville division (districts 5, 6, 7, 8, 9 and 10) with headquarters at Belleville; J. J. Connolly, assistant superintendent at Montreal, Que., has been appointed superintendent of the Montreal division (districts 1, 2, 3 and 4) with headquarters at Montreal; R. W. Scott has been appointed superintendent of Montreal terminals, with headquarters at Montreal; L. Harold, assistant trainmaster at Hamilton, Ont., has been appointed superintendent of transportation of the Eastern lines, with headquarters at Moontyn; C. S. Cunningham, superintendent Western lines at Detroit, Mich., having resigned, J. Caldwell has been appointed superintendent of the Detroit division; including Durand terminals, districts 27, 28, 29 and P., O. & N. Railway, with headquarters at Detroit; J. Ehrke, assistant superintendent at Battle Creek, has been appointed superintendent of the Chicago division, including districts 25 and 26, with headquarters at Battle Creek; O. F. Clark, trainmaster at Pontiac, has been appointed superintendent of transportation of Western lines, including districts 25, 26, 27, 28, 29 and P., O. & N. Railway, with direct supervision over all matters pertaining to transportation, and the office of master of transportation has been abolished.

E. W. Batchelder, whose appointment as assistant general manager of the Erie lines west of Buffalo, N. Y., and Salamanca, with headquarters at Cleveland, Ohio, has been announced in these columns, began railway work in 1870 as a telegraph operator on the La Crosse division of the Chicago, Milwaukee & St. Paul and from 1873 to 1879 was chief train despatcher of the Chicago division of the same road. He went to the Wabash in 1880 as train despatcher at Springfield, Ill., and later in the same year returned to the service of the Chicago, Milwaukee & St. Paul as chief despatcher and was then assistant superintendent on the River division. He left that company in 1889 to become chief clerk to the general superintendent of the Great Northern at St. Paul, Minn., and was later appointed assistant superintendent of the Fergus Falls division at St. Cloud, and then until 1895, was superintendent of the Montana division at Havre, Mont. He was out of railway work from 1895 until he went to the Erie, in June, 1903. The following December he was appointed superintendent of the Meadville division, and in November, 1912, was made assistant general superintendent at Marion, Ohio, which position he held at the time of his recent appointment as assistant general manager of the same road as above noted.

E. W. Batchelder.

Traffic Officers.

T. M. True has been appointed general freight and passenger agent of the Apalachicola Northern, with office at Port St. Joe, Fla., succeeding J. H. Hodges, resigned.

J. I. Campbell has been appointed commercial agent of the Chicago, Milwaukee & St. Paul, with office at St. Louis, Mo., succeeding H. G. Selby, resigned to accept service with another company.

C. N. McNulty, who recently resigned as soliciting freight agent of the Georgia, Southern & Florida, has been appointed freight soliciting agent of the Southern, with office at New York.

T. L. Jennings has been appointed commercial agent of the Chesapeake & Ohio and the Chesapeake & Ohio of Indiana, with office at Birmingham, Ala., succeeding F. W. Miller, commercial agent at Atlanta, Ga., resigned.

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J. P. Rochelle has been appointed traveling freight agent of the Missouri, Oklahoma & Gulf, with headquarters at Dallas, Tex., in place of F. S. Sleight, who has been transferred to Houston, Tex., as commercial agent.

I. W. Dudley has been appointed commercial agent of the Toledo, St. Louis & Western, with headquarters at Seattle, Wash. J. H. Hogg has been appointed live stock agent, with headquarters at East St. Louis, Ill., in place of E. McGraw, resigned.

R. M. Case, chief clerk in the passenger department of the Lake Shore & Michigan Southern, has been appointed assistant general passenger agent of the Lake Shore & Michigan Southern and the Dunkirk, Allegheny Valley & Pittsburgh, with headquarters at Cleveland, Ohio.

The headquarters of A. N. Brown, general traffic manager of the El Paso & Southwestern System and the Morenci Southern Railway, have been transferred from Chicago to El Paso, Tex. The Chicago office will be continued with G. W. Feakins in charge as assistant to general traffic manager.

R. M. Brander has been appointed division freight agent of the Virginia general division of the Chesapeake & Ohio, with office at Richmond, Va., succeeding A. S. Cary, resigned, and C. C. Dearhart, Jr., has been appointed traveling freight agent of the Virginia general division, reporting to Mr. Brander.

George W. Vaux, Canadian passenger agent of the Union Pacific at Toronto, Ont., and formerly general passenger agent of the Grand Trunk, has been appointed general agent of the passenger department of the former road, with headquarters at Chicago. L. F. Barron, local freight agent of the Illinois Central, has been appointed general agent of the freight department of the Union Pacific, with office at Chicago.

In consequence of the recent order of the Supreme Court the Southern Pacific announces that effective February 1 all joint agencies in connection with the Union Pacific will be abolished. The following will represent the Southern Pacific exclusively: R. S. Stubbs, general eastern freight agent, New York; L. H. Nutting, general eastern passenger agent, New York; J. H. Glynn, New England agent; W. B. Johnson, district freight and passenger agent, Baltimore, Md.; F. T. Brooks, district freight and passenger agent, Buffalo, N. Y.; R. J. Smith, district freight and passenger agent, Philadelphia, Pa.; G. G. Herring, general agent, Pittsburgh, Pa.; O. P. Bartlett, general agent, Atlanta, Ga., and Birmingham, Ala.; C. M. Evans, general agent, Cincinnati, Ohio; George B. Hild, general agent, St. Louis, Mo.; E. A. Macon, general agent, Detroit, Mich.; A. G. Little, general agent, Kansas City, Mo.; William K. McAllister, general agent, Denver, Colo.; W. G. Neimyer, general agent, Chicago. On the Pacific coast and in Salt Lake City, Utah, there will be no changes in the representatives.

Engineering and Rolling Stock Officers.

C. T. McElvany has resigned as master mechanic of the Missouri, Kansas & Texas of Texas, at Dennison, Tex.

N. L. Smithan has been appointed assistant superintendent of motive power of the Missouri, Kansas & Texas of Texas, with office at Dennison, Tex.

R. Q. Prendergast has been appointed master mechanic of the Cincinnati, Hamilton & Dayton, with headquarters at Indianapolis, Ind., succeeding W. G. Rose, resigned.

H. E. Holt, division engineer of the Chicago, Milwaukee & St. Paul, at Spokane, Wash., has been appointed assistant chief engineer, with headquarters at Chicago, succeeding W. H. Penfield.

H. D. Jackson has been appointed general master mechanic of the Alabama, Tennessee & Northern and the Tombigbee Valley, with headquarters at Panola, Ala. He is also in charge of the shop at Calvert, Ala.

F. L. C. Bond, resident engineer of the Grand Trunk, at Montreal, Que., has been appointed division engineer of the Eastern lines, with headquarters at Montreal; G. Beckingham, general roadmaster at Montreal, has been appointed superintendent of track, with headquarters at Montreal; J. H. Johnston, resident engineer at Montreal, has been appointed superintendent of bridges and buildings, with headquarters at Montreal; C. S. Ogilvie has been appointed assistant engineer of the Belleville division, with headquarters at Belleville, Ont.; H. Ferguson, general roadmaster at Toronto, has been appointed superintendent of track, Ontario lines; G. A. Mitchell, resident engineer at Toronto, has been appointed superintendent of bridges and buildings, and E. G. Hewson, resident engineer at Toronto, has been appointed division engineer, all with headquarters at Toronto, Ont. The offices of general roadmaster, master of bridges and buildings and resident engineer have been abolished.

M. A. Long, architect of the Baltimore & Ohio, at Baltimore, Md., has been appointed assistant to chief engineer of the Baltimore & Ohio-Cincinnati, Hamilton & Dayton System, with headquarters at Baltimore. Mr. Long was born on October 25, 1875, near Middletown, Ohio, and received his education in the public schools at Dayton, Ohio, and at Middletown, later taking a course in architecture and railroad engineering at the Scranton Schools. He entered the service of the Baltimore & Ohio on June 5, 1899, as architect and assistant on engineering corps, and was promoted to architect on that road in 1904, which position he held at the time of his present appointment as assistant to chief engineer, as above noted. He is a member of the American Society of Civil Engineers, the American Institute of Architecture, and is vice-chairman of the building committee of the American Railway Engineering Association.

M. A. Long.

Purchasing Officers.

H. W. Morris has been appointed purchasing agent of the Wabash Pittsburgh Terminal and the West Side Belt Railroad Company, with headquarters at Rook, Pa.

The office of purchasing agent of the Texas & Pacific, heretofore held by C. Ludolph, has been abolished, and hereafter matters pertaining to the purchasing department will be handled through Vice-President Freeman's office at New Orleans, La.

F. W. Mahl, assistant to director of maintenance and operation of the Southern Pacific, has been appointed director of purchases, succeeding W. V. S. Thorne, resigned. Effective January 31. Mr. Mahl has been appointed to the same position also on the Southern Pacific of Mexico.

OBITUARY.

William R. Jones, formerly assistant superintendent of the Utica & Black River, now a part of the New York Central & Hudson River, died at Carthage, N. Y., on February 4, at the age of 69.

J. T. Mason Barnes, who died on January 28, at his home in Baltimore, Md., was secretary and treasurer of the Western Maryland from 1896 to 1902, and then was assistant secretary and treasurer. On October 16, 1912, he was retired on an annuity.

E. H. B. Cull, division freight agent of the Wabash, with headquarters at Detroit, Mich., died in that city on January 31, aged 49 years. Mr. Cull had been connected with the Wabash at Detroit for 30 years, having been made division freight agent five years ago.

Stephen S. Palmer, president of the St. Louis & Hannibal, the Green Bay & Western, the Ahnapee & Western, the Kewaunee, Green Bay & Western and the Iola & Northern railways, also a director in various banking, gas, electric, insurance and manufacturing companies, with headquarters at New York, died on January 28, at Redlands, Cal., at the age of 60.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE PENNSYLVANIA RAILROAD has ordered 80 freight locomotives from the company's shops.

THE NORFOLK & WESTERN has ordered 40 Mallet locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 22 in. & 35 in. by 32 in. cylinders, 56 in. driving wheels and in working order will weigh 405,000 lbs.

THE SAN ANTONIO, UVALDE & GULF has ordered one consolidation locomotive from the American Locomotive Company. The dimension of the cylinders will be 20 in. by 24 in.; the diameter of the driving wheels will be 54 in., and the total weight in working order will be 144,000 lbs.

CAR BUILDING.

THE BALTIMORE & OHIO has ordered 8 postal cars from the Pullman Company.

THE DONORA SOUTHERN has ordered 50 coal cars from the Standard Steel Car Company.

THE ARMS PALACE HORSE CAR COMPANY will build 12 cars in its own shops, the underframes and trucks to be furnished by the Bettendorf Axle Company.

THE NATIONAL RAILWAYS OF CENTRAL AMERICA, owned by the United Fruit Company, New York, have ordered 20 freight cars from the Ralston Steel Car Company.

THE NEWBURGH & SOUTH SHORE has ordered 125 self-clearing ore cars from the Pressed Steel Car Company, and 50 general service cars from the Ralston Steel Car Company.

THE NORFOLK & WESTERN has ordered 1,000 gondola cars and 250 hopper cars from the American Car & Foundry Company, and 1,000 box cars from the Pressed Steel Car Company.

THE LOUISVILLE & NASHVILLE, mentioned in the *Railway Age Gazette* of January 31, as being in the market for 500 gondola cars, has ordered that equipment from the Mt. Vernon Car & Manufacturing Company.

THE CHICAGO, ROCK ISLAND & PACIFIC has ordered twenty 70-ft. coaches, eighteen 70-ft. chair cars, seven 60-ft. smoking cars, five 60-ft. three-compartment cars, and ten 60-ft. baggage cars from the Pullman Company; all of all-steel construction.

THE DULUTH & IRON RANGE, mentioned in the *Railway Age Gazette* of January 24, as having ordered 800 ore cars from the Standard Steel Car Company, ordered those cars from the Summers Steel Car Company. They will be built by the Standard Steel Car Company.

IRON AND STEEL.

THE WESTERN MARYLAND has ordered 8,400 tons of rails from the Carnegie Steel Company.

THE GREAT NORTHERN has ordered 20,000 tons of rails, divided equally between the Cambria Steel Company, the Bethlehem Steel Company, the Pennsylvania Steel Company, and the Lackawanna Steel Company.

SIGNALING.

The Railroad Commission of Indiana has ordered the Pere Marquette to install automatic block signals between Porter and the Michigan state line, 22 miles, by October 1, next. The same body has ordered the Pittsburgh, Cincinnati, Chicago & St. Louis to install automatic block signals between Richmond and Indianapolis, on 37 miles, and to take similar action in the case of all sections of the line where a single track is converted into double track.

Supply Trade News.

The Paxton-Mitchell Company has received orders for its metallic packing for the piston rods and valve stems on the 246 locomotives recently ordered by the Harriman Lines.

M. J. Madison, formerly assistant superintendent of the Morden Frog & Crossing Company, at Chicago, has been appointed superintendent of the plant of The Weir Frog Company at Cincinnati, Ohio.

The Milwaukee and West Allis properties of the Allis-Chalmers Company were sold by Commissioner Hazelton on February 3, to J. H. McClement of New York, chairman of the reorganization committee, for $2,250,000.

The Orenstein-Arthur Koppel Company, Pittsburgh, Pa., will move its general offices to Koppel, Pa., where its plant is now located. A two-story office building, 100 ft. x 160 ft., is now under construction at Koppel.

Frank N. Grigg, eastern representative of the Adams & Westlake Company, Chicago, for the past ten years, has resigned to become district manager of the Standard Heat & Ventilation Company, Inc., New York, with office at Washington, D. C.

Jordan D. Williams, Indianapolis, Ind., manufacturer and contractor for mastic rock asphalt floors, has received a contract from the Cleveland, Cincinnati, Chicago & St. Louis for about 30,000 sq. ft. of 1½ in. mastic rock floor for a freight house driveway.

S. P. McGough has been appointed general manager of the North American Railway Construction Company, engineers and contractors, with offices at Monadnock block, Chicago. A. S. Littlefield is president of the company; Emmet M. Fry, vice-president, and H. H. McDonald, secretary and treasurer.

A new company, under the name of Littlefield, Fry & McGough, has been incorporated with offices in the Monadnock block, Chicago, to make electric welded joints, as licensees of the Lorain Steel Company. The officers are Emmet M. Fry, president and general manager; S. P. McGough, vice-president, and Arthur S. Littlefield, secretary and treasurer.

M. E. Keig, who has been connected with the Atchison, Topeka & Santa Fe for several years, for the last five years in the purchasing department at Chicago, has accepted a position as secretary-treasurer of Harry Vissering & Co., with offices in the Great Northern building Chicago. Mr. Keig will also represent the Charles R. Long, Jr., Co., of Louisville, Ky.

The Isthmian Canal Commission will receive bids until April 1, 1913, for the purchase of supplies no longer needed. These supplies include steam shovels and parts; locomotives, dump and flat cars and parts; cranes, spreaders and parts; unloaders and parts; ballast plows; rock drills; concrete mixers and parts; injectors and parts; oil cups, lubricators and lubricator parts, etc. Circular No. 758.

W. W. Lavarack has resigned his position as chief engineer of the Federal Signal Company, Albany, N. Y., to become general manager of the American Railway Signal Company, Cleveland, Ohio. Mr. Lavarack, after a number of years experience in the signal field with railroads and manufacturers in England, came to the United States in 1896 and entered the service of the Standard Railroad Signal Company, since which time he has been connected with the Pneumatic Signal Company and the Federal Signal Company, as mentioned above.

O. C. Mann, manager of the Mann-McCann Company, Chicago, writes to the *Railway Age Gazette* as follows:

"I note that the Isthmian Canal Commission is beginning to offer for sale the 21 Mann-McCann and Mann earth spreaders that we built for them and a lot of extras for the same. I think that it is no more than right that the bidders on this equipment should fully understand that these machines were built special, and that their extreme clearance will not allow them to be shipped or used on any railroad on this continent, and that the extras were designed for these particular machines and cannot be used on any other spreader."

The sales of the Western Electric Company, Chicago, during the year 1912 will be between 71 and 72 millions, which is slightly

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more than in 1906, the previous largest year in the company's business. The increase has been in American sales outside of the Bell system, which have increased about 100 per cent. over 1906, and in European sales, which were the largest in the company's history. The results have been accomplished in the face of increased and increasing competition. The company is now selling to upwards of 30,000 customers in the United States alone. It is expected that the profits will be satisfactory considering the wider distribution and increased competition. The board of directors has established two additional vice-presidents in the company's organization, and has appointed to these newly-created positions Gerard Swope, general sales manager, and A. L. Salt, general purchasing agent.

John Hoffhine, for nine years assistant chemist of the Union Pacific at Omaha, has accepted an appointment with the American Brake Shoe & Foundry Company, with headquarters at 30 Church street, New York, effective on February 1. Mr. Hoffhine was born in Ohio 31 years ago. Immediately upon graduation from the Ohio State University in 1904 he entered the testing department of the Union Pacific at Omaha, where he soon advanced to the position of assistant chemist, with complete charge of the chemical and physical testing laboratories. He conducted exhaustive tests and analyses of the steel rails of the associated lines, and under the direction of W. R. McKeen, Jr., former superintendent of motive power and machinery, Mr. Hoffhine had charge of the material testing and research work in connection with the Harriman Lines standardization of passenger cars, freight cars and locomotives.

The Burden Sales Company, with general offices at 30 Church street, New York, and branch offices in Chicago, Atlanta, Ga., and St. Paul, Minn., has been organized by Gilbert H. Pearsall, president; H. H. Linton, vice-president; and Craig Graves, secretary and treasurer, to handle with the exception of horseshoes all the products of the Burden Iron Company, of Troy, N. Y., including Burden staybolt iron, Burden engine bolt iron, Burden rivets, etc. In connection with the general offices of the Burden Sales Company will be the eastern sales office of the Jacobs-Shupert United States Firebox Company, Coatesville, Pa., and the Oxweld Railroad Service Company, Chicago. Mr. Pearsall is also vice-president of the two latter companies, as was mentioned in the *Railway Age Gazette* of July 5, 1912, page 35, and August 30, 1912, page 407, respectively. He has recently resigned his position as secretary and manager of sales for Joseph T. Ryerson & Son, Chicago, with office in New York, as mentioned in last week's issue.

Samuel Thomas Park, heretofore superintendent of motive power of the Chicago & Eastern Illinois, at Danville, Ill., has been elected president of the Monarch Pneumatic Tool Company, with headquarters at St. Louis, Mo., succeeding William Miller, who has been made vice-president of the Pyle-National Electric Headlight Company, as previously noted in these columns. Mr. Park was born March 31, 1868, and was educated at Elizabethtown College, Elizabethtown, Ky. He entered railway service in 1883, as clerk to the master mechanic of the Louisville & Nashville at East Nashville, Tenn., and laid the foundation of his career in the mechanical department of that road. From 1893 to 1900 he was a division foreman on the Louisville, New Albany & Chicago, and its successor, the Chicago, Indianapolis & Louisville, and was then for two years division master mechanic of the Santa Fe Pacific at Winslow, Ariz.; for one year division master mechanic of the Southern California at San Bernardino, Cal., and for two years master mechanic on the Illinois Central and Chicago & Eastern Illinois roads at Centralia and at Danville, Ill. On March 10, 1905, he was appointed acting superintendent of motive power of the latter road, and on June 8, 1905, was appointed superintendent of motive power, which position he held until he resigned, effective February 1, to become connected with the Monarch Pneumatic Tool Company.

District Judge Hazel, in the United States district court, for the Southern district of New York, on January 27, handed down a decision in favor of the Union Tank Line in the litigation against the American Car & Foundry Company under the "Center Anchor" patent taken out by John W. Van Dyke. In accordance with this invention the middle of the tank of a tank car is secured to the underframe by rivets and the ends are held down between laterally retaining devices by means which allow the tank to expand longitudinally. The decision was in part as follows: "A reasonable construction of the claims will not permit restricting them merely to a tank body or plates riveted permanently to the underframe. . . . It is a fundamental rule that to constitute infringement it is unnecessary to use the entire device, and that if parts thereof are used in substantially the same way and in a similar contrivance it is infringement." The judge then found that the defendant had appropriated Van Dyke's method of center anchoring by riveting the casing to the shell, and though the method used differed slightly from that of the complainant, such difference was negligible, as the same result was achieved. It was also shown that the defendant's car is allowed free longitudinal expansion, thereby obtaining the precise results described in the claims in controversy. The judge decided that all the claims of the complainant were valid and were infringed by the defendant.

TRADE PUBLICATIONS.

Chicago & North Western.—The passenger department has issued an attractive booklet devoted to the outdoor winter sports at Lake Geneva, Wis.

Pneumatic Tools.—The Chicago Pneumatic Tool Company has issued bulletin No. 124, describing its pneumatic riveting, chipping, calking and stone hammers.

Electric Lighting.—The General Electric Company, Schenectady, N. Y., has issued an attractive illustrated booklet on G. E. Edison "Mazda" lamps for standard lighting service.

Pneumatic Hammers.—The Chicago Pneumatic Tool Company, Chicago, has devoted bulletin No. 124 to its pneumatic riveting, clipping, calking and stone hammers. In addition to descriptions this bulletin includes illustrations, diagrams and complete dimension tables.

Titanium Alloy.—The Titanium Alloy Manufacturing Company, Niagara Falls, N. Y., has published in a small folder specifications to govern the addition of Ferro Carbon-Titanium in the manufacture of both open hearth and Bessemer rails.

Boilers.—The Wm. H. Wood Locomotive Firebox & Tube Plate Company, Media, Pa., has published in a small pamphlet a very favorable report by John W. Harkom, a competent mechanical engineer, on three Wood boilers which had been in service for three years. The pamphlet includes also a study by the same author of the results of tests of Wood boilers by the New York Central & Hudson River.

Denver & Rio Grande.—A comprehensive review of the agricultural, mining, industrial and commercial conditions of Colorado, Utah and New Mexico, is contained in the annual review number of the Railroad Red Book just issued by the passenger department. The book contains a large number of contributed articles on the progress made during 1912 in irrigation, agriculture, mining and manufacture.

Wood Preserving.—The Barry Hardwood Creosoting Company, Kansas City, Mo., has issued an illustrated booklet containing a prospectus of the Barry hardwood creosoting process, which it is claimed will successfully treat hardwood with a preservative that will penetrate the center of the timber within eight or nine hours time. The appliance, while designed particularly for treating hardwood, can be converted by turning a valve for use with a softwood process.

Railway Service in the Balkan War.—According to a recent report from Beirut, the railway systems of the Hedsha Railway and of the French Company have been of the greatest possible assistance to the Turks in their military operations. But for these railways the Turkish authorities could not have got their troops together in so short a time and transported the reserves to the front. The military importance of the Baghdad and Anatolian railways has also been established for the first time. The latter railway was at once placed at the disposal of the military authorities, all passenger and freight traffic being stopped two days. On the other railways the ordinary traffic was not disturbed to any great extent.

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Railway Construction.

BOSTON & MAINE.—The Hampden Railroad, 15 miles long, between Springfield, Mass., and Bondville, which is to make a connection for the Boston & Maine by which it will have a route from Boston to Springfield parallel to the Boston & Albany and about the same length as the B. & A., is to be finished, according to announcements of the company, by the first of May. The Boston & Maine is to put in stronger bridges in place of those on the Central Massachusetts division so as to permit the running of heavier locomotives through from Boston to Springfield.

CANADA & GULF TERMINAL.—An officer writes, regarding the report that work is now under way on the extension from Matane, Que., east to Gaspe Basin, about 160 miles, that the surveys are all completed. It has not yet been decided when the work will be carried out. (April 19, p. 940.)

CANADIAN PACIFIC.—Sir Thomas G. Shaughnessy, president of this company, is quoted as saying that the new work on the western division for the present year includes the finishing up of some 300 miles of new line and building 500 miles additional. The plans include also the building of a tunnel five miles long in the Selkirk mountains.

EL PASO & SOUTHWESTERN.—An officer writes that there is no truth in the report that an extension is to be built south of Nacozari, Mexico, on the Nacozari Railroad. Surveys are only being made for the elimination of a few sharp curves on the present line.

HAMPDEN RAILROAD.—See Boston & Maine.

KENTUCKY SOUTHWESTERN ELECTRIC RAILWAY LIGHT & POWER COMPANY.—An officer writes that the company expects to begin work on a section of this line early this spring. The plans call for building from Henderson, Ky., southwest via Paducah, Mayfield and Murray to Hickman, in all about 210 miles. The work on the first section of 57 miles will be easy, and includes about 889,140 cu. yds. excavation work, and 135,550 cu. yds. of embankment. The maximum grades will not exceed 1 per cent., and the maximum curvature 8 deg. There will be one steel bridge 600 ft. long, a 4,662-ft. trestle, also 11 small stations and 3 sub-stations. H. C. Rhodes, president, and W. A. Calhoun, chief engineer, Paducah. (January 31, p. 230.)

MOBILE & EASTERN SHORE.—Under this name a company is being organized in Alabama, to build from Montrose Park, Ala., south to a point below Point Clear, about 30 miles. J. K. Glennon & Company, Mobile may be addressed.

MONONGAHELA VALLEY TRACTION.—An officer writes regarding the building of extensions to Salem, W. Va., to Lumberport and to Annabell, that surveys have been made for the first two lines and that they will be built, if the company is able to secure the right of way. Bids for grading will probably be asked for about April 1. The lines are to be laid with 80-lb. rails and bracket overhead construction will be used. J. O. Watson, general manager, Fairmont, W. Va.

NORTHERN PACIFIC.—According to press reports work has been started on an extension of the Clark's Fork branch from Bridger, Mont., south to Chance, about 20 miles.

ORANGE & NORTHEASTERN.—According to press reports a contract has been given M. Tansey for grading work on a section from Vinton, La., north. The company was organized last year in Texas, with headquarters at Orange, to build from White City, San Augustine county, Tex., east to a point on the Sabine river; also to build a 14-mile line from Orange, Tex., to Nibletts Bluff, La., in all 126 miles. E. Kennedy, president; H. White, assistant general manager, Orange. (September 6, p. 453.)

PENNSYLVANIA RAILROAD.—An officer writes that contracts have been let for piercing the three tunnels on the Allegheny division as follows: For the tunnel at East Brady, Pa., to be 2,660 ft. long, and for the tunnel at Wood Hill to be 2,870 ft. long, to Arthur McMullen, New York; for the third tunnel at Kennerdell, to be 3,350 ft. long, to the John A. Kelly Company, Philadelphia, Pa. (January 31, p. 331.)

QUANAH, ACME & PACIFIC.—Announcement has been made that this company which is building an extension from Paducah, Texas, west to Roaring Springs in Motley county, about 40 miles, will start work on the extension projected for some time across the Panhandle of Texas and through eastern New Mexico to Roswell, 300 miles, as soon as the line is finished to Roaring Springs. It is said that three routes are under consideration, one via Plainview, another via Lubbock and the third via Tahoka. The Q., A. & P. is being constructed largely by St. Louis capital. Sam Lazarus of St. Louis, Mo., is president and R. D. Yoakum, also of St. Louis, is third vice president of the road. (November 15, p. 973.)

WASHINGTON ELECTRIC.—According to press reports three important links in a chain of electric railways that will eventually connect Portland, Ore., with the principal cities on Puget Sound will be built this year at a cost of $2,000,000. A $10,000,000 mortgage has been filed in the state of Washington by the company to secure a 25-year 6 per cent bond issue, of which $2,000,000 will be issued for immediate development. The plans call for building lines as follows: From a connection with the line from Vancouver, Wash., at a point near Orchards, Wash., north to the Lewis river, 20 miles; from the present southern terminus of the line from Chehalis, to the Cowlitz river; from the northern terminus of the line from Centralia, to Olympia, 26 miles. In addition a new line is to be built from Vancouver east to Camas, but this will not form a part of the Portland-Tacoma line. When these improvements are completed there will remain a gap of about 50 miles between the Cowlitz and the Lewis rivers. A connecting line over this 50 miles will be built, also a connection between Olympia and Tacoma will be made to complete the through line between Portland and Puget Sound. H. C. Coffman is president, Chehalis, and A. Welch is general manager, Portland. (September 13, p. 491.)

WESTERN CANADA.—Incorporation has been asked for in Canada to build from Fort Churchill, on Hudson's Bay, south through Manitoba, south of the Churchill river and north of the Nelson river to a point at or near Sea Falls, on Nelson river, thence north of Lake Winnipeg and thence west via Prince Albert, Sask., to Calgary, Alb., with branch from a point near Manitoba Lake, Sask. Vincent, Seguin & Labelle, Ottawa, are solicitors for the applicants.

RAILWAY STRUCTURES.

BALTIMORE, MD.—An officer of the Pennsylvania Railroad writes that arrangements have been made to replace the present double track steel truss bridge 513 ft. long, with a four track reinforced concrete arch viaduct of three spans, to have a total length of 606 ft. on the Maryland division of the Philadelphia, Baltimore & Washington over Gwynn's Falls and the Western Maryland Tidewater Railroad in Baltimore. A contract for the work, which will require about 25,000 cu. yds. of concrete and 800,000 lbs. of steel bars for reinforcement, has been given to Charles McDermott, Pennsylvania building, Philadelphia, Pa.

CLEVELAND, OHIO.—The Baltimore & Ohio has announced plans for expenditures in Cleveland that will cost approximately $1,000,000, including two large freight houses, a large storage building, and additional yard and side track facilities.

SHREVEPORT, LA.—The Houston & Shreveport has let a contract for the construction of a new roundhouse to R. B. Shearer, of Lufkin, Tex.

TEXAS.—The Gulf, Colorado & Santa Fe has announced that $1,500,000 has been appropriated for improvements in Texas during this year as follows: Shops, engine houses and turntables, $260,000; siding and spur tracks, $230,000; water and fuel stations, $160,000; terminal yards, $140,000; station buildings and fixtures, $125,000; track fastenings and appurtenances, $115,000; increased weight of rail, $80,000; right of way and station grounds, $50,000; bridges, trestles and culverts, $50,000; additional main tracks, $40,000; block and other signal apparatus, $38,000; telegraph and telephone lines, $28,000; shop machinery and tools, $26,000; protection of banks and drainage, $25,000; dock and wharf properties, $21,000; fencing right of way, $20,000; ballasting, $20,000; improved frogs and switches, $5,000; interlocking plants, $1,500; miscellaneous additions and betterments, $39,000.

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Railway Financial News.

BOSTON & LOWELL.—Merrill, Oldham & Company offered on January 27, $1,000,000 4½ per cent. refunding bonds, due February 1, 1933, at a price yielding about 4.30 per cent.

BRUCE MINES & ALGOMA.—This company will apply at the next session of the Ontario legislature for authority to change its name to the Lake Huron & Northern Ontario, and also to increase the authorized stock from $300,000 to $12,000,000. This road now runs from Bruce Mines, Ont., to Rock Lake Mines, 17 miles.

CHICAGO & NORTH WESTERN.—This company has called for payment at the Farmers Loan & Trust Company, New York, $107,000 5 and 6 per cent. sinking fund bonds of 1879 at 105 and accrued interest to February 1, 1913.

CHICAGO, BURLINGTON & QUINCY.—This company has called for payment at par and interest at the New England Trust Company, Boston, Mass., $109,200 Denver extension sinking fund 4 per cent. bonds, dated December 1, 1881-February 1, 1922.

DULUTH, SOUTH SHORE & ATLANTIC.—This company has sold to William A. Read & Co., New York, $310,000 4½ per cent. equipment notes, series 12, dated December 1, 1912, and due $31,000 semi-annually beginning June 1, 1917. These notes represent part cost of 400 ore cars, the total cost of which was $391,750, the balance paid in cash. These notes are guaranteed by the Canadian Pacific.

GREEN BAY & WESTERN.—The directors have declared a distribution of 1¼ per cent. on the $7,000,000, class B, debentures, comparing with ½ of 1 per cent. paid in February, 1912, and 1911. The arrangement is that after 5 per cent. has been paid on both the stock and the series A debentures, the surplus is to be distributed pro rata to the holders of the B debentures.

LAKE HURON & NORTHERN ONTARIO.—See Bruce Mines & Algoma.

MINNEAPOLIS & ST. LOUIS.—F. J. Lisman & Co., New York, are recommending the purchase of the new 6 per cent. secured notes at 98½ and interest, yielding 7½ per cent. These notes are dated February 1, 1913, and due February 1, 1914, but are redeemable at par and interest at 60 days' notice. Of this issue, $3,000,000 are authorized and outstanding.

This company has also sold to bankers $1,000,000 4 per cent. bonds to retire $1,000,000 5 per cent. notes which matured February 1. The bonds sold include a block of the refunding and extension 4 per cent. bonds, of which $75,000,000 were authorized under date of January 1, 1912.

NEW YORK, ONTARIO & WESTERN.—The New York Public Service Commission, Second district, has authorized this company to issue $1,980,000 4 per cent. bonds to be sold at a price to be fixed hereafter. The proceeds are to be used for the payment of bills payable incurred for capital expenses to the amount of $1,571,564. The balance is to be spent on maintenance of way and equipment. This company is also authorized to issue $900,000 4½ per cent. equipment trust certificates, $30,000 of which are to mature semi-annually up to and including March 1, 1928. The proceeds are to be used for the purchase of 500 coal cars, 300 box cars, 100 flat cars, 50 stock cars and 50 refrigerator cars.

NORFOLK & WESTERN.—Stockholders of record February 17 will be permitted to subscribe before March 25, at 102½ for about $19,000,000 new 4½ per cent convertible 25-year debenture bonds, dated September 1, 1913, up to 15 per cent. of their holdings. Subscriptions will be payable either in full on or before March 25, or 52½ per cent. on March 25, and 50 per cent between September 2 and September 5. The bonds will be convertible any time after September 1, 1913, and before September 1, 1923. They are redeemable at 105 and interest any time after September 1, 1923.

PITTSBURGH & SHAWMUT.—This company has sold to Rhoades & Company, New York, and the Guaranty Trust Company, New York, $200,000 5 per cent. equipment trust notes, dated November 1, 1912, maturing in 20 semi-annual instalments. The proceeds will be used to pay for 250 hopper cars.

PITTSBURGH, MCKEESPORT & WESTMORELAND.—Receiver James B. Secrist will by order of the court of common pleas of Allegheny county, Pa., offer the property at public sale at the court house in Pittsburgh on February 25, upset price $60,000. The purchaser will take the property subject to the lien of the mortgage of the Pittsburgh & Westmoreland Railway to the Union Trust Company of Pittsburgh, dated August 1, 1904, and also that of the Pittsburgh, McKeesport & Westmoreland to the Harrisburg Trust Company assigned to the Columbian Trust Company of New York, dated December 1, 1908, under which there are $437,000 bonds outstanding. The $50,500 receiver's certificates, the interest accrued thereon and the cost and expenses of the receivership will be paid out of the proceeds of the sale.

QUEBEC CENTRAL.—Holders of 7 per cent. income bonds and 3 per cent. second debenture stock are informed that the company has created £338,000 ($1,690,000) second mortgage debenture stock and £338,000 ($1,690,000) sterling 5 per cent. third mortgage bonds. Interest in both cases is payable in London on January 15 and July 15, and the principal is redeemable at the expiration of 50 years, the issues constituting a second or third mortgage respectively on the undertaking next after the 4 per cent. first mortgage debenture stock, secured by the rental payable by the Canadian Pacific, and principal and interest guaranteed by that company. Holders of existing 3 per cent. second debenture stock or 7 per cent. income bonds are required to surrender them on or before February 17 for exchange. The basis of exchange is as follows: The old 4 per cent. debenture stock remains undisturbed, but certificates must be presented for exchange into new certificates setting forth the terms of guarantee of principal and interest by the Canadian Pacific. The old 3 per cent. second debenture stock is replaced dollar for dollar by new 3½ per cent. second mortgage debenture stock, principal and interest guaranteed by the Canadian Pacific. The old 7 per cent. income bonds are replaced dollar for dollar by 5 per cent. third mortgage bonds, the principal and interest guaranteed by the Canadian Pacific; a bonus of 10 per cent. will be paid to holders on making the exchange. The old capital stock is converted into stock transferable in sums of $5 and multiples thereof with a dividend of 4 per cent. a year until July 15, 1916, and 5 per cent. thereafter guaranteed by the Canadian Pacific.

SCOTT CITY NORTHERN.—The suit which was brought against this company, as mentioned in the *Railway Age Gazette* of January 24, has been dismissed, and W. H. Wagner, the unfriendly receiver, has been discharged.

SOUTHERN PACIFIC.—William Rockefeller has resigned as director and member of the executive committee of this company.

See item in regard to the Harriman Lines' dissolution plan in General News.

TORONTO, HAMILTON & BUFFALO.—William A. Read & Co., New York, have sold at prices to yield 4¼ per cent. the entire new issue of $1,500,000 4½ per cent. equipment notes, series A, dated February 1, 1913, and maturing in 20 semi-annual payments of $75,000 each, August 1, 1913, to February 1, 1923.

UNION PACIFIC.—See item in regard to the Harriman Lines' dissolution plan in General News.

WABASH PITTSBURGH TERMINAL.—The Guaranty Trust Company, of New York, the Bankers Trust Company and Sutro Brothers & Company, of New York, are placing at par and interest the entire new issue of $973,000 6 per cent. receivers certificates dated February 1, 1913, and due February 1, 1914, but callable at par and interest.

WABASH RAILROAD.—Judge Sanborn, in the United States District Court at St. Louis, on January 30, on application of Pierce & Greer, of New York, representing the Equitable Trust Company of New York, trustee under the first refunding and extension mortgage, appointed a master to hear evidence and determine methods of foreclosure of the mortgage in the pending proceedings preparatory to the order of the sale thereunder.

The receivers on January 30 applied to the court in St. Louis for permission to extend for 6 months the company's obligation in respect to the Wheeling & Lake Erie defaulted notes due February 1, amounting on June 30, 1912, to $9,807,958.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	10 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue **8,875** copies were printed; that of those **8,875** copies, **6,794** were mailed to regular paid subscribers and **595** were provided for counter and news companies' sales; that the total copies printed this year to date were **80,880** copies—an average of **8,669** copies a week.

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*Illustrated.

MR. HUMPHREY, in a letter on another page commenting on an editorial concerning the relation of the railway supply man and the superintendent of motive power, which was published in our issue of November 1, 1912, brings out clearly and forcibly the important part which the representatives of the supply interests are playing in the development of railway equipment. No one can deny this, and the railway officer who does not realize and feel grateful for such assistance would be hard to find. It was not our intention to detract from the credit which is due to the supply man, but rather to direct attention to the necessity of conserving the time of the head of the motive power department to as great an extent as possible. The railways have been severely criticized in many cases for not giving the motive power superintendent as much authority and responsibility as it is felt that he should have in order to secure the best results. Has this not been due in many cases to the fact that he has allowed himself to be swamped with details and has not had the proper perspective which is so essential for an executive officer, particularly when the men and equipment under his direction are scattered over hundreds of miles of road, sometimes in several different states? To get this broad perspective he must have capable subordinates to whom the various details can be referred and on whose advice he will have to depend almost entirely in many instances. His most important function will be in selecting and developing these assistants. A time study of an average day for an average mechanical superintendent would develop some startling facts as to the amount of time which must be devoted to matters which in many cases could be investigated and followed up just as effectively by properly trained subordinates. It was not intended to suggest that the friendly relations and the spirit of co-operation which have existed between the supply men and the railway officers be cut off or weakened, but rather that the supply men be as considerate as possible of the time of the mechanical superintendents, and that the latter improve their organizations so that as many of the details of their work and as much responsibility as possible be shifted on subordinates.

ONE way the railways save money wastefully is by not spending enough for supervision. More detailed supervision of all phases of operation is needed on most roads to increase effectiveness, both by improving service and reducing its cost. For example, in no other way can the accident record be so effectually dealt with. Supervision, as we conceive it, consists in constant efforts by competent officers to familiarize employees with the right ways to do things and constant checking to see that employees are doing things right. The root of most of the evil in the service of American railways is the failure of the managements to provide for the proper education and drilling of employees. Numerous investigations of accidents due to man failures disclose that the employees causing them have not been properly examined or instructed regarding the rules either when taken into the service or later. Accidents resulting from this are not the fault of the employees, but of the management. It is useless to say in reply that employees should familiarize themselves with the rules voluntarily. Supervision is the very essence of the function of management. Instruction, training, drilling must be precedent to knowledge and obedience on the part of employees; and the management that does not do them the best that is possible is deficient, in proportion as it falls short of this idea. It is very illogical for a railway management to blame or punish any shortcoming of any employee until it has first shown that the employee was selected with reasonable care, and has been instructed and drilled zealously and skilfully in the performance of the very duties which in the particular instance he has failed properly to perform. Deficiencies in supervision are not surprising when one notes the comparatively small number of men employed with official rank and authority. The total operating expenses of the railways of the United States in the fiscal year 1910, the last year for which there are complete statistics of the Interstate Commerce Commission, were $1,822,630,433. Of this $1,143,725,306 was paid ont in wages and salaries. Of this latter sum only $37,448,770 was for official salaries and the total number of "General" and "other officers" was 14,868. In other words, only this many men were employed and only this sum spent to supervise the operation of 241,000 miles of railway, the work of 1,684,552 employees, and the expenditure of $1,822,000,000. Of course, this statement is only approximately accurate. There is supervision of employees by other employees—of trainmen by conductors, of track laborers by section foremen, etc. But it is roughly accurate to call the compensation of officers the wages of supervision. Could not the number of men of official rank and the amount paid to them in salaries be largely in-

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creased with resulting benefits? Would not the results of the increased supervision much more than offset the increase in the total amount of official salaries?

THE CRISIS IN THE FIREMEN'S WAGE CONTROVERSY.

THE need for a better federal law for the arbitration of labor disputes on railways could not be more strikingly and conclusively demonstrated than it is by the crisis that has been reached in the controversy between the eastern railways and their firemen. Each side offers to arbitrate. Each refuses to arbitrate the way the other proposes. The firemen have taken a strike vote; and a strike may result. The interests of the public demand legislation forbidding a strike before arbitration, and prescribing a better means of arbitration than that now provided by the Erdman Act.

On the merits of the controversy the railways are clearly right. The firemen demand arbitration under the Erdman Act. The arbitration board would then be composed of one representative of the roads, one representative of labor and an umpire chosen by them or by Presiding Judge Knapp of the Commerce Court, and Commissioner of Labor Neill. The result would be determined entirely by the one man who was umpire. The issues involved are too important to be settled by any one man. Any man chosen would almost certainly have a slight bias one way or another and would decide largely according to his special bias. There ought to be at least three umpires, so that the disinterested members of the board would have a chance to confer and so that the slight bias of one in one way might be corrected by the slight bias of another in another way, and that varying talents, knowledge and experience might be brought to bear.

As an alternative to arbitration under the Erdman Act the roads have offered to make a settlement on the same basis on which the enginemen's controversy was settled. This would involve an increase in wages of about 5 per cent., and aggregating about $2,000,000 a year. The employees demand increases of 35 per cent., and aggregating $9,600,000 a year. If there is to be arbitration the railways favor a board similar to that which arbitrated the enginemen's controversy and which was composed of one representative of the railways, one representative of labor and five men chosen by the Chief Justice of the United States, the Presiding Judge of the Commerce Court and the Commissioner of Labor. Five umpires are still better than three.

The rights of the public are paramount, and that they would be better protected by an arbitration board such as that which settled the enginemen's controversy than by arbitration under the Erdman Act, seems self-evident. As the enginemen's board of arbitration said: "The fundamental defect of the Erdman Act is that the interests of the public are not guarded by it. Manifestly it is advantageous to both employers and employees to have the railroads get a sufficient income so that they will be able to meet the requests of the employees for increased compensation. Advances in rates cannot be made without the consent of the proper commissions. The railroads are not only subject to the commissions in rates, but are subject to them in regard to maintaining adequate service. The employees of the railroads are not subject to control through commissions."

Mr. Carter, the head of the firemen's brotherhood, has twitted the railway managers about the solicitude displayed by them for the interests of the public. It is significant that all of the expressions of solicitude for the interests of the public have come from the railway managers. Not one word has been uttered by Mr. Carter or any other representative of the firemen to indicate that they care a rap for the public. On the contrary, at one of the conferences between the firemen's committee and the managers, Mr. Carter said, "I speak the truth when I say that railroad employees are anxious that our little private troubles should not result in injury to both of us. This public that you are talking about sometimes had best not know our troubles." This statement is on a par with the announcement made by Warren S. Stone, grand chief of the Brotherhood of Locomotive Engineers, when the enginemen's controversy was pending, that it was time the public should be taught a lesson.

When men are so anxious to avoid publicity regarding matters in which the public is vitally concerned they are evidently trying to conceal something that the public ought to know. The attitude assumed by the employees in this controversy, and the publicity that the railway managers have given to the facts regarding it, have been hardly second, as influences for educating public opinion regarding the railway labor situation, to the report made by the enginemen's arbitration board.

In the meantime, it is to be hoped that some means will be found of averting a strike. A strike would be a public calamity, and if it lasted long it very likely would be the last serious strike among railway train employees in the United States. This public from which Mr. Carter wants railways and their employees to keep the facts about their little private affairs would take hold of the situation in a way that would teach a lasting lesson to both sides. Mr. Carter talks about the constitutional liberty of railway employees. If any class in this country has a constitutional liberty to injure the public and abuses it, that liberty will soon be curtailed. Constitutions exist to protect the rights of the public, not to protect special classes in the right to injure the public.

HEAD-ON COLLISION BETWEEN MUCKRAKERS.

PEARSON'S is a magazine consecrated to the gentle art of muckraking. In its issue for February it prints two articles in which railway transportation in the United States is discussed. One is entitled "Revolution," and is by our old friend, the president of the Ananias Club, Charles Edward Russell. Mr. Russell discusses railway accidents. The other article is entitled "Our Imitation Parcels Post," and is by Ellis O. Jones. His special grievance is that the parcel post law provides for a zone system of rates instead of for a flat rate. The reader who wishes to learn just how good and how bad our railways are is commended to these two articles. We publish below in parallel columns some of the useful information that they give. The italics are ours:

Mr. Russell on Railway Efficiency.	Mr. Jones on Railway Efficiency.
What is the trouble with the railroad system? Why, after about sixty years of scientific looting *it has broken down*; that is all. Why do we have all these frightful accidents on our railways? Same reason; that is all. *The old machine is physically unable to do the work.*	While transportation facilities in the meantime have everywhere become more and more highly developed and simplified; *while with improved methods and improved equipments and improved roadbeds*, the cost of carrying goods and people has decreased; while every indication and every consideration of public expediency has favored a lowering of our parcels post rate and an increase of our weight limit; nevertheless the interests have kept us from moving either hand or foot until this moment.

The foregoing illustrates the regard for facts shown by our muckraking friends. When they are discussing rates the economy and efficiency of our railways has so increased that they could operate for rates half as high as they get now. When they are discussing operation the efficiency with which it is conducted has degenerated until every person who gets on a train takes his life in his hands.

Mr. Russell shows great concern lest people think he is not telling the truth. He says that when statements such as his are made the "pen valets" of the railways jump up and shout "liar." Doubtless he has in mind the fact that several months ago the *Railway Age Gazette* reviewed another article on accidents written by him and proved him a falsifier on several counts. (*Railway Age Gazette*, December 8, 1911; January 19, 1912; March 8, 1912.) He said, for example, that an efficient automatic train stop device was in use on the New Zealand railways. We showed no such device was in use. He said he

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had got certain information regarding block signaling on the railways of the United States from the Interstate Commerce Commission. We published a letter from Judson C. Clements, then chairman of the commission, saying that Mr. Russell had not got the information from the commission, and furthermore that it was not correct. It is not surprising, therefore, that Mr. Russell fears somebody will question his veracity.

We might show that his article in *Pearson's* is an example of falsification by suppression. He has gone through the accident reports of the Interstate Commerce Commission and picked out those regarding accidents resulting from defects of railway plants, and ignores those regarding accidents due to man failures. He then concludes that practically all accidents are due to defects of the plants. The incorrectness of this conclusion is shown by the following statement in the annual report of the commission for 1912:

"The most disquieting and perplexing feature in the problem of accident prevention is the large proportion of train accidents caused by dereliction of duty by the employees involved. By far the greatest number of our serious train accidents are due to the failure of some responsible employee to perform an essential duty at a critical time. The seriousness of this problem is indicated by the fact that of the 81 accidents investigated up to September 1, 52, or more than 63 per cent. of the whole number, were caused by mistakes on the part of employees. These 52 accidents comprise 48 of the 49 collisions investigated, and 4 of the 31 derailments. They caused the death of 248 persons and the injury of 1,309 persons. Of the 48 collisions caused by errors of employees 33 occurred on roads operated under the train-order system and 15 occurred under the block system."

However, in this instance it is not necessary for the *Railway Age Gazette* to put Mr. Russell back in the Ananias Club. His coadjutor, Mr. Jones, has saved us the trouble.

AIR BRAKE HOSE.

INVESTIGATION of the troubles with air brake hose shows a general agreement that the present situation is serious, but it also shows a difference of opinion as to the causes and proper remedy. On the one hand are those who claim that so large a proportion of the failures are due to mishandling and mechanical injury that it does not pay to purchase a high grade hose. On the other side are those who claim that the failures due to poor material predominate and that a better grade of hose, even at a higher price, should be used. The specification under which air brake hose is now purchased by most roads was prepared and adopted by the M. C. B. Association in 1905—eight years ago—and except for a change in the label it is still in its original form. During this time there has been an enormous increase in the demand for rubber products, accompanied by an influx of high grade rubber and rubber substitutes, which, combined with the increased knowledge of the manufacturer as to the qualities of the substitutes and of changes in manufacture, has permitted the production of a hose which will meet the requirements of the M. C. B. specification when new, but by no means possesses the durability of the hose it was intended to insure.

A revised specification will probably be submitted to letter ballot following the next annual convention of the M. C. B. Association, and the question arises whether this specification should be revised so as to insure a hose which will better withstand mechanical injury, but that can be purchased without any considerable increase in the present average price, or whether it should insure a hose of much better quality which will not rapidly deteriorate after being put in service and that will probably require the payment of a considerably higher price. The answer to this question depends on accurate information as to the causes of air brake hose failures. If, as is shown by the records of a number of roads, mechanical injuries are the principal causes for removal, it will not pay to so revise the specification as to materially increase the cost. If, on the other hand, porosity, bursting and cracks are the chief troubles, it will be the duty of the association to require the use of a better and more expensive hose.

There is no doubt but what the fittings, especially the nipple, the method commonly used for applying them and the practice of uncoupling cars without also uncoupling the hose, are responsible for a large proportion of the failures and that more careful attention tending to the correction of these features would do much to reduce the damage. Records maintained by a number of roads show these features to be responsible for upward of 50 per cent. of the removals, and it is these roads that hesitate in advising the purchase of a more expensive hose. On the other hand, however, a recent test, most carefully made and covering over 22,000 pieces of removed air brake hose, showed that about 82 per cent. were porous and that the porosity was not localized, but appeared at various points or throughout the whole tube. If these results represent the general condition, or anywhere near the general condition, all doubt as to the necessity of a better material is removed. Bursted hose is the cause of a considerable proportion of the removals, and while this may in some cases be indirectly the result of mishandling or other user's fault, it is generally believed to be due to poor material. The present average life of air brake hose will not exceed one year, and probably will be closer to ten months. The life of hose under former conditions and when a better quality of material was used, ran from two to three years. One railway company is seriously considering the issuing of instructions to its purchasing agent forbidding him to purchase any air brake hose for its locomotives or passenger cars which is quoted at less than 60 cents a foot. Investigation and experience have shown that satisfactory hose cannot be purchased under this price. Several other companies are purchasing hose to their own specification, which is more rigid than those of the M. C. B. Association, and are finding it possible to obtain a much more satisfactory hose, although in every case its cost is greater.

All of this would indicate that the new specification should be drawn so as to insure a better quality of material, a more carefully made product and the production of an air brake hose which so far as the quality of the material is concerned will have a probable life of over two years. This should be done irrespective of the price. Porosity in most cases is probably due to minute holes in the inner tube. The present specifications call for three hand made calenders forming the inner tube, but it is very doubtful if this requirement is followed to any great extent and most hose now in use has a single machine squirted inner tube. The suggestion that the center calender be made of different color would correct this difficulty and largely overcome the porosity if the hose is properly inspected. Such a requirement should be included in the specification. Even three hand made calenders, however, will not insure a satisfactory inner tube unless the quality of the material is better than that usually furnished. It has been suggested that a tensile strength requirement be inserted in the new specification, and this would probably go a long way toward insuring good material. Such a requirement should, however, also cover the outer covering and have maximum and minimum limits in both cases. In the same connection the stretching test should be so formulated as to also assist in preventing the introduction of rubber substitutes, or of undercured and low grade rubber.

In addition to insuring a good quality of material and workmanship in the hose itself, the association would do well to consider the fittings, and a standard nipple, properly designed, will greatly assist in reducing the number of condemned hose as a result of kinking. Experiments made with different forms of nipples have indicated that the present customary design may be greatly improved. In the same connection instructions as to the proper method of applying the fittings to the hose could be adopted as recommended practice. The usual way of forcing

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the fittings in the hose by a powerful air cylinder is a great time saver, but often proves expensive in the end. Not infrequently the hose would be condemned before being applied to the car if it were possible to make an inspection of the inner tube.

Another feature that needs improvement is in applying the hose to the car. If the faces of the couplings are both in a true vertical plane they will pull apart with little damage to the hose, but if the nipple is turned too far the couplings will bind and a severe tension is put on a twisted hose.

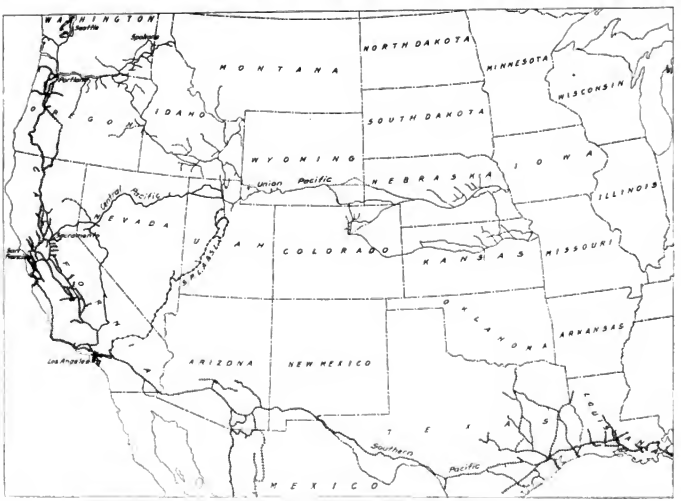
Taking everything into consideration it would seem possible to greatly reduce the hose failures, with their often expensive results, but that the original cost will be greater, although the net result will be profitable. It is the duty of the committee revising the specifications to make recommendations leading to the maximum benefit with the minimum increased cost.

THE UNION PACIFIC-SOUTHERN PACIFIC DISSOLUTION.

WHEN the decision of the Supreme Court in the Union Pacific-Southern Pacific merger case was rendered it was quite generally criticised on the ground that it would have little tendency to further the ends sought by the government, viz., to increase competition. Many of these criticisms were based on a wrong premise. It was assumed that, as the case directly involved only the consolidation of the Union Pacific and Southern Pacific, which owned the Central Pacific, the effect would be merely to separate the Union Pacific system and the Southern Pacific, including the Central Pacific. The court indicated, however, that there would be no objection to the Union Pacific retaining the Central Pacific. This was made the basis of a contention by Attorney General Wickersham that the Union Pacific must retain the Central Pacific. Mr. Wickersham has won on this point. This changes the aspect of the entire matter.

The Union Pacific, with the possession of the Central Pacific, reaches San Francisco and gets into the heart of northern California. One of the Central Pacific's lines reaches as far south as Fresno. The Union Pacific also keeps its half interest in the San Pedro, Los Angeles & Salt Lake, which gives it a line from Salt Lake City to Los Angeles. It is announced that the Central Pacific will have a complete staff of general officers in San Francisco. The San Pedro, Los Angeles & Salt Lake has most of its general offices in Los Angeles. The Union Pacific also retains control of the Oregon Short Line and the Oregon-Washington Railroad & Navigation Co., by which it reaches points throughout the Northwest, including Portland, Tacoma, Seattle and Spokane. By means of a 99-year lease the Southern Pacific gets that portion of the Central Pacific lines which constitutes a part of its line from San Francisco to Portland. The Southern Pacific also has trackage rights over the Northern Pacific's line from Portland to Puget Sound, and steamship lines between Los Angeles, San Francisco and the north Pacific coast.

There seems to be no doubt that the dissolution of financial control of the two systems is complete. The consequence is that they become active competitors for business all along the Pacific coast. This competition does not seem likely to materially affect rates. Active competition in rates can hardly exist under the present laws regulating them. It does look as if there would result an increase in competition in service. The change in the situation in California is most marked. Formerly there were constant complaints that the Southern Pacific had a monopoly in California. With the Southern Pacific now covering the state with a network of lines; with the Santa Fe especially strong in



Segregation of Harriman Lines Under Dissolution Plan.

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southern California and also reaching to San Francisco; with the Western Pacific reaching across the State to San Francisco; and with the Union Pacific by its controlled lines reaching Los Angeles and San Francisco and tapping some of the richest parts of the State, the complaint about monopoly can hardly any longer be made.

The struggle for business that will result between the Union Pacific lines and the Southern Pacific will be extremely interesting; and will not affect them alone. The Southern Pacific will strive to route as much California traffic southward and thence eastward over its lines to El Paso and New Orleans as practicable. In order to get its share of business to and from Chicago, it must have a strong connection to Chicago, and it must also strive to keep the territory it occupies from being invaded by still other lines. It seems likely to result that the Southern Pacific and Rock Island will draw more closely together. They already handle a good deal of traffic in connection with each other through the El Paso gateway. The El Paso & Southwestern has extended its line via El Paso to Tucson, and it is reported that it plans to go on to the Coast. The Southwestern connects with the Rock Island at Tucumcari, the Rock Island operating over tracks leased from it from Tucumcari to Santa Rosa, and the Southwestern handling through passenger trains from there to El Paso to the connection with the Southern Pacific. If the El Paso & Southwestern should extend to the Coast, the Rock Island, of course, could choose whether it would later work with the Southern Pacific or the Southwestern. In these circumstances, it would seem, as already indicated, that the Southern Pacific would be disposed to cultivate closer relations with the Rock Island. On the other hand, the Southern Pacific owns lines from El Paso to New Orleans and a steamship line from New Orleans to New York, whose interests it must protect. The Southern Pacific heretofore has delivered a good deal of business from California to the Union Pacific at Ogden. Naturally, it will strive in the future to take this business to El Paso at least, and to take as much of it as it can, while protecting its other interests, by way of its lines to New Orleans and its steamship lines to New York.

Heretofore, the Union Pacific has not been an originating carrier for California business. It now becomes a great originating carrier for that business, as it already was for business from the north Pacific coast. Its own lines extend only as far east as Omaha and Kansas City. It practically controls the Illinois Central, with a line from Omaha to Chicago, but it has heretofore handled most of its through business in connection with the Chicago & North Western, although it has also handled a large amount in connection with the Chicago, Milwaukee & St. Paul. It has some through train service to St. Louis in connection with the Wabash. As the Chicago, Milwaukee & St. Paul now has its own line to Puget Sound, and routes its own north Pacific coast business over its own line, it would seem that the relations between the Union Pacific and the North Western, which, having no line to the northwest, naturally would deliver more business to the Union Pacific for that territory, would grow closer rather than otherwise. The Rock Island has a line to St. Louis; the Southern Pacific has a traffic arrangement with the Frisco lines for handling business to and from St. Louis. It is an interesting question whether the Southern Pacific will work with the Frisco or the Rock Island in handling business to or from St. Louis. The probabilities seem to favor it working with the Rock Island to Chicago and the Frisco lines to St. Louis. Likewise, the probabilities seem to favor the Union Pacific working more closely with the Wabash in the handling of St. Louis business.

While what we have said in regard to the results of the dissolution of the Union Pacific and Southern Pacific is partly theoretical, it is plain that the way the dissolution has been carried out will make it necessary to draw a new map of the railway situation and the routes of traffic in the western half of the United States. Whether the railways as a whole, and the public as a whole, will benefit is conjectural. That some roads and some communities will benefit and that others will be hurt, seems quite likely. Experienced railway men differ so widely as to who will be helped and who hurt that we hesitate to make any conjectures on our own account. The probability seems to be that as between the railways themselves, who will ultimately be hurt and who helped will depend on which have the more skillful traffic departments and the more efficient operating departments. The railways directly concerned are most of them efficiently operated. Perhaps the competition will stimulate all of them to greater efficiency. It would seem, however, that one of the immediate effects will be to increase the cost of operation in the territory directly affected.

NEW BOOKS.

A Treatise on Cement Specifications. By Jerome Cochran. Cloth bound, 6 in. x 9 in., 191 pages, 7 illustrations. D. Van Nostrand Co., New York. Price $1.00.

While the author recognizes in his preface the impossibility of drawing specifications for cement which will be applicable to all classes of work and under all conditions, he has tried to make the presentation of the subject more complete than has ever before been attempted. The specifications proper cover 76 pages and include clauses on general conditions governing the use of cement, furnishing it to the contractor, purchasing it from manufacturers, delivering and storing it, inspecting and testing, testing requirements, methods of testing, and significance of tests. In addition to the specifications there are chapters on methods of mechanical analyses of Portland cement, bibliography of specifications for cement and bibliography of foreign cement specifications. The work is intended as a guide to students and young engineers in the preparation of specifications, and the aim has been to make this set consistent and in conformity with modern practice.

An Extension of the Dewey Decimal System of Classification Applied to the Engineering Industries. By L. P. Breckenridge and G. A. Goodenough. Bulletin No. 9 (revised edition). University of Illinois Engineering Experiment Station. Size 6 in. x 9 in., 117 pages. Price, 50 cents.

The filing and classification of engineering data has become a matter of much importance, and this bulletin was prepared for use as a guide in carrying out such work. Bulletin No. 9 was originally issued in 1906, and the demand was so great that a second edition was printed and distributed, 20,000 copies in all having been sent out. The demand for the bulletin having continued, the revised bulletin has been prepared with a number of changes and extensions presenting subdivisions of subjects in such detail as to constitute a complete classification for most industries, even though they are highly specialized. This revision has been made in accordance with the 1911 edition of "Decimal Classification," by Melvil Dewey. The experiment station is unable to make this revised bulletin subject to gratuitous distribution and a charge of 50 cents is made for copies postpaid.

Proceedings of the American Society for Testing Materials and Year Book. Cloth bound, 6 in. x 9 in., 600 pages. Published by American Society for Testing Materials, Philadelphia, Pa. Price, $5.

This volume contains the proceedings of the fifteenth annual meeting of this important organization, held in New York on March 28-29, 1912. These proceedings consist mainly in the revision of specifications adopted previously by this association. In the year book are given the charter, by-laws of the association and list of members. It also contains all the standard specifications, some 54 in number, which have been adopted by the association up to this time. These specifications include such subjects as Bessemer and open hearth steel rails, structural steel for bridges; engine, tender and car wheels, steel axles, locomotive cylinders, cast and wrought iron, cement, structural timber and yellow pine and trestle timbers. In addition seven sets of specifications adopted by other associations are published as information, including the specifications for rails and steel railway bridges of the American Railway Engineering Association and the specifications for rails of the American Steel Manufacturers, the Manufacturers' Standard Practice and the United States Steel Products Company

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Letters to the Editor.

RAILWAY OFFICERS AND RAILWAY SUPPLY MEN.

PITTSBURGH, PA., JANUARY 20, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

An editorial which appeared in your issue of November 1, 1912, page 822, with reference to the relations between railway officers and the representatives of railway supply houses only recently came to my attention, but discloses an attitude so fundamentally in error that I feel compelled to reply, not because I am now interested in the business of selling certain equipment to the railroads, but as a matter of simple justice to both parties involved in this discussion.

This editorial, among other things, quotes the criticism of a "foreign railway officer" during a recent visit to this country, who was "very much surprised at the great amount of time which the heads of the mechanical department give to receiving railway supply men," to which you add the following astonishing comment: "When we consider the tremendous responsibility which rests upon the average motive power department superintendent and the need for greater efficiency in that department, it seems a shame that his time should be taken up in listening to the salesmen's arguments as to the merits of the various devices used on cars and locomotives, or in the shop," etc.

As a matter of fact, the criticism of the foreign railway officer mentioned is so out of line with what I know to be the judgment of the great majority of railroad officials and involves so glaring a misconception, based on the idea that the railroad supply representative has *all to get* and *nothing to give*, that I am exceedingly surprised to observe the seal of your approval placed upon the suggestions made. I am convinced not merely from my own experience of many years as a railroad man, and particularly as a motive power officer, but through perhaps unusual opportunities for observation during that period that there is no single factor which can be made of greater practical value and material assistance to railway mechanical, operating and executive officers than the co-operation and active interest of the representatives of railway supply manufacturing concerns in connection with the numberless important and far reaching problems that are incident to railroad operations. This co-operation and assistance is of greater value to the railroad companies today than it ever has been before, largely by reason of the specialization and highly scientific and technical development taking place in every art and industry. The reasons for this relationship and interdependence are both sound and substantial: First, the business of the railroads is primarily—I had almost said exclusively—transportation; that is, the handling of freight and passenger traffic, which business has now assumed stupendous proportions. Second, the business of the "supply man," so called, is to study railroad conditions as they exist, to originate product or devices to meet real needs as they develop, and to show the railroad man how and why a particular product, apparatus, or equipment meets a real need to the profit or betterment of the railroad.

While there are exceptions, of course, the fact of the matter is that the representatives of practically all reliable railway supply houses are not merely "salesmen" in the narrow sense of that term as used in your editorial, but experts, educated in their respective lines far beyond what would be possible for any busy railroad official. In other words, the supply man is able to bring to the railroad official not only a different angle of view but a wealth of data and experience along the line of the specific railroad problem in which he is particularly interested. Whether it happens that apparatus is purchased from such supply man or otherwise, the opportunity is afforded the railroad man to acquire pertinent and valuable information which, in the nature of things, he cannot originate for himself through such imperfect media as correspondence, the technical press, or individual research; yet in a brief, time-saving interview with the supply man he may secure such practical (and profitable) familiarity with any given subject as would be impossible to obtain otherwise. Such knowledge cannot fail to be of assistance to him in practical railroad methods, and increased railroad efficiency as well as broadening his own capacity to handle railroad problems. The present tendency of the times is more than ever before in the direction of placing in the field thoroughly trained experts in each particular business, and competition is very largely coming to be based upon the broad assistance and co-operation which the supply man can render along lines related to, but outside of the mere selling of a particular product or equipment.

Now a word in regard to the railroad official himself: There are, of course, exceptions here also; but my personal experience, first as a railroad man, and second as a supply man, leads me to affirm that as a rule the most wide awake, enterprising and progressive railroad officials today welcome the representatives of the supply houses because they thoroughly appreciate the supply man as an ally and a co-laborer who can assist materially in yet larger results in the field of transportation, and not at all as useless pests created to make the lives of railroad men miserable, as might be inferred from your editorial. In any event, the railroad man is always the arbiter of the situation and may regulate interviews with supply men as best suits his time and convenience, by reason of which fact alone your editorial largely loses its force.

In brief, I wish to record my sincere testimony to the fact that the vast majority of railroad officials with whom I have come in contact are always ready to consider facts and more than willing to listen to and act upon suggestions in the direction of improvement. On the other hand, my experience is that railway supply representatives are normally considerate, patient, painstaking, and capable of rendering the railroads a large and valuable service because of their being thoroughly informed and interested in their product and its application to conditions directly affected thereby.

I feel very strongly, therefore, that, whatever the conditions may be abroad, the "foreign railway officer" quoted, entirely missed the point with reference to the contact of supply men with our railway officials on this side and the fairer and generally accepted view, as I have found it, is that the wonderful railroad transportation facilities now available in this country are the result of united effort, viz., the splendid judgment, courage, foresight, and executive capacity of the railroad man, with the technical knowledge, invention, and development along a hundred different lines on the part of the supply man; and lacking which unity no such progress as has been made would have been possible.

A. L. HUMPHREY,
Vice-President and General Manager, Westinghouse Air Brake Company.

NEW LINE FOR CHILE.—The Osorno to Puerto Montt Railway, the port of the latter name being the present terminus of the Longitudinal Railway, has recently been opened to public traffic. In 1906 the President of Chile was authorized to contract for the construction of this railway for a sum not exceeding $4,380,000. In 1907 a bid was made for this construction, within a period of five years, and on September 26 of that year work was commenced on the line. An additional sum of $162,360 appropriated by the government for inspection and expropriations of land makes the total cost of the line $4,542,360. The gage of the railway is 5 ft. 6 in., and the roadbed, which is a continuation of the central system, is 78 miles long and has 10 miles of switches. There are five stations between Osorno and Puerto Montt, 18 bridges and 160 culverts. The minimum curve of this railway has a radius of 325 yds., and the maximum grade is 1½ per cent. The 12 acres of land at Puerto Montt on which the station and yards of the railway are situated were reclaimed from the sea. A driveway 1,190 yds. long is being constructed at Puerto Montt.

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THE GRAND CENTRAL TERMINAL, NEW YORK.

The New Outbound Station was Placed in Service on Sunday, Feb. 2. Description of Details of This Important Structure.

The completion of the outbound station, the largest unit in the Grand Central Terminal project of the New York Central & Hudson River and the New York, New Haven & Hartford railroads in New York, announced in the news columns of the *Railway Age Gazette* last week, marks an important step in the development of large passenger stations in this country. This project embodies a number of unusual and very interesting conditions. In the first place, the investment feature has been carefully considered in the design of the entire terminal. The substitution of electricity for steam has permitted the utilization of the air rights for commercial purposes by the construction of additional facilities above the tracks, a portion of which will be leased to private parties. The revenue from these tenants will materially reduce the fixed charges on the entire terminal. This is the first development of this principle which permits the location of terminals in the heart of cities without involving the almost prohibitive outlay otherwise required. The construction work itself was made unusually difficult as the new building is located on the site of the old one and provision had to be made to accommodate the heavy traffic of both the New York Central & Hudson River and the New York, New Haven & Hartford at all times without delay. This traffic reached as many as 42 movements per hour at certain periods of the day and this had to be handled on only two tracks between Fiftieth and Fifty-sixth streets for several months. A new feature in the design of the station itself is the introduction of ramps or inclines to replace stairways in all main thoroughfares, while the separation of through and local traffic on different levels is unusual.

Looking West. Stairs Lead Up to the Side Street and to the Gallery at the Right. Four-faced Clock in Center of Room, Lighted from Within. Passage at Left of Stairs Leads to Interborough Subway, on Same Level.

Main Concourse, Grand Central Terminal, New York.

An inbound station will also be constructed immediately west of the outbound station to further divide the traffic between inbound and outbound business. The excavation is now nearly completed for this inbound station, which will be 200 ft. by 150 ft. in size, exclusive of a cab-stand 190 ft. by 45 ft. It is expected that this building will be ready for use about January 1, 1914. The general construction features of the entire project, outside of the station building proper, were

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described in the *Railway Age Gazette* of November 22, 1912, page 981, and the interlocking machines May 12, 1911, page 1115. This article will be devoted to the station building.

GENERAL FEATURES.

The outbound building faces on Forty-second street between Vanderbilt avenue and Depew place, and extends north to Forty-fifth street. It is 673 ft. long by 301 ft. wide and seven stories high at present, although provisions are made for 13 stories additional in the future. The base and lower portion of the structure are of Stony Creek granite with Bedford limestone above. The style of architecture adopted resembles somewhat the Doric motif and more directly the Tuscan, modified to some extent by the French Renaissance. The front of the station facing on Forty-second street opposite Park avenue is set off by three high arched windows, surrounded by massive pillars and surmounted by a large statuary group. Similar, though less elaborate arches face on Depew place and Vanderbilt avenue opposite Forty-third street.

Constructed coincident with, and an essential part of the station, is a new elevated roadway or street which starts at Fortieth street and Park avenue, crosses over Forty-second street and divides, passing around both sides of the building and coming down to the grade of the present street at Forty-fifth street, opening a new avenue for vehicle traffic north and south and relieving the congestion on Lexington and Madison avenues. That portion of the roadway parallel to 42d street, in front of the station, will be 50 ft. wide and will be protected on the outside by an ornamental stone balustrade.

Looking East; Forty-second Street on the Right; Concourse on the Left.
Main Waiting Room, Grand Central Terminal, New York.

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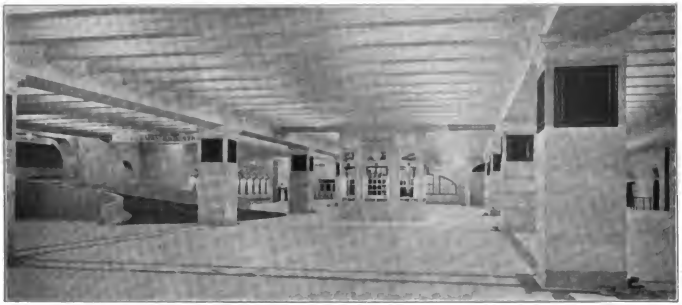
Cork insulation under the roadway will prevent disturbance to the stores which are located under this driveway on the level of Forty-second street. The westerly driveway is a public thoroughfare for traffic not necessarily destined to the entrances, at which most of the passengers will enter, lead directly to the express and suburban concourses by separate ramps, while the third entrance leads through the main waiting room to the express concourse. Other entrances are



Information Bureau in Center Is Immediately Below the Bureau on Upper Level.
Lower Concourse; Looking West.

station and will also provide access to the cab-stand in the station and to the baggage and mail facilities. That portion of the roadway south of the north line of Forty-second street is still uncompleted.

The three main entrances for foot passengers are located provided at Forty-third street on Depew place and Vanderbilt avenue, the former entering the main concourse directly, and the latter by way of the gallery. Two cab entrances are provided, one on Vanderbilt avenue and Forty-third street under the overhead driveway, for the use of passengers with-

Lower Concourse; Ticket-Office Windows and Ramp to Subway and Street.

on Forty-second street, one at the southeast corner of the building at Depew place, one at the southwest corner at Vanderbilt avenue and the third at the centre of the Forty-second street side directly opposite Park avenue. The two corner out baggage, and the other immediately north of the main concourse and adjacent to the baggage room, for passengers with baggage. Passengers from either of these cab-stands will enter the station on the gallery surrounding the main

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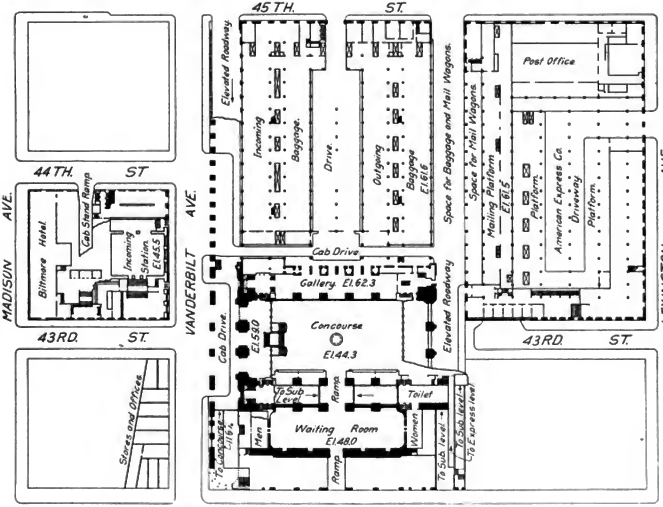
concourse and can descend to the main floor either by elevators or by a broad stairway at the west end of the contourse.

As the waiting room, concourses and platforms are all on different levels and all below the street level, an elaborate system of ramps was required. Temporary ramps in service during the early construction periods were arranged at different grades and the results carefully watched. From the experience gained here a maximum grade for the permanent ramps of 10 per cent. was established which was exceeded in only three instances where an 11 per cent. grade was required. Stairways are only used in auxiliary passageways where the amount of traffic is light.

THE MAIN FLOOR.

As about 80 per cent. of the people arriving at, or departing from the terminal use the subway, the elevation of the information bureaus, baggage and parcel rooms, telegraph offices, etc. This concourse is 287 ft. long, 120 ft. wide and 125 ft. high to the center of the arched roof, with a further extension under the gallery on the east end of 55 ft. and under the gallery and street on the west end of 105 ft. This concourse is finished in Botticino marble and buff tinted stone. The three large arched windows facing on Depew place and on Vanderbilt avenue opposite 43d street form the ends of the concourse. It is lighted at night by chandeliers in the galleries on the north side and ends and by concealed lights along the arched ceiling. No seats will be placed in this area.

The arched ceiling of the main concourse is painted turquoise blue. It presents a view of a section of the heavens as seen during the months from October to March, or from Aquarius to Cancer. Sweeping across the ceiling from east to west are two broad bands of gold, representing the Ecliptic and the Equator. The figures and signs, in their relation to one another and to the Ecliptic and Equator are shown as nearly as possible in astronomically correct arrangement and extend on a segment of a circle across the entire ceiling. The signs of the Zodiac in progression are Aquarius, Pisces, Aries, Taurus, Gemini and Cancer. Besides the signs of the Zodiac, there are depicted certain familiar constellations, among them being Orion, Pegasus, Musca and Triangulae. The signs and constellations are drawn on the blue field in gold outline and modeled delicately with a stipple of tiny stars. The great stars which mark the signs and constellations, 63 of them, are illuminated. From Rigel, the star marking the toe of Orion, or the Hunter, to Propus, marking the tip of his club, there is



Plan of Street and Baggage Room Floor Level; Grand Central Terminal.

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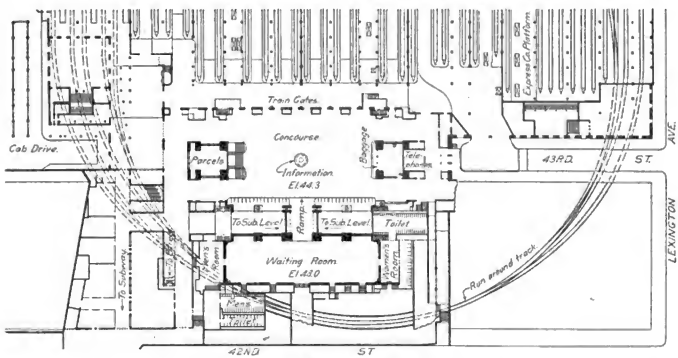
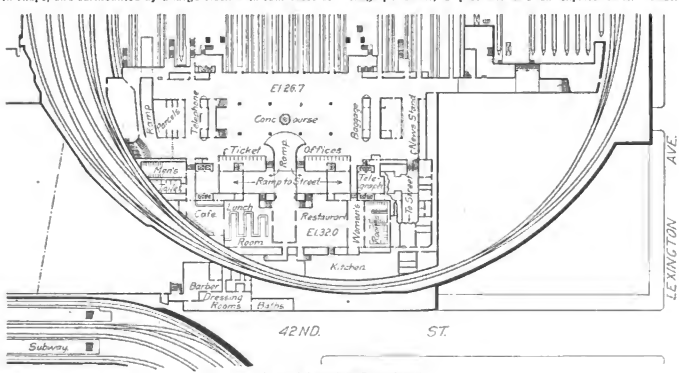
an expanse of 40 ft. The other constellations are on a similarly large scale. The milky way, composed as it is of myriads of tiny stars, is represented running across the ceiling from southwest to northeast.

The various facilities required by a traveler are arranged in the order of his usual preparations. Directly in the center of the concourse is located the information booth, octagonal in shape, and surmounted by a large clock with four faces so that it is visible from all portions of the concourse. Forty-eight ticket windows are arranged along the south side in two groups, those for the New York Central & Hudson River being located west of the central entrance into the waiting room and those for the New York, New Haven & Hartford east of this entrance. Under the balcony at the east end of the room is located the baggage checking room where the claim checks received at the inner cab-stand are exchanged for the regular baggage checks. Pneumatic tubes connect this office with the main baggage room. Directly back of this are situated the telephone booths, while to one side are the telegraph offices, a postoffice and an express office. Under the stairway leading from the gallery at the opposite end of the room is found the parcel room. Drinking fountains are installed in each of the four corners of the concourse. On the north side of the room, directly opposite the ticket win-



Plan of Express Floor Level.



Plan of Suburban Floor Level.

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dows, are the gates and indicators leading to the trains. Beyond these gates is a narrow concourse and short ramps leading to the platforms three feet below the level of the concourse and even with that of the car floors.

The main waiting room is situated between 42d street and the main concourse, the center entrance to the station leading directly into the waiting room and through this to the main concourse. It is 3½ ft. below the level of Forty-second street and 3 ft. 9 in. above the main concourse, connecting with both by ramps. This room is 65 ft. x 205 ft. in size, is provided with artistic beamed ceilings and is finished in buff stone and marble. It is lighted by five large electroliers suspended from the centers of large panels in the ceiling. Directly connected with this are the men's and women's waiting rooms, lavatories and toilets, while a stairway leads from this floor to the restaurant directly beneath. The women's waiting room is finished in quartered oak and is provided with a telephone room, hair-dressing parlors and shoe shining shop. Convenient to the men's or smoking room are a barber shop, baths and private dressing rooms. Several private barber shops are also provided so that an incoming traveler can reserve one ahead by telegraph, thus insuring immediate attention upon arrival.

THE SUBURBAN LEVEL.

Directly below the main concourse and similar to it in general details, is the suburban concourse. It is reached by ramps from the two main corner entrances and by a broad ramp from the subway. The latter is one of the most beautiful features of the station. It is a marble corridor 40 ft. wide between the main concourse and the waiting room and, opening above into these rooms, it presents a very pleasing effect, flanked as it is by large columns. This concourse is lighted by five large electroliers suspended by heavy bronze chains.

An information booth similar to that on the main floor is placed in the center of this concourse. Ticket offices for both roads are placed directly below those on the express level and are connected by small circular stairways enabling ticket sellers to go quickly from one floor to another as the business demands. Likewise, the baggage checking room is located directly below that on the express level and the parcel room on the suburban concourse is connected with that on the upper floor by a "dumb waiter," enabling a passenger to present his check for a parcel on either floor, as desired. The train gates open out on the north side of the concourse as on the upper floor.

A restaurant and a lunch room are located on the suburban concourse directly below the main waiting room, being divided by a heavy bronze grating with glass lights. The ceiling in this room is made up of a series of Gustavino arches of cream-colored tile giving a very attractive grotto-like effect. Access to this is had directly from the suburban concourse or by a stairway from the waiting room. Adjoining the east end of this restaurant will be a women's rest room, and at the opposite end will be a bar.

BAGGAGE AND EXPRESS FACILITIES.

The baggage room is situated immediately north of the main concourse on the 45th street level (17 ft. higher than the concourse, and directly over two wide platforms on the express level which are designed expressly for solid baggage trains. It is entered either directly from 45th street or by a driveway from Depew place. Outbound baggage can be unloaded either along the platform facing on Depew place or from the enclosed interior driveway. Passengers with baggage coming to the station by carriage will receive a claim check for their baggage at the cab-stand, which check will be exchanged at the regular baggage office on either the main or suburban concourses for a regular baggage check. Ten elevators are provided in the outgoing baggage room and nine in the incoming baggage room, some of which are so spaced that baggage can be lowered directly in front of the different cars in a solid baggage train along the special baggage platforms referred to. When baggage is not destined for such a train, but rather for one of the regular passenger trains, it will be lowered by the elevators to a transverse subway running beneath the tracks of the lower level near Forty-fifth street, carried through this subway to the proper point and raised to the track level by another elevator. Incoming baggage will be lowered to a subway near Forty-third street and taken to the baggage room. In this way all conflict in the handling of baggage is eliminated and interference with passengers is reduced to a minimum. Electric motor trucks are being used exclusively in the handling of baggage.

Across Depew place from the outgoing baggage room are to be found the facilities for handling mail and express, the driveway for the mail wagons being recessed back from Depew place to avoid interference with baggage wagons unloading at the outgoing baggage room doors opposite. Six elevators lead from the mail and express rooms to platforms below provided for solid mail and express trains, while such traffic destined for passenger trains will be handled in the same way baggage is.

All illumination of the station is by direct lighting from electroliers and individual lights, with the exception of the arched ceiling over the main concourse which is lighted by concealed lights. Ten per cent. of the lights are on an entirely independent system, so that no accident to the regular power supply can shut off the light entirely.

In view of the large amount of traffic now passing through this station it is interesting to note that the average annual increase in traffic for the last 10 years based upon the number of loaded cars handled is 7.1 per cent. Some idea of the volume of this traffic may be gained from figures gathered for the eight days from Friday, August 30, 1912, to September 6, including the Labor Day holiday. In this period 4,826 trains with 31,269 cars were handled, while 944,000 people passed in and out of the station. This was the heaviest traffic ever handled at this station and the trains were moved with an average delay of only .34 min. An average daily movement of about 600 trains and 3,700 cars is regularly handled at the present time, the maximum density being from 8:30 to 9:30 in the morning, with 39 scheduled trains inbound in the winter and 34 in the summer, and 13 scheduled trains outbound in the same time. About 7,500 pieces of baggage are also handled daily.

The construction of the Grand Central Terminal facilities is all being carried out under the supervision of George W. Kittredge, chief engineer, New York Central & Hudson River, and George A. Harwood, chief engineer, electric zone improvements. Warren & Wetmore are the architects of the station and terminal buildings.

SHOPS IN VICTORIA.—The Victorian government has decided to establish locomotive and car building shops at Ballarat and Bendigo at an estimated cost of $400,000 each. The Newport shops, where it was the intention of the government to centralize the manufacture of all rolling stock, have become congested, showing that there is a limit to the policy. There was a popular demand to build small shops at various stations, but the government has proposed two properly equipped shops. Practically all the plant and equipment will have to be imported. The scheme will put a certain amount of check on the ambition of local private enterprise, for the new shops, together with the Newport shops, will considerably increase the output of rolling stock in the near future. During last year the Newport shops turned out 37 locomotives, 78 passenger cars and 688 freight cars. This year the program is for the construction of 51 locomotives, including those to be assembled at the workshops from parts made by contract, 146 passenger cars, 75 vans and 928 freight cars. About 350 men are to be employed at each of the new workshops, and a rough estimate of the annual output from each is from 15 to 20 locomotives and 200 freight cars.

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VENTILATION OF STEEL SLEEPING CARS.*

Excellent Results Obtained with Exhaust Ventilators and No Deck Sashes Compared to Wooden Cars with Both Devices.

BY THOMAS R. CROWDER, M.D.

Two years ago the author presented before the American Public Health Association the results of a study of the ventilation of sleeping cars.† An attempt was made to determine the amount of fresh air which enters the running car under various conditions of operation, the places of entrance of the air, its distribution, and the general direction of its currents. Two plans of ventilating were considered in that study, which were called "natural ventilation" and "ventilation by exhaustion."

To the majority of the cars investigated there had been applied a device‡ intended to remove air through certain of the upper windows, or deck-sashes, by a suction effect dependent on train motion, all other deck-sashes remaining closed. This plan was called "ventilation by exhaustion." That the exhaust apparatus actually did what it was intended to do was easily determined by means of the anemometer. It was found that each of the exhaust ventilators would remove about 15,000 cu. ft. of air each hour at a 40 mile train speed. Six to eight of them were applied to each car.

The results of a large number of observations showed that by the application of this exhaust device the active ventilation of the body and berths of a sleeping car is considerably increased over and above what may be expected from the natural forces of the wind through the open deck-sashes, and that the flow of fresh air into the car is more regular and better distributed. The respiratory contamination of the air of the breathing zone and of the occupied berth remains almost constantly low. Carbon dioxid reaches a proportion of ten parts in 10,000 of air with relative rarity; and the computed fresh air supply averages about 2,000 cu. ft. per hour for each berth and about 40,000 cu. ft. per hour for the car. With the adoption of this exhaust system of ventilation as a standard of construction the deck-sashes cease to perform any important function. Indeed, they may become a direct hindrance to the most efficient operation of the device.

This previous study was made on the standard Pullman sleeping car of wooden construction. The exhaust ventilator considered was applied to cars which had been previously in service and had been originally ventilated by the natural or deck-sash method. Since the completion of that study the all-steel sleeping car has come into extensive use. These cars are all equipped with exhaust ventilators in the building; and for the reasons stated above the deck-sashes are omitted, or, if not entirely omitted, are reduced in number from twenty-four to four, and these four are very small. Only electricity is used for lighting; this avoids the necessity of making openings through the roof to carry away the combustion gases of burning lights. The upper portion of the car is almost entirely free from natural openings. It is therefore readily seen that whatever air enters these cars must come from crevices about windows and doors located low down. From this it would naturally follow that the lower levels of the car receive a larger air supply than with the older type of construction. It is not considered a matter of great hygienic importance whether they do or do not; no increase in the air supply is demanded on hygienic grounds; but in order to have some adequate information as to what actually does take place and to be able to make accurate comparisons, a series of thirty-six steel cars was investigated during the first two months of 1912.

The methods used in the investigation of these cars are the same as those previously employed. Samples of the air to be examined were collected in glass-stoppered bottles, sealed, and were analyzed in the Petterson-Palmquist apparatus for the determination of carbon dioxid. Air was collected from the center aisle, in order to determine the respiratory contamination of the general air of the car, and from lower and upper berths in order to determine the respiratory contamination of the air within them. From these contaminations air supplies have been computed as before.

All the observations in the cars included in the present series were made during the night, after the passengers had retired. The time ranged from 11:00 p. m. to early morning. The outside temperature varied from zero F. to 36 F.; it was generally as low as 20 F. Samples were taken as nearly simultaneously as possible in the aisle and in from three to six berths; samples from the same places were repeated at approximately fifteen minute intervals for one or two hours. This was done in order to obtain general averages, which are more important and give much more dependable information of the condition of the air than single observations or short series. From the latter erroneous conclusions are very likely to be drawn. It must be recognized that in any running car the conditions are liable to rapid and relatively great variation. Minimum actual rates of air supply, hence degrees of respiratory contamination, alternate with maximum actual rates; and these minimums and maximums may lie a considerable distance apart. They represent temporary and local, not continuous and general, conditions. General averages are much more significant.

GENERAL RESULTS.

The air tests first recorded were collected from the car body, and not from the berths. The air supply as computed is expressed to the nearest thousand in terms of cubic feet per car per hour. It is that volume which would keep the CO_2 at the average proportion found in the air of the car if the number of occupants did not change.

The following is a summary of these observations:

Cars examined	36
Average number of occupants	16.2
Number of air samples analyzed	246
Average number of samples per car	6.86
Average carbon dioxid	5.78:10,000
Highest average CO_2 in any car	8.13:10,000
Lowest average CO_2 in any car	4.72:10,000
Highest CO_2 in any sample	9.5 :10,000
Lowest CO_2 in any sample	4.5 :10,000
Number samples showing CO_2 over 10:10,000	0 (0.00 per cent.)
Number samples showing CO_2 over 8:10,000	5 (2.03 per cent.)
Number samples showing CO_2 over 7:10,000	20 (8.13 per cent.)
Number samples showing CO_2 over 6:10,000	56 (22.76 per cent.)
Number samples showing CO_2 6 or less:10,000	190 (77.24 per cent.)
Average hourly air supply per car, cu. ft.	54,600
Highest hourly air supply for any car, cu. ft.	175,000
Highest excepting Nos. 9 and 10,* cu. ft.	75,000
Average excepting Nos. 9 and 10,* cu. ft.	53,000
Lowest hourly air supply for any car, cu. ft.	32,000

Number of cars showing less than 40,000 cu. ft. per hour, 3. (8.33 per cent.)

*During the first ten experiments the drop-sashes in the doors were let alone as found; in all later experiments they were purposely kept closed while observations were being made. Only twice, namely, in experiments 9 and 10, was the air supply markedly affected by these open drop-sashes, and in these cars the sashes were opened widely.

The average air supply to the breathing zone of the steel sleeping car, as computed from the average proportion of CO_2 and the average number of occupants in the 36 cars examined, is

*Abstract of a paper presented before the Fifteenth International Congress on Hygiene and Demography, by Dr. Crowder, who is superintendent of sanitation for the Pullman Company, Chicago. It was also printed in the *Archives of Internal Medicine*, January, 1913.

†A Study of the Ventilation of Sleeping Cars, *The Archives of Internal Medicine*, 1911, vii, 85. Abstracted in *Railway Age Gazette*, August 25, 1911.

‡The Garland ventilator, which was described in the *Railway Age Gazette*, June 22, 1910.

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found to be approximately 54,600 cu. ft. per hour, as above stated; or, in those cars kept entirely closed, even to drop-sashes in the end doors, 53,000 cu. ft. per hour. This compares with 40,600 cu. ft. per hour for the older type of car, equipped with the same ventilating device, but maintaining the deck-sash construction, and with 28,300 cu. ft. per hour for cars having the ordinary deck-sash ventilation. The results in the steel car are also more uniform and more regular, as will be found by consulting the detailed results of the first group of experiments. The complete comparative averages may be grouped as follows:

WOOD CARS (WITH DECK-SASH CONSTRUCTION).

Natural ventilation (deck-sash method)—
Fully closed car ..... 18,500 cu. ft. per hour
With open deck-sashes ..... 28,300 cu. ft. per hour
With open deck-sashes and open end doors..... 40,700 cu. ft. per hour
Exhaust ventilation (the exhaust method)—
Fully closed car ..... 40,600 cu. ft. per hour
With open doors..... 57,900 cu. ft. per hour

STEEL CARS (CONSTRUCTED WITHOUT DECK-SASHES).

Exhaust ventilation—
Fully closed car ..... 53,000 cu. ft. per hour
With open drop-sashes in end doors..... 65,900 cu. ft. per hour

Any or all of these figures might be changed by longer series of observations. For most of the groups it is believed a sufficient number have been made to insure the relative correctness of the results obtained.

LOWER BERTH.

The observations in the lower berths cover all the cars investigated. The air supply per berth, as computed, is the number of cubic feet which must be supplied to one person each hour in order to maintain the CO_2 at the average proportion found. The berths included in this list were each occupied by one adult. The observations may be summarized as follows:

Cars in which lower berths were examined	36
Number of lower berths examined	128
Average number of lower berths per car	3.56
Total number of air samples from lower berths	856
Average number of lower berth samples per car	23.78
Average number of samples per berth	6.53
Average CO_2 in air of car body	5.78 ±0.000
Average CO_2 in air of lower berths	6.76 ±0.000
Highest average CO_2 in lower berths of any car	9.25 ±0.000
Lowest average CO_2 in lower berths of any car	5.53 ±0.000
Highest CO_2 in any lower berth sample	14 ±0.000
Lowest CO_2 in any lower berth sample	4.8 ±0.000
Number L. B. samples showing CO_2 over 12 ±0.000	4 (0.35 per cent.)
Number L. B. samples showing CO_2 over 10 ±0.000	178 (2.10 per cent.)
Number L. B. samples showing CO_2 over 8 ±0.000	1137 (16.00 per cent.)
Number L. B. samples showing CO_2 over 7 ±0.000	2281 (27.80 per cent.)
Number L. B. samples showing CO_2 over 6 ±0.000	4476 (55.61 per cent.)
Number L. B. samples showing CO_2 6 or less ±0.000	2360 (44.39 per cent.)
Number L. B. with higher CO_2 than aisle at same time	638 (76.87 per cent.)
Number L. B. with lower CO_2 than aisle at same time	68 (7.95 per cent.)
Number L. B. with CO_2 equal to aisle at same time	130 (15.19 per cent.)
Average hourly air supply per lower berth, cu. ft.	2,170
Highest average hourly air supply to L. B. of any car, cu. ft.	3,870
Lowest average hourly air supply to L. B. of any car, cu. ft.	1,140
Number cars showing average of less than 1,500 cu. ft. per L. B. per hour	2 (8.33 per cent.)

†These cars were Nos. 13, 22 and 23. The last two were on the same train and samples were taken in them at approximately the same time. The train was running directly with a strong wind. Nos. 13 and 22 are the same car, on different trips.

On the basis of 856 carbon dioxid determinations in the air of 126 lower berths in 36 steel sleeping cars equipped with exhaust ventilators, the average air supply per berth is found to be approximately 2,170 cu. ft. per hour. This compares with 2,030 cu. ft. for the lower berths of the older type of cars equipped with the same ventilating device, and with 1,390 cu. ft. in cars ventilated by the deck-sash method.

UPPER BERTH.

The results of examination of upper berths may be summarized as follows:

Cars in which upper berths were examined	21
Number of upper berths examined	30
Average number of upper berths per car	1.43
Total number of air samples from upper berths	207
Average number of upper berth samples per car	9.86
Average number of samples per berth	6.9
Average CO_2 in air of car body	5.86 ±0.000
Average CO_2 in air of upper berths	7.00 ±0.000
Highest average CO_2 in upper berths of any car	8.70 ±0.000
Lowest average CO_2 in upper berths of any car	5.44 ±0.000
Highest CO_2 in any upper berth sample	11.5 ±0.000
Lowest CO_2 in any upper berth sample	4.5 ±0.000
Number U. B. samples showing CO_2 over 12 ±0.000	0 (0.00 per cent.)
Number U. B. samples showing CO_2 over 10 ±0.000	5 (2.42 per cent.)
Number U. B. samples showing CO_2 over 8 ±0.000	34 (16.43 per cent.)
Number U. B. samples showing CO_2 over 7 ±0.000	83 (40.10 per cent.)
Number U. B. samples showing CO_2 over 6 ±0.000	139 (67.15 per cent.)
Number U. B. samples showing CO_2 6 or less ±0.000	68 (32.84 per cent.)
Number U. B. with higher CO_2 than aisle at same time	182 (79.82 per cent.)
Number U. B. with lower CO_2 than aisle at same time	13 (6.28 per cent.)
Number U. B. with CO_2 equal to aisle at same time	12 (5.80 per cent.)
Average hourly air supply per upper berth, cu. ft.	2,000
Highest average hourly air supply for U. B. of any car, cu. ft.	4,170
Lowest average hourly air supply for U. B. of any car, cu. ft.	1,280
Number of cars showing average of less than 1,500 cu. ft. per U. B. per hour, 2	(9.52 per cent.)

On the basis of 207 carbon dioxid determinations in 30 upper berths of 21 steel sleeping cars equipped with exhaust ventilators, the average air supply per berth is found to be approximately 2,000 cu. ft. per hour. This compares with 1,880 cu. ft. for the upper berths of the older type of cars equipped with the same ventilating device, and with 1,270 cu. ft. in cars ventilated by the deck-sash method.

COMPARISON OF LOWER AND UPPER BERTHS.

We are able to compare the ventilation of the lower and upper berths in the same cars in all of the 21 cars in which upper berths were investigated. The comparison for each car is shown in Table I. It will be seen that the ventilation of lowers and uppers is, on the average, much the same. It is relatively rare for the average air supply of the two to fall far apart. If one is high the other is high; if one is low the other is low. The general averages show results which would indicate that the lower receives slightly more air than the upper, but the difference is almost trifling. In 13 cars the lower received the greater air supply; in eight cars the upper received the greater supply. This runs in part counter to the findings of the previous study, where in every car the lowers were found to receive a little more air than the uppers. In that series there were only five cars in which this comparison could be made.

TABLE I.—COMPARISON OF THE VENTILATION OF LOWER AND UPPER BERTHS IN STEEL SLEEPING CARS EQUIPPED WITH EXHAUST VENTILATORS.

Experiment	CO_2 per 10,000 of Air: Aisle Aver. CO_2	Lowers No. of Tests	Lowers Aver. CO_2	Uppers No. of Tests	Uppers Aver. CO_2	Equivalent Hourly Air Supply per Berth: Lower	Upper
1.....	5.50	24	5.73	6	6.08	3,470	2,880
2*.....	5.25	32	6.64	8	6.50	2,270	2,400
3*.....	6.00	28	6.66	7	6.79	2,250	2,150
4.....	6.29	21	7.12	7	8.36	1,520	1,360
5†.....	5.45	30	6.18	20	6.68	2,750	2,240
6*.....	6.82	44	6.69	11	6.82	2,230	2,110
10‡.....	6.22	16	6.06	9	5.44	2,910	4,170
11.....	6.00	14	7.36	14	6.96	1,790	2,030
12.....	6.00	21	7.64	7	8.29	1,850	2,620
13.....	6.57	21	9.02	7	7.79	1,200	1,580
14.....	5.91	21	6.62	7	7.41	2,290	1,750
16.....	5.50	14	6.64	14	7.07	2,270	1,950
17.....	6.39	27	7.55	18	7.27	1,650	1,590
18.....	5.79	21	6.09	7	6.00	2,870	3,000
22§.....	7.21	28	9.25	7	7.79	1,140	1,580
24.....	5.92	24	7.01	12	7.42	1,990	1,760
26.....	5.20	20	5.55	10	5.75	3,870	3,430
29.....	7.30	20	7.81	10	8.70	1,570	1,280
30.....	6.30	20	7.01	10	7.85	1,990	1,560
33.....	5.30	20	5.91	10	6.45	3,140	2,450
34.....	5.08	24	6.85	6	6.25	2,110	2,670
	5.86	492	6.93	207	7.00	2,050	2,000

*Drop-sashes of end doors open 3 inches.
†Drop sash of rear door open 12 inches.
‡Drop-sashes of end doors open 24 inches.
§Train running directly with a strong wind.

On the basis of 207 carbon dioxid determinations in 30 upper berths of 21 steel sleeping cars equipped with exhaust ventilators, the average air supply per berth is found to be approximately 2,000 cu. ft. per hour. This compares with 1,880 cu. ft. for the upper berths of the older type of cars equipped with the same ventilating device, and with 1,270 cu. ft. in cars ventilated by the deck-sash method.

COMPARISON OF LOWER AND UPPER BERTHS.

We are able to compare the ventilation of the lower and upper berths in the same cars in all of the 21 cars in which upper berths were investigated. The comparison for each car is shown in Table I. It will be seen that the ventilation of lowers and uppers is, on the average, much the same. It is relatively rare for the average air supply of the two to fall

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ply is, of course, inversely as these proportions of CO_2; the lower had a greater air supply than the upper in 51.9 per cent., a less air supply than the upper in 33.5 per cent., and they were momentarily equal in 14.6 per cent. of the cases.

The upper berth has no window opening into it. The edge of the berth is about on a level with the top of the window. There is a space of about one-half inch between the edge of the berth and the wall—a total open space of about 36 sq. in. Through this wide crevice the upper berth receives much of its air supply, which must then pass inward and upward across the berth and its occupant toward the ventilator exits.

GENERAL COMPARISONS.

We may here bring together the comparative results for the car body and the lower and upper berths in the three classes of cars. The general averages of CO_2 and the computed air supplies are shown in Fig. 1, in which the CO_2 and the equivalent hourly air supplies per person are grouped for the three

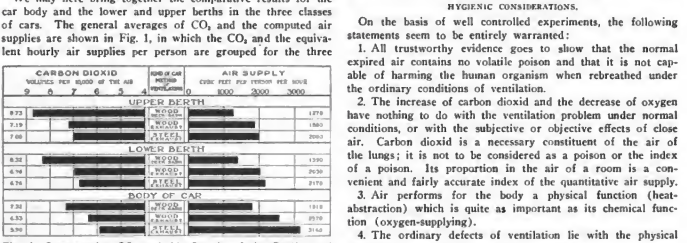

Fig. 1—Comparative CO_2 and Air Supply of the Berths and Aisle in Steel Cars with Exhaust Ventilation, and in Wood Cars with Exhaust and Natural Ventilation.

classes of cars, showing their relations as established by a study of the air of the aisle, the lower berth, and the upper berth, respectively.*

The determinations of CO_2 and computations of air supply refer to the running car. When a train stops, the active ventilation is much reduced and the CO_2 rises. It may finally reach a maximum of 20 volumes in 10,000, though it usually stops around 15. This rise in the CO_2 is generally detected within a very short time—one or two minutes. On starting again the air supply is increased and the CO_2 falls rapidly. In working out the series of observations presented in this and the previous study, no attention was paid to stops lasting up to four or five minutes; samples taken after those of longer duration have been dropped out of consideration. Had attention been confined strictly to the running car the results would be changed slightly; the CO_2 would be a little lower and the equivalent air supply proportionately higher.

As a general rule it is found that the CO_2 in the air of the berths and in the air of the aisle follow each other consistently in successive determinations, that of the berths averaging a little higher, as would be expected from the fact that the inflowing air from end passageways is not likely to enter them, but to be mixed in the aisles with the contaminated air that flows out from them.

From what has preceded it is seen that the air supply to the breathing zone of the steel car, constructed without deck-sashes, is materially increased over that of cars similarly equipped as to exhaust ventilating devices, but built with deck-sashes in the ordinary way. This increased ventilation is much more noticeable in the air of the aisles than in that of the berths; it results in a somewhat greater difference between the average CO_2 of the aisle and berths than was found in the previous series, which is interpreted to mean that more air flows from the end doors and passageway windows into the body of the car by reason of there being no crevices at the top to supply the exhaust demand of the ventilators. It is probable that the power of exhaustion developed by these ventilators is very slight as measured by differences of the internal and external barometric pressure. They no doubt act mainly by furnishing a ready exit and continuous outflow of that air forced in by the wind, preventing its damming back near the places of entrance. In this way a constant upward movement of the incoming air is assured, and this leads to a constant and equalized renewal of the air in the lower levels.

HYGIENIC CONSIDERATIONS.

On the basis of well controlled experiments, the following statements seem to be entirely warranted:

1. All trustworthy evidence goes to show that the normal expired air contains no volatile poison and that it is not capable of harming the human organism when rebreathed under the ordinary conditions of ventilation.

2. The increase of carbon dioxid and the decrease of oxygen have nothing to do with the ventilation problem under normal conditions, or with the subjective or objective effects of close air. Carbon dioxid is a necessary constituent of the air of the lungs; it is not to be considered as a poison or the index of a poison. Its proportion in the air of a room is a convenient and fairly accurate index of the quantitative air supply.

3. Air performs for the body a physical function (heat-abstraction) which is quite as important as its chemical function (oxygen-supplying).

4. The ordinary defects of ventilation lie with the physical function of the air and not with the chemical.

5. Temperature, humidity and air movement are the physical qualities of the air which are of importance in this relation.

6. The success of ventilation depends on whether or not these physical qualities of the air are so regulated as to maintain its physical function of heat abstraction without embarrassment to the reflex mechanism for the regulation of body temperature. "The good effects of efficient ventilation and of out-door air depend on the coolness, the relative humidity and the motion of the air and the ceaseless variation of these qualities." (Hill.)

These six statements, then, are the main items of the code which should govern attempts to ventilate. It will be noted that quantity of air as a measure of ventilation efficiency is to a large degree lost sight of, while the physical qualities of the air as they affect its ability to absorb body heat come strongly forward. The hygienic value of ventilation for the purpose of supplying chemically pure air is much less than has been generally supposed. It should now be looked on as a process to be carried out in the interest of the heat economy of the body.

DOUBLE TRACKING IN NEW SOUTH WALES.—A statement made by the minister for railways of New South Wales regarding the expenditure on double tracking work indicates that from July 1 to October 31, 1911, the expenditures totaled $865,000. Over the same period last year the amount was $1,160,000. Although the rate of expenditure had thus greatly increased, he did not anticipate any difficulty in meeting the requirements of the near future. It was explained that money was being spent on double tracking at a greater rate than at any previous period.

NEW LINE FOR QUEENSLAND.—Work on the Queensland government railway extension to connect the Chillagoe Company's line with the Mount Mulligan coalfield will be commenced shortly. In order to defray the cost of the undertaking, the Chillagoe Company has agreed to guarantee the issue of £125,000 ($625,000) 4 per cent. ten-year treasury bonds. The Queensland government will build and run the line. It is anticipated that the scheme will effect a saving in the government's fuel bill of from 30 to 40 per cent.

*Strictly considered there is no proper comparison of the aisles as set forth in this chart, because the number of passengers varied for the different classes of cars, and as this number varies the CO_2 and the volume of air *per person* will also vary in like ratio, with any given air supply to the car. The variation in the average number of passengers for the different classes was, however, so small as to make this direct comparison allowable.

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DECISION ON HOURS-OF-SERVICE LAW.

The Circuit Court of Appeals for the Eighth Circuit, Judges Hook, Smith and Van Valkenburgh, in the case of the government against the Kansas City Southern, has reversed the District court for the eastern district of Oklahoma, and holds that, in the case at bar, involving excessive hours of service of men on a freight train, in May, 1910, the railroad company did not show sufficient reason for disregarding the 16-hour limit; and has remanded the case for a new trial. The decision, prepared by Judge Van Valkenburgh, was filed January 24.

The road admitted that the men on the train in question were on duty over 16 hours, but in defense pleaded that the delays were due to the poor quality of the coal, though it had been bought from an approved source and had been inspected; to unexpected long delays in meeting opposing trains, to delays in switching and for cleaning the fire in the engine, all of these being unforeseen; also to the breaking of one of the rods used in shaking the grate of one of the engines, and to leaky flues.

The train started out on its trip forty-five minutes late; was delayed at Spiro thirty minutes to clean the fire and then thirty minutes more to wait for an opposing train; at Gans there was another delay of about one hour to meet another train; then there was a delay of one hour, ten minutes, due to the poor steaming of the engine, and fifty minutes for another meeting. When 14 miles short of the end of the run the conductor found that he had only 57 minutes left in which to complete the trip within 16 hours, and he set out about half his cars; but even with the size of the train thus reduced he still lost time and was nearly two hours in running this 14 miles. The lower court held that the railroad had made a good defense and decided against the government.

The circuit court of appeals finds that the defendant in its original answer did not properly set forth all of its reasons; but as the lower court seems to have been lenient in this matter the case is treated as though the answer had been full and complete.

Quoting numerous decisions, the court holds that this is a penal statute and therefore must be strictly construed; but also that it is highly remedial and, therefore, must be liberally construed in order that its purposes may be effected. Attention is called to the fact that in the hours of service law the words "knowingly and wilfully" do not appear; also, the clause relating to acceptable excuses for non-compliance with the law, does not contain the phrase "by the exercise of due diligence and foresight." But the purpose of the law was to prevent trainmen from working unreasonably long hours, and the carrier must be held to a high degree of diligence and foresight; as high as may be consistent with the object aimed at and the practical operation of the railroad. Numerous excuses for delay which are not acceptable under the law are set forth.

The court considers three of the excuses given in this case as worthy of consideration; the steaming qualities of the coal, the leaky flues of the engine and the defective shaker rod. Coal from the same source had not given trouble on other occasions; the engineman did not notice any defect in it; the entire testimony concerning it is meager and indefinite and the court accepts the presumption that the coal was good. The failure to make steam was much more probably due to the leaky flues.

As to the flues, the testimony is also indefinite and unsatisfactory. Testimony as to when the leaking began and as to the inspection of the engine is vague. Proof of diligence on the part of the company is far from conclusive. The reports made by the enginemen showing that the shaker rod needed repairs are not very satisfactory and there is some confusion on this point also; and the court is in doubt whether the rod was in good condition when the trip started; whether its derangement was not one of the ordinary incidents of operation which should have been anticipated. Moreover, the evidence is not clear as to whether this defect was what caused the delay at Spiro, and it is held that this defense of the company is not conclusively established. The train despatcher knew that the train was badly delayed, and at a number of places; and knew the reasons; and the decision of the court below that the despatcher exercised reasonable discretion is not accepted.

The court below was mistaken in directing a verdict for the defendants; it should have submitted the case to the jury under appropriate instructions; and, therefore, a new trial is ordered.

A LARGE CAR FERRY.

The Southern Pacific has long held the record for operating the largest ferry boat in the world, the *Solano*, but this road is now building at its shipyard in Oakland a larger steamer to be known as the *Contra Costa*. The *Solano* has been operating across the Carquinez Straits between Port Costa, Cal., and Benicia in practically continuous service for the past 32 years, transferring both passenger and freight trains. The *Contra Costa* is required to handle the increased amount of traffic.

The hull of the new boat will be of steel, the length over guards being 433 ft. and the width over guards 116 ft. Four tracks laid at 12 ft. centers will accommodate two locomotives with 36 freight cars or 24 passenger cars. The boat will be propelled by two radial paddle wheels on either side of the vessel. Two independent engines below the main deck, one on each paddle wheel shaft, will develop 2,500 h. p. each. The boiler arrangement includes eight dryback Scotch boilers. A restaurant, bar and waiting room will be located on the main deck for the convenience of passengers while crossing the river. The exact dimensions are as follows:

Length over guards	433 ft. 4 in.
Length over transoms	420 ft.
Width over guards	116 ft.
Beam moulded	66 ft.
Depth amidships	19 ft. 9 in.
Depth at sides	19 ft. 3 in.
Camber or reverse shear	1 ft.
Draft, light	5 ft.
Draft, loaded	6 ft.
Tonnage	3,800 tons

The addition of the second boat has necessitated the enlargement of landing facilities and an extra slip will be built at each side. At Port Costa the new slip will be located 1,400 ft. southeast of the present one. The length of the slip from the mouth to the nose of apron will be 450 ft. and the width at the mouth 200 ft., tapering to about 60 ft. at the apron. The wharf at the bay side, which is a continuation of the land side wharf at the old slip, is 35 ft. wide out to the fender. The fender or spring piles, which are on the bay side, are driven in two rows connected with each other by six ribbon courses each composed of four pieces of 3 ft. by 14 in. pine with joints broken to form practically continuous timbers.

The slip side of the wharf is protected by three rows of spring piles connected by 10 ribbon courses, the face of this piling being lined with about 4 in. by 8 in. sheathing. Starting with the apron the first 175 ft. of this sheathing is solid up to and around the terminal dolphins, which are composed of 70 piles, exclusive of the spring piles. The fender line on the land side extends 760 ft. beyond the mouth of the slip, 665 ft. of which is of two pile construction without sheathing and backed by two pile braced bents 6 ft. apart. All the sheath piles back of the apron hinges are creosoted, while the others are untreated. Where the wharf meets the shore a concrete retaining wall varying from 3 to 5 ft. in height protects the bank from crumbling and the deck of the wharf from contact with the earth.

At Benicia, the slip is located opposite the present one, being separated from it by a wharf 541 ft. long of the same general construction as that at Port Costa. The construction here is more difficult because of the necessity of removing a small island of rock lying in the path of the slip. The Benicia slip is 520 ft. long, with the wharf line 5 ft. above extreme high water.

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The aprons and operating mechanism are the same for both slips. The length of the apron proper is 100 ft. from hinges to nose and the width is 49 ft. Four tracks spaced 12 ft. between centers are provided on each apron. The free end of the apron is supported on a pontoon 45 ft. long and 11.5 ft. deep. The buoyancy is so regulated that with the counterweights in the towers it exceeds the weight of the apron by 10,440 lbs., enabling the platform to be raised to any height desired. To lower the apparatus, the counterweight is raised by two hydraulic cylinders 19 in. in diameter and 10 ft. long, working under a pressure of 125 lbs. per sq. in. Power is supplied by pumps and tanks on the boats.

SUPERHEATER SWITCH ENGINES WITH GAINES COMBUSTION CHAMBER.

The Illinois Central has recently received 10 switch engines of the 0-6-0 type from the American Locomotive Company; 30 more are under construction. They embody a combination of important features, which would seem to mark a distinct step forward in switch engine design. The main feature is the use of a Schmidt superheater, having 19 units, in conjunction with a Gaines combustion chamber. These are the first switch engines of which we have record that are so equipped, and the results will be watched with interest. Walschaert valve gear and the Ragonnet power reverse gear are also used. The following are the principal dimensions and data:

Type	0-6-0
Service	Switching
Fuel	Bituminous coal
Tractive effort	32,400 lbs.
Weight in working order	166,000 lbs.
Weight on drivers	166,000 lbs.
Wheel base, driving	11 ft. 8 in.
Cylinders.	
Kind	Simple
Diameter	21 in.
Stroke	26 in.
Wheels.	
Driving, diameter over tire	51 in.
Driving journals, diameter	9 in.
Boiler.	
Style	Extended wagon top
Working pressure	170 lbs.
Outside diameter of first ring	63 in.
Firebox, width and length	78 in. x 109½ in.
Tubes, number and diameter	151—2 in.
Tubes, length	13 ft. 4 in.
Heating surface, tubes	1,046.8 sq. ft.
Heating surface, flues	362.2 sq. ft.
Heating surface, firebox	150.5 sq. ft.
Heating surface, total	1,559.5 sq. ft.
Superheating surface	266.6 sq. ft.
Grate area	38.8 sq. ft.
Tender.	
Water capacity	5,500 gals.
Coal capacity	6½ tons

Ten of these engines are now in service, working with saturated steam engines which have 31,200 lbs. tractive effort, and while no tests have been run to determine the actual saving in water and fuel consumption, there is a very noticeable decrease. Very few sparks are thrown from the stacks and the front ends are found to be remarkably clean, most of the cinders collecting in the space between the brick arch and the back tubesheet. Several of the engines have been in service night and day for some time and it has been found necessary to clean the flues only once in two weeks.

The lack of cylinder condensation resulting from the use of the superheater eliminates almost entirely the throwing of water from the stack, a feature which will be much appreciated at passenger terminals. This also assists in making the engines respond quickly to the opening of the throttle, and on account of this feature one yardmaster claims he can handle from 20 to 25 per cent. more cars a day with these engines than with switchers of the same power using saturated steam. The yardmen are also enthusiastic over the saving in time resulting from the use of the power reverse gear. From an operating standpoint this time saving stands out most prominently, but the effect of the superheater in giving a quick responding or "smart" engine is almost as greatly appreciated. The engines are fitted with exhaust tips 4⅞ in. in diameter and having a ⅞ in. bridge at the top, the latter having been found necessary under the short cut-off conditions obtaining when moving any considerable distance. A special superheater oil is used for lubricating the valves and cylinders.

Illinois Central Switcher Which Has Several Important New Features.

RAILWAYS IN CYPRUS.—Cyprus possesses one railway on a gage of 2 ft. 6 in. from Famagusta, a point on the east coast, to Nicosia and Morphou. It is 61 miles long and was opened for traffic to the former place in August, 1905, and to the latter in March, 1907. The total cost of the line, including rolling stock, has been $637,335. The steepest gradient is 1½ per cent., but the line is generally level. The traffic is small and disappointing, and the expectation that Famagusta new harbor works, which have cost $570,000, would make that town the seaport of the island in place of Larnaca has not been realized. The gross receipts of the railway in 1912 were $57,035 and the operating expenses $58,315, this showing a deficit of $1,280.

RAILWAYS IN MAURITIUS.—Mauritius is well supplied with railways, which consist of six separate branches, with a total mileage of 120 miles. They are all of the 4 ft. 8½ in. gage, and there is in addition one short branch of 10 miles, which is on a gage of 2 ft. 6 in. The North and Midland lines, which together equal 67 miles, were opened for traffic in 1864 and 1865. The grades on the Midland line are very severe, as may be judged from the fact that, in a distance of 16 miles from Port Louis to Curepipe, the line rises 1,800 ft. The track for the four principal lines is composed of 74-lb. rails. These rails are gradually being replaced by 80-lb. rails. The other branches are laid with rails of varying weight, the Black River branch being laid with 40-lb. rails.

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REPORT OF CAR SERVICE COMMISSION.

Outline of the Results Obtained Thus Far and the Larger Problem of Interchanging "Legal-Tender" Equipment.

The commission on car service appointed recently by the American Railway Association to investigate complaints of diversion of cars, has submitted a report to the executive committee. The commission consists of Fairfax Harrison, president of the Chicago, Indianapolis & Louisville; R. H. Aishton, vice-president of the Chicago & North Western, and T. E. Clarke, assistant to the president of the Delaware, Lackawanna & Western, with Arthur Hale, general agent of the American Railway Association, as secretary.

The commission has held meetings at Chicago on November 18, November 20, December 21 and January 28.

The first case before the commission was that of the Baltimore & Ohio versus Wheeling & Lake Erie, which was given a preliminary hearing on November 20. It involved the alleged misuse of open cars. The evidence showed that the Wheeling & Lake Erie had used cars of the Baltimore & Ohio in its own trade because of shortage of its own cars, which were widely scattered, especially on roads west of Chicago and St. Louis. It developed that the balance in favor of the Wheeling & Lake Erie on these lines was over 1,200, while Wheeling & Lake Erie owed the Baltimore & Ohio some 500 cars. The commission, believing the best way to handle this case would be to correct the difficulty, took the matter up with all the western roads concerned and also with the roads connecting these western roads with the Wheeling & Lake Erie. Personal visits were made by members of the commission in most cases, and the response was so general that 800 cars were returned, regardless of home route, to the Wheeling & Lake Erie. This action was followed by a temporary improvement by the Wheeling & Lake Erie in its balance with the Baltimore & Ohio.

The commission next received the case of the St. Louis, Rocky Mountain and Pacific versus Colorado & Southern, which, like the prior case, covered open cars only. In this case also the commission secured such an improvement in the situation that the complaint has not since been heard from.

Immediately afterward the commission was requested by the Interstate Commerce Commission to take up the cases of certain coal roads in Illinois and Indiana, whose open cars were retained by roads north and west of Chicago. It became evident that the methods in the first two cases could not be successfully applied to such a large and serious situation, and the commission decided that the desired results could only be obtained by securing the co-operation of the railroads on a much larger scale. The commission therefore drafted the following declaration, which was promptly signed by practically all the roads centering in Chicago.

> It is hereby declared to be the policy of the undersigned that all open cars shall be returned in regular course to their owners without diversion or unnecessary delay for return loads, and to that end instructions will be given and enforced that open cars be loaded promptly only in the direction of home or sent empty to the home road under car service rules; and that such cars be given preference in movement over dead freight.

This declaration was generally put into effect with the result of relieving the situation at the coal mines in Indiana and Illinois.

The commission then received the following cases, all of which concerned open cars:

3 to 5—Chesapeake & Ohio vs. three railroads.
6 to 24—Hocking Valley vs. nineteen railroads.
25 to 26—Norfolk & Western vs. Wheeling & Lake Erie and Wabash railroads.
27—Midland Valley vs. Sunset Central Lines.

These cases were heard on December 21, and the evidence showed that the coal car situation was practically the same in the rest of the country as it had proved to be in the vicinity of Chicago. The declaration signed in Chicago was explained, and the complaining roads agreed that if such a declaration were signed and enforced generally, further action on these complaints would be unnecessary. The commission therefore requested all the railroads of the country to sign this declaration, and it has been generally signed, although in some sections modified to suit local conditions. The action taken, based upon this declaration, appears generally to have settled the open car situation for the moment, as all the cases before the commission have now been withdrawn, or allowed to lie dormant, excepting those of the Baltimore & Ohio, and Chesapeake & Ohio, against the Wheeling & Lake Erie, and the Midland Valley against the Sunset Central Lines. In these cases investigations were made by the commission which developed such exceptional conditions that it appeared necessary to exercise the power conferred upon the commission by Per Diem Rule 19, paragraph 5, and action has been taken as follows:

PENALTIES FOR VIOLATION OF RULES.

In the case of the Baltimore & Ohio against the Wheeling & Lake Erie, the commission found that there was a violation of car service rules by the Wheeling & Lake Erie in respect to Baltimore & Ohio cars during the period from September 1, 1912, to January 28, 1913, and imposed a fine of $9,884 to be paid by the Wheeling & Lake Erie to the Baltimore & Ohio, the expense incident to the investigation, $64.82, to be paid by the Wheeling & Lake Erie to the American Railway Association.

In the case of the Chesapeake & Ohio against the Wheeling & Lake Erie, the commission found that there was a violation of car service rules by the Wheeling & Lake Erie in respect to Chesapeake & Ohio cars during the period from September 1, 1912, to January 28, 1913, and imposed a fine of $3,534 to be paid by the Wheeling & Lake Erie to the Chesapeake & Ohio, the expense of $32.41 to be paid by the Wheeling & Lake Erie.

In the case of the Midland Valley against the Sunset-Central Lines the commission found that there was a violation of car service rules by the Sunset-Central Lines in respect to Midland Valley cars during the period from September 1, 1912, to January 28, 1913, and imposed a fine of $7,912 to be paid by the Sunset-Central Lines to the Midland Valley, the expense of $50 to be paid by the Sunset-Central Lines.

The commission has received no complaints involving open cars for over a month, but latterly it has received informal, though reliable, advice that the movement of our large crops has resulted in draining western roads of their box cars in favor of the eastern roads. Beside the information derived from railroads, the commission has received through the Interstate Commerce Commission complaints from the Minneapolis Chamber of Commerce, and the Western Grain Dealers' Association, of Des Moines, Ia. The commission is investigating this box car matter, but it is of opinion that the action taken in respect to open cars will not avail to remedy the box car situation—though it may palliate it temporarily.

The commission is advised that over 85 per cent. of the box car mileage in the United States is made under load, while open cars seldom average more than 55 per cent. loaded. It is evident that the prompt return of open cars to their owners cannot materially decrease their loaded mileage, so that the enforcement of Per Diem Rule 19 on open cars, as contemplated by the open car declaration, is practicable and advisable. The commission fears, however, that the sudden enforcement of drastic measures tending to return box cars to their owners without regard to the traffic which offered would result in a decrease in the loaded mileage of box cars. While such a course might fill the present shortages somewhat, it would infallibly result in new and greater shortages at all points in the country.

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The commission recognizes that a greater incentive should be given to the distributing railroads properly to equip themselves with box cars and to improve their demurrage and storage rules, especially at the seaboard, but it believes that these results can be obtained by some better method than a blind enforcement of Rule 19.

Having had the benefit of this experience and concentrated study of car service under existing conditions, the commission has formulated for its own guidance some general principles which it takes this opportunity to present for the consideration of the executive committee in the hope that further study of the problem may lead to a solution on an enduring basis of what is after all one of the most acute difficulties in the operation and financial management of the American railways today.

PRINCIPLES FOR STUDY OF CAR SERVICE PROBLEM.

1. In actual practice all equipment falls into two classes:

A. Special Equipment, e. g., open cars, which necessarily involve an empty return movement.

The fair use of special equipment can be, and now is, effectively regulated by Rule 19.

B. "Legal Tender" Equipment, e. g., box cars, which may be and are loaded at any time at any point in any direction, when there is traffic.

The fair use of box cars cannot be effectively regulated by Car Service Rule 19, because

2. The practice of the home route in the case of box cars is an economic waste, from which it has developed in practice that

3. There is in effect today a pool of "legal tender" equipment but without regulation and in its results unjust

(a) during times of car shortage to those originating lines which have provided the equivalent of, or more than, their quota of cars, and to the public served by those lines, and

(b) during times of car surplus, to distributing lines.

4. To be just to the railroads themselves and to the public generally, this pool should be regulated to the end that there shall be secured to every road the use, when it needs them, of its quota of "legal tender" equipment, whether its own or the equivalent in foreign cars, or, in the alternative, compensation in money for the difference. Such regulation can be made effective only by abandonment of the right to physical return to the owner of its own cars, and the substitution of the right to possession and use by each line of "legal tender" cars in kind equivalent to the cars by it owned and contributed to the pool.

5. The objections to recognizing a box car pool in the past have rested largely on the desire of roads, which have supplied their quota of "legal tender" equipment and have maintained them on high standards, to be assured of the use of cars measuring up to their standards. The answer is that in practice existing car service rules have not secured this result so far as box cars are concerned.

6. In any event the inequalities in standards, strength, equipment, capacity and maintenance, of the box cars in general use today are less than they have been, but the regulation of the existing pool should lead to the general adoption of a standard box car.

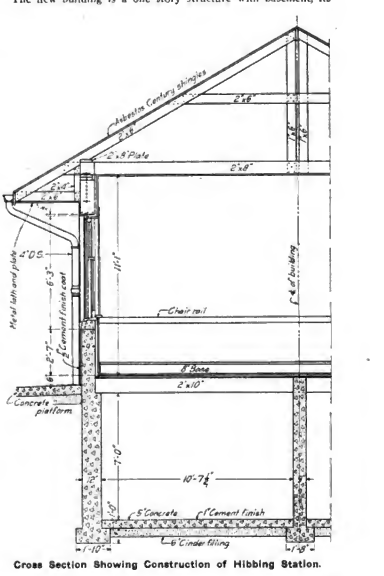
It is estimated that any car builder could build a box car on uniform standard specifications at a saving of at least $65 per car, under any market conditions. On the basis of box cars built in the United States in the calendar year 1912, viz.: 107,887, this would mean a saving of $7,012,655 in capital investment in the railroads and contributes not the least argument in favor of regulating the existing box car pool.

QUEENSLAND'S FIRST BUFFET CAR.—The Central-West Railway, Queensland, has just put in service a buffet car—the pioneer convenience of the kind in Queensland. This car, which was built at the company's shops, has been put on between Emerald and Longreach, which is rather a "dry" portion of the line.

DULUTH, MISSABE AND NORTHERN STATION AT HIBBING, MINNESOTA.

Hibbing, Minn., is one of the principal mining towns on the Missabe Range. It is the northern terminus of the main line of the Duluth, Missabe & Northern, and in addition to a heavy through passenger traffic to and from Duluth, this point supplies considerable local business to other towns on the range. In order to provide adequate station facilities for handling this passenger traffic, the company built a new passenger station last year in connection with the opening of its new line into Hibbing, which was made necessary by the development in open pit mining operations.

The new building is a one story structure with basement, its



Cross Section Showing Construction of Hibbing Station.

over-all dimensions being 111 ft. 6 in. x 24 ft. The waiting rooms extend the full width of the building; the portions assigned to men and women being separated by the ticket office, which is about two-thirds of the width of the waiting rooms. A single ticket window opens on the space that is common to both waiting rooms. A janitor's room, ladies' retiring room and toilet room occupy a strip 8 ft. 4 in. wide across the end of the ladies' waiting room and a storeroom, stairway to basement and men's toilet room occupy a similar position at the end of the men's waiting room. A baggage room and express room complete the floor plan.

The foundations and walls are of reinforced concrete, the exterior treatment suggesting the prevailing type of station archi-

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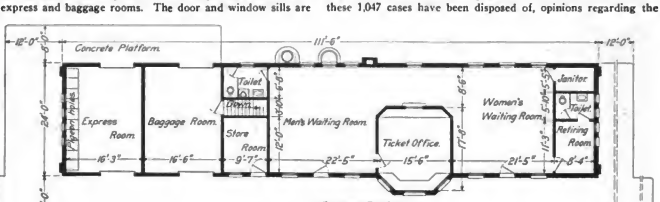
tecture found in the southwest. The foundations are carried down far enough to form a 7 ft. basement, which is floored with 5 in. of concrete on 6 in. of cinders. The exterior foundation walls are 12 in. thick, and the interior walls 9 in. thick. Above the floor level the exterior walls are 9 in. thick, finished on the outside with a ½ in. coating of pebble dash cement, and on the inside with plaster in the public rooms and plank wainscoting in the express and baggage rooms. The door and window sills are



Floor Plan of Hibbing Station; Duluth, Missabe & Northern.

of concrete, cast separate and set after the walls were cast. The floors are of maple, except in the men's toilet and the express and baggage rooms in which concrete is used. The roof is framed of timbers and covered with asbestos Century shingles. A concrete platform 235 ft. 6 in. x 12 ft. wide is provided in front of the station, and extensions to this platform are carried around both ends of the building.

The building and platforms are lighted by incandescent electric lights and the building is heated by a furnace located in the basement. Coal for this furnace is supplied to a basement storage room through a coal hole in the concrete platform.

The building was erected under the supervision of H. L. Dresser, chief engineer, and under the personal direction of George K. Nuss, inspector.

NEW LINES FOR BOLIVIA.—It is expected that the line from La Paz to Viacha, an extension of the line from Arica, Chile, to La Paz, will soon be open to traffic. When completed this will be the second line from La Paz to Viacha, an important center.

REPORT OF BLOCK SIGNAL AND TRAIN CONTROL BOARD.*

Statistics.—Since the organization of the board in July, 1907, 1,146 devices and systems intended to promote the safety of railroad operation have been brought to the board's attention, and in 1,047 cases complete plans have been furnished. All of these 1,047 cases have been disposed of, opinions regarding the practicability and merit of the devices or systems having been transmitted to the proprietor in each case.

The Block System.†—The desirability of using the block system as the only reasonably safe method of regulating the movements of railway trains, which had already been set forth by the Commission in several of its annual reports, was confirmed. The Commission, as well as this board, in recommending compulsory legislation, has taken the conservative attitude that the Government should not prescribe detail methods, but should

Duluth, Missabe & Northern Station at Hibbing, Minn.

*The Block Signal & Train Control Board of the Interstate Commerce Commission went out of existence June 30, 1912. Its final report, dated June 29, has just been published by the commission. This report consists mainly of a review of the five years' work of the board, which work has been made known to the readers of the RAILWAY AGE GAZETTE in its notices of the four annual reports of the board. In the present article we give extracts from those chapters of the final report which are of present interest. An appendix to the report, filling 15 pages, contains a description of the automatic train stop of the Railway Automatic Safety Appliance Company, of Wilmington, Del., which was tried on the Pere Marquette and the Pennsylvania. In this apparatus the "stop" is a horizontal arm fixed on a post about 4 ft. high, and it applies the brakes on a train by striking a projection carried on the buffer beam of the locomotive.

†A general review of the block system and its use in the United States was issued by the Commission in February, 1907, before the establishment of this board.

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require the gradual installation of the block system on all railroads carrying passengers. The soundness of the principle that the block system is the one and only adequate method now known of spacing trains not only has the constantly renewed indorsement of the majority of prominent railroads, as evidenced by their action in extending its use, but there is a special and significant indorsement in its use on an increasing number of lines which are used only by freight trains. . . . The propriety of using the block system on these lines of light traffic, and the economical results of such use, have been set forth, especially in Appendix B of the fourth annual report. A report was made on the use of the simple manual block system on the Northern Pacific under regulations—the "A B C system"—increasing its safety without the addition of costly electrical apparatus, and simplifying and cheapening the operation by abolishing the time-table and its complicated rules. This was published in Appendix A of the second annual report. . . . Subsequently a change was made in the A B C system which improved it. This was in the provision for moving trains in case of failure of the telegraph wire. Instead of an emergency time-table, the simple train staff, with no electric locking from station to station, was provided.

Automatic Train Stops.—The automatic train stop, the investigation of which was one of the two chief purposes aimed at in the establishment of this board, continues to be a live subject, and serious attention is being given it by competent engineers. . . . Inductive systems—that is, those in which electrical apparatus on the roadway acts upon electrical apparatus on the train by means of electrostatic or electromagnetic induction, and without any physical contact—continue to offer promise of success. A mechanical-trip type of train stop now being tried has a rigid roadside member so securely fastened to the track as to be as little susceptible to breakage or removal as a rail of the track itself. This rigid member acts upon the engine member of every train at every point of indication and causes an air-brake valve to be opened. This is the normal operation at the entrance of a train to each block section if the fixed visual signal is at "stop" or if the block section is obstructed. If, however, the fixed signal is at "proceed," or the route clear, the movable roadside member comes into operation to engage a member on the engine in such a manner as to prevent the escape of air from the brake pipe due to the previous opening of the valve by the fixed roadside member, or it in some other way forestalls or nullifies its action. Not only does such an arrangement place the mechanical trip within the class of "closed-circuit" devices, but it assures that each apparatus will be operated every time a train passes a signal or a point of indication, thus affording a complete check of its operative condition.

Track.—In the use of steel rails prior to 1900 there were comparatively few rail fractures. During the past 10 years the breakage of rails has increased rapidly until now it is of very frequent occurrence. On some roads the number of broken rails found in a single day during the past winter was a matter of grave concern to the officers. It is probably owing to the use of the automatic block system and its track circuit, which in most cases detects broken rails, that more accidents of a serious nature have not resulted from these breakages.

It is of the greatest importance to discover the cause of these rail breakages. The Bureau of Standards in its investigations conducted for the Safety Appliance Division of the Interstate Commerce Commission has performed an excellent service, and this work, if continued, will no doubt contribute very materially to the solution of the problem. Of the number of things pointed out in the report of the Bureau of Standards two are conspicuous: (1) That by the present method of inspection faulty rails are passed for shipment from the mills, and (2) that rails are overloaded.

From the fact that since 1900 an effort has been made by the mills to shorten the time of making rails so as to increase the mill output, and that by so hastening the metallurgical process the soundness of the metal has been decreased, one obvious method of improving the quality of rails would appear to be to take all the time needed to insure sound rails. . . . If the railroads of the country will unitedly insist that the rails furnished them shall conform to the best specifications they are able to compile, a considerable improvement in the quality of the steel will result. It is also doubtless true that more attention should be directed toward determining just what stresses are being developed by the enormous wheel loads now being carried and whether rails can be made to carry them, or whether the practicable limit of loading has been reached.

The board has devoted considerable time to the investigation of various designs of ties intended as substitutes for wood ties. The most that can be said for the many designs that have been submitted is that in general they indicate only in moderate degree an appreciation of the real problem to be solved. On the Bessemer & Lake Erie the I-beam form of steel tie has been given a thorough trial. From the standpoint of strength, durability, and adaptability to the use of proper track fastenings this form of steel tie can be said to be adequate. It furnishes a good support for vertical loads, and proper resistance for forces in compression, tension, and bending. With stone ballast it holds the track in adjustment more satisfactorily than with light ballast. Projecting flanges have been used to secure greater resistance against displacement, and no reason is apparent why such flanges should not prove adequate.

Concrete ties are found in only a few experimental installations. The use of concrete ties reinforced with steel must remain a question for the future, as no examples of this type are in use. Considering the great advance in the use of reinforced concrete during the past few years, it may be hoped that eventually a reinforced concrete tie will be evolved meeting practical requirements. . . . A common defect found in many designs of ties is the complication of the rail fastenings. Where bolts are used both the head and the nut should be accessible and the bolts should be capable of renewal without disturbing the ballast to any extent. Most inventors make no provision for shimming. To provide adequately for shimming or for widening the gage appears to have been a difficult problem for inventors, as it involves the use of adjustable fastenings, with consequent chance for lost motion and change of adjustment. Another factor having to do with both form and material is the question of insulation of the rails on the one side of the track from those on the other, where electric track circuits are used for signaling. The electric track circuit is coming more and more into use, and no design of tie can be deemed suitable for general use which does not adequately provide for insulation of the rails from the ties.

Headlights.—The board has had submitted to it a number of plans and descriptions of locomotive headlights and devices for enabling such lights to be moved so that the beam of light may be thrown upon a curved track ahead. The board believes that it is not practicable properly to control the direction of a headlight beam through the swiveling of the trucks or by any relation of the train or engine to the track upon which it is running, but that simple mechanical means may readily be designed to swing the headlight so that the engineman may, within limits, have complete control over the direction of the beam.

It is found in practice that very few oil headlights give a sufficiently brilliant light to illuminate the track far enough ahead of the engine to enable an obstruction to be discovered and the train brought to a stop before reaching it. There seems to be no sound reason, however, why by the use of properly designed reflectors and lenses the oil headlight cannot be made to give a much better light than it generally affords. The so-called high-power headlights use electric current or acetylene gas. The electric apparatus is somewhat more complicated than that required for the gas headlight. It is not believed that the danger of explosion from the use of the acetylene headlight is sufficient to militate against its use. The amount of light from either is

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believed to be ample. If a headlight is to be used as more than a marker it should be a high-power light having both the direction and intensity of the beam controllable by the engineman. The control of the direction of the beam enables the engineman to illuminate curved track ahead and throw light along the slopes of cuts where landslides are likely to occur. The control of the intensity of the beam by the engineman directly from the cab is regarded as a necessity, as when meeting or passing other trains and for preventing improper reading of fixed or classification signals. Perhaps the most common and the most weighty objection to the use of high-power headlights is that an engineman running in one direction is dazzled by the light of an engine coming toward him. To meet this objection it is deemed important that every high-power headlight should be so arranged that the engineman can occult it at will.

Car Couplers.—The board has examined a number of couplers, but none that possessed such exceptional merit from the standpoint of safety as to warrant a recommendation that it be used to the exclusion of many of the couplers already in actual railway service. It is believed that the Master Car Builders' Association has the coupler problem fairly well in hand, and that couplers are now being furnished which meet the demands of safety as fully as can be expected owing to the restrictions of manufacture and in view of the exceptionally hard service to which such appliances are subjected.

Automatic Connectors.—The use of a practical device for automatically connecting the air brake, steam heat, and signal pipe lines through a train is desirable, not alone from the standpoint of safety, but also because of economy and the saving of time in train operation. Automatic connectors have been in experimental use for several years. They are of two general types, namely, side-port and butt-face. The side-port connector is one in which the contact faces are in a vertical plane parallel to the track. The butt-face connector is one in which the contact faces are in a vertical plane at right angles to the track. It is imperative that upon general adoption all connectors must be of the same general type so far as the contour of their coupling heads and range of their gathering and registering devices are concerned. In other words, the side-port and butt-face types of connectors cannot be used together, nor can the pin and funnel and wing types of gathering devices be used together. It is apparent, therefore, that until some one type has been decided upon by adequate authority and definitely adopted as standard, little progress in equipment for actual service can be hoped for. Another important question is the stopping of leaks and making light repairs. From an operating standpoint it is clearly impracticable to have an engine at hand for the purpose of separating cars whenever it becomes necessary to remove defective gaskets and insert new ones. Some means must be provided for doing such work while the connector heads are coupled together. . . . The gathering and registering device must be capable of considerable distortion without destroying the ability of the connectors to register and lock in position when their faces are brought together. Not only for convenience and for obvious mechanical reasons, but also to make it possible to couple hand hose with the automatic connectors during the transition period, connectors should be located directly below the car coupler and in a vertical plane containing the center line of the coupler. To meet the requirements of the Master Car Builders' Association the center line of the connector head must not extend downward farther than 17½ inches below the horizontal center line of the drawbar. The central axis of the connector head must also be the center line of the air-brake port. A practicable connector, therefore, must be located within very restricted limits, and in addition must be so designed that it will meet all extraordinary conditions of train operation, not only in road service but in switching yards and terminals as well. . . . .

Inspections.—In previous reports references have been made to inspections carried on by the board covering signalling practices, methods of operation, and conditions of roadway. These inspections have been continued. They have been made for the double purpose of (*a*) carrying on the investigation relating to block signal systems and other devices intended to promote safety in railway travel, and (*b*) to set forth in a summary for the benefit of the officers of railroads any bad practices or unsafe conditions observed. Brief summaries of these inspections were published in the third and the fourth annual reports. Some statements regarding inspections in an appendix to the fourth, which were couched in brief and general terms, conveyed wrong impressions concerning the conditions on certain roads. Those railroad officers who have considered that their roads were unduly criticized in this statement of inspections and who have made known to the board their definite objections have been furnished with detail information showing the grounds for the board's statements.

General Conditions Affecting Safety.—In discussing this subject it may be assumed at the outset that railroad officers and employees are as anxious to do everything in their power to promote safety as the public is to have safeguards provided, and that railroad officers and employees are not immune to the horrors of a terrible wreck. If all think alike and have the same desire, why are not better safeguards provided? The general answer, for most railroads, is the expense involved. Money is not available with which to provide and install the apparatus; it is needed elsewhere. The railroad officer responsible for results does his utmost to meet the demands made on him. His first responsibility, as he sees it, is to provide earnings. He knows that if he fails in this some one will be found to replace him. It is but natural, therefore, that the railroad officer has in the struggle for existence given chief attention to the conditions directly affecting the financial end of the business, and less attention to the conditions affecting safety. Safety he very much desires, but earnings he must have. Then, too, there is the element of chance in the one which is totally lacking in the other. This chance must be taken, not in the spirit of gamble, but simply as a necessity. Human life has a value, the same as freight, and if it has been lost in transit it is paid for and becomes one of the operating expenses. The problem for the railroads is one of great difficulties, if not impossibilities. There is the immensely greater volume of business to be handled; the palatial passenger service, with greatly increased speeds and consequent demands on equipment and roadbed; and the general advance in wages; with resultant higher cost of construction, maintenance, and operation. All these things have added to the expense on the one hand, with no corresponding increase of earnings on the other. Every added demand upon existing facilities and methods introduces sources of danger. As the demand does not diminish, it seems necessary that methods and facilities must improve if the standard of safety is to be maintained.

As regards methods, it may be said that on the large majority of American railroads excellence of administration is nullified by faulty organization, magnification of individual function to the detriment of team work, and by an almost entire absence of a definite system of broad training of subordinates for higher duties. These, and the shifting of responsibility from one officer or department to another, prevent the attainment of that high order of discipline and morale which must be had if carelessness is to be overcome and skill and painstaking loyalty are to govern the acts of the men on whom the public must depend for safety. As has been observed in former reports, this condition is largely due to causes which have their roots in the conditions of society in America.

While the deficiencies noted above may explain, they can hardly excuse failure to take greater advantage of the facilities for promoting safety which already exist or are ready for final development by the railroads. The railways have been slow in installing the block system, long since demonstrated to be the prime requisite for safety against collision. The railroads have failed to investigate as fully as they should the availability of devices to supplement the block system as now used, and which

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if adopted would add directly to the safety secured by existing means. This question of neglect of definite measures affects the public also. The failure of the government to require the installation of the block system is a definite feature of recent congressional history, there being more and stronger reasons to require this improvement than exist for the use of some other safety devices now required by law. Intelligent co-operation by the States and the Federal Government in establishing more uniform requirements for the operation of railroads would result in marked advancement and help to do away with the uncertainty felt by railroads as to their future. . . .

NEW YORK COMMISSION REDUCES SUBURBAN FARES.

The New York State Public Service Commission, Second District, Frank W. Stevens, chairman, acting on complaints from mayors and citizens, has ordered sweeping reductions in the fares charged to suburban passengers between Westchester county points and New York city by the New York Central and the New York, New Haven & Hartford railroads, and the order provides for the reëstablishment of the rates which were in effect on June 30, 1910. The reductions to and from the principal points are as follows:

NEW YORK CENTRAL.

HUDSON DIVISION:	Present rate.	Reduced rate.	HARLEM DIVISION:	Present rate.	Reduced rate.
60-trip monthly.			*60-trip monthly*		
Yonkers	$6.75	$5.90	Williams Bridge ...	$5.60	$5.15
Irvington	7.95	7.30	Mount Vernon ...	6.50	5.60
Tarrytown	8.25	7.60	White Plains	8.10	7.35
Croton	9.60	8.65	*50-trip family tickets.*		
Peekskill	11.05	10.30	Williams Bridge...	$6.25	$6.25
50-trip family tickets.			Mount Vernon ...	11.20	9.80
Yonkers $12.00		$11.50	White Plains	18.40	16.40
Irvington	17.60	16.40	*Round-trip.*		
Tarrytown	20.00	17.55	Williams Bridge...	$0.25	$0.25
Croton	27.20	24.75	Mount Vernon ...	.60	.45
Peekskill	32.80	29.90	White Plains	.95	.90

NEW YORK, NEW HAVEN & HARTFORD.

One-way fares.	Present rate.	Reduced rate.	*60-trip monthly.*	Present rate.	Reduced rate.
Mount Vernon	$0.35	$0.30	New Rochelle	7.65	6.35
New Rochelle	.40	.35	Port Chester	9.90	8.25
Port Chester	.60	.55	*50-trip family tickets.*		
60-trip monthly.			Mount Vernon ...$12.50		$10.00
Mount Vernon ...	$6.75	$5.60	New Rochelle	14.50	12.00
			Port Chester	21.75	19.25

The new rates are ordered to be put into effect on March 1, and to continue for a period of at least three years.

In discussing the case, the Commission states that the rule it has uniformly followed in cases of increase of rates charged by a corporation subject to its jurisdiction is as follows:

A rate (1) fixed and established as the voluntary act of the corporation itself; (2) which has been charged and collected by the corporation during a period of time sufficiently long to show that it is not a mere experiment, and has been the rate which the corporation charged and collected as a regular and settled rate; (3) which has been accepted by the public in its dealings with the corporation as just and reasonable; (4) under which business affected by the rate has prospered and increased, must, as against the corporation, be treated as presumptively just and reasonable.

It is unreasonable to increase such a rate without a new state of facts which make the old rate not remunerative. Such facts, if they exist, are peculiarly within the knowledge of the corporation. A change having been made by it from a presumptively reasonable rate, the burden lies upon it to overcome the presumption that the increased rate is unreasonable.

The commission thinks that the roads have not succeeded in overcoming the presumption that these increases were unjust and unreasonable; and, continuing, says:

1. We hold that as matter of public policy, the rates into New York city from the commuting district should be placed at the lowest possible point, both in the interest of the public and of the railroads. The prosperity of the railroads is bound up with the growth and prosperity of the city of New York. It is of the utmost importance that homes for literally armies of people may be found in the county of Westchester. Every consideration of public welfare demands that that county be given over to the residences of those who earn their livelihood in the city of New York. Without them, the city's work cannot be done, and the city itself affords no proper place of residence for hundreds of thousands except on terms of unwarranted congestion or excessive expense. Public health, public convenience, and public interest in every way require that cheap and rapid transportation be afforded into New York city from points as far out in the country as is practicable, and any policy which makes against this must be disapproved.

From the point of view of the railroads, their prosperity is bound up in the growth and development of New York city, very largely dependent upon cheap transportation. The railroad corporations should be prepared to afford this transportation at the lowest possible rates, if they are to consult properly their own financial interests in developing and encouraging the enormous business which the city as a whole gives to them, both freight and passenger.

For these reasons the question is not just how many tenths of a cent the rate can be raised or lowered for each mile of travel, but at what point it should be placed in order to enlarge the commuting business, increase the suburban population, and thereby increase the general prosperity. Of course, this point must be fixed with proper reference to fair and reasonable returns to the corporation.

2. An attentive study of the evidence submitted satisfies us that the increased rates have operated unfavorably to the communities affected; that they have discouraged travel; that they have not permitted the growth and development of the communities within the commutation zone; and that they have added materially and unjustifiably to the burden of those who are required to travel back and forth daily in order to carry on their business in the city.

3. The Commission is also satisfied from the evidence that the revenues derived from the increased rates have not increased above those received formerly in anything like the proportion of increase of rate. The ostensible reason of the companies for increasing these rates was the increased expense of operation. This expectation has in a large measure, according to the evidence, been disappointed. The operating costs have not been decreased, but the gross earnings from the commutation rates have not afforded the relief to the companies which they expected from the increase in rates. This is another proof that the effect of the increase has been to diminish travel and not to better the net financial result to the companies. We are convinced that the fares complained of tend to restrict rather than to promote travel and to such an extent as to defeat materially the purpose for which commuters' fares are primarily established.

4. The New Haven company has based its defense upon tollage and terminal charges paid by it for the use of the Grand Central Terminal. It allocates such charges wholly against the passenger traffic in and out of that terminal, with certain fixed amounts per regular passenger and other fixed amounts for each commutation passenger. By making this allocation it claims to have shown that it is carrying the commutation traffic at a loss, and hence that there is no possibility of saying that the rate charged by it is unreasonable.

We are of the opinion that this allocation to the particular traffic handled cannot be sustained. Such allocation is against universal practice, and has never before been made. . . . The New York Central has to bear the same terminal expenses, but does not appeal to the principle which is urged by the New Haven.

We regard these tollage and terminal charges as being in the nature of rent, and the fixing of the same by the number of passengers passing through the station is only a method of measuring the amount of rent paid. In principle, the case is precisely as though the New Haven paid a fixed sum determined arbitrarily instead of a variable sum determined by the number of passengers using the facilities. These rent charges must be con-

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sidered as a part of the general expenses of the road and apportioned upon its entire business, precisely as the charges of maintaining all of its other stations are apportioned. We are unable to see any reason why the general rule should be departed from in this case.

The foregoing conclusions are the result of much study and consideration. They dispose of the cases and require that the rates be restored to those prevailing before the increases complained of.

These cases have not been free from embarrassing questions. The Commission is not disposed to overlook or minimize the contention of the respondents that the increase in costs of operation should be reflected in rates. It should not be forgotten that the increased costs claimed by the respondents arise largely from the alleged increased cost of moving trains by electric energy. The Commission feels that, assuming some such increased cost to have been shown, there should be taken into consideration in connection therewith that the change from steam to electricity as a motive power has made possible the utilization of the site of the Grand Central Terminal for other purposes and to an extent that may well pay an adequate return upon the cost of the station itself. It is a serious question, to be determined only by future developments, whether the use of electric energy is not the only possible method of economical operation in a city like New York, and whether it will not, all things considered, justify the continuance of the former rates rather than an increase in rates.

There is another matter of large importance in the case of the New Haven. It has at very great expense built and put in operation the New York, Westchester & Boston as far as New Rochelle. It contemplates a completion of that line to Port Chester. When that road is completed to Port Chester, if it makes such connections and arrangements in New York city as to enable it to furnish a service as convenient and adequate as that which the New Haven now furnishes into the Grand Central Terminal, a question will at once arise whether the New Haven may not justly seek by all reasonable means to divert traffic from its main line to the New York, W. & B., and thereby reduce its terminal expenses and increase its returns upon its subsidiary investment. . . .

NATIONAL TRAIN INDICATORS.

The illustrations show the types of train indicators in use at the two great passenger stations in Manhattan, New York City—the Pennsylvania station, which was opened in 1910, and the Grand Central Terminal, just put in service last week. In both of them the information given to the passenger is put in simple and effective form, and two important features of an indicator, simplicity of operation, and architectural design in harmony with the building, have been successfully carried out. The indicators in the Pennsylvania station are operated by hand, as is the flat part of the Grand Central indicators; but the upper triangular indicators at the Grand Central contain electric motors by which the rolls, carrying the aprons or ribbons bearing the names of the trains, are operated, under the control of the gateman, who opens and closes the circuits by means of levers fixed in the wall at the side of the gate.

The Pennsylvania indicator is of cast iron. The post is set in line with the high iron fence surrounding the concourse, and serves as one of the posts of the fence. At each gateway leading to a platform there are two indicators, one on each side. The posts are about 16 ft. high. The sign cards are 17 x 32 in., made of aluminum. These cards are large enough to display not only the name of a train, but its principal destinations. A card bearing 29 words is easily readable a fair distance away. The cards of an indicator are carried on a light frame, inside of the larger frame, as shown in Fig. 2, and this inner frame is lowered by means of a small crank inserted in the hole shown near the base of the post. The movable parts are operated by five shafts, ½ in. in diameter, by means of miter gears and universal joints. The track number at the top is illuminated from within, but the rest of the lettering is made visible by the ordinary lighting of the room or building. The numerals used for showing the time of the train are borne on thin steel ribbons, enameled on both sides. A single crank serves to move both the name card and the time ribbon.

In the Grand Central Terminal two general types of indicators are used; one, Fig. 3, showing indications on two faces at right angles, and visible from all parts of the room, the

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Train indicators at New York City Stations.

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other, Fig. 4, presenting only one flat surface. The faces of the indicators shown in Fig. 3 are 26 in. x 40 in. The opening is about 10 in. x 30 in. In the round disk in the ornamental top the figures show the number of the track. These indicators are made of metal, heavily coppered.

The flat indicators, showing names of stations for trains on track No. 30 (Fig. 3) are set at the sides of the gateway, and are not shown in the engraving. In this picture the reader sees a sample of all the gateways to trains on the upper level. In the lower concourse, the triangular indicators are set on top of the flat indicators. The flat indicators on the lower level are somewhat less ornate in design than that here shown. In all of these the striking feature is the simplicity of the design and the simplicity and effectiveness of the lettering—plain white letters on a solid, dull black ground.

These letters are painted on black curtains, all of the curtains likely to be wanted at a particular indicator being rolled on sticks, like curtain rollers, and kept in the drawers in the lower part of the indicator. To display the bulletin of a train the roller bearing it is put in position at the bottom of the space allotted to the curtain, and its upper end is drawn to the top of the space by means of endless chains, one at each side, which, when moved by the attendant, unroll the curtain its full length, displaying the names. The operation takes only 10 or 15 seconds. The section of the indicator containing the drawers is about 3 ft. 6 in. high and the mechanism for turning the chains is in a space, about 10 in. high, immediately above this. These indicators are 11 ft. high and from 32 in. to 40 in. wide. The curtain is made of black, waterproof, rubber-faced drill and it is about 5 ft. long. The curtains are the same size and color as the space which they cover and as, when stretched, they lie flat, the appearance of the indicator when empty is precisely the same as when in use, except for the absence of all the lettering, but the track number.

All these indicators are made by the National Indicator Company, Long Island City, N. Y. In the Pennsylvania station there are 44, of the type shown, and at the Grand Central there are 28 of the angle type and 34 of the flat. Indicators like Fig. 4 have been made also for the Erie and the Baltimore & Ohio.

FUEL ECONOMY ON THE BUFFALO, ROCHESTER & PITTSBURGH.

By H. C. WOODBRIDGE,
General Manager's Special Representative.

During the past five or six years we have made good use of the stereotyped methods for effecting economy in fuel. Bulletins, lectures, tests, demonstrations and better supervision have resulted in a creditable increase in the ton miles per ton of coal consumed, but we were still confronted by the fact that a large percentage of the coal supply was being burned or thrown out the stack without producing any returns on the money invested. Engines standing at terminals or on sidings ready for service or while drifting, were almost without exception "howling" their approval of the fuel furnished and the one thing that our firemen could do to prevent this immediate waste, and at the same time keep the engines ready for service, was to open the firebox door, and this procedure which was advocated, though not enforced, was frequently the prime cause for leaking flues and fireboxes, which in turn resulted in engine failures, shop expense and much waste of fuel. Opening the fire door also permitted the presence in the firebox of an excess amount of cold air which contributed to incomplete combustion and consequent waste of valuable gases.

We therefore decided that the much instructed firemen and engine preparers must be furnished with suitable means for overcoming this, and to this end we designed the smokebox damper with attachments, which is shown in the drawings. The economies effected by the use of this appliance in 13 engines during the past six months have been so marked that orders have been issued requiring that all Buffalo, Rochester & Pittsburgh locomotives be similarly equipped at the earliest possible date.

While the damper was originally intended to be used only when the engine was standing or drifting, during the first experiment it was discovered that such a means for controlling the draft on the fire could be used to great advantage while the engine was working, particularly when maximum effort was being exerted at slow speed. Under such circumstances the drain on the boiler capacity is not great because of the slow speed, but without the damper it was necessary that a very heavy fire be carried in order that the intense and heavy, though infrequent exhausts, would not create draft enough to tear holes in the fire or otherwise destroy it. With the damper closed, or nearly closed, our firemen maintain only a light fire during the most severe service, with a consequent reduction in fuel consumption and physical effort. Partially or entirely closing the damper restricts equally the draft through all flues.

At terminals the dampers are left closed while the fires are being cleaned, the usual leakages about the deflector plates or damper fittings being sufficient to keep the gases from backing out the firebox door when the blower is applied, preventing, however, a great inrush of cold air and consequent sudden chilling of flues and firebox.

Experiments demonstrate that the proper use of this attachment will effect a saving of 3,000 lbs. of coal per trip in freight service or per day in pusher service. The reduction in fuel consumed in an engine with a closed damper, as compared with an engine with an open damper, while standing on sidings or at terminals, is very marked, but we have not made tests of sufficient duration to determine what the actual saving is.

The following description of the operation and use of the draft regulating damper is taken from an instruction pamphlet for the engine crews and engine terminal employees, which was issued by the superintendent of motive power, F. J. Harrison.

The damper is located in the front part of the smokebox, and has an operating rod extending from the lever arm on the dam-

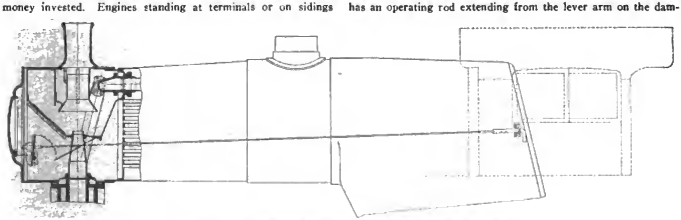

Fig. 1—Draft Regulating Damper in a Wide Open Position.

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per shaft back into the cab at the fireman's side of the boiler. It is shown wide open in Fig. 1 (the handle pushed ahead into the third notch) in which position there is practically no interference with the draft, and the fire will burn as freely as though the engine was not equipped with a damper. It should be allowed to remain in this position only when it is necessary to increase the steam pressure rapidly, or when, because of adverse conditions, it is necessary to subject the fire to a maximum draft.

The damper is shown closed in Fig. 2 (the handle is pulled back into the first notch) in which position there is nearly complete obstruction to the passage of gases or air through the flues or smokebox. It should be placed in this position whenever the fire is being cleaned or has been removed from the grates in order that cold air will be prevented from passing through the flues. While the fire is being cleaned the blower must be used lightly. The damper should also be closed whenever an engine under fire is standing or drifting. At such times the draft on the fire is so mild that the coal in the firebox cokes, combustion taking place much more slowly than when the draft is not obstructed, and at the same time the heat of the slow fire is largely retained in the boiler. Under such conditions cold air cannot enter the firebox through a hole in the fire in sufficient quantities or rapidly enough to cause injury to the firebox or flues.

It must also be closed whenever it is advisable to decrease the steam pressure or to deaden the fire preparatory to drifting

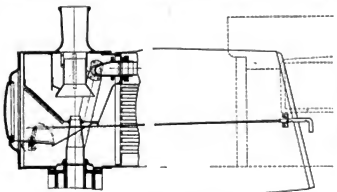


Fig. 2—Draft Regulating Damper in a Closed Position.

or stopping, or to prevent popping while the engine is working; and also when there is danger of the fire being partially destroyed by excessive draft, as when an engine slips or during many switching movements, when the draft on the fire would otherwise be excessive.

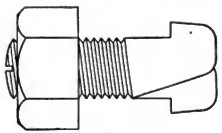
The damper is shown in an intermediate position in Fig. 3. Placing it in this position will so restrict the draft that under normal working conditions the most economical methods of firing can be employed with consequent economy in labor and fuel.

The draft regulating features of a locomotive, such as the stack, stack extension or petticoat pipe, nozzle tip, etc., must of necessity be constructed and located so that the engine will not fail because of a lack of steam, even when supplied with coal of inferior quality or when handled by a more or less inexperienced engine crew, under the most trying conditions of service. It is evident that such an arrangement will provide for an unnecessarily severe draft under favorable or normal working conditions, and therefore a means for restricting the draft while the engine is working makes possible a lighter and more scientific firing.

ARGENTINE RAILWAYS.—The Buenos Aires-Pacific Railway, between July, 1911, and October 15, 1912, opened to traffic 332 miles of new line and established 27 new stations.

A NEW TYPE OF BOLT.

There are many occasions when construction would be simplified and time saved if the inner side of a tube or box member, to which it is necessary to connect some other piece, was so placed that a bolt could be passed through from the inside. A type of bolt intended to overcome this difficulty has been invented by Peter M. Kling, an employee of the Brooklyn



The Kling Bolt.

Rapid Transit Company, and is being placed on the market by the U. S. Metal & Manufacturing Company, New York. It is split into two pieces, each half having a head so shaped that it will pass through any hole that will take the body of the bolt. When the two halves are entered they are brought into alinement, the nut is put on; the two heads shown in the illustration hold the material in the same way as the head of an ordinary bolt. The splitting does not reduce the tensile strength as the area of the metal at the head is greater than that at the root of the thread.

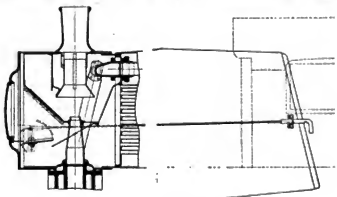


Fig. 3—Draft Regulating Damper Partly Open.

RAILWAYS IN CEYLON.—Ceylon has an extensive system of railways, with a total length of 577 miles, of which about 509 miles are of the 5 ft. 6 in. gage, the remainder being on a gage of 2 ft. 6 in. The track is laid with 80 and 88-lb. rails on the former gage, and 46¼-lb. rails on the latter. Extensions are now under construction, the most important of which is that of the northern line to Mannar, which, when completed, will form a short and convenient route to India.

WAGE ADVANCES IN VICTORIA.—The Victorian government has authorized increases in the wages of railway employees which will involve an additional expenditure of about $225,000 annually. The announcement has not been received with satisfaction by the employees interested. What seems to be aggravating the situation is the fact that at present the general rate of wages in Victoria is rather less than that of New South Wales, South Australia and Western Australia. Had not the revenue shown a decline of $250,000 for the first three months of 1912 as compared with the year previous, the government would probably have agreed to the higher wage.

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General News.

The Louisville & Nashville, following conferences with representatives of the brotherhoods, has increased the pay of enginemen and conductors.

The senate of the Colorado legislature has passed a bill requiring the railways in the state more than twelve miles in length to equip all of their locomotives with headlights of 1,200 candle power.

It is announced that the Portland Railway, Light & Power Company will begin work at once on the electrification of 23 miles of the line of its subsidiary company, the Mount Hood Railway & Power Company, from Montavilla to Bull Runn, Oregon.

The United States Civil Service Commission announces examinations March 5 and 6 at cities throughout the United States and also at Culebra, Canal Zone, for the position of accounting and statistical clerk for the Interstate Commerce Commission; salaries, at the beginning, probably $1,200.

Senator Gronna, of North Dakota, has introduced in Congress a bill requiring interstate carriers to transport live stock at the rate of twenty miles an hour, or faster. There is a provision that the carrier must not unload animals without the consent of the shipper, unless it is absolutely necessary to do so. The bill also prescribes that penalties be paid to shippers by the carriers for delays.

The New York, New Haven & Hartford intends to take care of its old and faithful employees who become incapacitated in its service. E. O. Brown, for many years commercial agent at the Grand Central station, New York City, who retired on February 1, has been given a pension for the remainder of his life. President Mellen says that he intends to see that all employees of long service and equal fidelity with Mr. Brown shall be similarly pensioned.

According to the New York *Journal of Commerce*, the New York, New Haven & Hartford was recently offered by financial interests control of the Bangor & Aroostook. The offer was refused on the ground, it is understood, that beyond projects to which it is fully committed and the development of the Rutland, the New Haven's policy hereafter will be contraction rather than expansion and the improvement of the properties that it already owns and controls.

S. Hirai, vice-president of the Imperial Government Railways of Japan, has written to R. C. Richards, chairman of the Central Safety Committee of the Chicago & North Western, asking for literature and information on the subject of the organization of safety committees with a view to the introduction of a "safety first" campaign on the Japanese railways. Mr. Richards has furnished him with a large amount of information on the subject.

The Senate committee on interstate commerce has held hearings in Washington this week on the subject of physical valuation of railroads, and a number of representatives of railroad companies presented protests against the proposed law. The bill introduced in the house by Mr. Adamson, of Georgia, authorizing the Interstate Commerce Commission to make a valuation, was passed by the House, but in the Senate important modifications have been made in it; hence the giving of further hearings.

Among the latest devices adopted by railways for the purpose of constantly reminding their employees of the "safety first" idea, the safety committee of the Canadian Pacific is distributing colored cards containing a series of "Safety First Resolutions for Railway Men for 1913," including many suggestions of ways in which accidents may be averted by the exercise of care. The committee has also distributed a large number of "safety first" mottoes to be pasted in hats, on which are printed: "The chance taker is a widow maker and an orphan maker," or "The chance taker helps to support the artificial limb maker."

Between two hundred and three hundred shopmen of the Lehigh Valley at Packerton, Pa., have gone out on strike. The road, however, had its car repairs in such good shape that it decided to lay off one hundred of its car repair men. Three hundred of their companions in the Brotherhood of Railway Carmen of America then demanded that the hundred men who had been laid off should be reinstated and put to work. The request was refused on the ground that there was no work for them to do, and the men walked out. Three hundred other employees in the shops remained at work.

President Mellen, of the New York, New Haven & Hartford, about a month ago, announced that, pending the construction of No. 20 crossovers on that road, as called for by the Public Utilities Commission of Connecticut, new timetables would be adopted soon, in order to provide for the slower schedules necessary on account of the stops which have to be made at short crossovers, as required by the state commission. He now announces that Mr. Whaley, the new vice-president in charge of operation, thinks that perhaps the public can be better accommodated by leaving the principal schedules as they are; and, therefore, the issuance of the new time-tables will be postponed. Mr. Whaley asks for time in which to further consider the problem. Mr. Mellen thanks the public for courteously heeding his former notice and says that he hopes Mr. Whaley's plan will cause the public less inconvenience than would follow the installation of a new general time table.

The House Committee on interstate and foreign commerce held a hearing in the capitol at Washington last week on the general subject of safety of railway employees and passengers; but the only subjects taken up appear to have been automatic stops, high power headlights and steel cars; and only brief testimony was taken on these. The committee will have no further hearings during the present session, and there does not seem to be any likelihood of action on any of the subjects considered. No one appeared either for or against the bill, which has been before Congress for several years, to make compulsory the use of the block system. Jacob A. Cantor appeared as an advocate of the La Croix automatic train stop, and B. F. Wooding appeared in favor of his device of a similar nature. A representative of the Commercial Acetylene Company spoke on the bill which has been introduced in Congress to require high power headlights on locomotives, arguing that, by reason of the great differences of opinion as to what are the desirable characteristics of a high power light, the whole subject had better be left in the hands of the Interstate Commerce Commission. Representative Charles A. Talcott spoke in favor of the bill to make compulsory the use of steel passenger cars.

Governor Recommends Sale of Texas State Railroad.

In a message to the legislature Governor Colquitt of Texas recommends that the state dispose of the Texas State Railroad, for the reason that it has been a financial burden since its construction. The state, it is said, has been having an unpleasant experience in government railroad ownership. Several years ago it built a railroad between Palestine and Rusk and also built a short line to give one of its plantations in South Texas a transportation outlet. The latter road has been sold at a heavy loss from its original cost. The other line is known as the State Railroad. Governor Colquitt says: "The State Railroad is still a Jonah and a heavy expense to the penitentiary management. It has been operated during the last two years at a loss of over $80,000. There are $100,000 of bonds on it held by the public school fund; they bear 5 per cent. interest. According to the railroad commission, the road cost $577,899.63, and showed a depreciation of $68,828.12 at the time of its valuation. It still runs from Rusk to Palestine."

Amenities on the New Haven.

I have agreed to meet our men's representatives once a month, to devote a day to them if need be, to receive their suggestions, the result of their observations, and to profit by them, I hope, to our mutual advantage. I can ill spare the time, but know of no better use for it.

I believe there must be better co-operation on the part of the officials and labor organizations, or the result will be worse for both. I am earnestly desirous of promoting that closer co-operation by all means in my power.

Personal conferences with employees or their representatives are most beneficial. Personal acquaintance is most important. Through personal contact many erroneous impressions are dis-

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sipated. Less differences arise where there are opportunities for discussion of matters of mutual interest.

The president of a large business enterprise should not be unknown to those who are working to make that enterprise a success. The employees should see the personal side of the man at the top, not hedged about by what their imaginations have surrounded him, but as a human being like themselves—with all their frailties, prejudices, and limitation. They can grow to like him and he them; and both can do better work in consequence.—*President Mellen.*

Y. M. C. A. for Safety.

At a recent conference in Chicago between the heads of a number of railway safety committees and representatives of railroad Young Men's Christian Associations, a plan was agreed upon for the co-operation of the railroad associations with the railway companies in the promotion of the "safety first" movement. The railway men will prepare lectures on safety, to be given at association centers, and in the delivery of these lectures the men in charge will have the advantages of the facilities of the associations, such as stereopticons, motion picture apparatus, etc.

Firemen's Wages.

The leaders of the firemen's brotherhood reported on February 10, that 33,916 men had voted on the question of empowering the officers to order a strike on the 54 eastern roads, and only 1,158 of these were against the proposition. After a conference with the railway officers it was said that no concessions were made on either side; and on Wednesday, the 12th, at the request of the firemen Judge Knapp, of the Commerce Court, and H. W. Hangar, acting commissioner of labor, arrived in New York and went into the conference with the firemen and afterwards with the officers of the railways, to see if conciliation could be effected. The conferences were still going on at the time of going to press.

The railways' committee, Elisha Lee, chairman, on Monday issued a statement saying:

If the firemen announce that as a result of their strike vote their committee will call out the men, the railroads will of course take steps immediately to prepare for the operation of trains under strike conditions. The companies feel, however, that such a catastrophe should, in the public interest, be prevented at all hazards.

Some indication of the attitude of the firemen toward arbitration established by public authority as a means of settling all labor disputes is given by President Carter. At one of the very first meetings with the committee of managers, he said: "When the railroads try to put over a compulsory arbitration law, we are going to beat you. We will give you that tip right here today. You can't get it through."

The firemen have offered to arbitrate the questions at issue under the Erdman Act. The committee make it clear that the real purpose of the strike vote threat is to force one of the ways, if possible, to agree to arbitration in such form. The Erdman Act was never devised to settle such a vast problem as that presented in settling the relations of 52 railroads with their employees. That is a problem, the railways maintain, which must be settled by a commission of sufficient size and character to represent the public interest and be free from political influence of every kind.

The railroads contended in the engineers' case, and they contend now, that the appointing power, if this power is to be taken over by the federal government, should be in the hands of officials holding a "life tenure," and it was for this reason that the Chief Justice of the United States was added to the appointing board. The defects of the Erdman Act were noted by the arbitrators themselves in the engineers' case and commented on at length in their report. There have been a number of unsatisfactory and unjust awards, and the law has been severely criticised, not only by the railroads, but by the employees and their representatives.

The railroad controversy with the firemen date back to last July. The firemen first asked for an increase of $20,800,000, or about 77 per cent. They later modified their request so as to ask for an increase of about $15,134,000, or 56 per cent. Then they made other changes in their demands, which, as submitted to the men on the strike ballot, call for an increase in the firemen's payroll on fifty-four eastern railroads of $9,600,000, or about 35 per cent. Such an increase is neither warranted by conditions, nor within the roads' ability to pay, having regard to all of their obligations.

Proposed Government Railroads in Alaska.

President Taft has sent Congress a message recommending the construction by the government of two independent railroads in Alaska involving 733 miles of line at a cost of about $35,000,000. This recommendation is in accordance with the report of the special commission which was sent to Alaska several months ago. The President says that the roads ought to be operated by private interests under lease. He proposes that the equipment now being used on the Panama canal shall be transported to Alaska for the building of these railroads.

The commission recommends a line from Cordova by way of Chitina to Fairbanks and one from Seward around Cook inlet to Iditarod. The first would run to the Bering coal fields and the second to the Matanuska field. The plans of the commission contemplate the use of existing railways.

The President in his message says:

"The commission finds that railway connections with open ports on the Pacific are not only justified but imperative if the fertile regions of inland Alaska and its mineral resources are to be utilized. The commission describes all of the railway routes. From Chitina to Fairbanks, 313 miles, the estimated cost of a road is $13,971,000. The commission proposes that if this railway is built by other interests than those controlling the Copper River & Northwestern, and if an equitable traffic arrangement cannot be made with that company, connection should be made with Valdez by the Thompson Pass route, 101 miles, estimated to cost $6,101,479."

The President says that if commercial development of the two fields named should disclose that the quality of the coal is the same in both, the Bering river field would have the advantage of greater proximity to open tidewater. A branch line from the Copper River Railway to the Bering river field, a distance of 38 miles, at an estimated cost of $2,054,000, is recommended to afford an outlet for the coal on Prince William Sound and into the Copper river valley and the region where there is at present the largest market for Alaska coal.

Union Pacific-Southern Pacific Dissolution.

The following is the official announcement of the dissolution plan to separate the Union Pacific and Southern Pacific:

"The boards of directors of the Union Pacific Railroad Company and Southern Pacific Company approved plans which have been under consideration by special committees for several weeks and which have been worked out with the attorney general, subject to the approval of the courts, as follows:

"The purchase by the Union Pacific of the entire capital stock of the Central Pacific consisting of $67,275,500 par value of common and $17,400,000 par value preferred for the sum of $104,189,941—the cost at which it stands upon the books of the Southern Pacific Company. Of this amount, $84,675,500 was to have been paid in stock of the Southern Pacific Company held by Union Pacific, at par, but legal difficulties having been found in the way the plan has been changed so that payment is to be made as follows, viz.: $126,650,000 par value—being the entire amount of stock of Southern Pacific Company held by Union Pacific—is to be offered to the stockholders, common and preferred, of the Union Pacific and stockholders of the Southern Pacific Company other than the Union Pacific and Oregon Short Line, for subscription at 98½ per cent. and accrued dividend. This offer is to be underwritten and subscribers are to receive the dividend payable April 1, 1913 (details to be given later). The proceeds of $84,675,500 of this stock less the underwriting commission and expenses is to be paid over to Southern Pacific Company, together with $5,449,000 of the Southern Pacific Company's 4 per cent. gold bonds and $14,065,441 in cash.

"The attorney general of the United States has assented to the essential features of this plan, but it is of course subject to the approval of the district court in which the government litigation is pending, and also dependent upon the approval by the California Railroad Commission of agreements for certain trackage and running rights in that state. The plan and agreements will be presented to the court and commission with the least possible delay."

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The *Wall Street Journal* on the morning after the announcement of the dissolution plan printed the following:

Syndicate headed by Kuhn, Loeb & Co., which will underwrite the offering of the $1,26,650,000 Southern Pacific stock to Union and Southern Pacific stockholders will receive a commission of 2 per cent.

Southern Pacific stockholders will be entitled to one share of Southern Pacific stock for every three shares now held, and Union Pacific stockholders to one share of Southern Pacific stock for every four shares of Union Pacific now held, preferred stock sharing equally with the common.

At the time when it was proposed to exchange $84,000,000 of the Southern Pacific stock as part payment for Central Pacific, the bankers informed the attorney-general that as the remainder of the Union Pacific's Southern Pacific stock amounted to $46,-650,000, they could see no reason why he should not have free rein in deciding who should participate in the syndicate, as the necessary money could be raised without much trouble. When it was discovered, however, that the Kentucky laws prohibited Southern Pacific from accepting its own stock and that it would, therefore, be necessary to market the entire $126,650,000, the bankers satisfied the attorney-general that they would have to have utter freedom in forming the syndicate to prevent a serious disturbance of the market, assurance being given that the syndicate would so handle the stock as to carry out the Supreme Court's decree insisting on wide distribution thereof.

Decided emphasis is laid upon the fact that the plan, as it goes before the court, is not the railroad's plan, and, therefore, subject to decided alteration, but is the plan which has been formulated in a way to satisfy the government and that, therefore, it is not anticipated that the court will be disposed to make any important changes.

When asked whether there was likely to be any great change in the Southern Pacific board at the annual meeting in April, a prominent director said: "I do not believe so. It is to my mind a most creditable comment on the integrity and ability of the American business man that Julius Kruttschnitt, now chairman of the Southern Pacific board, Henry W. DeForrest and their confreres who were formerly associated with the Southern Pacific and the Union Pacific, have, since the dissolution, taken up the fight for the Southern Pacific in earnest and contended every inch of the ground that has been gone over, and have faithfully and competently championed the cause of the Southern Pacific stockholders. The same is true of the Union Pacific officials, who have waged the battle as though they had never been connected with the Southern Pacific. The separation of the two properties is complete; the control of the Southern Pacific will be in the market for any aspiring line, such as the Rock Island, to purchase. I know we have the government's approval for the statement that the dissolution of these two properties has been real."

It is understood that the agreement under which the Central Pacific stock is deposited as security for $28,800,000 Southern Pacific bonds is such that although the ownership of the stock might change, the bonds would not need to be retired as long as the stock certificates were left in possession of the trustee.

The Grand Trunk in Massachusetts and Rhode Island.

Counsel for officers of the Grand Trunk, indicted in New York City on charges of violation of the anti-trust law, has asked the court to order testimony taken in London to show the character of the acts of the directors of the Grand Trunk in connection with the alleged unlawful doings in Massachusetts and Rhode Island. An interurban company, proposing to build an electric road from Boston to Providence, has asked for a charter allowing it to use the proposed route of the Grand Trunk's unfinished line, the Southern New England; and the Grand Trunk people say that they have told the electric company that its application would be favorably considered. Among the promoters of the electric line are Kidder, Peabody & Company, Stone & Webster and James F. Shaw. The Grand Trunk says, further, in a published statement:

"1. That the suspension of work on the Palmer-Providence line was ordered from London in November as a result of a resolution adopted by the directors, because of the impossibility of obtaining money in London.

"2. That the cause of the inability of the Grand Trunk to get money was due to the financial stringency and state of semi-panic resulting from the Balkan war.

"3. That there was no cause for the suspension of the Palmer-Providence project except the conditions resulting from the Balkan War, and the inability of the Grand Trunk to get money.

"4. That at the same time as the suspension of work on the Palmer-Providence extension, orders were received from London to suspend work throughout the Grand Trunk system. . . .

"6. That the board of directors did not intend to abandon work on the Palmer-Providence extension, but expected that it would be resumed as soon as the financial conditions made it possible.

"7. That the provisional New Hampshire Corporation, the formation of which was alleged to have been contemplated by the Grand Trunk Railway Company to construct a line from White River Junction to Boston, was never considered by the Grand Trunk directors, and that if any act was done by the late President Hayes, looking to the organization of such a corporation, it was done without authority from the board of directors and not ratified by them."

"The Providence extension is a Central Vermont matter. It has nothing to do with the proposed extension of the Central Vermont to Boston, nor has it any connection with the proposed traffic or trackage agreement with the New Haven, which, if carried out, would obviate the necessity for duplicating the Boston & Maine. Reference to the abandonment of the Providence line, or to an agreement between the New Haven and the Grand Trunk, are both misleading, because there was no abandonment and there never has been an agreement—only a proposed agreement."

American Society of Engineering Contractors.

At the annual meeting of the American Society of Engineering Contractors, held in New York on January 14, it was decided to establish an information bureau through which members of the society in good standing can receive answers to specific questions. The questions submitted will be referred to members of the society who specialize in the various fields, and the answers will be mailed to the members and also published in the journal of the society. A committee was also appointed to consider the advisability of this society endeavoring to protect its members against unjust contracts and specifications.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & A. R., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. C. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

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ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hilles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren F. Taylor, Richmond, Va. Next convention, June 18, Hot Springs, Va.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1913, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May, 1913, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES' ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTH WEST RAILROAD CLUB.—S. L. Kennedy, G. N. Ry., St. Paul, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY LIGHTING ASSOCIATION.—C. A. Goodwin, Jr., Kansas City, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Sidlow, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—C. H. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Telegr. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Next meeting, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and August, St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—C. H. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. C. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Rumapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Monday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 1, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 2d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The lower house of the Oregon legislature has passed a bill, recommended by the state railroad commission, which gives the commission power to suspend an increased rate, pending an investigation.

Emory R. Johnson, professor of transportation at the University of Pennsylvania, and special commissioner on Panama traffic and tolls, appointed by President Taft, gave an address before the City Club of Chicago, on February 5, on the subject of Panama canal tolls. He advocated a repeal of the clause in the act fixing the Panama canal rates which provides for the exemption of tolls for coastwise shipping. Professor Johnson's views were commented on in the *Railway Age Gazette* of November 22, 1912, page 1005, and December 6, 1912, page 1073.

Rates on cotton from New Orleans to Liverpool, which have been very high for several months, have now dropped to a point where considerable shipments are being made, 41 cents per 100 lbs. having been quoted last week. Rates have been as high as 68 cents a part of the time. At this rate, and at 50 cents, which prevailed for a time, a good deal of cotton from Arkansas and other states north of Louisiana was driven away and was exported through Boston, Newport News and Brunswick. At one time cotton was sent from Arkansas to Liverpool through Boston at 5 cents per 100 lbs. cheaper than through New Orleans.

The committee on interstate and foreign commerce of the lower House of Congress held hearings last week on the bill, proposed by the Stanley investigating committee, to amend section 3 of the interstate commerce act, second paragraph, by adding to the last line a provision to the effect that carriers shall not be required to give the use of terminal facilities to a rival carrier *except for switching purposes.* The effect of the four italicised words would be to leave the Interstate Commerce Commission free to require a railroad to do switching for competing roads and to regulate the rates for such service. Attorneys for the Pennsylvania, the Louisville & Nashville and the Chicago, Milwaukee & St. Paul appeared in opposition to the bill. Mr. Sewall, representing the C. M. & St. P., showed how hay and vegetables were certain tracks in Chicago, were more valuable than on certain other tracks; and how it would be unjust for a road to be compelled by law to farm out its advantages to any other road that might apply.

A Thirty Years' Custom to Be Abandoned.

The Pennsylvania and the Baltimore & Ohio have given notice that after the end of this month they will cease to deliver freight by wagon to store doors in Washington, D. C. This free delivery of freight has been in vogue at Washington since about 1883. The Pennsylvania has issued a circular explaining its action, which is in part as follows:

The making of free store-door deliveries of certain classes of shipments originated in 1883 out of the desire to relieve serious congestion in the Washington freight terminal. This unusual practice was confined to certain classes of shipments originating in the territory adjacent to the Atlantic Seaboard and south of Wilmington. At that time most manufactured articles came from the North Atlantic States. . . . Washington now enjoys a privilege which is accorded to hardly any other city of the United States. As the plan never extended to shipments from the west and south, the withdrawal will not affect traffic from those territories. The plan of free delivery was originally adopted as a temporary expedient, and was never intended to be permanent, and no increase in freight rates was made; since that time there has been an actual reduction of freight rates to Washington from the territory affected. For example, the rates on traffic to which free delivery was extended, from New York to Washington, in cents per 100 lbs., have been as follows:

	1st Class.	2d Class.	3d Class.	4th Class.
1883	50	40	30	25
1913	37	31	26	20

The plan of free delivery was expensive for the company, which made an arrangement with a local express agency to make deliveries on its behalf. Owing to increased cost of operation, the express company has increased its charges to the railroad company for the service rendered.

The original boundaries of free delivery were coterminous with the old city of Washington. The Interstate Commerce

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Commission has in two recent decisions, however, extended the area of free delivery on the ground that the limitation of territory was an unjust discrimination against consignees outside.

The original temporary and anomalous condition, which had continued for no logical reasons, should, as a matter of propriety to all parties concerned, now be discontinued. The railroad has been making great improvements in the freight facilities in the city of Washington, and since 1902 has expended about $4,500,000 in improving freight facilities in the city of Washington. Interest at 5 per cent. on the investment of $4,500,000 amounts to $225,000 per annum.

As no increase of rates was made when free delivery was instituted; as there has been a reduction in the rates concerned since the practice has been in vogue; and as the expensive improvements referred to have added extensively to the facilities, there should not now be any further reduction in freight rates.

It is the purpose further to add to freight facilities in Washington, probably including another new freight station.

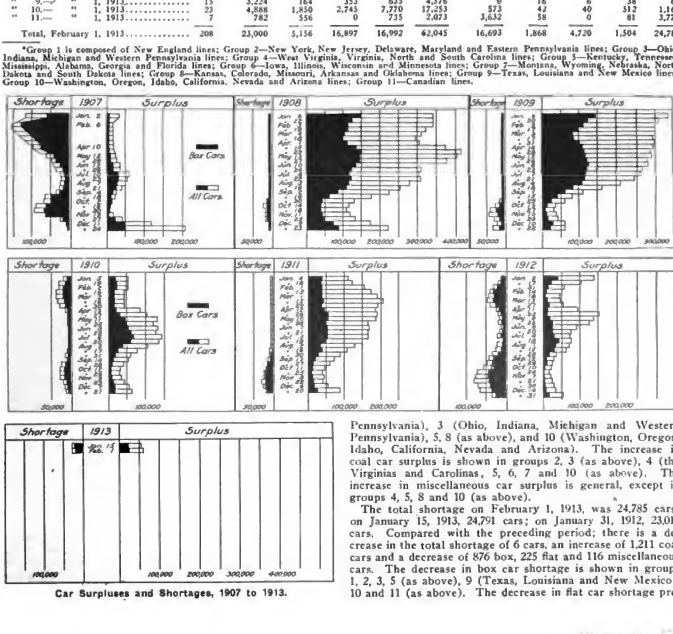
Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 137, giving a summary of car surpluses and shortages by groups from October 25, 1911, to February 1, 1913, says: The total surplus on February 1, 1913, was 62,045 cars; on January 15, 1913, 53,230 cars; on January 31, 1912, 55,592 cars. Compared with the preceding period; there is an increase in the total surplus of 8,815 cars, of which 3,221 is in box, 625 in flat, 4,746 in coal and 223 in miscellaneous cars. The increase in box car surplus is general, except in groups 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 6 (Iowa, Illinois, Wisconsin and Minnesota), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), and 11 (Canadian Lines). The increase in flat car surplus appears in groups 1 (New England Lines), 2 (New York, New Jersey, Delaware, Maryland and Eastern

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—February 1, 1913	7	304	809	49	172	1,334	175	19	233	57	484
" 2.— " 1, 1913	32	1,107	65	1,676	268	3,116	3	0	1,406	0	1,409
" 3.— " 1, 1913	31	2,718	479	6,049	1,392	10,638	1,316	4	211	193	1,724
" 4.— " 1, 1913	11	8,228	98	1,103	1,021	10,450	1,049	553	2,380	250	4,232
" 5.— " 1, 1913	27	43	25	666	455	1,189	2,928	510	141	133	3,714
" 6.— " 1, 1913	31	596	397	2,533	2,524	6,052	3,472	666	266	168	6,572
" 7.— " 1, 1913	5	0	165	135	463	763	694	0	35	0	729
" 8.— " 1, 1913	19	1,110	548	1,566	1,577	4,801	851	0	0	72	923
" 9.— " 1, 1913	15	3,224	164	353	635	4,376	0	16	6	38	60
" 10.— " 1, 1913	23	4,888	1,850	2,745	7,770	17,253	573	42	40	312	1,167
" 11.— " 1, 1913	7	782	556	0	735	2,073	3,632	58	0	81	3,771
Total, February 1, 1913	208	23,000	5,156	16,897	16,992	62,045	16,693	1,868	4,720	1,504	24,785

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

Pennsylvania), 3 (Ohio, Indiana, Michigan and Western Pennsylvania), 5, 8 (as above), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona). The increase in coal car surplus is shown in groups 2, 3 (as above), 4 (the Virginias and Carolinas), 5, 6, 7 and 10 (as above). The increase in miscellaneous car surplus is general, except in groups 4, 5, 8 and 10 (as above).

The total shortage on February 1, 1913, was 24,785 cars; on January 15, 1913, 24,791 cars; on January 31, 1912, 23,011 cars. Compared with the preceding period; there is a decrease in the total shortage of 6 cars, an increase of 1,211 coal cars and a decrease of 876 box, 225 flat and 116 miscellaneous cars. The decrease in box car shortage is shown in groups 1, 2, 3, 5 (as above), 9 (Texas, Louisiana and New Mexico), 10 and 11 (as above). The decrease in flat car shortage pre-

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vails in groups 1, 3, 5 and 8 (as above). The decrease in miscellaneous car shortage is in groups 1, 3, 6, 7 and 11 (as above). The increase in coal car shortage is general except in groups 3, 5, 6 and 9 (as above).

Compared with the same date of 1912; there is an increase in the total surplus of 6,453 cars, made up as follows, an increase of 10,239 box, and 2,855 coal, and a decrease of 2,909 flat and 3,652 miscellaneous cars. There is an increase in the total shortage of 1,774 cars, of which there is an increase of 1,651 box, 1,330 flat, and a decrease of 818 coal and 389 miscellaneous cars.

Car Location.

The accompanying table, which is taken from Car Location, bulletin No. 2, of the American Railway Association, gives a summary of the location of freight car equipment by groups on December 31, together with surpluses and shortages on the same date.

CAR LOCATION ON DECEMBER 31.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., Ala., Ga., Fla. No. & So. Carolina.	Ky., Tenn., Miss., La., Ark.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	88,344	673,566	270,709	169,766	165,815	306,269	7,895	149,447	29,858	129,499	126,967	2,244,375
Home Cars on Home Roads	38,099	326,342	79,814	90,746	67,169	227,302	2,004	59,925	11,239	63,542	80,683	1,046,965
Home Cars on Foreign Roads	47,445	347,224	190,895	109,020	98,706	176,767	5,891	89,522	18,649	63,867	45,384	1,192,470
Foreign Cars on Home Roads	65,484	342,289	196,839	90,839	88,914	193,930	3,135	83,559	16,959	73,363	76,270	1,238,101
Total Cars on Line	103,583	668,531	276,653	181,585	156,023	421,432	5,139	145,484	48,198	136,905	151,453	2,285,006
Excess or Deficiency	18,039	*15,035	5,944	*18,181	*9,792	15,163	*2,756	*3,963	18,340	7,496	25,386	40,631
Surplus	1,292	6,996	2,372	3,861	2,818	3,794	742	7,084	3,667	14,271	1,763	50,659
Shortage	612	7,876	2,263	6,257	7,635	5,434	932	22		1,770	3,146	33,601
Shop Cars—												
Home Cars in Home Shops	4,995	28,743	10,378	8,900	8,976	16,668	536	7,442	1,405	3,569	3,710	95,342
Foreign Cars in Home Shops	2,072	9,017	8,459	2,121	2,547	6,134	83	2,807	1,670	2,528	803	38,265
Total Cars in Shop	7,067	37,760	18,837	11,021	11,523	22,842	621	10,249	3,075	6,097	4,513	133,607
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	44.54	48.44	29.48	45.43	40.47	56.00	25.86	40.10	37.60	49.10	64.00	46.65
Total Cars on Line	118.86	99.27	*102.10	90.90	94.09	104.21	79.26	95.91	161.26	105.79	120.14	101.81
Home Cars in Home Shops	5.84	4.27	4.18	4.46	5.41	4.41	6.79	4.98	4.70	2.76	2.94	4.27
Foreign Cars in Home Shops	1.87	1.34	3.40	1.06	1.54	1.62	1.08	1.79	5.59	1.95	.64	1.75
Total Cars in Shops	7.73	5.61	7.58	5.52	6.95	6.03	7.87	6.77	10.29	4.71	3.58	6.12

*Denotes deficiency.

Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 138, covering car balances and performances for October, 1912, says:

The miles per car per day, for October was 26.0, an increase of 1.6 over September, 1912, and the highest figure of which we have record. This figure for October, 1911, was 25.0.

Ton miles per car per day was 433 in October, 1912, compared with 396 in September, 1912; this is also the highest figure in our record, this is an increase of 43.35 per cent. over the figure for October, 1911, which was 382.

The proportion of home cars on line was 50 per cent., compared with 53 per cent. in September. This figure for October, 1911, was 58 per cent.

There is an increase of 0.1 per cent. in the percentage of loaded car mileage compared with September, 1912. The per cent. of loaded car mileage in October, 1911, was 72.6 per cent.

The average earnings per car per day were $3.03 compared with $2.73 in September. There is an increase of 11.40 per cent. over the earnings for October, 1911, which were $2.72.

The table on the opposite page gives car balance and performance in the month covered by the report, and the diagram on the same page shows car earnings and car mileage and different car performance figures monthly from July, 1907.

Annual Dinner Traffic Club of Pittsburgh.

The annual dinner of the Traffic Club of Pittsburgh was held on January 30, at the Hotel Schenley, Pittsburgh. As in previous years, the dinner was attended by a large number of railway officials of high rank from nearly all parts of the country. The attendance was over 600, of whom about 200 came in three special trains composed entirely of private cars from New York, Chicago and St. Louis. President J. T. Johnson of the club presided, and George A. Post, president of the Railway Business Association, acted as toastmaster. Mr. Post, in his address, reviewed the development of new standards of business ethics which has taken place in the business world generally, and which he said has largely been responsible for the increase in the regulation of the railways, and declared that railway regulation has now reached such a point that railway men may well be the freest from any special solicitude as to what changes may be wrought by the change of party domination at Washington, for the reason that they are now "as thoroughly in the power of the people as the ingenuity of mortal mind could devise." The fact that a democratic president will succeed a republican will not mean that there will be any change in the atmosphere surrounding the executive department concerning railroads. He said:

"To my mind, this situation in some respects, has its compensations. The people, regardless of party affiliations, having recorded their will, and having overborne all opposition in subjecting the railroads to rigorous inspection of even minute details of operation, have no longer any misgivings about their power to compel the railroads to do whatever they want them to do. Therefore, the incoming administration cannot be imbued with the sentiment that in the railroad field there is an Augean stable to be cleansed. The railroad question is now narrowed down to that of revenue sufficient for efficient service and the conservation of railway credit. This is susceptible of study in the light of facts and figures. In approaching its consideration the issue is not befogged by any suspicion of guilt as to the honesty of the figures, for the government controls the figures.

"It is my conviction that from now on there will be less and less of open hostility to railroads, and a closer analysis of their needs and of their efficiency. Upon those points there will be, of course, divergent views, attended by acrimonious discussion as to the personal or territorial interests of the disputants' clash. But the underlying conditions are now healthful, because they are constantly under supervisory observation.

"There is well grounded solicitude on the part of the railways at the present time, but it is not a solicitude born of any fear of castigation for evils that may be uncovered. It is a solicitude that there may not be due heed taken to their financial necessities. That is naturally a matter for grave concern, and it is a matter which sooner or later must have the painstaking attention of the American people. They will awaken some day to a full realization of how deeply it is their concern. Their awakening will be mightily helped by such warnings as one that was a short time ago sounded by Charles A. Prouty, long an honored member of the Interstate Commerce Commission, and recently its chairman. He said: 'The United States is trying an experiment which never has been successfully worked out yet in the history of the world. It is trying to build, develop and operate its railroads by private capital under rates and regulations fixed, not by the owners of that capital, but by the public. We can make rates reasonable, we can remove discriminations, we can put in schedules for the running of trains; all that is easy. The question is here: Can we obtain under this system the new money which is necessary to develop our own railroad systems and to build new railroad systems?'

"So, it is apparent that the question now is *not* what the people

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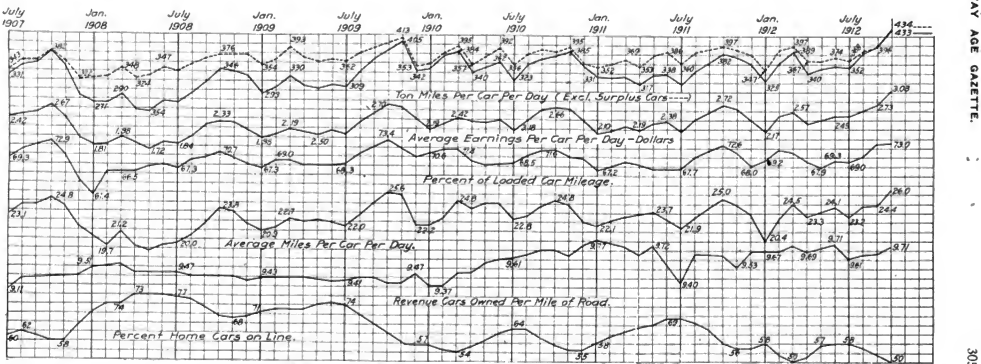
FREIGHT CAR BALANCE AND PERFORMANCE IN OCTOBER, 1912.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	84,730	686,079	221,240	189,580	168,980	410,847	17,234	141,022	29,072	141,154	124,224	2,212,112
Average number of system cars on line	40,378	325,230	112,040	86,179	68,159	254,926	4,549	58,923	17,107	61,348	82,731	1,111,570
Railway-owned cars: Average foreign on line	35,653	313,357	116,244	73,947	71,534	201,690	13,014	67,037	32,674	65,119	60,038	1,071,202
Total Railway-owned cars on line	104,835	638,587	228,284	160,126	139,693	456,622	18,473	125,960	49,781	126,467	142,769	2,191,597
Excess	11,280	*47,442	7,044	*29,454	*29,287	45,775	1,239	*15,062	20,709	*14,687	18,545	*31,340
Per cent. of cars on line to total owned:												
Home	48	48	51	45	40	62	26	42	59	44	67	50
Foreign	65	45	52	39	43	49	81	43	112	46	48	49
All railways	113	93	103	84	83	111	107	85	171	90	115	99
Private cars on line	4,337	44,343	11,915	3,862	7,364	19,237	2,663	9,771	4,731	11,233	2,998	122,654
Total, all cars on line	109,172	683,130	240,199	163,988	147,057	475,859	21,136	135,731	54,512	137,700	145,767	2,314,251
Per cent. of cars in shop	7.47	5.19	8.15	6.43	8.15	6.66	6.13	7.94	4.89	4.73	5.54	6.36
No. of freight engines owned	1,366	10,422	3,102	3,426	2,714	6,632	538	2,806	847	3,012	1,821	36,687
Average cars on line per freight engine owned	80	66	77	48	54	72	39	48	65	46	80	63
Total freight-car mileage	60,995,606	553,563,838	171,904,704	136,986,858	124,204,367	381,463,978	35,121,827	106,207,587	43,571,874	145,548,031	120,584,116	1,880,152,786
Average miles per car per day	18.0	26.3	22.1	26.9	27.3	24.2	55.4	26.7	26.5	34.2	26.7	26.0
Per cent. loaded mileage	75.6	69.8	75.0	70.7	75.6	73.8	74.3	75.1	70.8	75.9	76.5	73.0
Ton-miles of freight, including company freight	767,642,686	9,687,368,245	3,256,322,412	2,333,813,306	1,906,336,618	4,586,238,547	522,670,046	1,621,474,193	363,345,731	2,210,267,991	1,770,054,263	29,025,534,038
Average ton-miles, including company freight:												
Per car-mile	12.6	17.7	20.4	17.0	15.4	16.3	15.2	15.3	13.5	15.5	14.7	16.7
Per loaded car-mile	16.6	25.3	27.8	24.1	20.4	21.9	20.5	20.5	18.7	20.4	19.2	22.9
Per car per day	227	464	451	459	422	394	843	408	357	529	392	433
Gross freight earnings	$8,256,347	$57,435,707	$17,589,054	$14,460,396	$13,893,060	$43,376,001	$4,241,119	$15,936,418	$5,817,223	$23,540,824	$13,184,957	$217,721,126
Average daily earnings: Per car owned	$2.82	$2.70	$2.36	$2.46	$2.65	$3.41	$7.94	$3.56	$6.25	$5.40	$3.42	$3.16
Per railroad car on line	2.49	2.90	2.49	2.91	3.21	3.06	7.41	4.08	3.65	6.03	2.98	3.20
All cars on line	2.40	2.71	2.36	2.84	3.05	2.94	6.47	3.79	3.33	5.54	2.92	3.03

*Denotes deficiency.



Freight Car Mileage, Earnings and Performance, 1907 to 1912.

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shall do to the railroads. They have done it. The burning question is: What shall the railroads be permitted to do *for the people?*

"Pending the consideration of this all-important question, the railways may accelerate public action by a consistent, persistentt course of so ministering to the people's desires and necessities, with the facilities they have, as to win their appreciative regard."

The other speakers were Emory R. Johnson, professor of transportation and commerce at the University of Pennsylvania and special commissioner on Panama traffic and tolls, and Arthur Brisbane, chief editorial writer of the Hearst newspapers. Professor Johnson reviewed the controversy regarding the policy of exempting the coastwise carriers from payment of canal tolls, making use of much of the data regarding the traffic to be handled through the canal which was included in his report to the president, and which has been abstracted in previous issues of the *Railway Age Gazette*. Professor Johnson declared that as between arbitration of the question of the exemption of the owners of the coastwise shipping from the payment of Panama Canal tolls and the repeal of the toll amendment clause of the canal act, the latter course seems the simpler and wiser one to pursue. "If we arbitrate and lose," he said, "we must return all the tolls that have been collected, and henceforth either charge no tolls, or collect the same tolls on all vessels using the canal. If we arbitrate and win we will but have established our right to pursue a policy which is at least of doubtful wisdom. Whatever the Hay-Pauncefote treaty may ultimately be held to mean, the policy of exempting the owners of the coastwise ships from canal tolls should be decided upon its merits. The American people will insist that our treaty obligations, whatever they may be, shall be fulfilled."

Professor Johnson submitted figures showing that approximately $19,250,000 will be required annually to make the canal commercially self-sustaining, and that unless tolls are assessed against the coastwise shipping the revenue from the operation of the canal will fall far short of this amount. The government can be justified in relieving the coastwise shippers from the payment of tolls, and thus in reducing the canal revenue by $16,000,000 or $20,000,000 during the first decade only upon the condition that the general public, rather than the owners of the coastwise vessels, will profit from this loss of revenue to the government, and because the rates of the coastwise steamship companies will be regulated by conference in accordance with what the traffic will bear rather than with reference to the cost of service, the rates paid by shippers will be the same whether tolls be paid or not.

The effect which canal tolls upon coastwise shipping will have upon rail and water rates, and the adjustment of the charges of coastwise carriers and the railroads engaged in handling traffic between the two seaboards of the United States was summarized by the speaker as follows:

"The rates on traffic handled by regular steamship lines between the two seaboards will be but slightly affected by canal tolls. Only such producers and traders as use vessels which they own or charter for the shipment of full cargoes will profit by the exemption of the coastwise shipping from tolls. Probably 99 out of every 100 shippers will pay the same rates whether there be tolls or not. Most of the intercoastal traffic will consist of general commodities and package freight handled by the established steamship lines. Bulk cargoes of lumber, coal, ore and heavy steel products will comprise a relatively small share of the total traffic. The rates charged by the several steamship lines will be the same. The charges will be regulated by agreements among the competing companies and will be fixed primarily with reference to what the traffic will bear and only secondarily, if at all, with reference to the cost of the service to the carriers. The several steamship lines will maintain relatively stable schedules of charges which will ordinarily be adjusted with reference to the even more stable schedule of commodity and class rates maintained by the transcontinental railroads and their eastern rail connections. If the regular steamship lines are required to pay Panama tolls, their payments to the government will be a part of their operating expenses which will thus be increased by the amount of the tolls. If the steamship companies are exempted from the payment of tolls they will thereby receive a subsidy equal to the amount of the tolls not collected by the government.

"In advocating the policy of adhering to business principles in the management of the Panama Canal, it is not recommended that the rate of tolls should be high. Indeed, the schedule of charges fixed by the President establishes relatively low rates—rates that will not unduly restrict the use of the canal. The owners of the vessels that serve the coastwise trade will derive greater benefit from the canal than will the owners of any other vessels. Rates double those established by the President might be imposed without preventing the canal from being used by the coastwise carriers. In view of these facts, it seems just that those who derive immediate benefit from the use of the canal should pay reasonable tolls."

INTERSTATE COMMERCE COMMISSION.

The commission has further suspended from January 25 until July 26, certain schedules in a supplement to the tariff of the Central of New Jersey, which advance class rates from points in Pennsylvania to St. Paul, Minn., and other destinations.

The commission has further suspended from February 1 until August 1 certain schedules in Leland's tariff, which advance rates for the transportation of sash, doors and blinds from stations in Louisiana to stations in Texas and between other points.

The commission has suspended from January 29 until May 29, an item in a supplement to W. P. Emerson's tariff, which advances rates for the transportation of edible nuts from New Orleans and Port Chalmette, La., to St. Louis, Mo., and other points.

The commission has further suspended from January 29 until July 29 certain schedules in a supplement to W. H. Hosmer's tariff, which advance rates for the transportation of cartridge shells from Chicago, St. Louis, Mo., and other points to Kansas City, Mo., and other destinations.

The commission has further suspended from February 8 until August 8, certain schedules in supplements to the tariff of the Chicago, Milwaukee & St. Paul, which advance rates for the transportation of grain between points in Iowa, South Dakota and Minnesota and points in Illinois and Wisconsin.

The commission has further suspended from January 28 until July 28, and May 28, the schedules in certain tariffs, which eliminate reconsignment and storage privileges at Minnesota Transfer, Minn., on lumber and shingles shipped from points in Oregon and Washington to eastern destinations.

The commission has suspended from January 6 until March 31 a tariff of the Southern Railway in Mississippi, which advances by amounts averaging about 2 cents per 100 lbs. rates for the transportation of gum and cottonwood lumber, staves and heading from points in Mississippi to Mobile, Ala., and other points.

The commission has further suspended from February 1 until August 1 a supplement to F. A. Leland's tariff and a supplement to W. A. Poteet's tariff, which advance rates for the transportation of certain commodities between certain stations located in Texas common point territory and St. Louis, Mo., and other points.

The commission has further suspended from February 8 until August 8, certain schedules in supplements to the tariffs of the Chicago, Milwaukee & St. Paul and the Chicago, Rock Island & Pacific, which advance rates for the transportation of starch from Cedar Rapids, Ia., and other points to Missouri river points on traffic destined beyond.

The commission has suspended from January 30 until April 30 certain items in certain tariffs, which cancel existing joint through rates and routes for the transportation of lumber and shingles from Edmonds, Everett, Anacortes, Olympia and Dupont, Wash., to eastern points in connection with certain lines, leaving the combination of local rates to apply in case shipments are made over those lines.

The commission has suspended from February 2 until June 2 certain schedules in supplements to the tariff of the Chicago, St. Paul, Minneapolis & Omaha, which advance from 9½ cents to 10 cents per 100 lbs. rates for the transportation of brick from St. Paul, Minneapolis and Minnesota Transfer, Minn., to Union Center, Baraboo, Madison and Beloit, Wis., and Belvidere, De Kalb, Dixon and Fulton Junction, Ill.

The commission has suspended from February 1 until June 1 a note in a supplement to Hosmer's tariff, which cancels joint

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rates on salt from Milwaukee, Wis., to points on the Wabash west of the Mississippi river. As to most points this would result in an advance of 3½ cents per 100 lbs. For example, the present rate from Milwaukee to Omaha via the Chicago & North Western and the Wabash is 14 cents per 100 lbs., the proposed rate being the combination on Chicago of 17½ cents per 100 lbs.

The commission has suspended until May 31 certain tariffs, which establish new storage charges for the transportation of dangerous articles other than explosives, including such commodities as petroleum and petroleum products. Under the suspended tariffs the commodities mentioned, if not removed from railroad premises within 24 hours after date of arrival, would be subject to a storage charge of 10 cents per 100 lbs. for the second 24 hours after arrival and to a storage charge of 20 cents per 100 lbs. for each 24-hour period thereafter until removed from railroad premises.

Complaint Dismissed.

Standard Vitrified Brick Company et al. v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Clements:

The commission found that the rate of 12½ cents per 100 lbs. on brick from the Kansas gas belt to various Chicago, Burlington & Quincy stations in Missouri and Iowa for an average haul of 400 miles was not unreasonable. (25 I. C. C., 669.)

Highland Park Manufacturing Company v. Southern Railway. Opinion by the commission:

The commission found that lawful rates according to published tariffs had been charged on shipments of cottonseed from Charlotte and Pineville, N. C., to Rock Hill, S. C. The rates were attacked as unreasonable but the evidence was not conclusive. (26 I. C. C., 67.)

Miller Manufacturing Company v. Wabash Railroad, et al. Opinion by the commission:

The complainant shipped a portable cooling room from St. Louis, Mo., to Keewatin, Minn., and contends that the defendant did not charge the proper rate according to its tariff. The testimony was confined to the matter of classification and the commission found that the charges were properly assessed according to the tariff. (26 I. C. C., 71.)

Casey-Hedges Manufacturing Company et al. v. Central of Georgia. Opinion by the commission:

The complainant contends that the failure of the defendant to absorb a portion of the switching charges of the connecting lines at Chattanooga, Tenn., on through shipments of coke from Durham, Ga., when $1 per car switching charges was absorbed by it on shipments of coal, resulted in a discrimination against coke in favor of coal. The commission found that the competition between these two commodities was negligible and that the present rate on coke between the two points in question, including the switching charge, was reasonable. (26 I. C. C., 63.)

Reparation Awarded.

John W. Keogh v. Minneapolis, St. Paul & Sault Ste. Marie. Opinion by the commission:

The commission found that the rates charged by defendants for transportation of excelsior bolts in carloads from certain Wisconsin points to St. Paul, Minn., were unreasonable and prescribed lower rates for the future. (26 I. C. C., 73.)

Ludowici-Celadon Company v. Pennsylvania Company, et al. Opinion by the commission:

The commission found that the charges collected by defendants for transportation of three carloads of unglazed tile slabs or brick tile, from New Lexington, Ohio, to Springfield, Mo., were in excess of the published rate. (26 I. C. C., 82.)

Rates on Fence Posts Not Advanced.

In re investigation and suspension of advances in rates by carriers for the transportation of fence posts from stations in Arkansas to Kansas City, Mo., and other points. Opinion by Commissioner Clements:

The proposed advances are from 12 to 15 cents to Kansas City and from 18½ to 21 cents to Omaha and Lincoln. The defendants did not contend that the present rates on fence posts are unreasonably low, but that as that commodity took lumber rates in other sections of the country, they were justified in making the proposed increases which would put the rate on fence posts on the basis applicable on lumber between the same points. The commission found that the evidence in support of the proposed increases was not conclusive, and dismissed the complaint. (26 I. C. C., 42.)

Rates on Excelsior and Excelsior Wrappers Increased.

In re investigation and suspension of advances in proportional rates by carriers for the transportation of excelsior and excelsior wrappers from certain stations on the Bangor & Aroostook to Brownville Junction, Maine, and other points. Opinion by Commissioner Prouty:

The proposed advances are one and two cents per 100 lbs. on the portions of the through transportation service performed by the initial carrier. The commission found that they are not excessive and that the resulting through rates are not unreasonable. The order of suspension was vacated. (26 I. C. C., 44.)

Rates from West to Stations on Line of Rhode Island Company.

In re investigation and suspension of advances in class and commodity rates by carriers from western points to stations in Rhode Island, located on the line of the Rhode Island Company. Opinion by Commissioner Prouty:

The present rates from the West to points on the line of the Rhode Island Company are on the same basis as the rates from similar points to Boston. By the suspended tariff the defendants propose to establish certain arbitraries to the points in question over Boston, as was formerly the practice. The commission found that the Boston rate applies at nearly all points in Massachusetts, Connecticut and Rhode Island, that communication is extremely easy and that competition between the points in the vicinity is very active. The commission decided that in future the rates to the points in question should not exceed the Boston rate (26 I. C. C., 51.)

Rates from the Walsenburg Coal Field.

In re investigation and suspension of advances in rates by carriers for the transportation of coal from the Walsenburg district of Colorado to stations in Kansas, Oklahoma, and Texas. Opinion by Commissioner Harlan:

The defendants undertook to advance the coal rates from the Walsenburg field to points in Kansas, Oklahoma, and Texas by 35 cents a ton, without making any change in the rates to the same destinations from the Canon City field. The commission decided that the suspended tariffs should be canceled, but that the defendants should be allowed to establish a coal rate from the Walsenburg field that is 10 cents higher than that from the Canon City field to the same destinations. The contention of carriers that discrimination cannot be predicated of a carrier by a shipper not on its line is not sustained, as an undue discrimination against a given point may be effected as well by a joint rate as by a one-line rate. (26 I. C. C., 85.)

Relief from Fourth Section.

B. L. Gillis & Son et al. v. Philadelphia, Baltimore & Washington et al. Opinion by the commission:

The complainant contends that the rate of 10 cents per 100 lbs. on sugar in carloads from Philadelphia, Pa., to Salisbury, Md., is unreasonable because the rate from Philadelphia to Norfolk, Va., a point to which Salisbury is intermediate, is only 8½ cents per 100 lbs. The commission found that the rate to Norfolk, Va., was affected by water competition and that the present rate to Salisbury is reasonable compared with rates to similar points. Relief from the fourth section was granted in the case of the rate from Philadelphia to Norfolk. (26 I. C. C., 61.)

Rates on Clay Products Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of brick from Brickland, N. Mex., to stations in Arizona. Opinion by Commissioner Harlan:

The advances in rates on clay products, including brick, common and pressed, also hollow building tiles or blocks, minimum 40,000 lbs., from Brickland, N. Mex., to points on the line of the Southern Pacific, in Arizona, were proposed to readjust the present rate arrangement which results in discrimination in favor of Brickland compared with other points. The proposed scale is

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based approximately on 2 cents per ton per mile for the first 50 miles, and for longer hauls on a basis of 1 cent per ton per mile for the additional mileage. The commission decided that the present arrangement does result in discrimination in favor of Brickland and that the proposed rate was not unreasonable. The order of suspension was vacated. (26 I..C. C., 8.)

Rates on Cement, Paving and Roofing Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of cement, paving or roofing and other commodities in carloads from Chicago and Milwaukee, Wis., and other points to destinations in South and North Dakota, Montana and other states. Opinion by Commissioner Clements:

The proposed advances in the rates in question are uniformly two cents per 100 lbs. The principal contention of the complainant was that under the proposed arrangement the combination rates between certain points would aggregate less than the proposed joint rates between those points. The defendant agreed to realine all such rates and it was shown that if this were done the complainant would make no further protest against the defendant's tariff as a whole. The order of suspension was vacated with the understanding that the carriers will make the necessary corrections. (26 I. C. C., 11.)

Cotton Storage Regulations.

Dumee, Son & Company v. Pennsylvania Railroad. Dumee, Son & Company v. Philadelphia & Reading. Opinion by Commissioner Clements:

In this case the complainant contends that the defendants discriminated against Philadelphia, Pa., by reducing the period of free storage time at the piers from 30 to 10 days when export cotton originated at Philadelphia without changing the period of 30 days allowed at the piers on all export cotton not originating in Philadelphia. The commission found that in a large number of cases the defendants had to pay large per diem charges on account of the delays at the piers. It was also shown that 30 days were still allowed on cotton originating outside of Philadelphia on account of the uncertainty of timely connections with steamers after long rail hauls and also on account of the competition with other ports. The commission decided that as the sailing dates were readily ascertainable at Philadelphia, the ten-day period was quite sufficient.

Cotton is also shipped to the complainant at local stations in Philadelphia. The damaged portion is there removed and the remainder is rebilled locally to the export pier billed for export. The complainant contends that as all of the original consignment to Philadelphia, except the damaged portion, is eventually exported, the storage rules applicable to export cotton should govern the shipment to and from the local station in Philadelphia and, therefore, 30 days should be allowed instead of four days applicable to strictly local traffic. The defendants contend that the shipments in question were strictly local in character and that if they were not they would have been shipped directly to the pier instead of to the local stations. The commission found that there were no transit privileges permitting the sorting en route of export cotton at Philadelphia and that the present practice of the complainant resulted in two separate local shipments and that therefore they were subject to the storage regulation applicable to local traffic. (26 I. C. C., 33.)

Indiana Points Discriminated Against.

Indianapolis Freight Bureau v. Cleveland, Cincinnati, Chicago & St. Louis et al. Opinion by Commissioner Harlan:

The complainants contend that the millers and grain dealers at Indianapolis and other Indiana points are discriminated against in favor of the millers and grain dealers at Champaign, Ill., Cincinnati, Ohio, and other points on account of a note in the tariffs of the lines south of the Ohio river which provides that the proportional or shrinkage rates will not be applied on shipments of grain and grain products on which milling-in-transit privileges have been accorded at points north of the Ohio river and east of the Illinois-Indiana state line. This note puts the grain dealers and millers at Indiana points under a rate disadvantage of two cents per 100 lbs. on shipments to Atlanta, Ga., as compared with the dealers and millers at Champaign, Cincinnati and other points, although the through movement in each case is over the same route. The grain dealers of Louisville, Ky., objected to any modification of the present tariffs on the ground that transit at Indianapolis has not been properly policed, but the commission found that even if this were the case it would not justify a rate discrimination against Indianapolis. Grain moves to the southeast either through the upper or lower Ohio river crossings. The grain dealers of Louisville also urged that the upper Ohio river crossings have no other market for grains than the southeast, while Indianapolis has the eastern as well as the Virginia and Carolina territory and should not, therefore, be given the southeast also. The commission found that such a rate policy would be fair neither to the millers and dealers of Indianapolis nor to the consumer in southeastern territory. The commission went on to say that the carrier may not, as a public servant, serve one community at the expense of another or build a rate wall around one point to advance the interests of a competing point. The defendants attempted to justify the note in their tariffs on the ground that it was compelled by competition with other Ohio river crossings. The commission decided, however, that it was more probable that the enjoyment of transit privileges under the same rate by millers and dealers at Indianapolis would not be felt so much by the millers at the lower Ohio river crossings as by their competitors at the upper crossings on the same route. The commission decided further that whether the consequences of the new competition would be felt at the lower crossings or at the upper crossings, Indianapolis and other Indiana points are now discriminated against and that in future they should be given the full use, at the same aggregate through charge, of the transit privileges which are accorded to all other points on the same routes. (26 I. C. C., 53.)

Rates on Horses and Mules Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of horses and mules in carloads to Chicago, St. Louis, Mo., and other points and stations in South Dakota, Nebraska, Kansas, Oklahoma, Colorado and Wyoming. Opinion by Commissioner Harlan:

The proposed increases in the tariff under suspension range from 50 cents to $16.50 per standard car. The defendants declared that while they required more revenue for this service, the real purpose of the advances was to eliminate a "low rate basin" by raising the rates from this territory to a more equitable basis compared with the rates from adjacent territory. The testimony showed that the traffic in horses and mules had been decreasing rapidly and that at present it was less than one-tenth of the traffic in cattle from the territory in question. The defendants contended that the per car earnings should be considerably larger for the transportation of horses and mules than for the transportation of cattle, partly on account of the greater value of a carload of horses and partly on account of the damage claims on that traffic which is about six times as great as on cattle traffic. The diminishing supply of horses has resulted in an increase in their value, and also there has been a material increase in their quality and grade since the present rates were established. The commission found that the rates on horses from this district were too low compared with the rates on cattle, and also that the order suspending the proposed advances should be vacated. This order must not be understood to be final in case the reasonableness of any rate involved should be attacked at some future time. (26 I. C. C., 47.)

STATE COMMISSIONS.

The New York State Public Service Commission, First district, has ordered the United States Express Company to cease charging 25 cents, or any sum, for carrying baggage checks, this charge being in addition to the charge imposed for transporting [in the opposite direction] baggage covered by such checks.

The Illinois Railroad & Warehouse Commission held a hearing at Chicago on February 5, on the adoption of a uniform bill of lading. Representatives of the principal organizations of shippers having headquarters in Chicago protested against the adoption of the proposed bill until the Interstate Commerce Commission has given its final approval. Representatives of the railways present advocated its adoption. The question was finally taken under advisement by the commission.

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REVENUES AND EXPENSES OF EXPRESS COMPANIES AS REPORTED TO THE INTERSTATE COMMERCE COMMISSION.

Name of Company.	Miles of line covered.		Gross receipts from operation.	Less express privileges, Dr.	Total operating revenue.	Operating expenses.				Net operating revenue (or deficit—).	Taxes.	Operating deficit (—), or income (or loss—), last year.	Increase or decr. (—) in income (or loss—), last year.
	Steam roads.	Other lines.	Express revenue.	Operation.		Maintenance.	Traffic.	Transportation.	General.	Total.			
Adams Express Co.	31,500	4,286	$2,954,513	$3,016,552	$1,030,207	$1,186,255	$62,786	$12,901	$1,108,261	$1,180,953	$1,380,894	$313,277	—$351,923
American Express Co.	31,500	4,286	2,954,513	3,016,552	1,030,207	1,186,255	62,786	12,901	1,108,261	1,180,953	1,380,894	313,277	—351,923
Canadian Express Co.	6,124	839	589,705	595,705	115,895	117,096	7,367	1,026	113,099	10,988	132,830	17,831	—38,337
Canadian Northern Express Co.	4,024	22	51,227	38,500	12,899	30,010	410	11,898	1,368	20,675	13,931	8,72	15,059
Globe Express Co.	3,804	495	267,099	89,383	177,491	135,461	2,791	1,792	24,503	4,101	32,548	3,086	5,719	30,287	6,005
Great Northern Express Co.	8,469	495	267,099	89,383	177,491	135,461	2,791	1,792	24,503	4,101	32,548	3,086	5,719	30,287	6,005
National Express Co.	3,009	218	130,301	15,093	115,208	53,256	5,113	8	51,231	2,054	59,406	4,140	6,442	4,583	—1,614
Northern Express Co.	3,009	218	130,301	15,093	115,208	53,256	5,113	8	51,231	2,054	59,406	4,140	6,442	4,583	—1,614
Southern Express Co.	21,128	821	1,123,119	1,295,149	643,918	565,886	16,322	7,198	461,449	76,199	561,168	7,642	23,155	—35,233	—90,942
United States Express Co.	28,817	3,963	1,787,204	1,794,992	828,451	916,541	36,093	14,244	871,043	42,160	964,160	46,617	56,637	—10,240	2,875
Wells, Fargo & Co.	44,320	17,643	2,440,143	2,676,858	1,366,616	1,310,241	85,793	24,582	1,093,044	93,062	1,267,881	223,753	54,638	167,895	112,240
Western Express Co.	6,000	18	162,040	166,348	38,308	128,040	3,268	1,358	32,052	1,430	36,108	4,690	6,190	1,500	1,500
TWELVE MONTHS OF FISCAL YEAR, 1912.															
Adams Express Co.	31,500	4,786	$33,756,834	$34,191,956	$17,833,972	$16,357,984	$835,194	$112,935	$13,175,098	$1,079,377	$15,152,504	$1,205,390	$720,390	$960,991	—$173,841
American Express Co.	31,500	2,985	41,934,581	43,214,474	21,055,986	22,638,068	1,022,453	371,177	17,949,939	1,567,568	20,526,047	1,271,021	371,686	1,340,418	—1,430,099
Canadian Express Co.	6,124	839	7,076,460	7,154,705	1,387,740	1,407,952	88,400	12,312	1,357,188	118,052	1,575,952	133,831	34,462	206,183	—72,352
Canadian Northern Express Co.	4,024	22	602,108	622,236	241,414	380,912	2,913	4,345	176,393	16,278	302,129	320,107	18,282	174,041	43,292
Globe Express Co.	2,904	...	762,752	773,219	388,259	387,960	10,353	20,253	294,682	49,614	371,902	16,088	8,919	72,169	—8,279
Great Northern Express Co.	8,649	495	2,851,794	2,879,919	1,729,273	1,143,395	30,241	16,867	839,605	46,468	933,244	209,151	41,203	107,948	—59,565
National Express Co.	3,009	218	1,387,204	1,402,611	1,270,023	132,587	10,241	8	109,008	4,158	123,416	9,171	1,012	10,823	—1,652
Northern Express Co.	7,527	277	2,954,159	2,994,657	1,553,435	1,470,272	40,914	40,231	937,324	63,467	1,081,936	386,786	58,059	328,707	—177,724
Southern Express Co.	21,128	821	15,383,780	15,628,470	7,728,291	7,900,179	209,952	105,671	5,367,383	772,335	6,946,541	1,503,638	178,174	1,235,464	—400,055
United States Express Co.	28,817	3,963	20,369,974	21,311,598	10,472,737	11,002,241	494,315	183,397	9,488,308	1,143,310	11,310,019	2,547,828	358,241	2,746,013	—1,957,727
Wells, Fargo & Co.	44,320	17,643	28,503,179	29,443,124	16,842,572	12,600,551	1,004,315	331,787	12,264,236	1,000,213	14,600,551	1,842,573	354,241	1,842,573	—1,487,332
Western Express Co.	6,000	18	1,140,912	1,162,096	563,963	599,043	14,334	33,705	423,846	40,056	513,933	85,106	9,500	75,608	64,825

Operated in previous periods: Steam Roads—3 22,795; $ 54,379; $ 7,362; $ 1,370; $ 8,466; $ 11,422; $ 7,310; $ 11,735; $ 58,827; $ 42,356; $ 4,843. Other Lines—$ 3,776; $ 2,539; $ 830; $ 337; $ 135; $ 816; $ 3,911; $ 11,116; $ 8.

Railway Officers.

Executive, Financial and Legal Officers.

E. F. Bisbee, formerly vice-president of the Oklahoma National Stock Yards, has been elected vice-president of the St. Louis National Stock Yards, with headquarters at National Stock Yards, Ill., in place of George R. Collett, resigned.

John Skelton Williams, until recently president of the Georgia & Florida, has been elected chairman of the board of directors of that road. Bruce W. Duer has been elected vice-president in charge of operation, with headquarters at Augusta, Ga., and C. T. Earnest has been elected secretary and treasurer.

G. C. Jones, general manager of the Central Vermont at St. Albans, Vt., has been elected vice-president, in charge of construction, transportation and maintenance departments; M. M. Reynolds has been elected vice-president, in charge of financial and accounting departments, and J. E. Dalrymple, is vice-president, in charge of traffic department. M. M. Reynolds and J. E. Dalrymple also hold similar positions on the Grand Trunk and the Grand Trunk Pacific, with headquarters at Montreal, Que.

The following appointments and resignations went into effect February 6, on the Union Pacific: C. B. Seger, deputy comptroller, was appointed vice-president and comptroller, succeeding William Mahl, resigned; Thomas Price was appointed assistant secretary, succeeding Joseph Hellen, resigned, both with headquarters at New York, and the following resignations were accepted, but no successors appointed: J. Kruttschnitt, director of maintenance and operation; L. J. Spence, director of traffic; Maxwell Evarts, general counsel; W. A. Worthington, assistant director of maintenance and operation; F. W. Mahl, assistant to director of maintenance and operation; W. S. Basinger, assistant to director of traffic; F. H. Plaisted, assistant to director of traffic.

Operating Officers.

L. W. Tucker has been appointed general manager of the Brinson Railway.

S. M. Woodward has been appointed superintendent of the Manufacturers' Railway, with headquarters at St. Louis, Mo., succeeding John J. Baulch, deceased.

S. S. Russell, superintendent of car service of the Central Vermont, at St. Albans, Vt., has been appointed general superintendent of transportation with office at St. Albans, and his former position has been abolished.

J. A. Shepherd, general manager of the Western Maryland, has been appointed superintendent of the Kansas City Terminals of the Missouri Pacific, with headquarters at Kansas City, Mo., succeeding J. A. Somerville, assigned to other duties.

John F. Keefe has been appointed superintendent of the Northern division of the Central Vermont, with office at St. Albans, Vt., succeeding C. E. Soule, resigned, and J. R. Fitzgerald has been appointed trainmaster of the Third and Fourth districts, with office at St. Albans.

B. R. Pollock, general manager of the New York, New Haven & Hartford, at New Haven, Conn., has resigned that position and has been appointed general manager, transportation department of the Boston & Maine (controlled by the New Haven), with office in the North station, Boston, Mass. A portrait of Mr. Pollock and a sketch of his railway career were published in the *Railway Age Gazette* of December 13, 1912, page 1159.

Miles Bronson, whose appointment as manager of the Grand Central Terminal, with headquarters at New York, was recently announced in these columns, has been appointed also general superintendent of the electric division of the New York Central & Hudson River succeeding A. R. Whaley, resigned, and Garret H. Wilson, assistant superintendent of the Grand Central Terminal, at New York, has been appointed superintendent of the Grand Central Terminal, also of the electric division of the New York Central & Hudson River.

G. L. Whipple, whose appointment as superintendent of transportation of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has been announced in these columns, was

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born January 30, 1872, at Keithsburg, Ill. He received a common school education and began railway work in 1887 with the Chicago, Milwaukee & St. Paul as a telegraph operator, which position he held for seven years. He was then a train despatcher for eight years, chief train despatcher four years, trainmaster four years and assistant superintendent of transportation for two years, until February 1, when he was made superintendent of transportation.

G. A. Stokes, whose appointment as superintendent of the Toronto terminals of the Grand Trunk has been announced in these columns, entered the service of that company on November 15, 1897, as a telegraph operator at Listowel, Ont., remaining in that position until October, 1898. He was then until March of the following year relieving agent, and from March, 1899, to April, 1907, was agent consecutively at Harrison, Ont., at Wingham, at Wiarton, and at Brantford. In April, 1907, he was appointed train despatcher at Stratford, Ont., remaining in this position until November 1, 1910, when he was made yardmaster at Don, Toronto, and in September, 1912, was appointed general yardmaster at the Toronto terminals. He was promoted on October 25, of the same year, to acting superintendent of the Toronto terminals, which position he held at the time of his recent appointment as superintendent of the Toronto terminals of the same road, as above noted.

G. A. Stokes.

William Scott Wilson, who has been appointed superintendent of transportation of the Ontario lines of the Grand Trunk, with headquarters at Toronto, Ont., as has been announced in these columns, was born at Caledonia, Ont., and was educated in the public and high schools of his native town. He began railway work in May, 1888, as operator and ticket clerk on the Grand Trunk and served in the same capacity at various places in western Ontario, until 1894, when he was made despatcher at London, Ont. From 1897 to 1901 he was with the Great Northern, in the states of Minnesota and Washington, also with the Pacific Coast Railway, and the Pacific Coast Steamship Company. He was appointed despatcher on the Grand Trunk at Island Pond, Vt., in June, 1901, leaving that position in July, 1902, to go to the Rutland Railroad as despatcher at Rutland, Vt., and from December 1, 1902, to May, 1907, he was despatcher on the Grand Trunk at London, Ont. In May, 1907, he was made chief despatcher of the same road at Stratford, Ont., remaining in that position until July 1, 1910. He was then promoted to trainmaster at Stratford, which position he held at the time of his recent appointment as superintendent of transportation of the Ontario lines, of the same road, as above noted.

W. S. Wilson.

The Canadian Pacific has created a department of investigation, in charge of Rufus C. Chamberlain, until recently chief of police at Vancouver, B. C., whose title will be chief of the department of investigation, with office at Montreal, Que. Hereafter all enquiries or investigations excepting those involving the relations between officials and employees, and those which must necessarily be conducted through the audit department, will be under the control and supervision of the chief of the department of investigation, who will report to the president. He will have such assistants on the different sections of the system as may be necessary to enable him to perform his work efficiently.

W. A. Cooper, general superintendent of sleeping, dining and parlor cars and news service of the Canadian Pacific, has been appointed manager, with office at Montreal, Que., and the following subordinate officers of this department have been appointed: A. Rutledge, general superintendent eastern lines, Montreal; H. F. Mathews, general superintendent western lines, Winnipeg, Man.; H. G. Ganson, assistant general superintendent western lines, Vancouver, B. C.; F. A. Tingley, superintendent British Columbia division, Vancouver; W. H. Pratt, assistant superintendent British Columbia division, Vancouver; J. M. Willard, assistant superintendent Manitoba division, Winnipeg, Man.; D. S. Fraser, assistant superintendent Manitoba division, Winnipeg; A. Bayard Smith, assistant superintendent, Toronto, Ont.; W. H. Power, second assistant superintendent, Glen yards, Montreal, Que., and J. H. McNeill, second assistant superintendent Alberta division, Calgary, Alta.

Traffic Officers.

R. R. Beegle has been appointed assistant milk freight agent of the Erie Railroad, with office at Buffalo, N. Y.

Harry E. Webster has been appointed traveling coal freight agent of the Baltimore & Ohio, with headquarters at Uniontown, Pa., succeeding H. C. Tucker, promoted.

James R. Wood, passenger traffic manager of the Pennsylvania Railroad, with headquarters at Philadelphia, Pa., will be retired under the pension rules of the company on March 1.

Engineering and Rolling Stock Officers.

D. McCooe has been appointed superintendent of track of the Grand Trunk, at the Toronto, Ont., terminals.

A. G. Holt is the assistant chief engineer of the Chicago, Milwaukee & St. Paul, with office at Chicago, and not H. E. Holt as stated in our issue of last week.

William D. Faucette, whose appointment as chief engineer of the Seaboard Air Line, with headquarters at Portsmouth, Va., has been announced in these columns, was born in June, 1881, at Halifax, North Carolina, and was educated at North Carolina State College of Agriculture and Mechanic Arts, at Raleigh, N. C., where he received the degree of B. E. and C. E. He began railway work with the Seaboard Air Line in 1901 as inspecting engineer at Savannah, Ga., and was engaged in terminal, river and harbor work, also on yards, etc., and the following year was made assistant engineer at the Savannah office. Two years later he was placed in charge of that office, and in 1905 was transferred as assistant engineer to the chief engineer's office at Portsmouth, Va. In 1910 he was made chief clerk to the president of the same road at New York, remaining in that position. President N. S. Meldrum was succeeded by W. J. Harahan, in September, 1912, at which time Mr. Faucette was transferred in the same capacity to Norfolk, Va. He remained in that position until January 1, 1913, when he was made chief engineer of the same road, with headquarters at Portsmouth, as above noted.

W. D. Faucette.

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H. W. Ridgway, master mechanic of the Colorado & Southern at Denver, Colo., has been appointed superintendent of motive power and car department, with office at Denver, succeeding H. C. Van Buskirk, resigned.

Howell H. Althouse, chief engineer of the Erie Railroad, having resigned to take service elsewhere, the duties of that office will, until further notice, devolve upon Robert C. Falconer, superintendent of construction, with headquarters at New York.

Joseph Chidley, division master mechanic of the Lake Shore & Michigan Southern at Collinwood, Ohio, has been appointed assistant superintendent of motive power of the Lake Shore & Michigan Southern, the Dunkirk, Allegheny Valley & Pittsburgh, the Chicago, Indiana & Southern, and the Indiana Harbor Belt, with office at Cleveland, succeeding S. K. Dickerson, transferred. O. M. Foster, division master mechanic of the Lake Shore & Michigan Southern, at Elkhart, Ind., has been appointed master mechanic, Lake Shore division, with office at Collinwood, succeeding Joseph Chidley, promoted. M. D. Franey, assistant division master mechanic, at Collinwood, succeeds Mr. Foster, and B. F. Kuhn, superintendent of shops at Collinwood, succeeds Mr. Franey.

Purchasing Officers.

George H. Jenkins has been appointed assistant to general purchasing agent of the Grand Trunk, with office at Montreal, Que.

Joseph Campbell Snyder has been appointed assistant purchasing agent of the New York Central & Hudson River, with headquarters at Grand Central Terminal, New York. He was born on March 24, 1876, at Richmond, Va., and was educated in the public schools at Washington, D. C. He began railway work on May 18, 1893, with the Richmond & Danville, now a part of the Southern Railway. In June, 1901, he entered the service of the New York Central & Hudson River as a stenographer in the purchasing department, and now becomes assistant purchasing agent of the same road in charge of the purchase of steel products, rubber goods, paints, oils, and such other articles as may be assigned to him from time to time by the purchasing agent.

OBITUARY.

H. A. Price, assistant general passenger agent of the Intercolonial Railway at Montreal, Que., died on February 2.

W. J. O'Meara, for many years eastern passenger agent of the Chicago, Burlington & Quincy at New York, died on February 7, at Bellerose, Long Island, at the age of 46. He had been in the service of the Chicago, Burlington & Quincy for 27 years.

Joseph W. Gilluly, treasurer of the Denver & Rio Grande, died suddenly at his home in Denver, Colo., on February 6, aged 62 years. Mr. Gilluly has been with the Denver & Rio Grande since August, 1872, when he began as a clerk in the auditor's office. From August, 1878, to June, 1879, he was chief clerk in the treasurer's office and was then auditor until November, 1880, when he was appointed cashier, which position he held until July, 1886, at which time he was elected treasurer. He also was treasurer of the Rio Grande Southern.

Thomas Walton Roby, comptroller of the Seaboard Air Line since July 1, 1900, died on February 7, at Norfolk, Va. He was born on December 20, 1851, at Quincy, Gadsden county, Fla., and was educated at Quincy Academy. He began railway work in June, 1878, as bookkeeper on the Florida Central, and since that time has been in the continuous service of that and other companies now included in the Seaboard Air Line. In April, 1880, he was made secretary and treasurer of the Florida Central and was later treasurer of the Florida Central & Western, then cashier and auditor of the same road. For about one month in 1884 he was auditor of the Florida Transit & Peninsula. From March, 1884, to October of the following year he was auditor of consolidated lines known as the Florida Railway & Navigation Company, and then to April, 1889, was auditor for receivers of the same road, later becoming auditor of the same property which was reorganized as the Florida Central & Peninsula. He was appointed comptroller of the Seaboard Air Line on July 1, 1900.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE CHICAGO, TERRE HAUTE & SOUTHEASTERN is figuring on 5 locomotives.

THE LOUISIANA & ARKANSAS has ordered 4 ten-wheel locomotives from the Baldwin Locomotive Works.

THE BIRMINGHAM & SOUTHEASTERN has ordered 1 ten-wheel locomotive from the Baldwin Locomotive Works.

THE WABASH, CHESTER & WESTERN has ordered 1 eight-wheel locomotive from the Baldwin Locomotive Works.

THE MARYLAND STEEL COMPANY has ordered 1 six-wheel switching locomotive from the Baldwin Locomotive Works.

THE PENNSYLVANIA RAILROAD has ordered 30 Pacific type locomotives and 15 switching locomotives, from the Baldwin Locomotive Works.

THE LAKE SHORE & MICHIGAN SOUTHERN, mentioned in the *Railway Age Gazette* of December 20 as figuring on a number of locomotives, is now definitely in the market for 23 switching locomotives.

THE ST. LOUIS SOUTHWESTERN, mentioned in the *Railway Age Gazette* of January 17 as being in the market for 20 locomotives, has ordered 10 consolidation locomotives and 10 ten-wheel locomotives from the Baldwin Locomotive Works.

CAR BUILDING.

THE HAVANA CENTRAL is in the market for 740 freight cars.

THE BALTIMORE & OHIO is in the market for 1,000 50-ton coke cars.

THE MINERAL RANGE is in the market for 100 all-steel rock cars.

THE MISSOURI, KANSAS & TEXAS is in the market for 1,000 drop-bottom stock cars.

THE CHICAGO, ROCK ISLAND & PACIFIC has ordered 1,000 box cars from the the Western Steel Car & Foundry Company.

THE HARRIMAN LINES have ordered 3,100 box cars and 2,200 stock cars from the Pullman Company, 500 flat cars from the Bettendorf Axle Company, 2,000 gondola cars from the Pressed Steel Car Company, and 800 automobile cars, 10 caboose cars and some box cars from the Standard Steel Car Company.

THE PENNSYLVANIA SYSTEM has ordered 10,000 freight cars as follows: 4,500 from the Cambria Steel Company; 2,500 from the Pressed Steel Car Company; 1,500 from the Standard Steel Car Company; 1,000 from the American Car & Foundry Company, and 500 from the Ralston Steel Car Company. These cars will all be of 100,000 lbs. capacity. Of the total, the Lines East will get 5,000 cars and the Lines West, 5,000 cars. The order comprises 8,000 all-steel hopper cars, 1,000 wood and steel gondola cars, 500 refrigerator cars and 500 wood and steel box cars.

IRON AND STEEL.

THE GREAT NORTHERN has ordered 15,000 tons of rails from the Illinois Steel Company.

THE WATERLOO, CEDAR FALLS & NORTHERN has ordered 7,000 tons of rails from the Illinois Steel Company.

GENERAL CONDITIONS IN STEEL.—Satisfaction with the present conditions in the steel industry is felt generally in spite of the recent falling off in orders. The volume of unfilled orders on the books guarantees steady operation for the first half of the year, and even if orders fall considerably below shipments within this period, steady operation for the mills in the last half of the year is assured. The prices are satisfactory, and should production continue at its present rate, earnings will be on a rising scale, for there is a large amount of steel to be delivered which was booked at prices considerably below current quotations.

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Supply Trade News.

The H. W. Johns-Manville Company, New York, has opened a branch office in the Dooly block, Salt Lake City, Utah.

C. H. Burt, formerly in the signal department of the New York Central & Hudson River, has been appointed sales engineer of the Signal Accessories Company, 30 Church street, New York.

The American Steel Foundries, New York, have declared a quarterly dividend of one-half of 1 per cent. The last previous quarterly dividend was 1¼ per cent., and was paid May 15, 1911.

F. H. Allison has been made general purchasing agent in charge of all office and factory supplies for the American Vanadium Company and the Flannery Bolt Company, both of Pittsburgh, Pa.

The Ceresit Waterproofing Company, Chicago, has created a superintendence department which will be in charge of John J. Lyons. It will be the function of this department to superintend any structure where engineers or architects desire to have a check on its practice of the waterproofing work. When superintendence is desired, the company is prepared to give a bond of guarantee.

C. J. Olmstead, who has been assistant western manager of the Westinghouse Air Brake Company in the western district, has been appointed western manager with headquarters at Chicago, effective February 1. Mr. Olmstead was born in Concord, Mich., and in 1890 entered the employ of the Pullman Company at Chicago, as chief clerk in the manufacturing and sales department. He remained with this company in various capacities for several years, leaving in April, 1905, as assistant to the general manager, to become associated with the Westinghouse Air Brake Company as commercial representative in the western district. This position he held until he was promoted to the office of assistant western manager, with headquarters at Chicago, on June 1, 1912, which position he has held until his new promotion as western manager.

C. J. Olmstead.

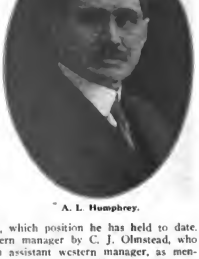
The General Electric Company, Schenectady, N. Y., has received among recent orders the following: Two 50-ft. gas-electric motor cars for the Great Northern; nine 100-h. p., four-motor, car equipments with Sprague-General Electric portable unit control for the Salt Lake & Ogden; one 15,000-k. w., Curtis turbo-alternator for the Rhode Island Company; sub-station equipment consisting of two 300-k. w., 600-v. rotary converters, six 100-k. w., 2300-370 v., transformers and switchboard apparatus, also 11 55-h. p. four-motor car equipments for the Toledo & Chicago Interurban.

The annual report of the Chicago Pneumatic Tool Company for the year ending December 31, 1912, shows profits of $1,002,260. After deductions for depreciation, improvements, interest and sinking fund payments, the amount available for dividends was $601,195.60. Four per cent. dividends amounting to $257,951.32 were paid, leaving a balance of $343,244.28 carried to surplus. The total surplus account carried forward at the close of the year was $2,007,181. President W. O. Duntley, in his report, states that the substantial increase in net earnings for the year 1912, compared with the year 1911, is due to the favorable development of business generally during the last nine months. The plants are being operated to their capacity, necessary improvements have been effected at all the plants, and they have been maintained in the usual first-class condition.

The twentieth annual dinner of the Chicago Railway Equipment Company was held at the Union League Club in Chicago, on the evening of February 4. This being the "China" anniversary of the organization of the company, all of the decorations were of a Chinese character. The dinner was attended by officers, directors and stockholders of the company and some outside guests. President E. B. Leigh and other officers of the company read papers reviewing its history, and showing how its present prosperity has been attained. Secretary-Treasurer Walker and General Superintendent Harrison having been with the company ever since its organization, were presented with gold watches by President Leigh on behalf of the company. Mr. Leigh himself was then the recipient of a silver loving cup presented by the stockholders. H. S. Burkhardt, formerly president of the company, acted as toastmaster, and short talks were made by several persons.

Another important addition has been made to the Westinghouse family of associated companies by the incorporation of the Locomotive Stoker Company, which corporation will take over the patents, goodwill and all other rights and interests, pertaining to mechanical stokers for locomotives, heretofore owned by the Westinghouse Air Brake Company. This includes the Street locomotive stoker, which has been so successfully developed under the auspices of the Westinghouse Air Brake Company, by Clement F. Street, who now becomes vice-president and one of the directors of the Locomotive Stoker Company. The directors of the company are: H. H. Westinghouse, John F. Miller, A. L. Humphrey, W. S. Bartholomew and Clement F. Street. The officers of the company are as follows: W. S. Bartholomew, president; A. L. Humphrey, vice-president; Clement F. Street, vice-president; F. L. Wassell, secretary; P. W. Lauder, treasurer, and J. H. Eichel, auditor. The headquarters of the company will be at Schenectady, N. Y., where the Street stokers will be manufactured as heretofore. Additional manufacturing facilities have been provided to care for the rapidly increasing demand. The New York office of the company is at 30 Church street, and the Chicago office, 827 Railway Exchange building. W. S. Bartholomew, recently elected president of the Locomotive Stoker Company, has been in the railway supply business for over twenty-five years, having been for many years western representative of the Adams & Westlake Company, and later eastern manager of that company, with headquarters at Philadelphia. He went with the Westinghouse Air Brake Company, as New England manager, in 1903, and became western manager in 1905, which position he has held to date. He is succeeded as western manager by C. J. Olmstead, who has up to this time been assistant western manager, as mentioned elsewhere in these columns. A. L. Humphrey, who, in

W. S. Bartholomew.



A. L. Humphrey.

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addition to his many other duties, becomes one of the vice-presidents of the Locomotive Stoker Company, is well known in railway and railway supply circles, having for ten years prior to 1888 been apprentice, foreman and master mechanic on the Chicago, Burlington & Quincy, Union Pacific, Southern Pacific and Atchison, Topeka & Santa Fe railways. From 1888 to 1903 he was superintendent of motive power of the Colorado Midland, Colorado Southern and Chicago & Alton railroads; 1903 to 1905, western manager of the Westinghouse Air Brake Company, Chicago; 1905 to 1909, general manager of the Westinghouse Air Brake Company, Pittsburgh, and from 1909 to date vice-president and general manager of the Westinghouse Air Brake Company, which position he still holds.

Clement F. Street.

Clement F. Street, vice-president of the Locomotive Stoker Company was born near Salem, Ohio, and at the age of 18, after attending college for one year, entered the works of the Buckeye Engine Company as a machinist's apprentice. After three years he entered the drawing room of the same company. The next two years were spent in drawing and erecting steam engines and boilers on the road. For two years after this he was chief draftsman for the Johnstown Company, Johnstown, Pa., and for the following four years, chief draftsman in the motive power department of the Chicago & St. Paul Railway with office at Milwaukee, Wis. In 1892 he resigned this position to go to the *Railway and Engineering Review*, Chicago, as mechanical editor with which publication he remained for seven years, both as mechanical editor and manager. One year of this time, however, was spent in a trip around the world in the interest of the Field Columbia Museum. He left the *Railway and Engineering Review* to go to the Dayton Malleable Iron Company and spent nine years in designing and selling railway supplies for this company, for the Wellman, Seaver, Morgan Company, Cleveland, Ohio, and for the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. In 1907 he conceived his general idea of the locomotive stoker and arranged with the Westinghouse Air Brake Company to supply the necessary funds for developing it. Since that time he has devoted his entire time and energy to the perfection of the device, and during the past year has conducted a regular business of making and selling these stokers under the firm name of Clement F. Street, Inc., Schenectady, N. Y.

The McKeen Motor Car Company, Omaha, Neb., has received orders as follows: Two 55-ft. motor cars and one 200-h. p. switching locomotive for the Minneapolis & Northern; one 70-ft. 200-h. p. motor car and one 200-h. p. switching locomotive for the Lake Erie & Youngstown; five 70-ft. motor cars for the Sunset-Central lines, for use on the Morgan's Louisiana & Texas Railroad & Steamship Company, the Galveston, Harrisburg & San Antonio, and the Houston & Texas Central.

H. M. Perry has accepted a position with Edwin S. Woods & Co., Chicago, manufacturers of "anti-friction" side and center bearings and will devote his energies to both the mechanical and sales departments. Mr. Perry has had a wide experience in car building, having been connected with the Flint & Pere Marquette, the Atchison, Topeka & Santa Fe and the Algoma Central & Hudson Bay in the capacity of master car builder. Mr. Perry was connected with the Pullman Company about 1885 as general superintendent, and shortly thereafter with the United States Rolling Stock Company in the same capacity; and at a later date with the Madison Car Company as manager. Later he devoted about three years to expert investigation on brake beams in service.

Railway Construction.

ABERDEEN & ROCK FISH.—An extension has been opened for business from Oak Mills Junction, N. C., east via Skibo to Fayetteville, 13 miles.

ALTOONA NORTHERN (Electric).—An officer writes that the company will build the line from Altoona, Pa., to Patton, 20 miles. S. Morris, Altoona, may be addressed. (January 31, p. 230.)

ATCHISON, TOPEKA & SANTA FE.—See San Pedro, Los Angeles & Salt Lake.

CENTRAL IDAHO RAILROAD.—See Oregon Short Line.

CHARLESTON INTERURBAN.—This company will build an extension, it is said, east to Montgomery, W. Va., about 25 miles. The route is via Dana, Malden, Dickson and Cedargrove. W. E. Chilton, Charleston, W. Va., is president.

GULF, TEXAS & WESTERN.—According to press reports this company has amended its charter to build an extension of the line under construction from Jacksboro southeast to Salesville, 23 miles, from the latter place south to Mineral Wells, an additional 8 miles. Surveys for this extension were started some time ago. (September 20, p. 559.)

IDAHO NORTHERN RAILWAY.—See Oregon Short Line.

KENTUCKY, TENNESSEE & ALABAMA.—This company is to be organized at Chattanooga, Tenn., it is said, to build from Williamsburg, Ky., southwest to Chattanooga, Tenn., about 150 miles, with branch lines to Harriman and to Wartburg.

MOBILE & OHIO.—A new branch called the Dawes branch has been opened for business from Mann, Ala., to Dawes, 8 miles.

MORGANTOWN & DUNKIRK VALLEY (Electric).—See Morgantown & Wheeling.

MORGANTOWN & WHEELING (Electric).—An officer is quoted as saying that this company proposes to build about 65 miles from Cassville, W. Va., northwest via Brave, Pa., to Wheeling, W. Va. The Morgantown & Dunkirk Valley, which is building from Morgantown, W. Va., northwest via Randall, Cassville and Pentress to Blacksville, 22½ miles, is to form part of the line. L. S. Brock, president, and Hennon & Hartley, chief engineers.

NATIONAL RAILWAYS OF MEXICO.—A new line on the Guadalajara division has been opened for business from Penjamo, Mex., south to Jauja and Zacapu, 48 miles, with a spur from Jauja to Cantabria, 3 miles.

NEW YORK ROADS.—The New York Public Service Commission, First district, has awarded contracts for the construction of the Astoria branch to Cooper & Evans at $860,744, and for the Corona branch to the E. E. Smith Contracting Company at $2,063,588, of the proposed rapid transit system in Queens borough. These branches are to run from the Queens end of the Queensboro bridge, one north to Astoria and the other eastwardly to Corona and Flushing. The contracts awarded cover the greater part of these two routes. Bids for the section covering the junction and embracing the joint station near the Queens end of the Queensboro bridge have not yet been asked for. Both lines will be elevated railroads, and under the proposed dual system are to be operated jointly by the Interborough Rapid Transit Company and the New York Municipal Railway Corporation (Brooklyn Rapid Transit). (January 31, p. 231.)

NORTHERN PACIFIC.—According to press reports bids are being asked for grading a 12-mile extension of the Sunnyside branch from Gibbon, Wash., northwest to Granview.

The Sidney branch of the Yellowstone division has been opened for business from Glendive, Mont., north to Sidney, 55.2 miles.

OIL BELT (Electric).—An officer writes that the plans call for a line from Charleston, Ill., south via Casey, Bellair, Oblong, Hardinville, Bridgeport, Linn and Patton to Mt. Carmel, about 100 miles. Contracts have been let to the Lamar Construction Company. Track has been laid on 14 miles and this section is now in operation. There will be two steel bridges on the first section between Oblong and Bridgeport, including one 80-ft. span,

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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L. B. SHERMAN, *Vice-President.* HENRY LEE, *Sec'y & Treas.*
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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 10,600 copies were printed; that of these 10,600 copies, 8,946 were mailed to regular paid subscribers and 346 were provided for counter and news companies' sales; that the total copies printed this year to date were 69,750 copies—an average of 8,720 copies a week.

VOLUME 54. FEBRUARY 21, 1913. NUMBER 8.

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*Illustrated.

THE necessity for giving more attention to the sanitary condition of railway coaches is forcibly presented in an article by J. T. Ainslie Walker on another page. If the medical authorities can agree on a suitable preparation, which it is practicable to apply for disinfecting the cars, the railways will undoubtedly be more than willing to make efficient use of it. Three roads have recently made provision for more aggressive measures along sanitary lines by the appointment of medical officers to take charge of such work. The next logical step, after the passenger car situation has been attended to, will be a consideration of box and refrigerator cars which are used for the transportation of food products. Such cars, which are not sealed when empty, are often entered by trespassers whose condition is anything but sanitary, and frequently are misused by the more ignorant classes of employees. They are also sometimes contaminated by perishable goods in an advanced state of decay. No provision is made for guarding against infection from these causes, or for properly cleansing the cars before they are again loaded with foodstuffs. How this may be accomplished effectively will be an important problem for the new school of medical or sanitary officers to solve in a practical manner.

MANY railroad officers who have risen to the position of superintendent or higher have stowed away a collection of worthless stock certificates. This collection represents "investment" in wild-cat schemes of one kind or another. The same thing is true of thousands of Americans who have worked their way up to business positions corresponding in salary with that of superintendent on a railroad. But this loss of savings seems especially unnecessary in the case of railroad men. A banker advising a client about investments will make a sharp distinction between investments that are proper for a business man and that are proper for a widow or other person entirely dependent on income from investments. Investments for the latter will yield not much over 4½ per cent.; for the former 5½ to 7 per cent. Most railroad men are business men in the sense that they are not dependent on their income from investments. If a railroad man invests in securities of a semi-speculative character of his own company or of a competitor, he is in a far better position to watch his investment closely than is the ordinary non-railroad man who is working for a salary, and who invests in railroad securities. The advantages of having railroad officers invest in railroad securities is utterly apparent. But how many superintendents have gone or written to the financial vice-president of their company and asked for advice as to investments? The mere thought seems radical and against accepted practice. Yet the treasurer or financial vice-president of a large road is in an exceptionally good position to recommend investments. Of course all sorts of objections at once present themselves, the most obvious being that if the investment turns out badly the investor will be inclined to hold his adviser responsible. But many of the same difficulties suggest themselves in the management of a pension fund, and in practice they do not prove to be formidable. The treasurer of one of the largest railroad companies in the country makes investments for the pension fund of his company every few months, and while, of course, he cannot make what would be called a business man's investments, he can and does use his position and knowledge to make the most profitable investments possible. Would it not be feasible to let it be known among officers of the rank of superintendent or above that if they cared to write to the treasurer or to the financial vice-president and ask definite questions in regard to an investment in any of the securities of their company they will receive an answer telling them what are the advantages and disadvantages of the particular investment?

COMPARISONS of statistics regarding accidents occurring under widely differing conditions may not be highly instructive, but they may not be without significance. Accidents on railways, excepting those to trespassers, are largely due to shortcom-

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tickets at theater box offices easily rank first. The patron who is charged $2 for seeing the kind of shows given at most "first class" play houses is entitled to courteous treatment. If he should get that, it would, in many cases, be all he got for his money. But he seldom receives the courteous treatment, and he often has to go out and buy tickets from a scalper at a large advance in price. It is easy to imagine what the public would say and do if the employees of railways treated their patrons as the employees of theaters treat theirs, and, if, in addition, the railways let a large share of their transportation and sleeping car tickets fall into the hands of scalpers who made the public pay extra for them.

As to the service given to the public by employees of national, state and municipal governments, to which our correspondent alludes, it is probably the worst of all. The mail carrier on your route is usually very obliging and civil. He is a cheering and outstanding exception to the rule; and even mail carriers are not always polite. As to the general run of government employees, if the citizen desires to know how obliging and courteous they are, let him go to the city hall to pay his taxes, or to the federal building to get information. He will soon learn that government exists, not as the great Declaration says, for the benefit of the governed, but for the benefit of their employees. Some people think railway service in this country would be improved under government ownership. After thirty years of public operation of the old State railway system in France and four years of public operation of the Western Railway in that country, M. Guyot, formerly Minister of Public Works of France, writes: "It has set up a class of workmen and employees who consider that the line is run for their benefit and not for the convenience of shippers or travelers."

But—the *Railway Age Gazette* is a publication devoted to railway transportation. It considers it to be its function to do what little it can in a modest way to improve railway service. Suppose railway transportation is 75 per cent., or 80 per cent., or 90 per cent. efficient. We deem it our function to comment on the 10 or 15 or 25 per cent. of inefficiency as well as on the 75 or 80 or 90 per cent. of efficiency; and such comment does not imply that the efficiency of railway service is less than that of other forms of service rendered to the public. It is unfortunate that when a journal or a man devoted to the interests of a particular line of business tries to tell 100 per cent. of the truth about it, those whose attitude toward that business is critical or unfriendly are more likely to believe the comments made which harmonize with their own views than those which run counter to them. Fortunately, on the other hand, most people are disposed to be fair, and 100 per cent. candor inspires confidence and belief in fair people. Therefore, it is to the selfish interest of railways that all those who wish them well shall try to tell, not merely the facts, but all of the facts about them. Furthermore, that is the only-square thing to do.

Recognizing and conceding our great limitations, both in point of ability and virtue, we venture to set down that this is the policy that this paper is trying to follow. God forbid that we should offer up the prayer of the Pharisee; but we can't help adding that while we are trying to tell what is bad as well as what is good in the railway business, there are many other publications that would show more consistency, if not more of a still greater virtue, if they would try to tell what is good as well as what is bad in the railway business.

NEW BOOKS.

Diary of a Roundhouse Foreman. By T. S. Reilly. Bound in cloth. 158 pages. 5 in. x 7 in. Published by the Norman W. Henley Company, 132 Nassau street, New York. Price, $1.00.

The book is published in the form of a diary and gives in colloquial form the experiences and trials of the engine house foreman. The hero of the story is a young college graduate who is serving his apprenticeship and has endeavored to push his way to the top. Many suggestions are given for the diplomatic handling of men.

Letters to the Editor.

TRAIN-ORDER SIGNALS NORMALLY AT STOP.

New Orleans, La., January 28, 1913.

To the Editor of the Railway Age Gazette:

The "slogan" of today in railroad circles is "Safety First"; and in some states, this one for example, the railroad commission is demanding that roads not equipped with block signals shall increase the number of telegraph offices, especially night offices, in order that trains may be better spaced. Whether this is or is not done, there is one thing that should be done at once; keep the signals normally at stop. To keep them at "proceed," as is done at present invites disaster. I can recall a number of serious collisions that would have been prevented had the semaphores displayed stop instead of proceed, caused by operators taking train orders for trains which had passed their station. It is the rule that despatchers shall not place a restricting order at a station for a train where there is any doubt as to the train having passed, or by the average running time could have passed the station; but the rule is often ignored. The normal position of the semaphore was changed from stop to proceed, not with the view of increasing the safety of trains; but with the idea of eliminating the stops caused by operators when there were no orders for trains and no reason for spacing; or to allow agents more time to attend to station work outside of the office. On the road with which I serve, on one district alone, within the past month, four trains have passed stations without the knowledge of the operators, the operators reporting the trains as "not yet by." Subscriber.

SOME REASONS WHY RAILWAYS DO NOT GIVE 100 PER CENT. SERVICE.

——, February 10, 1913.

To the Editor of the Railway Age Gazette:

Referring to the editorial in your issue of January 31, entitled "Some More Reasons Why Railways Are Unpopular," I am not an apologist for incivility or inefficiency; the facts are indisputable. It is not practicable anywhere in life to receive 100 per cent. of the time 100 per cent. of efficiency from 100 per cent of employees, nor can you get the maximum efficiency 100 per cent. of the time even from the 100 per cent. man, and in whatever degree the capacity of the human machine falls below the 100 per cent. maximum standard, he gives less than 100 per cent. of efficiency some or all the time.

Let me illustrate by concrete examples I can vouch for personally, and a large portion prove by a witness:

Thursday, January 30, 1913. United States city of 425,000. Breakfast at one of the three best hotels: waiter service attention inferior; coffee inferior; food and cooking good. Lunch at same hotel: waiter service attention very inferior; food and cooking good; coffee inferior. Dinner at another of the three hotels: waiter A1; food and cooking excellent; coffee a grade above lunch and breakfast.

November 13, 1912.—United States city of 2,500,000. At a high class hotel that really tries to give excellent service. Breakfast, all good except leathery toast served, although prior instructions to waiter specified precise wishes, i. e., that toast be freshly made and hot. Bath tub plug unserviceable; could not retain water in tub.

November 14, 1912.—Same hotel. Hat girl gossiping with captain at dining room door; paid no attention whatever until called. Breakfast, all good except toast, which was the other extreme—hard as a board, could not be eaten readily.

Now, Mr. Editor, while the foregoing items are not too serious to me, I have heard a railway meal service damned altogether for less. I am not necessarily a crank; but I am cranky enough to be able to observe inefficiency wherever it comes within my observation. In the course of nearly forty years' railway service,

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and, I believe, considerably more than one million miles traveling—at least ten of those years living all the time in hotels, sleeping and dining cars—I feel fairly qualified to give the opinion that man for man and place for place the railway and its employees compare favorably with the average commercial house and its employees, and excellently well with governmental service and employees, federal, state or municipal.

It matters much how the railway employee is addressed and what is the physical and mental condition of the inquirer. Not every man is gifted with inexhaustible patience to answer with unruffled serenity *all* the questions asked; and the way some are put, the hectoring bully, the nervous woman, the utterly inane, almost insane, slush that is dignified by being called "a question" or "an inquiry!" I was through the mill as a ticket clerk, and writhed and suffered and still kept civil, and today careful inquiry shows that after four decades the same exacting public exacts still more than when I was a lad, and our boys have just the same kind of heterogeneous collection to deal with.

Pardon me for taking so much space, but there are two sides to every phase of these matters, and there is as much fault on the part of the public as of the railways. NEW YORK.

THE LESSON OF IRVINGTON.

CHICAGO, January 29, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have been reading your editorial of last week, page 133, telling, under 18 heads, the causes of the collision on the Cincinnati, Hamilton & Dayton. You say that railroad officers will need no assistance in making use of this lesson; but it seems to me that it is somewhat of a mixed problem, or at least that there is room for quite a lot of discussion as to what action should be taken on some of the points in your list. Looking at one's own road and the conditions actually on hand to be dealt with, the question whether a certain duty is up to the employee, or to the supervising officer, or to the directors of the company, sometimes admits of more than one answer.

The causes of this collision, as outlined by you, are: (1) The block system was not arranged to protect against opposing movements; (2) because of bad judgment or overloaded trains, engines became stalled on hills; (3) the engineman covered the headlight prematurely; (4) the engineman started to close the switch, but did not carry out his purpose; (5) the switch was not lighted; (6) Gross made a positive statement when he had as a basis only a supposition; (7) the passenger engineman did not slacken speed; he should have done so because of the absence of the light; (8) the lamp had failed; (9) the engineman was specifically responsible, according to rule 104 A; (10) the conductor and each of two brakemen attended the switch at different times, but no one of the three cared enough about the light to relight the lamp; (11) the company allows disregard of the rule prescribed to insure the safety of trains when lights do not burn; (12) the failure of lights is frequent; (13) trains have to double hills frequently; (14) the engineman was not sufficiently experienced; (15) the brakeman was not sufficiently experienced; (16) the fireman was not sufficiently experienced; (17) the speed as limited by a city ordinance was exceeded by the passenger train; (18) the electric headlight of the passenger engine was out of order and a poorer light or no light had been put in its place.

Where lies the responsibility? Item 17 surely should be referred to the president of the road. Where a city imposes a speed limit of 30 miles an hour three or four miles out in the country, the absurdity of the situation ought to be apparent, even to an alderman; and it is the duty of a railroad company to do everything practicable to get such an ordinance changed. If a change cannot be had, the road must obey the rule; or, if it deliberately decides to defy the law, it is due the trainmen to explain to them the company's attitude. Breaking a law habitually, the officers set a very bad example, particularly if the reasons for their decision are obscure or are kept secret.

The 18th item is troublesome, also. The slowness of shop foremen (often due in large measure to difficulties with help for which the foreman is not responsible) and an unwise policy as to carrying a sufficient supply of repair parts, in many cases seem to combine to neutralize the value of the large sums of money that have been spent for high-power headlights. If legislatures with their crude measures are going to prescribe headlights, there would seem to be necessary still another law to provide for state inspection or periodical inquiry to see that the lights actually are used with regularity and effectiveness.

Item 8, keeping switch lights burning, is another difficult point. The percentage of switch lights failing is exceedingly small, and yet the few failures that do occur make much trouble. Perhaps, if the Indiana rule requiring trains to stop and revive dead lights could be generally enforced the imperfect lights would make still more trouble, and then somebody would be disturbed sufficiently to produce an actual reform. Keeping lamps cleaned, filled and provided with good wicks, properly adjusted, is not a difficult task; but it is a difficult task to get trackmen who will be 100 per cent. efficient in this work. The proper remedy, it seems to me, is not to make trains stop for dead lights, but to have all switches protected by distant signals, so that safety will be insured simply by reducing speed. Reducing speed would not impose very serious delay, while yet the inconvenience would be sufficient, if all cases were promptly reported, to force somebody to take action.

Items 3 and 9 are plainly up to the engineman. Items 5 and 6 are equally clear; there is no excuse for this plain shiftlessness. Item 10 is equally conclusive against the conductor and the two brakemen, both of whom, I understand, had had occasion to turn the switch; but consideration of the cases of these three men only brings out in strong light the need of much more detailed, minute and rigid supervision of all of the work of men who, like these, are out of sight of their boss all the time. In the case of men—quite as intelligent as freight conductors—in offices and shops the need of admonition, instruction, reproof or exhortation is evident every day; and yet we go on blindly trusting freight train men to do their work entirely in accordance with their own individual judgment. That they will do many things wrong is a foregone conclusion.

In all the other items of this indictment it is the officers, not the employees, who have got to do the house cleaning. Indeed, every ambitious superintendent or trainmaster will feel a personal relation to every item of the whole 18; for, whatever the shortcomings of his men, he means to cure all shortcomings if he can discover how to do it. But as to items 1, 2, 7, 11, 12, 13, 14, 15 and 16, who will raise any question? Every now and then some accident shows a general laxity throughout the service. This seems to be one of that kind. Our problem is not an "accident problem"; that is a misleading term. It is the problem of good management, and mainly one of good management of men. Is it not time that we got away from this attitude of the governmental authorities, always looking at symptoms, and turn our attention to more constructive ideas? Good management is always a duty, even if no accident ever happened, and if good management be constantly striven for the accident record, after a time, will be reduced, so that no official will need to lie awake nights worrying about his responsibility for it.

It seems to me that the most significant items in this list are the last three—14, 15, 16; three inexperienced men. Would not the correction of these features surely have prevented the accident? Without doubt. Who will boldly adopt a rule that *no train of any class*, no light engine even, shall ever be run over the road except with thoroughly tried men in charge? Thorough trying out will involve much apprenticeship and a decided increase in expenses; but shall we ever secure safety without adequate attention to this feature? Why should not every division superintendent at once present to his general manager an estimate of the cost of so enlarging his working force of enginemen, firemen and conductors as to provide for all emergencies. AN ASSISTANT TO.

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A CRITICISM OF JAMES J. HILL'S STATISTICS.

CAMBRIDGE, MASS., January 15, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In his remarkable address before the Railway Business Association recently (*Railway Age Gazette*, December 20, 1912), James J. Hill has made a masterly presentation of the railway situation, and has set forth strong and convincing arguments to show that the one paramount need of the railways is greater terminal facilities. Mr. Hill's opinions are held in highest regard both in and out of railway circles and his statements command the greatest respect, since hardly anyone is better acquainted than he with the details of operation and the large matters of administrative policy of American railways. It is, therefore, with some hesitation that the writer ventures to call attention to the doubtful use which Mr. Hill has made of statistics of foreign railways to illustrate his address, particularly those applying to Germany. Similar mistakes and omissions are occasionally noted in the statements of other railway officials of high standing, and it may be of interest to call attention to some features which deserve attention in the interpretation of statistics of European roads.

The figure most commonly misinterpreted or misapplied is that giving the average revenue per ton mile. This unit for the United States in 1910 was 0.753 cents; in Prussia-Hesse in the same year it was 1.37 cents; and on the North Eastern Railway of England, the only line in England computing ton-mile statistics, it was 2.30 cents in 1909. It is frequently concluded that the British shipper pays freight rates which are 206 per cent. higher than the rates in this country; and the shipper in Prussia is charged 82 per cent. more. Such a conclusion, however, is faulty. In the first place, neither England nor Prussia have express companies. Their freight traffic includes the smaller packages which in this country go by express, and in England, particularly, the freight service between all important points moves with a speed and regularity that resembles passenger service. To make a fair comparison between the ton-mile rates of the United States and these foreign countries it is necessary to add to our ton mileage and revenue the tonnage moved by the express companies and the revenue therefrom. Ton-mile statistics are not computed by the express companies, but a recent study made by the Interstate Commerce Commission established the fact that for three selected months the average revenue *per ton* was $30.80, the average distance carried not being given. But whatever may be the express ton-mile rate, it would undoubtedly tend to increase the average freight ton-mile rate considerably.

In the second place, the English freight rates (on which the North Eastern ton-mile revenue is based) include a charge for the collection and delivery of freight at originating point and at destination. In this country the railways do not collect and deliver like the express companies, and if this expense were added to our average ton-mile rate the effect would be startling. Every condition favors the United States in the usual basis of comparison, since we have a higher percentage of low grade freight taking low commodity rates (much of which moves by water in Europe) and our haul is five times as long as on the North Eastern of England, and twice as long as in Prussia. Consequently, our terminal charges per ton-mile are less.

A comparison between countries on a passenger-mile revenue basis is fairer than the ton-mile unit, but even in this case one fact is often overlooked. In this country a generous proportion of our travelers ride in parlor cars. The extra charge for this privilege goes to the Pullman company and is not included in the passenger-mile rate. In England and Germany the first-class carriages are equivalent to our parlor cars and their passenger revenue units include the excess charges to travelers who use the first-class cars. A very few parlor cars are now being introduced in England, but they are unknown in Germany. To make a proper comparison of the passenger-mile revenue in the three countries it would be necessary to make some allowance for the 0.5 cent per mile additional paid in the United States by passengers who use parlor cars. The average revenue per passenger mile in 1910 was 1.938 cents in the United States and 0.89 cents in Prussia-Hesse. The figure for Great Britain is not available. It is evident from the very low passenger rates in Prussia that the passenger traffic is carried at or below cost, and the administration necessarily must recoup itself from the freight service, in which the rates are relatively higher. The tabulation which follows shows the normal rates and the division of the passenger traffic in Prussia-Hesse in 1910:

Class.	Normal Rates per Passenger Mile. Slow Trains.	Fast Trains.	Per Cent. passenger miles in each class.
First class	2.68c.	2.79c.	0.89
Second class	1.72	1.84	11.00
Third class	1.15	1.22	39.51
Fourth class	0.766	....	44.59
Military	....	....	4.01

As already stated, the Prussian first class corresponds to our parlor car; their second class is as good or better than our modern coaches; their third class is not quite as comfortable as our very old coaches, and we have nothing that compares with their fourth class, in which the great majority of passengers are obliged to stand. First class compartments are designed to seat four passengers; second class, six passengers, and third class, eight passengers.

The figures which Mr. Hill uses for traffic density do not agree with those of other authorities. His estimate for Great Britain (it must be an estimate since ton mileage is not computed except on the North Eastern) is 529,622 ton miles per mile of line. A recent bulletin of the Bureau of Railway Economics gives the North Eastern density as 814,713. Mr. Hill's figure for Germany is 827,400, but the official statistics of the *Reichs-Eisenbahn-Amt*, 1910, give 933,569 metric tons, which is equivalent to 1,029,000 tons of 2,000 lbs. The latter figure is but slightly less than the ton-mile density of the United States, which in 1910 was 1,071,086.

The density of passenger mileage is of equal interest since it must be taken into account with the freight density and the two balanced if we are to form an intelligent opinion of the relative performance. The following tabulation shows that Prussia exceeds the United States in both freight and passenger density, but if the comparison is narrowed to Group 2 (comprising roughly the States of New York, New Jersey, Pennsylvania and Delaware) a territory more nearly like Prussia, the showing is more favorable to the highly developed Eastern section of this country. In Group 2 the passenger density is less than one-half that of Prussia, but the ton mileage is 143 per cent. greater. The figures are for 1910.

	Ton miles per mile of line.	Passenger miles per mile of line.
United States	1,071,086	138,169
Prussia-Hesse	1,150,490	693,921
Group 2, U. S. A.	2,797,011	314,187

As a proof that the railways of the United States have been capably managed, and their resources and powers used to the highest business advantage, Mr. Hill calls attention to the fact that in the United States we move 272 tons one mile for every dollar of net revenue, while Germany moves only 172, France 88, and Great Britain but 58. This unit of comparison is misleading, since net revenue is made up of receipts from both passenger and freight (transportation, and the ratio of one to the other, and the units of revenue, differ widely in the several countries named. In the United States 23 per cent. of operating revenue comes from passengers; in Prussia-Hesse, 29 per cent.; in France, 33 per cent.; and in Great Britain, 38 per cent. It would be as fair to express the relation between passenger miles and net revenue, and point to the showing as evidence that our resources and powers are *not* used to advantage. In the United States, for each dollar of net revenue a passenger is moved 32 miles; in Germany, the distance is 97 miles, or three times as far. Neither comparison, however, is of any practical value.

WILLIAM J. CUNNINGHAM,
Assistant Professor of Transportation, Harvard University.

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THE NEEDS OF THE RAILWAYS.*

What Can and What Cannot Be Done by the Railways Themselves to Offset the Increasing Expenses of Operation.

By Samuel O. Dunn,
Editor of the *Railway Age Gazette*.

When I speak of the needs of the railways I do not mean what they need to serve themselves. I do not even mean what they need merely for their own profit, the good of their employees and the benefit of those who travel and ship. I mean what they need to promote the interests, not only of those having investments in railways, but also of the much larger number having investments in other enterprises; not only what they need for the good of those who work for them, but also what they need for the good of all who work at all; not only what they need for the benefit of the relatively few who travel much, but also what they need for the benefit of the many who travel little or none; not only what they need for the benefit of the relatively few who ship, but also what they need for the benefit of the many who produce and consume what is shipped.

The prime requisite of good transportation is safety. Our railways are less safe than they ought to be. Their accident record is often exaggerated and misrepresented. But without exaggeration or misrepresentation it is bad enough.

The accidents on American railways are usually discussed as if they were a distinct disease. They are less a disease, perhaps, than a symptom. We are rather notorious for accidents in all our industrial pursuits. We have a bad name for automobile and other casualties in our city streets. We have more homicides and fewer punishments for them than other leading nations. The diagnosis all these symptoms suggest is that, for temperamental or other reasons, we as a people tend to act in disregard of our own safety and the rights and safety of others. They suggest that we have not been apt, either in our industrial organizations or our governments, in devising means for controlling those of a reckless and unruly spirit.

The problem of dealing with trespassing is the problem of dealing with more than half of all the fatalities on our railways; and as long as it is handled as it is now by the governments there will be no reduction in the deaths of trespassers, which now number over 5,000 a year.

Probably three-fourths of all accidents, except those to trespassers, are due to railway employees incurring risks in ignorant or intentional disregard of the operating rules, and to the failure of the managements to give the instruction and training and administer the discipline necessary to stop these things. It seems possible, however, that some form of government regulation may required to reduce these man-failure accidents. In England way operating rules when filed with and approved by the ..rd of Trade acquire the force of law. The same thing is ..rue in our own state of Indiana as to rules filed with the state railroad commission.

The classes of accidents already referred to, constituting together a very large majority, are not remediable by physical improvements in the railways, but only better laws, better railway rules and better enforcement of and obedience to them. There are, however, many accidents that can be reduced only by physical improvements which will cost very large amounts.

ARE FACILITIES INADEQUATE?

Next to safety the most important requisite of good transportation is adequacy. There is much complaint that at certain times the freight service of our railways is inadequate. In 1906, 1907, and again in 1912 we have been seriously troubled with what are called "car shortages." The situation last fall was not as bad as it was in the years 1906 and 1907, but it would have been worse if the fall and winter had not been remarkably mild.

The statistics show that these so-called car shortages are usually comparatively brief. They commonly begin around October 1, reach their maximum late in that month or early in November, and disappear before January. The largest net shortage was in February, 1907, and amounted to 137,847 cars. The next largest was that of October, 1907, reaching 82,811 cars; and the third largest that of November, 1912, amounting to 51,259 cars. On the other hand, the net surpluses since 1907 have usually exceeded 100,000 cars, have often exceeded 300,000, and have been as much as 400,000. Furthermore, the shortages are not of annual occurrence, while large surpluses are.

These figures show that the trouble has been merely that our railway facilities have been unable to carry the peak of the load. Now, which involves the greater economic loss to the country—to have transportation facilities that are inadequate to handle the maximum traffic, or to have facilities which are in excess of the requirements most of the time? It is generally accepted in business that it is best to have your plant large enough to handle the regular maximum business satisfactorily. Doubtless, the same principle applies here.

The congestion of traffic in 1906 and 1907 came at the end and climax of a period of industrial and commercial expansion, during which traffic had increased greatly and railway construction and the purchase of equipment went forward rapidly. The congestion of traffic last fall came at the end of a period of comparative business depression, during which there was relatively little construction of new lines and purchasing of new equipment, and at the beginning of what promises to be another period of great industrial and commercial development. Much of the equipment is now in a condition of relative depreciation which will make it necessary soon to replace it. This combination of conditions suggests that unless rapid increases in the facilities of the railways are made we may in a very few years be confronted with a congestion of traffic even worse than that which lasted from the fall of 1906 until June, 1907.

MOST ECONOMICAL MEANS OF INCREASING CAPACITY.

The most economical way to increase the capacity of a railway is, when practicable, to increase the capacity of its cars and the power of its engines. Cars of large capacity and engines of great power together make it possible to handle a given traffic with a minimum of trains; and the fewer trains you run the more traffic you can handle with a given mileage of main tracks.

American railways have acted on these principles more effectively in the handling of freight than any others. They increased the average capacity of freight cars from 28 tons in 1902, to 36 tons in 1910, or 21.4 per cent. in eight years. The Prussian-Hessian state system, which is the leader of Europe in economy of operation, increased the capacity of its cars from 14.1 tons in 1900 to 15.5 in 1909, or less than 10 per cent. The average capacity of its cars is less than one-half as much as ours, and it increased in nine years less than one-half as much in proportion as did ours in eight years. We have no figures regarding the average seating capacity of passenger cars in this country. On the Pennsylvania Railroad it increased from 57 in 1900 to 63 in 1909, or 10.5 per cent. The increase in the same years on the Prussian-Hessian Railways was from 46 to 49, or 6.5 per cent. The average tractive power of the locomotives on the railways of the United States increased from 20,485 pounds in 1902 to 27,282 in 1910, or 33 per cent., and far exceeds the power of the locomotives of any other railways.

The result of this combination of increases in car capacity and

*From an address delivered before the Graduate School of Business Administration of Harvard University, Cambridge, Mass., December 4, 1912.

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locomotive power in the United States was large increases in the tonnage and the passengers hauled per train. The average number of tons per train in 1900 was 271, and in 1910, 380, an increase of 40 per cent.; and the increase in passengers per train was from 41 to 56, or 36 per cent. The Prussian-Hessian railways increased their train load from 163 tons in 1900 to 233 tons in 1909, or almost 40 per cent. The percentage of increase in their train load in nine years was as great as that in ours in ten; but our train load was substantially larger at the beginning of the period than theirs was at the end, and was 63 per cent. greater in 1910 than theirs was in 1909. They increased their number of passengers per train from 80 in 1900 to 84 in 1909, or 6.3 per cent.

The additions to the average train load have been made possible, of course, not merely by the increases in the capacity of cars and the tractive power of engines, but also by many reductions in grade and curvature, and much strengthening of track.

The operating and financial results gained by the means outlined have been notable. The mile of line is the unit of railway operation. The number of tons of freight hauled one mile per mile of road grew 45.3 per cent. between 1900 and 1910. This more dense freight traffic was handled with an increase in the number of freight cars per mile of road of 25 per cent., and an increase in freight train mileage per mile from 2,557 to 2,683, or but 3 per cent. Between 1900 and 1910 the increase in the density of passenger traffic was 60.5 per cent. This largely increased traffic was handled with an increase in the number of passenger cars per 100 miles of road of but 8.3 per cent., and an increase in the number of passenger trains run one mile per mile of line of from 1,887 to 2,279, or 21.7 per cent. It was possible, owing to the increases in train loads, to handle the large increases in freight and passenger traffic with an addition of but 2.9 per cent. to main tracks per mile of road, and an addition of only 8.7 per cent. to the mileage of all tracks per mile of road. There were large increases in the prices of materials and the wages of labor, and these tended to increase operating expenses. The increase in operating expenses per mile was from $4,933 in 1900 to $7,658 in 1910, or 55 per cent. The increase in the cost of road and equipment per mile was from $56,567 to $63,631, or 12.4 per cent. In other words, on each mile of road there was handled an increase of 45.3 per cent. in freight traffic, and of 60.5 per cent. in passenger traffic, with an increase in expenses per mile of 55 per cent., and an increase in investment per mile of 12.4 per cent. The increase in the freight density of the Prussian-Hessian roads between 1900 and 1909 was from 889,441 ton miles to 1,069,743 ton miles, or 20.3 per cent.; the increase in their operating expenses per mile was from $10,373 to $14,527, or 40 per cent.; and the increase in their cost of construction per mile from $98,050 to $110,727, or 12.9 per cent. On comparing the figures for the nine-year period 1900-1909 in both the United States and Prussia-Hesse, we find that the freight density of our roads increased 29.7 per cent. and that of theirs 20.3 per cent.; that the operating expenses of our roads increased 37.2 per cent. and those of theirs 40 per cent.; and that the cost of road and equipment of our roads per mile increased 9.7 per cent. and that of theirs 12.9. It is probable that meantime the increase in the density of our passenger traffic was about as great in proportion as in theirs, although their passenger density in 1900 is not available.

CAN CAPACITY CONTINUE TO BE SO ECONOMICALLY INCREASED?

What has been said shows the way the capacity of our railways has been intensively increased in the past and the results gained. It also shows that their intensive capacity must be further greatly and rapidly augmented. Can this further increase in capacity be attained by the same methods, and with the same economy as past increases?

It would seem that the extent to which the capacity of some kinds of cars can be increased in future is somewhat limited. Furthermore, commercial conditions prevent increasing the average load per freight car in proportion to the average capacity per car. Attempts to increase minimum carload weights always call forth protests and opposition. How great are the practical obstacles to increasing freight car loading is illustrated by the fact that, while between 1902 and 1910 the average capacity per car increased 21.4 per cent., the average loading increased only from 17 to 19 tons, or less than 12 per cent. There is no question, however, that, without any increase in the present capacity of cars it would be commercially practicable to greatly increase their average loading; and this would be, in effect, to increase the freight carrying capacity of the roads in the most economical way possible.

There are practical limits to the increases that can be made in the capacity of passenger as well as of freight cars, and more especially in their loading. Travelers in this country demand a large amount of car space and usually get it. On one of the large western trunk lines the average number of passengers per car in 1902 was 11, and in 1912 only 13, although meantime the density of its traffic and the size of its cars had largely increased.

There are obstacles to the utilization of the increased capacity of engines as well as cars. The longer freight trains are made the more trouble there is from buckling and draw-bars pulling out. The longer trains require longer passing tracks; and there is greater difficulty in handling them at yards and terminals. Railway train employees are hostile to the handling of extremely long trains with ordinary-sized crews, and in many states are getting legislation passed to increase the size of crews. This, of course, tends to nullify one of the main advantages of running long trains, viz., the saving in labor cost. In Arizona the people by referendum ballot at the last election adopted a law to prohibit the operation of freight trains exceeding 70 cars. There are also commercial difficulties. To secure large average freight train loads it is necessary to have much low grade traffic so situated that it can be conveniently assembled in large quantities at certain points, and then moved slowly in large solid trains for substantial distances; and these conditions do not obtain on all roads.

The practical difficulties to increasing passenger train loads are still greater. The public demands more and more frequent service; it insists on trains being run on fast schedules; and both these things hinder increases in passenger train loads.

The practical obstacles to increasing train loads in proportion to the power of locomotives are illustrated by the fact that while the average tractive power of the locomotives of our railways increased 33 per cent. between 1902 and 1910, the average number of tons per train increased only 28 per cent. and the number of passengers per train only 24 per cent. The difficulty of increasing passenger train loads beyond a certain point is especially great. The railways of Interstate Commerce Commission Group II have a passenger traffic density 129 per cent. greater than the average in the United States, yet they carry only 12.5 per cent. more passengers per train than the average. The railways of Prussia-Hesse in 1909 had a passenger traffic density over 430 per cent. greater than that of our railways, or 675,023 passenger miles per mile as compared with our 127,299; and 60 per cent. of their passengers were third class, while practically all of ours are first class; yet they carried only 85 passengers per train as compared with our 54, or only about 52 per cent. more. Because of the fact that increased passenger traffic cannot be dealt with with anything approaching a proportionately increased train load the economies that can be introduced in handling it are incomparably less than that that can be made in the handling of freight.

The differences between the train loads on different roads are very large, and indicate that many railways, by reducing their grades, strengthening their tracks and buying more powerful locomotives, can materially increase them. All that it is meant to indicate here is that progress in this direction in future may be less rapid in proportion than it has been in the past.

EXTENSIVE ADDITIONS AND IMPROVEMENTS NEEDED.

If my reasoning is correct, it will be necessary in future to make larger proportionate increases in the amount of equipment and the number of trains run to handle the increased freight

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business. Our passenger traffic has in recent years been increasing faster in proportion than our freight traffic. This, doubtless, will continue to be true. The number of passengers carried per car and per train has not been, and, doubtless will not be, susceptible of as great increase in proportion as the tons hauled per car and per train. Therefore, the increase in the amount of passenger equipment that will have to be provided and in the number of passenger trains that will have to be run will be even greater in proportion than the necessary increases in freight equipment and freight trains.

With the amount of equipment now handled and the number of trains now run, tracks and terminals are overtaxed. Therefore, we must have more tracks per mile of line; and if the amount of equipment and the number of trains run must in future increase faster in proportion to the traffic than they have in the past, then it follows that there must in future be larger increases in our miles of track per mile of line in proportion to the increase in traffic than there have been in the past, and that these increases must be made both in main tracks and in yard tracks and sidings.

There is one class of improvements in passenger service which the public especially demands, and which should be mentioned here because of their great cost. These are improvements in passenger stations and terminals. These improvements are made, not only to increase the convenience and comfort of beginning and finishing railway trips, but also to gratify the civic pride and aesthetic tastes of the people of the different communities. Some of my economist friends question whether there is a public demand for such large expenditures as are made on passenger terminals and whether they are economically justifiable. They may not be economically justifiable; but it is certain that there is a public demand for them.

There is needed extensive, as well as intensive, development. There are large parts of our country in which mileage should be increased. During the half-decade ending with June 30, 1906, the total mileage increased 5,300 miles per year, while during the half-decade ending with June 30, 1911, it increased only 4,231 miles per year. While there is this need for new construction in certain sections, the need for intensive development now exceeds that for extensive development.

The provision of the facilities needed will require a very large investment. Various estimates have been made. They range from $1,100,000,000 a year to $1,700,000,000 a year. There may have been larger. The increase in the cost of road and equipment in 1902-1907 was 21 per cent.; and at the end of the period facilities were inadequate. It is probable that in future it will be necessary to buy more equipment and build more tracks and terminals in proportion to provide for any given future increase in business than it has been heretofore. And besides, the demands for unproductive improvements to increase the comfort and the safety of transportation and the expenditures needed to satisfy them are much greater than in the past. Apparently it is conservative to say that the percentage of increase in cost of road and equipment during the next five years should be at least 40 per cent. There are no figures for cost of road and equipment later than 1910. Probably for 1912 it would be about $15,500,000,000. An increase of 40 per cent. in that in five years would be $6,200,000,000. That is a very large sum. But even if no new mileage were built, and there were an increase of 40 per cent. in the probable present cost per mile of road and equipment, it would be raised to only $90,000, or $21,000 less than that of the railways of Prussia-Hesse in 1909, $51,000 less than of the capitalization per mile of the railways of France in 1908, and $184,000 less than the capitalization per mile of the railways of the United Kingdom in 1909.

MAKING UNPRODUCTIVE IMPROVEMENTS FROM EARNING.

Railway officers contend that the unproductive improvements should be largely made from current earnings. This view has the endorsement of high authority. The board of eminent and public spirited citizens that recently arbitrated the wage controversy between the eastern railways and their locomotive enginemen said:

"Some of these expenditures (from earnings) are for the elevation of tracks through cities, the elimination of grade crossings, the introduction of safety appliances, the electrification of roads entering the larger cities, and the construction of elaborate, often monumental, terminals. While the elevation of tracks, the elimination of grade crossings, the introduction of safety devices, etc., do somewhat increase the net earning power of the road, in that traffic is more easily and rapidly handled, it cannot be said that this increase is anything like proportionate to the additional investment; yet the public demands these additions and betterments for their safety, comfort and convenience. The policy of withholding a considerable amount out of the income for additions and betterments is not criticized. Indeed, it is believed to be wise."

The earnings used for these purposes may either be surplus funds left over after substantial dividends have been paid; or they may be funds so used when no dividends, or only small ones, are paid. In the past earnings often have been used for both productive and unproductive permanent improvements; and as the arbitration board said in the report just quoted, "in many cases the 'water' put on the market has been made substance altogether by the above process, by the increasing value of real estate, especially in cities, and other factors; in other cases this has been accomplished in part. In still other cases much of the common stock does not yet represent substance." When stockholders have voluntarily gone without dividends, or accepted small ones, it has been with the expectation of getting a substantial return later from the invested earnings. They would not have released the bird they had in hand if they had not expected to get the two they thought they saw in the bush. The same thing will be true in future. And as the arbitration board said in its discussion of this subject, "If the dividends are decreased below a reasonable amount, for the sake of additions and improvements, the stockholders are justified in regarding the amount put in as their property, and therefore a basis for future dividends." If net earnings are inadequate to yield both interest and reasonable dividends and a surplus from which to make unproductive improvements, and the improvements are made from earnings which might properly be paid out in dividends and are subsequently capitalized, the effect in unduly inflating and loading down the railway's capitalization is just the same as if the unproductive improvements had been made from new capital in the first place. The conclusion is that a railway whose capitalization is reasonable ought, at least under normal conditions of prosperity, to earn and pay interest on its bonds and substantial dividends on its stock, and have besides a sufficient surplus for such improvements as should be made from earnings.

The arbitration board said in its report:

"If, on the other hand, the dividends now paid are reasonable and the additions and betterments are taken out of the income such expenditures should not be the basis upon which new securities are issued."

It certainly does seem, both in view of our past experience and as a matter of principle, that nothing should be capitalized except what represents actual risk taken or actual sacrifice made in establishing and developing the business. There is risk taken when people invest in the stock of a new railway even if they pay only $50, or even $25, a share for it; and there is sacrifice when they refrain from taking any dividends at all on an investment of only $25 or $50 a share, or only 3 or 4 per cent. on an investment of $100 a share; and we must continue to pay people in one way or another to take these risks and make these sacrifices just as long as risk and sacrifice are necessary to the development of industry; and they will be necessary as long as there is any industry left to develop. On the other hand, it is a sound principle that when a railway has paid substantial dividends and invested surplus in the property that surplus should not be capitalized, but left there to benefit the public by enabling the road to give better service and to benefit the security holders by protecting them in

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bad years as well as in good in the enjoyment of their usual interest and dividends.

HOW IS NEW CAPITAL TO BE RAISED?

Practically all of the needed productive improvements and extensions should and must be made from new capital derived from the sale of bonds and stocks. The rate of interest in general has risen in recent years, and the bond market of the railways has been affected by this. Then, our railways have heretofore been financed to so great an extent with the proceeds from the sale of bonds that their funded debts are excessive in proportion to their outstanding stocks. Their net capitalization in 1910, according to the statistics of the Interstate Commerce Commission, was $14,338,575,940, or $62,657 a mile; and of this $8,811,584,162, or $38,505 per mile, or over 60 per cent. was funded debt, and $5,526,991,778, or $24,152 per mile or nearly 40 per cent. was stock. Considering them as a whole their outstanding debt is excessive in proportion to their outstanding stock. What the present stockholders need for their own good and the public's is not more creditors but more partners. For some years to come improvements and extensions ought to be, and in many cases must be, financed chiefly with capital raised by the sale of stock.

If, however, a higher rate of interest must be paid on bonds and a larger proportion of railway financing is to be done in future than heretofore by the sale of stocks it will be necessary for the roads to earn more net in proportion than heretofore to pay a return on the total investment in their properties; for in order to market stock it will be necessary to pay a dividend on it substantially exceeding the rate of interest of bonds, the reason being, of course, the larger risk involved in investment in stock.

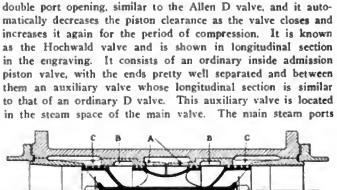
Now, are the net earnings of the railways large enough, or are they likely to become large enough, to make the improvements that should be made from earnings, and to pay a proper return on the present capital and the needed additional investment of capital? In 1900 the net operating income was 5.4 per cent. on the net capitalization and 4.65 per cent. on the reported cost of road and equipment; in 1905 it was 6.3 per cent. on the net capitalization and 5.26 per cent. on the cost of road and equipment; and in 1910 it was 5.7 per cent. on the net capitalization and 5.73 per cent. on the cost of road and equipment. The highest of these percentages of return seems small compared with the rates of return in other lines of industry. The average percentage of net earnings on the capital of national banks was 11.4 in 1900, 13.7 in 1905, and 16 in 1910; and the net earnings on the investment in manufactures in the same years was, 1900, 17 per cent.; 1905, 13 per cent.; 1910, 12 per cent. If one is disposed to reject these figures it would seem sufficient to say that if investment in railways had heretofore been as profitable as in other lines, the increase of investment in railways would have been sufficient to have caused their capacity to have increased as fast in proportion as the productive capacity of other industries.

There is no question that there is going to be a very large increase in traffic and gross earnings. Just how large the increase in gross will be will depend on the rates the roads are allowed to charge. Assuming any given amount of gross earnings, net operating income will depend on how efficiently the railways are operated, how much their taxes are, and what unit prices and wages they have to pay for materials and labor. With so many factors that are uncertain, evidently no one can accurately predict the future of net operating income. The extent to which expenses, and, therefore, net income depend on the efficiency of management has been brought into much prominence in recent years. It has been charged that generally speaking, the management of our railways is much less efficient than it ought to be and can be made. In the earlier parts of this paper, it has been shown that the managements have very perseveringly and effectively endeavored year after year to keep down expenses and fixed charges by increasing the capacity of equipment and the average loading of cars and trains. It is generally recognized by railway managers and students of railway operation—indeed, it is incontrovertible—that it is by these methods that the greatest economies can be effected. In view of these facts and many others that could be cited it is a little hard for one who is constantly in close contact with railway matters to believe that the railway managements have not been doing about all that has been reasonably practicable to promote economy and efficiency. During the ten years from 1900 to 1910 the average wages and prices paid increased 25 or 30 per cent., and average rates received increased very little; and yet the increase in business and economy in management enabled the roads to increase their net earnings.

The vital question regarding future operating expenses is as to whether the prices of materials and equipment and the wages of labor are going to advance, and if so, how much. If traffic should grow much and wages and prices should rise in the next decade, and there should be no increases in freight and passenger rates, it seems highly probable that the increase in operating expenses would be excessive in proportion to the increase in gross earnings; that in consequence the increase in net earnings would be inadequate; and that therefore the intensive and extensive development of the railways would be insufficient. But the conditions are now pretty generally appreciated, especially by the more important railway regulating authorities; there is a growing public disposition to question what may seem unreasonable demands regarding conditions of work and wages on the part of railway employees; there is also a growing tendency in most parts of the country to deal with railway rates in a conservative manner; and, therefore, on the whole prospects seem good that the increases in railway net earnings that are needed will occur and that the roads will be able to, and will, very greatly improve and enlarge their facilities.

HOCHWALD PISTON VALVE.

An interesting arrangement of piston valve has recently been introduced on a number of German locomotives. The peculiar features of the valve are twofold: it has the equivalent of a double port opening, similar to the Allen D valve, and it automatically decreases the piston clearance as the valve closes and increases it again for the period of compression. It is known as the Hochwald valve and is shown in longitudinal section in the engraving. It consists of an ordinary inside admission piston valve, with the ends pretty well separated and between them an auxiliary valve whose longitudinal section is similar to that of an ordinary D valve. This auxiliary valve is located in the steam space of the main valve. The main steam ports



The Hochwald Piston Valve.

are indicated at *A*, and the auxiliary valve has a bearing equal only to the lap of the valve. It is shown in its central position, with the two steam ports *A* open into its interior. The rings of the main valve at the ends cover the ports *C C*, which lead to the cylinder, and have a lap considerably less than that of the auxiliary D valve.

Suppose the valve to be moved to the left from its central position. The first event is to uncover the steam port *C* at the right, allowing the exhaust to escape. Next the lap of the valve at the left-hand end uncovers the steam port *C* at that end, and puts the whole interior of the valve in communication with the cylinder, thus increasing the end clearance of the piston

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by that amount. This persists during the period of compression. When the valve has moved to the left by the amount of the lap of the auxiliary valve, the steam from the left-hand port *A* passes up and over the rings through the left-hand cavity *B* and into the left-hand cylinder port. At the same time the edge of the right-hand port *A* is opened into the interior of the valve and steam passes by this route to the left-hand cylinder port *C*. The lesser lap of the main valve causes the port *C* to be wide open while double the width of opening for the flow of steam is afforded by the two openings of the auxiliary valve.

When the valve closes, the steam is first cut off by the auxiliary valve, and expansion occurs in the ordinary way during the period elapsing up to the point when the main valve closes the cylinder ports *C*. Then the space in the interior of the valve is cut off from the cylinder and the clearance of the piston is correspondingly decreased, with a consequent rise in the expansion line of the indicator diagram corresponding to this decrease of clearance. The result is that the valve presents the advantage of an ample clearance space during compression and a small one during expansion.

TRAIN ACCIDENTS IN JANUARY.[1]

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of January 1913:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
7.	Southern; G. & F.	Hazlehurst.	xc.	P. & F.	1	0
18.	Vandalia	Terre Haute.	rc.	P. & P.	4	17
19.	Illinois C.	Brookhaven.	bc.	P. & F.	2	5
24.	Phila. & R.	Vardley.	xc.	P. & F.	0	11
28.	Wabash	Defiance.	rc.	F. & F.	1	0

Derailments.

Date.	Road.	Place.	Cause of Derailm't.	Kind of Train.	Kil'd.	Inj'd.
1.	Ches. & O.	Huntington.	d. bridge.	F.	8	1
3.	New Orl., M. & Chi.	Leaf, Miss.	d. bridge.	P.	2	14
17.	Cleve., C. C. & St. L.	Stockwell.	b. tire.	P.	1	60
16.	Boston & A.	Charlton.	ms.	P.	1	9
17.	Penn.	Lock Haven.	slide.	P.	0	1
24.	Illinois C.	Melvin.	unx.	P.	0	5
31.	St. Louis & S. F.	Ardmore.	.....	P.	0	8

The trains in collision at Hazlehurst, Ga., on the 7th were northbound passenger No. 5 of the Southern Railway and a freight of the Georgia & Florida. The passenger train struck the freight train on the crossing of the two roads, overturning two cars. The engineman of the passenger was caught between the engine and tender and was killed. There are no signals at the crossing. The freight had stopped before crossing, but the passenger had not.

In the rear collision at Terre Haute, Ind., on the afternoon of the eighth, passenger train No. 20, second section, eastbound, ran into the rear of local passenger train No. 8, standing in the station. Two cars of the standing train were badly damaged. Two passengers and two employees were killed and 11 passengers, 5 employees and one other person were injured. The collision was due to excessive speed of No. 20 approaching the station, and to disregard of the rights of the standing train.

The trains in collision near Brookhaven, Miss., on the night of the 19th, were a southbound express passenger and a northbound freight. Both engines and several cars were badly damaged. One engineman and one brakeman were killed, and five passengers were injured. The collision was due to a misplaced switch, the lamp of which was not burning.

[1]Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc, obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of locomotive en road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)—Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

In the collision near Yardley, Pa., on the evening of the 24th a westbound express passenger train ran into a locomotive without train and both engines and the baggage car were wrecked. Three trainmen and 8 passengers were injured. The light engine was wrongfully using a crossover on the time of the passenger train.

The trains in collision near Defiance, Ohio, on the 28th, were westbound freights. The leading train had been stopped just beyond a curve and the following one ran into it at full speed. One brakeman jumped off and was killed. The collision is charged to the flagman of the standing train, who had gone back only 850 ft., though a severe snowstorm prevailed.

The train derailed on the Chesapeake & Ohio near Huntington, W. Va., on the 1st, was a westbound freight. The engineman and seven bridge repairmen were killed and one employee was injured. The train was moving at only about six miles an hour over a bridge supported on temporary trestle work, one side of which appears to have been undermined by a flood which had raised the Guyandot river about 8 ft. This accident was reported in the *Railway Age Gazette* of January 10.

The train derailed on the afternoon of the 3rd near Leaf, Miss., was southbound passenger No. 3 and the tender and first three cars in the train broke through a bridge and fell to the swamp below. The train porter and the news agent were killed and 11 passengers and 3 employees were injured. The cause of the derailment was the failure of the piles supporting the bridge.

The train derailed near Stockwell, Ind., on the afternoon of the seventh, was westbound passenger No. 15, and two cars were wrecked. The train was running at about 60 miles an hour and the derailment was due to a broken tire on one of the wheels of the baggage car. One passenger was killed and 60 passengers and four employees were injured, two of the injured being possibly fatal.

The train derailed at Charlton, Mass., on the evening of the 16th was westbound passenger No. 39. The rear car was thrown off the track at a facing point switch, the evidence indicating that the switch was turned by a freight fireman just as the rear truck of the rear car was passing. The train was running at about 35 miles an hour and the car was thrown violently against the pusher engine of a westbound freight which stood on the side track, crushing in one side. The porter of the car was fatally injured. Nine passengers were injured, four of them seriously. The track and cars were examined after the accident and no defect found.

It was mechanically impossible for the switch to be opened without first throwing the unlocking lever situated 40 ft. east of the switch. The fireman claims to have thrown this unlocking lever, which controls the switch, as train No. 39 was passing, but denies throwing the switch. Assuming the speed of the train to have been 35 miles an hour at the time of the accident, it would have been impossible for the fireman to unlock the lever and walk to the switchstand of the switch before the rear of the train had reached that point. While the fireman insists that he did not throw the switch, yet it is impossible to reach any other conclusion. The fireman has been in the service since 1906, is a qualified engineer and had a good record up to this time.

The train derailed near Lock Haven, Pa., on the 17, was a southbound express, and the cause of the derailment was a large rock which had fallen down from the side of a mountain. The whole train, except the rear car, was derailed, and an express car was overturned, seriously injuring the messenger. The baggage car and two passenger cars fell down a bank.

The train derailed near Melvin, Ill., on the 24th, was the "Daylight Special" southbound. The train was running at about 35 miles an hour; the tender and first four cars were overturned. Five passengers were injured. The cause of the derailment was not discovered.

The train derailed on the St. Louis & San Francisco near Ard-

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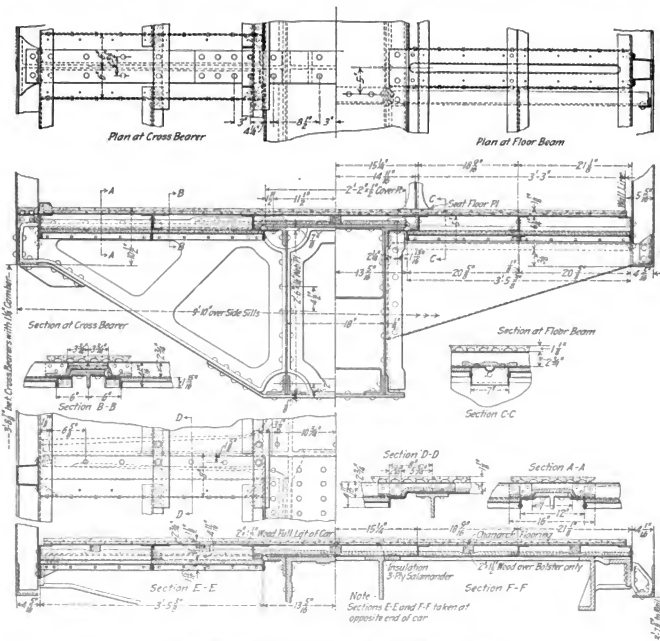
more, Okla., on the 31st of January, was passenger No. 580. The tender was the first vehicle to leave the track. All of the cars were derailed and the smoking car was overturned. Eight passengers were injured.

Electric Car Accidents.—Of the accidents to electric cars in the United States reported as occurring in the month of January, two were attended with fatal results; a slight collision on the third avenue elevated line of the Interborough in New York City, on the 25th, in which one passenger was killed, and a collision between a passenger train and a freight train on the International Interurban Railway near Lockport, N. Y., on the same day, in which the motorman was killed and 10 or 15 passengers were injured. The freight train was at a standstill on the main line about a half mile south of the station. The forward passenger car and one car of the freight were completely wrecked. On the Toledo & Western Interurban line at Toledo, Ohio, an express car, filled with merchandise, ran off the track in the street and was overturned on the sidewalk, where it took fire, from a stove inside, and was partly destroyed.

STEEL COACHES FOR THE NEW YORK CENTRAL.

The New York Central Lines have recently put in service a number of coaches which represent the most recent development in the design of all-steel passenger equipment. These cars are 70 ft. long over the end sills, 77 ft. 9¾ in. over the buffers, and are mounted on six-wheel trucks set at 54 ft. centers. They will seat 84 passengers and are particularly note-



Details of Underframe; New York Central Lines Steel Coach.

worthy for the strength of the end construction and the thoroughness of the insulation.

In the underframe, Commonwealth combined cast steel double body bolsters and platforms are used, connected by fish-belly type center sills, and side sills consisting of steel angles. The center sills, which are spaced 18 in. apart, are built up of ¼ in. web plates with two 3½ in. x 3½ in. x ½ in. angles at the bottom, and one 3½ in. x 3½ in. x ½ in. angle at the top. For a distance of 22 ft. 8¾ in. at the center they have a depth of 31 in. A top cover plate 26 in. x ½ in., extends their full length.

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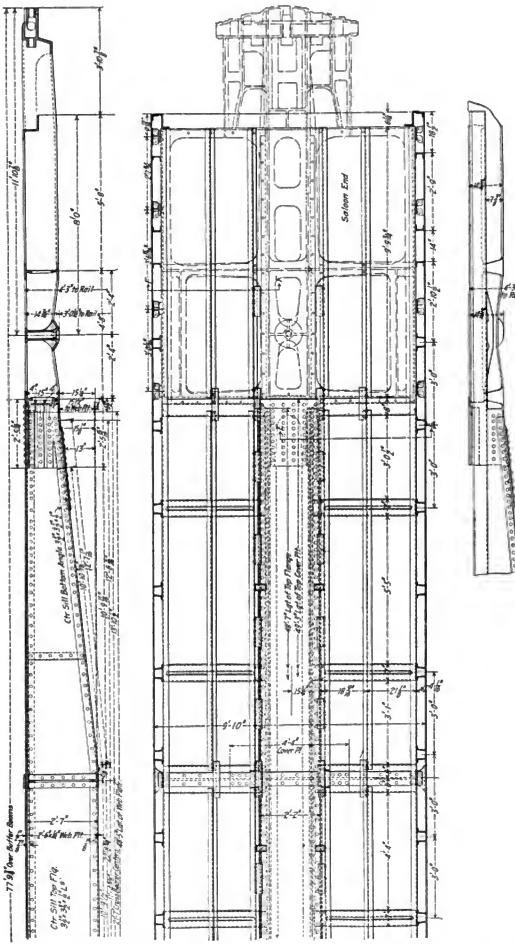

Arrangement of Underframe Members; New York Central Lines Steel Coach.

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Two cast steel cross bearers are used, with top and bottom cover plates, 6 in. x ½ in., and there are seven pressed steel floor supports of channel section on each side of the car. The outside floor stringers consist of an angle pressed from ¼ in. plate, while the intermediate stringers are of Z shape, pressed from ⅜ in. plate. The stringers extend the length of the car.

The posts are pressed from ⅛ in. steel, are of channel section with flanges, to which a 1/16 in. cover plate is riveted; a 5 in. 6½ lb. channel, extending the entire length of the car, forms the plate. The belt rail is placed outside the posts and extends the length of the car, while back of it between the posts are placed 4 in. x 4 in. x 3/16 in. pressed steel angles. The side sheathing is riveted between the belt rail and these angles.

A 6-in. Z-bar is used for the body corner post and is set in a pocket in the underframe casting at the bottom, while at the top it is secured to both the side and end plates. Back of this post is a large cast steel knee extending along the side of the car for 23½ in. and reaching as high as the belt rail. This is intended as an anti-telescoping device and was furnished by the Commonwealth Steel Company. The door posts are 6 in., 12¼ lb., I-beams and are also set in pockets in the underframe casting. They are fastened at the top to the end plate, which is a 5 in. channel placed with the web in a horizontal position. This plate is secured to the side plates and the deck sills by a gusset bracing. The intermediate end posts are 4 in. Z-bars secured at the top and bottom in the same manner as the side posts.

The vestibule diaphragm posts are 6 in. I-beams, also resting in pockets. They are supported at the top by a 5 in. channel extending back to the end frame and secured to the gusset which reinforces the end plate. There is also a similar channel secured to the opposite side of the post, which extends upward and outward to a connection at the junction of the deck end plate and side plate. The former is a 5 in. straight channel with the flanges cut away at the end and the web turned inward for riveting to the deck side plate. A diagonal brace extends from the top of the door post at this point and large gusset plates are used to make the joint rigid. In addition there is a diagonal brace from the top of the vestibule diaphragm post to the side plate near its junction with the corner post. The vestibule corner post is ¼ in. thick, pressed to the proper contour and secured to the buffer beam extensions at the bottom, and to the side plate and vestibule end plate at the top. The latter is a 3½ in. x 3½ in. x ¼ in. angle, and is riveted to the vestibule diaphragm posts above their connection to the diagonal braces.

Special attention has been given to the insulation of the car. Next to the inside finish at all points is a ½ in. sheet of Resisto or H. W. Johns-Manville Company "Nycinsul" insulation, and on the inner face of the outer sheets a ¼ in. sheet of Resisto is applied. The latter is brought inward around the posts and other members and is joined to either the inner insulation or the wooden fastening strip which secures the inside finish. This insulation is secured to the plates by fasteners spot welded in place. There is no continuous metallic connection between the inside and outside of the car at any point, and all open spaces between the framing are carefully filled with wood blocks or other suitable material.

The carlines, both upper and lower deck, are of channel shape and are pressed from ⅛ in. plate. The interior finish is of steel, finished to imitate mahogany, except below the window sills and on the headlining, where agasote is used. The window sills and sash are of Cuban mahogany. The Gould axle system of electric lighting is employed.

The total weight of the car is 142,000 lbs., giving a weight per square foot of interior floor area of 22.9 lbs., and per seated passenger of 1,690 lbs. Both the Barney & Smith Car Company and the American Car & Foundry Company have built cars from this design, which is the result of co-operation between the engineers of the railroad company and the builders.

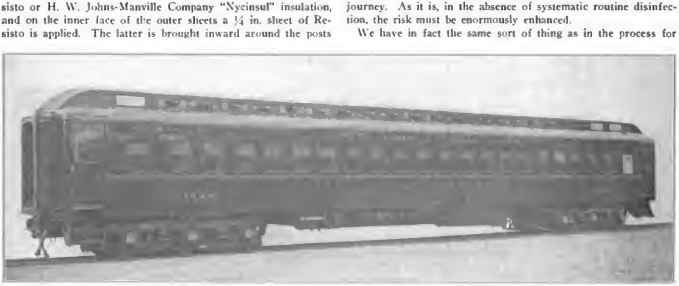
SCIENTIFIC CLEANSING OF RAILWAY COACHES.

By J. T. Ainslie Walker.

This article has been prepared in response to a suggestion made by Mr. Sherman Allen in connection with the treasury department movement to bring about better sanitary conditions on railroad cars and vessels. There are various phases presented by this problem, but the remarks are confined to one upon which I can speak with some little authority—one which, up to the present, has received little serious attention; that is that particular phase which deals with the transmission of disease through the agency of the bacilliferous dust to be found on the floors of railway cars.

The number of passengers carried in the United States exceeds 1,000,000,000 a year; and in round figures this traffic is accommodated in 50,000 cars, or 20,000 persons per car per year. There is no material available for framing any estimate of the proportion of passengers in an infectious condition. In the case of certain diseases there can be no question as to their being infectious before they can be recognized; and of so huge a total—being in fact more than 10 times the entire population of the country—it is clear that there must be a large number of cases carried in a condition of unrecognized infection. If the cars were disinfected, for example, after each journey, each passenger's risk in railway travel would be confined to his chance of sitting by the side of an infected person during the journey. As it is, in the absence of systematic routine disinfection, the risk must be enormously enhanced.

We have in fact the same sort of thing as in the process for



New York Central Lines Steel Coach.

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detecting scarce bacteria in water; if a very large quantity is passed through a single filter, the deposit will contain and infect a culture tube with the organism which is being sought, where any manageable quantity of water would probably fail to do so. The deposit in the case of each railway car is the residual infection of such of its 50,000 inmates per year as may have been infected; and there must be an enormous increase of risk to individual passengers from this inevitable accumulation of infective matter over the risk which would be run if the cars were disinfected regularly.

In the course of a discussion on a paper entitled "Infection in Transportation," read by Dr. H. M. Bracken, secretary of the Minnesota State Board of Health, at the first annual meeting of the National Association for the Study and Prevention of Tuberculosis, Dr. Victor C. Vaughan of Ann Arbor, said he held it proved that railroad cars scatter infection.

Applying Disinfectant to Hudson & Manhattan Car.

Writing on "Dust and Disease," in the *American Journal of Public Health* of September, 1912, Prof. Winslow and Dr. Kligler, in referring to certain experiments conducted by Dr. Prausnitz, state that of 21 animals inoculated with dust from railway carriages, 5—or nearly 25 per cent.—developed tuberculosis, and that Dr. Kinyoun, of Washington, on several occasions found pneumococci (the organism of pneumonia) in similar dust.

A medical writer in the Philadelphia *Public Ledger* of January 13, 1913, says: "Railroad cars bear an unenviable reputation as centers for the spread of infection, and there can be little doubt of the urgent need for the adoption of more efficient methods of cleansing and disinfection—particularly the latter."

It would not be a difficult matter to adduce further evidence as to the infective potentialities to be found lurking on the floors of railroad cars, but the above should be sufficient to convince even the most sceptical.

EXISTING REGULATIONS.

Replies to an inquiry addressed to each state as to the methods of disinfection employed in railroad cars engaged in interstate transportation, show that 11 call for the use of formaldehyde, 23 have no regulations at all, and five require the application of certain unspecified preparations. There is, however, no uniformity of procedure. In some cases, the regulations call for treatment of the cars at the end of each journey; in others, they receive attention at intervals of one to two months.

The preponderance of formaldehyde fumigation over all other forms of disinfection, as revealed in these figures, is greatly to be regretted from the fact that this method is wholly unreliable. As I have had occasion to point out recently, contrary to the generally accepted notion as to the use of formaldehyde for fumigating rooms, this disinfectant does not act in the form of a vapor or gas; in practice, it is dissolved in the minute droplets which result from the condensation of steam, in the absence of which formaldehyde has no bactericidal action whatever. Water will take up in solution 40 per cent. of formaldehyde gas, in which form it is known officially in the United States Pharmacopœia as "formaldehyde solution," the Rideal-Walker co-efficient of which is 0.3; i. e., it has about one-third the efficiency of pure carbolic acid. If we take one part of carbolic acid in 20 parts of water as our stand-

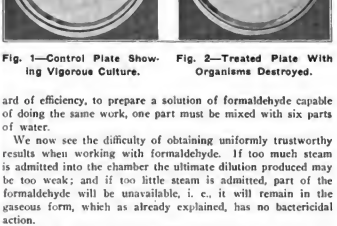

Fig. 1—Control Plate Showing Vigorous Culture. Fig. 2—Treated Plate With Organisms Destroyed.

ard of efficiency, to prepare a solution of formaldehyde capable of doing the same work, one part must be mixed with six parts of water.

We now see the difficulty of obtaining uniformly trustworthy results when working with formaldehyde. If too much steam is admitted into the chamber the ultimate dilution produced may be too weak; and if too little steam is admitted, part of the formaldehyde will be unavailable, i. e., it will remain in the gaseous form, which as already explained, has no bactericidal action.

Klein, the eminent European bacteriologist, in a report to the London County Council in 1902, said: "In cases where wood flooring, unpainted or unvarnished articles of furniture or similar absorbing materials and cloth fabrics are to be subjected to disinfection on account of their being possibly polluted with tubercular sputum, disinfection with formalin (40 per cent. formaldehyde) will not suffice."

In view of the fact that the destruction of the tubercle bacillus is one of the principal objects to be aimed at in the disinfection of railroad cars, the futility of using a preparation which on the highest authority has been demonstrated to be inefficient for this purpose must be manifest. Dr. Vaughan on the occasion referred to above said the method of disinfection by formaldehyde was "simple nonsense," and the medical writer in the *Public Ledger* characterizes formaldehyde fumigation as "a tedious, dangerous and unreliable method of performing this work."

The only satisfactory alternative to fumigation is the appli-

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cation of a modern liquid bactericide of guaranteed efficiency. As regards the relative merits of the two processes, the *British Medical Journal* of November 3, 1894, referring to the disinfection of rooms by fumigation, stated: "On the ground even of economy there is no comparison between this obsolete process and a disinfectant spray; and while cases of renewed house infection are familiar to almost every medical officer in this country, we have Dr. Dujardin-Beaumetz's authority for saying that where the disinfectant spray has been introduced they are practically unknown in France."

The efficiency of the liquid spray method of disinfecting cars was demonstrated recently by practical experiments carried out before prominent officials of the New York Central & Hudson River, the Interborough Rapid Transit Company, the Erie and the Hudson & Manhattan. It was shown that the time occupied in treating the floor of a car by this method was only about 30 seconds, and that from a bacteriological point of view, the result was satisfactory, as will be seen by referring to the accompanying illustrations which represent the actual bacteriological plates employed in the experiments conducted before the officials of the Hudson & Manhattan Railroad Company.

The procedure adopted was to inoculate two sterile agar plates with a strong culture of B. prodigiosus (a bacillus much used by bacteriologists in experimental work by reason of its distinctive coloring), one of which was reserved as a control (i. e., it received no treatment), and the other placed on the floor, of which it became an integral part during the process of spraying—the glass cover of the plate, of course, being removed during this operation. Both plates were then incubated for 24 hours. The efficiency of the process is clearly shown in the accompanying illustrations, Fig. 1, the control plate, displaying a vigorous culture, while on Fig. 2, the plate treated, the organisms have been completely destroyed.

SELECTION OF BACTERICIDE.

As stated above, the most suitable preparation for use in railroad cars is one of the modern high-testing varieties. It should perhaps be explained here for the benefit of those who may not be familiar with the subject, that, briefly, the germicidal efficiency of a disinfectant is stated in terms of pure carbolic acid, which is taken as the standard. For instance, if we say a disinfectant has a co-efficient of 5, we mean that this preparation is five times stronger than pure carbolic acid and should be diluted for use accordingly. The standard dilution of pure carbolic, as adopted by hospitals, etc., is 1 in 25; therefore, using a disinfectant having a co-efficient of say, 5, the equivalent dilution would be 1 in 125. Working with a disinfectant having a co-efficient of 20—and preparations of this strength are available—it will be seen that the dilution equivalent to 1 in 25 pure carbolic acid is 1 in 500. The use of such a preparation will not only ensure efficient disinfection, but will entail a surprisingly low expenditure. Taking $1.50 per gallon as a fair average price in bulk for such a disinfectant, a simple calculation will show the cost of the working dilution of 1 in 500 to be well under one-third of a cent per gallon. Practical experience has shown that one gallon of such a dilution is sufficient for the disinfection of 600 square feet, from which it follows that 10,000 square feet can be disinfected at a cost of approximately 5 cents. A further advantage accruing from the adoption of the higher co-efficient is the complete absence of the objectionable odor which renders impossible the use of low dilutions, such as 1 in 125.

Railway companies are among the most enlightened of the public services, and although up to now the means which they have used for disinfection are utterly inefficient and capricious, the reason for this inefficiency is largely to be found in the fact that little but caprice has been available for their guidance.

DIRECT RAILWAY FROM ROME TO NAPLES.—The work on the direct railway now under construction between Rome and Naples, Italy, is being pushed forward rapidly.

MONTHLY CIRCULAR TO STATION AGENTS.

The Canadian Pacific, whose station agents are scattered over an immense territory, issues for their benefit a regular monthly bulletin, containing changes in connections and other things which, though perhaps not so important as new time tables, embrace nevertheless many details which enable the agent to better serve the public. Beginning with the present year this bulletin is enlarged and takes the shape of a handsome illustrated circular of eight pages; and its contents are made sufficiently attractive to induce the live agent to read it, even when the matter may seem not to affect his station. In line with the improvement in station service, now engaging the attention of superintendents in all parts of the country, this circular is to be warmly commended. A first step in broadening an agent who is too narrow is to get him interested in railroad matters outside his own field, and a circular like this is an appropriate means. The January circular contains 32 numbered paragraphs. A local agent could not do better than prepare himself to pass an examination on his knowledge of these 32 subjects. Some roads, to compile so much news in a single month, and make it interesting, would have to go outside their own territory; but that is not an objection to the idea. We note the information given in some of the Canadian Pacific items:

Paragraph 1 gives information of a change in train service on a branch, including a notice of a stage connection. Other paragraphs give information about through tickets, about conventions, about optional routing on certain tickets, and other subjects commonly found in circulars to agents.

Paragraph 3 tells of 66 miles of new double track just finished on certain divisions. No. 4 tells about new steamships being built for the company, with something about proposed excursions by these vessels. There is a picture of the "Empress of Russia." Paragraph 7 tells of the new city ticket office of the company in Montreal and there is a full-page illustration of the building, which belongs to the Dominion Express Company.

A paragraph of about 200 words describes the company's new yards at Transcona, six miles east of Winnipeg, which will occupy 550 acres of land and will have a capacity for 12,000 freight cars. A similar paragraph describes the new St. Lawrence river bridge at Montreal and the new station at Vancouver, which will cost $1,250,000. Other enterprises of the company mentioned are the enlargement of the hotel at Quebec; telephone train despatching, now extending throughout nearly the whole of the main line across the continent; new cars and engines ordered in the month of December, and new extensions of the service of the Dominion Express Company. At Fort William the company is building a bascule bridge to give access to its plant on Island No. 2; this will cost a million dollars.

A whole page is devoted to notes concerning the development of western Canada. At Calgary the Canadian Pacific telegraph office, in 1905, employed five persons; now the number employed is 150. At Medicine Hat a New York capitalist is building 100 dwelling houses. Carloads of machinery are arriving at this place every day, and the number of banks in the city is now eight. At Saskatoon a new concrete bridge over the South Saskatchewan river will be 1,462 ft. long, 61 ft. wide and cost $330,000. The Canadian Pacific hotel at Winnipeg will be extended at a cost of $1,500,000. Dropping from these grand enterprises to the every-day details of humdrum work, paragraph 32 calls the attention of agents to the instructions in regard to handling correspondence.

NEW GERMAN RAILWAY.—A railway line of considerable strategic importance is to be built from Hanover to Cuxhaven, the German seaport at the mouth of the estuary of the Elbe river. The line, which will be about 120 miles long, will pass through Rottenburg, Bremervörde and Bederkesa. As the railway does not run along the coast, but midway between the Elbe and Weser rivers, trains will not be exposed to the fire of warships.

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IMPRESSIONS OF HUNGARIAN RAILWAY PRACTICE.

Shop Emergency Hospital, Drinking Fountains, an Efficient Apprentice System, and the Labor Situation Are Noteworthy.

By Henry W. Jacobs.

At Budapest I had the pleasure of visiting one of the large shops of the Hungarian Railway in company with the general superintendent of motive power, Johann Papp. At this place, although the shops are not nearly as large as at Crewe, England, I found that, as a whole, the layout was more complete in detail than in the shops either in Europe or in the United States that it has been my pleasure to visit. Mr. Papp told me that the embodiments and refinements in shop and roundhouse layout which are applied in practice in Budapest were gathered by him, as a result of many journeys, from the best practice of each of the civilized railroad countries, including the United States and Canada.

EMERGENCY HOSPITAL.

For instance, on my first entering the office building assigned to the superintendent of shops, I was struck with the room, conveniently located at the entrance, for the reception of anyone who might be injured in the shops. This emergency hospital chamber was equipped with an operating table and the most modern surgical apparatus, so that major emergency operations could be conducted without a moment's delay.

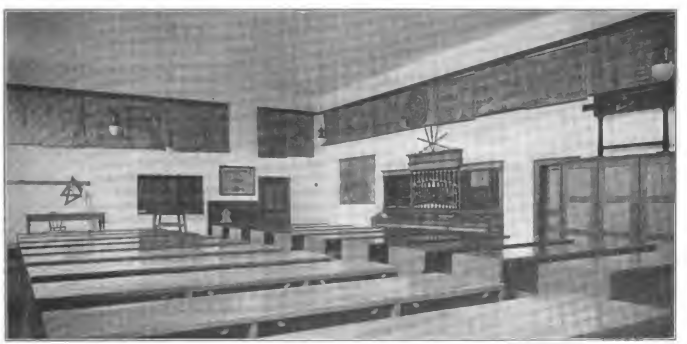
Not only are the shop employees so provided for, but men in the train service and passengers are similarly prepared for in case of any accident to trains, a full hospital train with road cars being held in readiness for departure to the scene of any accident upon telegraphic notice. The special equipment of these trains, allowing for the difference in purpose, is similar to that of our emergency cars for mining disasters. The cars constituting these trains are not old converted coaches, ill adapted to the purpose in view, but are complete with every regard for the comfort and succor of the injured.

DRINKING FOUNTAINS.

Another indication of the attitude of the administration toward the welfare of the men was in the machine shop. I observed a construction somewhat like a soda water fountain, with a neatly dressed girl in attendance. This naturally surprised me very much, and I inquired as to what it meant. It developed that in order to offset the desire for alcoholic drinks, the superintendent of shops, Mr. Hermann, had decided to establish these soda fountains in the shops, where various kinds of soft drinks could be obtained by the workmen practically at cost, the men being free to come and go for such refreshing beverages just as they would in our shops for ice water. Any small profit that might remain over from the sale of the drinks was applied to a charity. Undoubtedly this institution is a most excellent step in the interest of the sobriety and health of the employees, and the superintendent of shops, or chief of shops, as he is called, is to be congratulated for this practical, humanitarian step.

APPRENTICE SYSTEM.

The next point that impressed me was the apprenticeship school or shop. Here in a separate building from the main plant the apprentice spends the first two years of his service under the direct supervision of instructors. Tools are made, such as chisels, flatters, taps, and many small parts of locomotives, in addition to many models of either special machine or locomotive types. During my visit they had under construction, to be used as a permanent exhibit, a complete model of one of the beautiful railroad bridges that have just been completed, spanning the Danube. This work was done by the apprentices under the careful supervision of practical mechanics. What particularly impressed me was the explanation given by Mr. Papp as to the method and purpose underlying the instruction period of the apprentices. Instead of the boys and young men passing from one department of a shop to another in a rather indiscriminate manner, picking up knowledge of work, perhaps sometimes indifferently from a foreman or the mechanics, or sometimes shop instructors, they were set apart during the first two impressionable years of their apprenticeship to be thoroughly



Apprentice Class Room of the Hungarian State Railways at Budapest.

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grounded by those who were known to be most competent to instruct in skilled practical work, as to the right and best ways of doing each class of work so that bad or faulty habits of work would not be learned—to be unlearned later. For the succeeding two years the boys work in the regular shops where they receive additional care and instruction and gradually become amalgamated with the regular working organization. After the preliminary two years the boys are much better fitted to go into the main shops with the older mechanics and continue their apprenticeship.

During apprenticeship the boys have to attend school for two hours of each day, and for these study, lecture and drawing periods they are paid as they would be for productive work, the railway administration knowing that the cost of this instruction is a most valuable asset in the working ability of its future mechanics. The schedule of study hours during the four years' apprenticeship is as follows:

	Hours per week for each of the four school years.			
	1st year.	2nd year.	3rd year.	4th year.
Reading and general instruction	1	1	1	..
Review instruction in reading and writing	1	..	..	..
Composition	1	1	1	..
Arithmetic and geometry	2	2	..	..
Review instruction in mathematics	1	..	..	..
Time keeping and cost accounting	..	..	1	..
Physics and chemistry	2	1	..	..
Elements of mechanical design	..	..	1	1
Instruction in theory of machine power operation	..	1	1	1
Instruction in hygiene	..	..	..	1
Mechanical drawing	4	4	4	4

In selecting apprentices the first chance is given to those sons of railway employees who have capacity for this class of work. Candidates for membership must have passed through the middle grades of the common school, and be over fourteen years of age. Every year a theoretical and practical examination is held. In addition to giving oral and written answers to examination questions, the boys are permitted four hours in which to accomplish a certain piece of work according to a blueprint. The way in which this work is done, as well as the mental aptitude shown by the pupil, determines his proficiency. The examinations are conducted in the presence of parents and others of the public that are interested. Prizes are awarded for those that are especially advanced.

Before completing his fourth year of apprenticeship, the apprentice must produce a masterpiece of work, usually a model of some machine, locomotive or structure used in the railroad service. During the apprenticeship course the boys are paid regular wages, which are increased from term to term, ten per cent. of their earnings being held out in a savings fund until the end of the apprenticeship.

Upon the completion of their apprenticeship there is no binding agreement upon the young men to continue in railroad service, although places are provided for those that desire them. The Government Railroad Administration considers it its duty to the industries of the nation to offer this sacrifice upon the altar of education and advancement of the commercial development of the people.

I regretted that in this visit there were not present such missionaries as George M. Basford, who for many years has been an advance prophet of railroad apprenticeship instruction in the states, and also those men who have followed up his inspiration by practical application on some of our largest railway systems, such as Mr. Thomas, Mr. Cross, Mr. Henshaw, and others, whose ideal has been to make thinking, skilled mechanics of the younger generation, rather than specialized automatons. In Budapest was wrought into complete execution the kind of instruction that these American pioneers are so earnestly developing on the roads that they serve, and too much credit cannot be accorded to the earnestness of their work and the support that is being given by their officers.

WHAT BECOMES OF THE APPRENTICE?

What becomes of these apprentices after they have completed their general grounding as all-round mechanics? It is only after this general training that the special development of the particular abilities that the young man may have shown is undertaken. In no American shop have I seen specialized pursuits and occupations carried to the extent and thoroughness that exists in the shops at Budapest. In each class of work, such as erecting, rod, bench, piston rod and crank pin work, machine work, etc., each of the gangs was composed of carefully trained men who were especially fitted for the particular class of work to be performed by it. It was explained that certain qualities in mechanics, as in poets, are inherent and cannot be acquired by training. How often do we see men operating fast moving machinery requiring quick action and co-ordination of the eyes, the brain, and the hands, who may have quick action between the eyes and the brain, but do not have co-ordination of the hands, so essential to most efficient operation. These men would be much better adapted to their occupation if they were working on the erecting floor or at the bench. Again how often do we find men of a nervous and energetic temperament fretting away their time standing at machines when they should be working in the erecting shop where vent could be given to their energetic natures. And again we find men running lathes where great accuracy of touch is required, such as in making close fits, who are by temperament and physical make-up ponderous and clumsy, and who would be happier working in a steam pipe gang lifting and fitting up heavy steam pipes. The contrast and misfit of occupation is as glaring as the performance of a draft horse would be on a race track.

The two years of training in a separate building gives those who are studying the character and capabilities of the apprentices an opportunity to later select and assign them to that class of work which is especially fitted to their qualities and characteristics. A man does that thing best which he loves to do—because he can do it well rather than because he is directed to do the work without consideration for or sympathy with his particular aptitudes.

TRADES ORGANIZATIONS.

Of special interest is, of course, the organization and attitude of the body of the working men in the shops, etc. The policy of the Hungarian State Railways is that of the open shop. Trade unions in the form that we know them in the United States are non-existent on the government railroads. In Hungary many recruits from all classes of trades (outside the railways) are drawn to a political party known as the social democratic party, whose members are principally socialistic. This political party has a vigorous representative in the parliament, and its program is one of spirited protest against the constituted form of government. For this reason it is deemed against the interests of, and loyalty to, the state to permit those who serve the state to be affiliated with a political organization in conflict with the administration of the state enterprises. No man in the state railroad employ may be a member of the social democratic organization, upon pain of dismissal.

ADJUSTMENT OF GRIEVANCES.

On the other hand, excellent arrangements are made for the presentation or discussion of grievances or desired changes in the working conditions of the men. The men have regularly elected representatives from among their own members, for each division of the railway, and for the railway as a whole. These representatives sit in session with officials selected by the railway for the mutual discussion and adjustment of matters affecting the welfare of the men. In practice this permanently constituted arbitration board seems to work out very satisfactorily, for both in working conditions and in rates of pay the railroad men, and particularly the shop men, are better off than those in similar kinds of work in private employ elsewhere in the country.

The railway administration has no difficulty in attracting to its service the most competent men in each of the trades, it being considered an honor to be in the government employ. When a man has served a probation period of three years, he then becomes a sworn worker for the state, and cannot be

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summarily dismissed. If there were just cause for dismissal or other corrective measure, this cause is determined as a result of evidence presented before a regularly constituted court, or committee of inquiry, and upon its recommendation a responsible officer will take action. In this way the men are guarded against injustice due to action that is hasty, ill considered, tyrannical or born of personal feeling or prejudice on the part of some minor official or foreman. In the manifest love that the men have for their work it is seen that this security in their positions, so long as they do their duty, does not make them slothful or negligent.

In spite of the fact that there is always a superabundance of competent men in the various trades anxious to get into the railway service, the railway administration deems it to be to the interest of its employees and their families, that opportunities should be afforded their sons to specially fit themselves for railroad positions, if they are capable of so doing.

Because of this general method of training, the men not only turn out careful work of high quality, but the occupations being specialized favor large production of similar units or pieces at a minimum price per piece. A further factor in bringing the standard unit cost to a remarkably low figure is the system of paying the men upon an output basis instead of an hourly wage. These two policies, careful training and intensive wage system, coupled with careful engine house inspection by the engineemen themselves, make for the best and cheapest locomotive operation; and when replacements or repairs are necessary, these operations are performed at the minimum cost. For these reasons, the costs of locomotive maintenance are found to be extraordinarily low on the Hungarian lines, upon any unit basis selected for comparison, as compared with American or with other European lines.

RECORDS OF AUTOMATIC BLOCK SIGNALS.

Automatic block signals are now an important element in the safety of travel on most of our principal railways, and they are so conspicuous a feature that even the unthinking public takes cognizance of them. The advertising department makes use of them, and to good effect. One transcontinental line, in advertising a recent excursion, emphasized the statement that "every inch" of the line to be traversed was protected by automatics.

And, though the perfection to which automatic signaling has been brought on American railroads makes a highly creditable chapter in recent railroad history, this creditable record gets very little notice in print. We have an almost unbroken record of negative evidence, for reports of collisions due to faults in automatic signals are exceedingly rare; but this negative evidence is about all. The reader, therefore, will be interested in the following records of the performance of automatics on eight prominent roads for one year. We are not permitted to name the roads, but the facts have value regardless of names. Moreover, we have to show the reverse, not the obverse of the picture. The magnitude of the signals' virtues is shown by setting forth the exceedingly small proportions of their faults.

As is well known to railway men, the signal records of different railways are kept according to methods which in details are quite varied, so that exact comparisons cannot be made except by means of elaborate studies not now practicable. Nevertheless, these ratios are in some degree instructive. And the figures are suggestive by way of showing the paucity of information available and the need of standards.

AUTOMATIC BLOCK SIGNAL PERFORMANCE ON 8 RAILROADS.

Road.	Ratio of Failures to Operations; 1 in	Ratio of Dangerous Failures to Operations; 1 in
E[1]	.....	.....
G	58,746	2,746,663
H	175,222	3,072,983
I	26,783	1,427,506
N	35,308	.....
O	27,017	1,260,535
R	21,878	2,475,180
W	.....	660,464
Y	.....	1,606,231

[1] See below.
[2] One month.

All causes of false clear automatic signals reported on road E for 12 months were as follows:

a, Water leaked into case; froze slot-arm in clear position.
b, Someone broke into home head (inclosed disk signal) and bent counterbalance rod so it fouled head, holding signal clear.
c, Reported clear with train in block; maintainer found nothing wrong.
d, Grounded slot coil.
e, Distant arm reported clear with train in block. No cause found.
f, Home disk bent and fouled side of head.
g, Distant arm partly clear with home arm at stop; sleet and snow on blade.
h, Home arm going to stop position caught on lamp; pole changer did not operate and home and distant in rear cleared together.
i, Reported. No cause found.
j, Water in relay contact held local circuit closed.
k, Lightning.
l, Carbon point of relay fused by lightning.
m, Corroded and grounded joint in battery wire.
n, Open joint in wire under planking at drawbridge.
o, Grounded control circuit.
p, Temporary home and distant line wires crossed; insulation maliciously or maliciously cut.
q, Broken mechanism.
r, Tie plates under insulated joint bridged the insulation; current came from rear battery and closed relay.
s, Broken stop link.
t, Foreign current.
u, Polarized armature stuck.
v, Western Union guy wire touched line.
w, Someone broke open relay box and bent relay fingers; relay remained closed.

In this list it will be seen that carelessness or inefficiency of the men in charge was responsible for items *m*, *r*, *u*, *v*, and probably *o*; cold weather for *a* and probably for *j* (freezing of condensed moisture); snow for item *g*; lightning for *k*, *l*, and probably *d*; malice or mischief, *b p*, and *w*; and defects of apparatus *f*, *h*. *n*, *q*, and *s*.

Road H is one with a dense passenger traffic within a small territory. Road N reports that the record is "admittedly poor," new signals having been installed before there had been time to instruct maintainers properly in their duties.

The causes of all false clear automatic signals reported on Road O for 12 months were as follows:

a, Defective signal magnet.
b, Ice in signal cylinder.
c, Ice on contacts of switch circuit controller—failed to shunt track.
d, Fin in connecting rod leading from switch to switch box either worked out or was removed by person unknown; failed to shunt track.
e, Switch circuit controller disconnected; failed to shunt track.
f, Broken wire leading from rail to switch box; failed to shunt.
g, Springs weak in combined circuit breaker and plunger lock; failed to shunt.
h, Improper wire connections to signal.
i, Lineman changing wires got control wire crossed with another wire.
j, Pivot screw on polarized armature of relay becoming loose and binding armature it could not move.
k, Bracket in relay tightened causing same conditions as last preceding.
l, Magnet burned out by lightning and relay armature fused closed.
m, Relay badly damaged by lightning, not allowing armature to drop away.
n, Caution (light). Relay sticking clear.
o, Contact points in relay stuck to contact post.
p, Rods supporting relay contact binding failed to open when de-energized.
q, Fixed red marker light displayed white by reason of lens falling out. Broken set screw.
r, Lamp burg en bracket improperly. Showed white light.
s, Broken insulation on pole changer. (Two cases.)
t, Operating rod on pole changer broken.
u, Broken rail or broken bond wires and foreign current. (Five cases.)
v, Disk signal. Moisture between armature and magnet on buffer holding disk clear.
w, Disk signal. Bearings slightly worn.
x, Unknown. (Two.)

30 Total.

In this list, four items, *c*, *d*, *e*, *f*, have to do with connections at outlying switches. These appear to have occurred in sections where the signal control (wire line) circuit was not run to the switch and where, consequently, a track connection, arranged on the "open circuit" principle, was depended upon to set the signal in the stop position when the switch was opened. Ten

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of the failures here listed, *b*, *g*, *h*, *i*, *j*, *k*, *n*, *o*, *p*, and *r*, are chargeable to negligence; but it is to be observed that in at least four of the cases, *b*, *g*, *j*, and *k*, the trouble was of a character which could have been prevented only by the highest degree of vigilance; in other words, we have here a reminder that the requirements of the signal maintainer's duties are severe.

On Road Y the causes of all false clear automatic signals reported for one year were as follows:

December—1, from relay sweating and freezing.
January—1, due to control wire cut and short circuited. (Maliciousness.)
February—1, carefully investigated but no cause discovered.
March—1, due to relay sweating.
April—1, due to piece of baling wire thrown over line wires; 1, due to control wire touching lightning arrester wire, thereby grounding circuit. (Fault of maintainer.)
June—3, due to lightning damaging relays; 1, due to piece of barbed wire thrown across line wires; 3, due to ants getting into arc lamp lightning arresters and thereby grounding circuits; 1, due to circuit controller sweating; 1, due to bent vertical rod rubbing against inside of post; 1, cause unknown.
July—1, due to relay contacts fused by lightning.
August—3, due to lightning damaging relays.
October—1, due to slot arm of signal mechanism being improperly adjusted (fault of maintainer); 2, failures the cause of which is uncertain but supposedly due to excessive mechanical friction in toggles of slot arm (the toggle angles are to be changed).
November—1, carefully investigated but no cause found.

Road Y adds the following comments: "We investigate all false clear failures very carefully and take such action as is necessary to prevent their recurrence whenever it is possible to do so. We have succeeded in getting an oil that will not freeze at our lowest temperatures and have no further trouble from dash-pots freezing, which used to cause some failures. Last year we increased the toggle angle on certain signal motor mechanisms from 5/16 in. to 3/4 in. on three divisions and since this change we have had no unexplainable false clear failures on these three divisions. We therefore believe that practically all of our false clear failures, which used to be reported as 'cause unknown,' are really due to friction in the slot arm and can be prevented by this change. By substituting bone bushing for Lavite bushings in our relays we have reduced the number of false clear failures due to relays being damaged by lightning, but have not been able to entirely overcome them. We have so far been unable to find any lightning arrester that will protect our relays and other signal apparatus and all lightning arresters that we have tried so far have shown a liability to ground our circuits from time to time. Failures are occasionally caused by relays sweating and then either freezing or rusting, but we have found no cause for this and no remedy up to date. Although there are two failures in the above list caused by pieces of wire being thrown over our line wires (which are bare) we really have very few false clear failures from this cause and do not feel justified in using insulated line wires, which would cause other trouble. To prevent failures from up-and-down rod rubbing, we are taking the guides out of all our signals as we have decided that they do more harm than good."

As we have said, the really significant thing about these records is what they tell by indirection. The writer who will put on paper an equally illuminating story of the maintenance which has produced the 999,999 safe movements (to one that is unsafe), has not yet arisen. As further illuminating the problem which confronts the signal engineer in his efforts to achieve perfection there is given below the record, for three months, on a prominent road, of the discipline administered in cases where employees were chargeable with misconduct or negligence. In each of these cases all of the employees of the department were made acquainted with the facts as here given, with the names omitted.

DISCIPLINE: SIGNAL DEPARTMENT.

November 3.—Slot at interlocking plant slipping. Investigation revealed that batteryman was careless; battery dirty. Batteryman suspended two days.

November 8.—Signal failed on account of exhausted battery element. Maintainer and batteryman inspected battery less than one week previous. Maintainer and batteryman suspended one day each.

November 17.—Batteryman discharged for being off duty without permission.

November 19.—Batteryman discharged for drinking and neglect of duty.

December 1.—Slot control springs in electric lock changed by maintainer to remain permanently closed. Maintainer suspended ten days.

December 2.—Signal lamps found in dirty condition and otherwise neglected. Lampman suspended two days.

December 16.—Batteryman transferred to construction gang on account of inability to be neat. His previous good record earned this consideration.

December 31.—Signal failed and delayed several trains on account of maintainer being absent without permission. Maintainer discharged.

January 6.—Careless maintenance and inspection of lamps. Lampman discharged.

January 15.—Improper inspections of signal batteries and lamps. Maintainer and batteryman discharged.

January 31.—Mechanical repairman intoxicated. Discharged.

WHAT MANY STATION AGENTS MISS.

BY A STATION AGENT.

With the increasing tendency of the state and interstate commissions to regulate and lower rates, and the insistent demands of the employees for higher wages, there is left but one source of increased profit for the American railroads, and that is to get more business.

The agent at important competing points is naturally expected to be on the lookout, and to get all of the business that can possibly be secured; this is all well and good, but the agent at the smaller point may do something; he has not been properly impressed with the necessity of working up business. It has usually been understood that as there was no competition all business was sure to be given to him.

The successful farmer is the one who makes two blades of grass grow where only one grew before; and the successful agent is one who gets two tons of freight where only one was secured before, whether his station has competition or not.

Many agents are working day in and day out over gold mines of possible revenue; but being blind they see not, and being deaf they hear not. The community around may be capable of producing an unlimited amount of some commodity, which would furnish a neat revenue if a market was secured for it, and at the same time make the people more prosperous. It may be grain, timber, potatoes, tobacco, live stock, or any of the numerous things that go to furnish the revenue of a railroad. The thing necessary is to get the local people interested, get them to work together. Get them willing and eager to handle the producing end of the matter, and then as a rule the finding of a market is easy. Enthusiasm is most contagious, and once let a live agent go into the matter in earnest, and he will be surprised at the support given him and at the results obtained.

For instance, the town of A issued bonds and built a dam across the river to secure waterpower for generating electricity, to be sold at cost to residents, and for use of incoming industries. The town authorities, men who were elected, not on account of their fitness for the position, nor on account of their business ability, but because they were good fellows, have been vainly trying to get some company to come in and use this power free, but thus far a thousand horse power or more remains idle. It is a source of possible revenue for the railroad company, and it seems to me that the agent there should interest himself in trying to assist the townspeople; but he takes the stand that it is the duty of the traffic department to look after such matters. The traffic man in charge of that district, who is a good man and is doing his best, has so much territory to cover that he cannot give this matter the attention it deserves. It is a source of possible revenue, and the company is losing that revenue.

This agent has leisure time and the company is paying him for all of his time; why cannot he use this time, that belongs to his employers, in assisting the town officers in getting some industry to come in?

Station B is situated in an agricultural district. The people by popular subscription built a factory to can vegetables raised

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by the farmers. The farmers fairly swamped it with tomatoes, corn, pumpkins, and everything that it could handle, but through ignorance of selling methods, and inefficient management it was a losing venture. After the second year it shut down. A few feeble efforts were made to sell the property, but what was everybody's business was nobody's business, and the machinery lay and rusted several years, and was eventually sold for junk. Here was another possible source of revenue. The owners of that property would have practically given the plant to someone that would guarantee to operate it, and it would seem that the agent, with the assistance of his traffic or industrial department, could have found some canning company that would take it.

Agent Jones was in charge of station C for eight or ten years. He handled the position as others before him had handled it, taking in what money came his way. If business was good it was all well and good; if it wasn't, why, he was not paid for worrying! Agent Brown took his place. Brown made it a point to get acquainted with his patrons; he learned what crops they raised most successfully. Through the agricultural college maintained by his state he secured much information about the crops they were producing. He worked up sufficient interest among the farmers to get them to invite representatives from the agricultural college to address them. He circulated a paper among them in which they pledged themselves to plant a certain acreage in potatoes the following season, provided a warehouse was built, and secured pledges for about 600 acres.

Armed with this he went after the larger and more important wholesale potato companies, with the result that two warehouses were at once put up. In former seasons the farmers had a market for their crops only as buyers happened in; now they have a steady market and can sell any day. In former years the total of the land planted in potatoes would not exceed 100 acres; this last season over 500 acres were dug. When one figures that about four acres will produce a carload of potatoes, which will average $50 freight charges, it will be seen that not only the farmers made money, but that the railroad came in for its share.

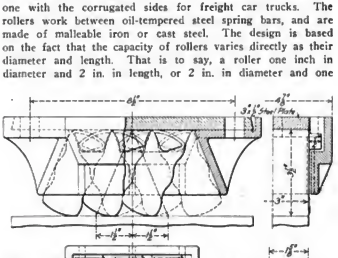
In a matter of this kind the agent at the noncompeting point has an advantage, in that he gets all of the business he helps develop. If it is a competing point his competitor is sure to share in the results of his labors. The agent at the country station has an advantage over the agent in the city, in that the city agent must work up such matters to hold his position, while the man at the small town is overlooked; and when he does start something, it is noticed.

There are two ways of getting a good position; one, by being appointed to one; another, by developing the one you have into a good one. To my notion there is much more satisfaction holding one of the latter than the former.

RAILWAY DEVELOPMENT IN BOLIVIA.—The ambitious program of railway construction in Bolivia which was put forward as long ago as 1904 has only been fulfilled in part. The cost of construction per mile is exceptionally heavy in that country even for South America. Nevertheless there are open to traffic today in Bolivia some 700 miles of native line, exclusive of the track of the same systems which is located in neighboring territory. Recently a preliminary survey was made of the entire line of the Chimore railway, the work having been divided into sections, the first of which is from Salta to Santa Rosa; the second from Santa Rosa to Santo Domingo; the third from Santo Domingo to Puerta Patino; and the fourth from Puerta Patino to Secuano. The fifth will reach the headquarters at Trinidad. Plans for a branch railway from Macha-cama-ca to Uncia have been completed and passed by the government. It has also accepted the proposal of a French syndicate for the construction of a line between Quiaca and Tarija. This line will supply an important link in the railway system of the republic, and will place Bolivia in direct communication with Argentina.

ANTI-FRICTION SIDE BEARING.

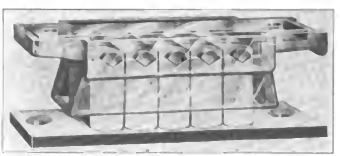
An interesting development in side bearings for car and tender trucks has been made by Edwin S. Woods & Company, Chicago. These bearings are intended to carry heavy loads with a short travel. The illustrations show two applications; the one with the flat sides is used for tender trucks, and the one with the corrugated sides for freight car trucks. The rollers work between oil-tempered steel spring bars, and are made of malleable iron or cast steel. The design is based on the fact that the capacity of rollers varies directly as their diameter and length. That is to say, a roller one inch in diameter and 2 in. in length, or 2 in. in diameter and one



Three-Roller Side Bearing for Freight Cars.

inch in length, will have twice the capacity of a roller one inch in diameter and one inch in length. In the case of the tender roller bearing, there are five rollers 4 in. in diameter and 3 in. long, which is the equivalent of one large roller 10 in. in diameter and 6 in. long. These rollers have a side clearance of ⅛ in., and the friction is restricted to the rolling on the two bearing plates.

The drawing shows a three roller bearing for freight cars. These rollers are corrugated, which allows them to be in contact in all positions and still have a greater length of travel than



Anti-Friction Side Bearing for Tenders.

in the case of the flat-sided roller. In the normal position the corrugations will be in contact at their apices. As the rollers move to one side or the other the apex of one corrugation will slide into the hollow of the other until there is a positive bearing, as shown in the illustration. Of course, it is necessary that these corrugations be carefully made to the correct radius, which is one-half the width of the roller. In the present instance the travel is 1½ in. each side of the center line, making a total of 3 in., which is probably more than will

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be required in this class of service, although by slight changes in the design of the roller this movement can be increased. The claims of the makers of this device are that it is of simple construction, contains no small parts, requires little attention, and has a large carrying capacity.

GRAPHO-METAL PACKING.

A difficult problem in the maintenance of locomotives is that of keeping the rod and valve packing in a good, non-leakable condition with the least amount of wear. To provide for this a new packing was recently placed on the market by the American Piston Company, Indianapolis, Ind. It is known as the Grapho-Metal packing and, as its name implies, is a combination of a special soft babbitt metal and graphite. It is made up of half rings, as shown in the illustrations, and is

Nut Lock and Piston Rod Shields for Westinghouse Cross Compound Pump.

especially adapted to air pumps, valve stems, throttle rods, cab valves, injectors, etc. It is easily compressed by screwing the gland nut down hard after it has been applied, which forces it against the rod, adapting it to the position or shape of the rod, and in this way allowing for any imperfections in alinement. The end surfaces of the upper and lower rings contain a lower percentage of graphite, thus forming a support for the packing in cases where the stuffing box clearance is too great; also sealing the packing into the stuffing box, and in this way restricting the loss to service wear only. This is

Air Pump Packing.

Throttle Rod Packing.

found to be slight, owing to the lubricating qualities of the graphite which is always in contact with the rods.

The air pump packing is divided into rings and is applied in the ordinary manner, care being taken to see that the gland nuts are firmly screwed into place. The special advantage of the packing in this service is that no swabs or oil cups are required, as the graphite will give the necessary lubrication. After the pump has been in operation a short time the packing will become polished, which will reduce the friction and wear. Reports from roads using this packing state that it has been in service during the last 18 or 20 months and is still in good condition. The pumps may be taken out of service and repaired without necessarily destroying the packing, as the lye or acid baths usually given the pumps at such times have no effect on it.

The throttle packing is made up of a number of rings, depending upon the depth of the stuffing box, and is applied in the same manner as on the pump, being screwed hard up into place so that there will be a positive bearing on the rod. The packing for cab fittings is made in one piece. This packing has also been used successfully on injector steam rams and water valve stems, and is being developed for use on steam pistons for superheater as well as for saturated engines. It has also been successfully used on a needle valve of a Diesel crude oil engine during the past year, resisting a pressure of 1,200 lbs. per square inch.

A combination piston rod shield and nut lock has been devised by the same company for use on air pumps, which together with the air pump packing described, comprise the air pump packing set. The illustrations show the shields for a Westinghouse cross compound pump. The large shield is shown open ready to be placed around the rod. It is closed and held in position by the bolt and nut shown. The inner sleeve is then raised by pressing down on the adjusting lever until it bears firmly on the upper and lower gland nut. The cam on the head of the bolt is then thrown over, firmly clamping the shield to the gland nuts. The necessary adjustments for making the locking lever effective are made with the knurled nut on the clamping bolt.

UNION PACIFIC ACCIDENT CHART.

The Union Pacific has posted in its various agency offices a large "accident chart" showing the remarkable improvement in its accident record in the last nine years, as the result of its campaign for safety in operation. The chart looks like a condensed profile of a road across the Rocky mountains, except that it shows only one slope, the peak being almost at the beginning of the record in 1903. The chart is ruled vertically for months and years from July, 1903, to June, 1912, and horizontally for train accidents per 1,000,000 locomotive miles, and the resultant curve shows the fluctuations in the accident record by seasons, with an almost constant reduction from year to year. Beginning at a point showing 19 train accidents per 1,000,000 locomotive miles in July, 1903, the highest point reached is for December of that year, when the line shows 27 accidents per 1,000,000 locomotive miles. In the fiscal year 1904-1905, the highest point shown is 25 accidents; in 1905-1906, 22; 1906-1907, 17; 1907-1908, 16; 1908-1909, a fraction over 16; 1909-1910, 13½; 1910-1911, 8; 1911-1912, 6. The highest and lowest points on the chart are for December, 1903, with 27 accidents, and February, 1912, with a fraction under 3. Below the chart is printed the following:

"The black irregular line shows the reduction in accidents as a result of the heavy investments made by this company in automatic electric block signals, good equipment, first-class roadway and double track, aided by good men and good discipline.

"This chart does not include injuries or deaths, but illustrates the causes that contribute to same, although of accidents classified below, the large majority do not cause deaths or injuries.

"Collisions.

"Derailments from defects of road and equipment, negligence in operating and unforeseen obstructions.

"Other train accidents.

"The Union Pacific holds courts of inquiry to determine the cause and responsibility in each case, and gives to the public information promptly of all its accidents when accompanied by fatalities or injuries."

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Maintenance of Way Section.

THE March Maintenance of Way Edition, if published the third Friday of the month, as is our usual custom, would be issued on March 21. The American Railway Engineering Association will meet in Chicago on March 18-20, and a *Daily Railway Age Gazette* will be issued on the morning of March 21. It has, therefore, been decided to publish the Maintenance of Way Edition one week earlier than usual, or on March 14.

THE recent renewal of active hostilities in Mexico will be watched with concern by those southwestern roads which depend on Mexico as the main source of their track laborers. This latest outbreak, combined with the war in southeastern Europe, will undoubtedly intensify the labor shortage during the coming season.

IF marks are made upon the rails at the ends of sections of track which are now heaving badly, they will be of considerable assistance next summer when the season's track work is under way. By improving the drainage at a few of these worst places each year, the standards of maintenance on the entire section can be greatly raised in a few years at a comparatively moderate expense.

AT this season of the year the handling of locomotive cinders is frequently a vexatious problem. It is necessary that they be removed from the pits promptly, and when wet down before loading they are very likely to freeze in the cars so that in some cases it is necessary to use light charges of dynamite to break the frost before unloading. At most terminals the disposal of these cinders during the winter is far from satisfactory.

THE mildness of the winter thus far is in marked contrast to the conditions existing a year ago, except in the north Pacific coast states, where the winter has been more than usually severe and the snow fall above normal. However, even in the central states, although comparatively free from snow, the temperature has been low enough during recent weeks to cause considerable difficulty in keeping all facilities in use. For this reason, the next contest, that on "Winter Methods," is timely. In this contest, descriptions of methods new or not generally used for overcoming any of the many difficulties encountered in the prosecution of construction or repair work, or in the routine maintenance work of keeping the tracks, water stations and other facilities in service, will be eligible. Prizes of $25 and $15 will be paid for the first and second best papers received, while all others accepted and published will be paid for at our space rates. All contributions should be sent to the Civil Engineering Editor, *Railway Age Gazette*, Transportation building, Chicago, and must be received before February 25.

ONE of the best evidences of the increasing appreciation of the value of the annual exhibit of the National Railway Appliances Association, which will be held in Chicago from March 15 to 21, inclusive, is the comment heard after the close of each exhibit that more supervisors and foremen attended than in any previous year. The attendance of these men reflects the more general support given this exhibit by the railway officers, many of whom not only arrange for their men to get away, but advise their supervisors and more progressive foremen to attend. One roadmaster, located over 450 miles from Chicago, had his foremen select two of their number to attend the exhibit last year. These men were at the Coliseum an hour before the doors opened and spent the entire day studying the various devices. Upon their return they wrote a report which was discussed at the next meeting of the foremen. Several roads in the vicinity of Chicago sent all their foremen from certain divisions last year, while others at a distance arranged for their roadmasters to attend. The value of the opportunity to see not only the more recent developments in maintenance of way material, but also standard appliances used on other roads, is evident. The roadmasters and foremen are among the most careful students of the various devices, and many exhibitors vouch for the practical criticisms made by them.

WITH the shortage of labor which is certain to develop during the coming season, and which will be more serious than that of 1912 if present indications of the amount of work to be undertaken are accurate, it is highly essential that those in charge of maintenance of way work make every effort to start as early in the spring as possible. Those roads which started early last year not only got practically all the men they required, but were enabled to select their forces to a large extent and secure them at a rate considerably lower than that paid later in the season. When wages advanced about the middle of the summer they were able in some instances to let many of their men go without serious detriment to their work, while other roads which started late in the season were unable to secure the number of men required, and in a number of instances were forced to postpone needed improvements entirely. Furthermore, work done in the spring is better done, for the weather conditions are more favorable and the men are more willing to work after a winter spent in inactivity. To take full advantage of these conditions, plans must be made now and material secured and distributed in advance of the work. Ties can be stacked along the right of way ready for insertion; rail can be distributed and switch and other material can be assembled so as to guard against needless delays. Enough tools for the work in view can be gathered together, bunk cars can be cleaned and fitted up for the men and many other preparations made which will lessen the amount of work necessary when the season actually opens. Not only is it economical to start early, but from the outlook it will be positively necessary to do so this year if the work outlined is to be completed.

THE seasoning of ties and other timber before treatment has been the cause of much discussion for years. Equal attention has not been given to the benefits resulting from seasoning ties after treatment. Owing to the very rapid increase in the use of treated ties, the demand for them has been such that they have been given little opportunity to season after leaving the retorts, but have been immediately shipped out to be put in track, especially late in the fall. Because of the increased expense and difficulty of operating a plant in the winter, many plants whose capacity is such that they can treat the required amount of timber during the summer season close down during cold weather soon after they have completed treating that season's requirements. As a result ties are required the following spring almost as soon as the plant begins operation and are put into the track as fast as they can be taken from the cylinders. The detrimental effects of this practice have been observed with ties treated with zinc chloride more than with those treated with creosote. The rapid corrosion of track fastenings, especially spikes in zinc chloride treated ties, has been noted in some instances and has been generally attributed to lack of seasoning of the ties. The rapid drop in potential of track circuits for signals and crossing bells which has been observed where such ties have been used has also been attributed to the same cause. The detrimental effects of a too quick insertion of creosoted ties are, however, of a different nature and are reflected in the tie itself. Not only are ties which have thoroughly dried out after treatment much less disagreeable to handle, but they are more solid throughout, as would be expected to be the case

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after the oils which tend to soften the fibres have evaporated. This also tends to give greater strength to the timber itself, which is desirable. On one road where a quantity of ties had been allowed to stand for about a year before being put in the track, the section foremen reported that it was more than usually difficult to drive spikes into them. This same effect is brought out in the tests conducted on the Atchison, Topeka & Santa Fé on "Long Leaf Pine Bridge Timbers," an abstract of the results of which was published recently in these columns. While these tests were carried out on long bridge timbers, and they were subjected to stresses different from those to which ties are subjected in the track, the same qualities of increased strength and toughness are desirable in both. While an increase in the time allowed for seasoning ties increases the amount of money tied up in them, at least two roads have concluded that the advantages gained by this seasoning after treatment are of sufficient importance to justify the expense and are taking the steps necessary to secure these advantages by operating their treating plants throughout the winter.

PERIODICAL BRIDGE INSPECTION.

IN a paper on "Railroad Bridge Design in Europe and America Compared," presented to the Western Society of Engineers on February 10, the author draws a number of comparisons which in general are favorable to American methods. But in discussing the testing and inspecting of bridges he takes occasion to approve the European practice. He points out that the matter of tests is given no mention in American bridge specifications while it is a prominent feature of the regulations governing design on European roads. He speaks favorably of the use of test trains, whose composition and placing are minutely given in the French railway regulations, and of the periodical inspection which is denied and required by the Prussian regulations, contrasting the practice in both these respects with that in the United States, where, he says, "such matters have been left entirely with the maintenance of way department."

While it is no doubt true that "there is not enough periodical inspection of bridges in America," the author's implication that all such inspection is handled by track men who are not competent to judge of the condition of bridges cannot be substantiated. The inspection by trackwalkers, of all bridges covered in the track inspection, is the only form of inspection that comes under the track department, and it is intended only to guard against damage to the structure from drift, high water, slides or train accidents, which would make immediate operation unsafe. In addition to such inspection there is probably not a road of importance in the country which does not have some method of bridge inspection by experienced bridge men. While they may properly be classed in the maintenance of way department on some roads, they are apparently not so classed by the author of the paper.

The fact that American specifications do not cover the testing and inspecting of bridges as is customary in Europe is no reflection on American practice. In this country a railway draws up specifications governing the design, construction and erection of bridges, work which is handled wholly or in part by contract. Since periodical inspection of bridges in service is made by company employees and not by contractors, the roads' regulations for inspection naturally take the form of instructions to the men responsible for the work. In Europe the bridge specifications are usually prepared and enforced by the governments. Design, construction and maintenance are all handled by the road or its contractor in accordance with the specifications of the governments, and for this reason all these points are covered in one set of specifications.

Although test trains for periodically determining the strength of bridges have not been used to any great extent in this country, at least one prominent road, the Pennsylvania Railroad, does use this system. Serious doubts as to its efficacy have been raised recently by bridge men because the test made on a bridge near Glen Loch, Pa., on November 26, failed to detect a condition which caused a wreck the next day.

The paper considers only steel structures, which explains the statement that "bridges that are properly designed and not overloaded practically never wear out," and the inference, in the discussion of rivet strength, that the provision for frequent inspection is tantamount to a confession that the structure is not properly designed. But, granting the truth of the first statement as to steel bridges, the second does not necessarily follow even for such structures. Inspections are made as much to avoid failures as to detect them. Under certain conditions such as a movement of the substructure or the closing of an expansion joint, the action of a properly designed bridge may be so changed as to be equivalent to a change in the loading. Even if new bridges designed according to present standards need no inspection, there are very few roads on which all structures fall within this class. Since the erection of the older bridges on most lines, train loads have increased, foundations have weakened and steel connections have deteriorated so that there are now structures in various degrees of serviceability. In addition to these, most roads have built timber structures which admittedly require careful inspection to insure their safe condition. So no road can afford to overlook regular and frequent bridge inspection.

The American Railway Engineering Association has realized this and includes in its Manual a set of instructions for bridge inspection which provides for inspection of three kinds: First, by regular track forces daily or as often as they inspect the track; second, by bridge foremen at regular intervals of from one to six months, and third, annual or semi-annual inspections by men experienced in bridge design and maintenance, and primarily responsible for the maintenance of bridges on the entire road. The association regards these three inspections as the least a road should do to make its bridges safe. A number of roads are doing even more than this, and all are gradually coming up to that standard as a minimum.

On account of the widely differing forms of organization on American roads the systems of inspection vary considerably. The inspection by track men is more uniform than the other two forms, for trackwalking by some member of a section gang is practically universal, and it is obvious that such an inspection made primarily to insure the safety of the track should also include the bridges.

There is probably greater variation in the method of making the second type of inspection than in the case of either of the other two, and many roads have not yet adopted any system which can be classed under this head. There is need, however, for some form of inspection between the frequent casual examination by an unskilled laborer and the infrequent critical inspection by a technical officer. On some roads each division has one or more bridge inspectors, who spend their time examining the structures on their territory and reporting monthly to the division officer in charge of bridge maintenance. Such men are usually picked from bridge gangs so that this inspection is not very different from that on roads which require the division bridge foreman or master carpenters to regularly examine all structures under their supervision.

On roads having a bridge engineer the technical inspection is usually made by him in person, although in some cases this is done in theory only, and inspectors from the bridge engineer's office handle most of the detailed work. In some cases the bridge engineer takes an engine and business car and makes one trip over the entire system, inspecting personally in detail all bridges of a certain span or class. In other cases the bridges are covered in a general inspection of track which is participated in by the division officials, the bridges receiving the attention of the bridge engineer, the division superintendent, the division engineer or master carpenter, and perhaps also the local bridge foreman.

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Letters to the Editor.

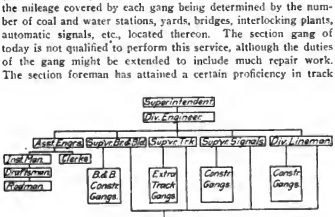
A SUGGESTED ORGANIZATION FOR COMBINED FORCES.

CHICAGO, December 20, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

There is a feeling among many operating officers that the maintenance organization should be rearranged to eliminate certain losses and effect a higher state of efficiency. Numerous ideas on the subject have been advanced, which have at least provided a foundation for further development and several practical tests are now being made, the results of which should furnish interesting data for future progress. It is a usual occurrence, under present conditions, to see men of the various departments, such as linemen, bridge men, signal men, carpenters, water service men and others, leave their division headquarters on the morning train and return on the evening train, and in the majority of cases the aggregate time spent in actual labor represents a small proportion of a day's work.

The logical solution of the problem is to establish maintenance gangs at various points on the division to maintain all structures, the mileage covered by each gang being determined by the number of coal and water stations, yards, bridges, interlocking plants, automatic signals, etc., located thereon. The section gang of today is not qualified to perform this service, although the duties of the gang might be extended to include much repair work. The section foreman has attained a certain proficiency in track



Proposed Organization for Maintenance of Way Department.

work, by many years' experience, but there are few who are mechanics or who have any perception of mechanical devices, and as most of them are middle aged men, there is slight probability that they will acquire a practical knowledge of other work. There are many men on the division who might be developed into good foremen for maintenance gangs, but there is one man who is already well qualified for the position; this man is the signal construction foreman, who is a good electrician, carpenter and blacksmith, is a good man on concrete work, is familiar with the gasolene engine and its operation, understands the use of tools, is accustomed to work from plans and blue prints and to conform to the company's standards and in fact must be an all around mechanic who will tackle anything and accomplish it in a workmanlike manner.

The organization of the gang would depend upon the particular requirements of the section in question, but in general there should be an assistant foreman, a few fair mechanics and as many laborers as are necessary from time to time. The gang should have a motor car and a standard complement of tools. With such an organization and equipment a foreman could maintain everything on a territory several times the mileage of that now covered by the section gang. He would lay out his work each day and assign the various jobs to the best advantage. Several jobs might be in progress at the same time—the foreman with some laborers repairing an interlocking plant, telegraph or telephone apparatus; the assistant foreman with a few laborers putting in new ties, a new rail or repairing a bridge, while each of the mechanics with a few laborers might be unloading company material, cleaning up the right of way and station grounds or other work. The daily patroling of the track could be assigned to capable men of the old section gang, who, while they were not doing this could help on other work.

A first class foreman could be obtained for $90 or $100 per month, but on sections that did not require an all around man the salary could, of course, be less, based on the requirements; the assistant foreman should receive from $50 to $65 per month, the mechanics from 20 to 25 cents an hour and the laborers about 15 cents an hour. In addition to providing an efficient and economical organization this arrangement would also provide an excellent training school for maintenance employees and there would be an incentive for bright young fellows to engage in the work, as there would be far greater opportunity for steady advancement than under present conditions where young men of the right kind do not seek positions on the section because the pay is low, the work mostly routine and the chance of advancement small.

The establishment of a maintenance of way gang as outlined above would necessitate a rearrangement of the division organization and the following organization is suggested. The division superintendent of today is a busy executive officer and as he has an assistant superintendent and a train master to direct transportation matters, and a master mechanic to direct motive power and equipment matters, so he should have an officer to direct maintenance of way matters, as is now the practice on some roads. As maintenance of way comprises engineering work the division engineer is the logical head to direct these matters, to whom should report the supervisor of bridges and buildings, the supervisor of track, the supervisor of signals and the division lineman, where one is required, also the assistant engineers, draftsmen, clerks, etc. The maintenance foreman should report to the division engineer through the supervisors of track, signals, etc., and receive instructions from the several supervisors. The various kinds of addition and betterment work require numerous construction and extra gangs; these gangs should be under the direction of the proper supervisor. The chart shown herewith is a graphic representation of such an organization. On a small road or on branch lines where there are few special structures or apparatus it would be an economical arrangement to send a maintenance gang over the line from station to station, as required, to make necessary repairs, the repairs to be made being determined by the division engineer from an inspection trip over the line at certain specified periods. This gang should have good bunk cars, material cars, a tool car and also a cook car when good board is not available at reasonable prices.

F. W. RIZER,
Assistant Engineer, Chicago, Burlington & Quincy.

OUR PRESENT TRACK CONSTRUCTION.

OMAHA, Neb., February 10, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In the *Railway Age Gazette* of December 20, 1912, there appeared an article entitled "Advantages of Renewing Ties to Face," by R. P. Trabue, roadmaster of the Nashville, Chattanooga & St. Louis. I attempted this about 30 years ago and am still fully convinced of the many advantages of this system, but gave it up because railroads in that day, and to an extent yet, have periods of "economizing" when unsatisfactory operating methods prevail, including the deferring of maintenance expenditures—arbitrary cutting down of requisitions for rails, ballast, ties for renewal, etc. While track which has been maintained under the ordinary method will stand two or three years of this "economizing," if in fairly good condition, it is a very serious matter if there are sections of from 2,000 to 3,000 ft. in a place that should be renewed to face.

Mr. Trabue states, in this article, that "The last advantage is what I consider the most important to be obtained by the method

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of renewal of ties in continuous stretches, a more uniform degree of rail bearing. Experience with both methods of renewals has shown that the greatest safeguard against broken rails lies in the highest possible degree of uniformity of resistance of the ties. Statistics show that the number of derailments caused by the broken rails is greater than that due to any other defect of railway roadbed. (See *Railway Age Gazette* of January 12, 1912.) These same statistics show an average of one broken rail for every 714.4 rails in track, of Bessemer steel. On 139 miles of main line track on this division laid with 80 lb. rail, open hearth and Bessemer, two rails broke in 24 months, or an average per year of one broken rail for 44,480 rails in track."

The advantages of renewing ties to face are much greater in stone ballast than in gravel, chats, or dirt, both as to the cost of renewal and the uniformity of rail bearing obtained, but barring defective rails and equipment, rails break because of uneven bearings, and not because the rail cannot carry the moving load from tie to tie or with every other tie removed.

It is safe, however, to conclude that no considerable percentage of the differences shown between the broken rail record of the country at large and that of the Nashville, Chattanooga & St. Louis, is attributable to the system of tie renewal. The Nashville, Chattanooga & St. Louis has a very old and well seasoned roadbed, well drained and ballasted, and not a very heavy tonnage, in a climate where the thermometer rarely falls to zero and where the temperature is below the freezing point but a very small portion of the time. Many rails have been broken when the temperature was extremely low, and the roadbed frozen solid. Under these conditions, in some cases, 20 or 30 rails have been broken in a few hours by a single pair of flat wheels. I believe it will be conceded that no sound rail of 80 or 90 lb. section will break, except under very defective equipment, if it has even bearings at intervals of two feet which are not more compressible than timber and crushed stone and are not loaded beyond their elastic limits. By renewing ties to face approximate uniformity of bearing, so far as the action of the tie is concerned, is obtained and maintained for several years, and at all times is more nearly uniform than in the usual method. So far as the ballast is concerned a nearer approach to uniformity is possible and maintainable than when ties are put in here and there every year; but we are skating on thin ice if these differences account for five per cent. of the broken rails.

In 1881 a lot of 56 lb. rails was rolled, some of which are still doing service. If one of these old rails is taken from the track, laid on the ties and turned over and over it will be seen to have a succession of kinks in every direction from one end to the other. These rails have rarely broken and they have carried loads on dirt track which have broken 80 lb. rails on ballasted track. The axle loads have more than doubled since these rails were rolled and while then our high speed trains were made up of light passenger equipment, they now have axle loads as great or greater than our freight. Add to this the fact that we have raised the center of gravity of our engines in the meantime probably two feet, until they are undesirably high and as high as designers dare make them, causing a rolling which greatly increases the vertical load on one rail or the other; the increase in dynamic effect of the unbalanced part; the fact that the present high stiff rail cannot adjust itself to the uneven bearing upon the ties as the light limber rail could; that it is difficult, if not impossible, to make the present heavy rail compare with the old 56 lb. rail in quality; and that the whole load rests on the same width of sub-grade as before; and we will find, I believe, that the service calls not for 80, nor 90, nor 100 lb., but for 120 lb. rails to insure the same degree of safety, so far as broken rails are concerned, as we had with the 56 lb. rail.

Rails rest directly on ties that are continually decaying and failing in their support. The change that takes place in the course of the life of a tie is enough to make proper support of the rail by the tie impossible, regardless of the condition of ballast and sub-grade. The tie rests on ballast of various kinds which is continually working and grinding and crushing, and even when of such a nature that it is not affected by frost or water, it is continually failing in its support, and more rapidly in some spots than in others. In turn, the ballast rests on earth material subject to great variation in its ability to support ballast owing to the different degrees of moisture and frost action which may also lift places of varying sizes and abruptness, so we see we are dependent on three undependable factors for bearings for our rails.

Considering the rail as a continuous girder, loaded in a specific way, and leaving out of consideration the accidental excessive loading due to flat wheels and other equipment defects, we do not know the length of span nor the initial stresses necessary to make the girder take its bearings. In fact, we do not know what our rails are subjected to with any degree of certainty. The heavy axle loads have undoubtedly come to stay and to increase still further, while our track design is becoming more and more unsuitable. The old oak pole tie, once in the majority, is falling further and further into the minority. By heavier rail, tie plates, screw spikes, timber treatment, more ballast, better drainage, and by the never ending tamp, tamp, tamp, of the section men the losing fight is prolonged only to finally force the adoption of a track design that will transmit the load on the rail to a level below the action of the elements making it relatively permanent, and positive in action.

There are no signs of an evolution from the present position to a scientific solution of the problem, and every radical change in the plan of railroad track supports thus far suggested involves greatly increased first cost, and doubtful results. The necessity for extensive and very expensive experiments at this time is apparent, but it is hardly likely that the required funds for any real improvement along these lines will be available so long as the roads are in the hands of inexperienced, ignorant, and hostile committees, commissions and politicians. In fact, it seems more probable that if the present trend of affairs continue for another five years it will be impossible to meet the requirements for transportation even as efficiently and safely as at present.

E. Holbrook,
Special Engineer, Union Pacific.

ABSTRACT OF ENGINEERING ARTICLES SINCE JANUARY 24, 1913.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since January 24, 1912:

Lift Bridges Over the Buffalo River.—The construction of three movable bridges replacing fixed spans over the Buffalo river at Buffalo, N. Y., involved some interesting work, particularly in the substructures. The piers for one of these bridges consisted of pairs of cylinders which were built inside of steel sheet piling cofferdams. This work was described in an article by Emile Low, consulting engineer, Buffalo, N. Y., in the issue of January 31, page 197.

A Continuous Rail.—A composite rail having a removable head which is cramped over a base section, the two sections having staggered joints, was described in the issue of January 31, page 207.

American Wood Preservers' Association.—The election of officers and business at the closing session of the Wood Preservers' convention which were too late to include in the last maintenance section, were mentioned in the issue of January 31, page 217.

Base Failures in Rails.—A letter by Paul M. La Bach, assistant engineer, C. R. I. & P., commenting on the causes of base failures in rails, was published in the issue of February 7, page 237.

An Analysis of Steel Ingot Manufacture.—A discussion of the six ingot defects to which forging steel is ordinarily liable and the means for correcting them, written by Bradley Stoughton, consulting engineer, New York, was published in the issue of February 7, page 245.

The Grand Central Terminal, New York.—The new Grand Central Terminal, New York, opened for service Sunday, February 2, which is one of the most unusual passenger stations in the world, was illustrated and described in the issue of February 14, page 279.

A Large Car Ferry.—A new ferry boat, the "Contra Costa," which will be the largest ferry boat in the world, being built by the Southern Pacific for operation between Port Costa, Cal., and Benicia, was described in the issue of February 14, page 288.

D., M. & N. Station at Hibbing, Minn.—The construction of a combined concrete and timber station for a small city was described in the issue of February 14, page 291.

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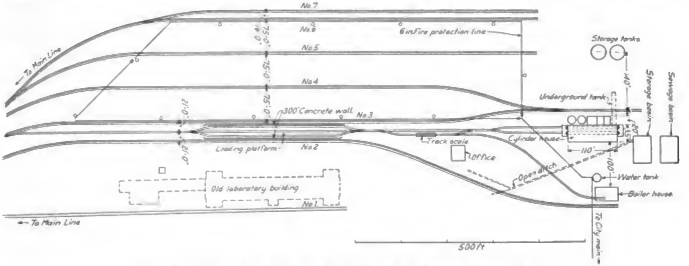
TREATING PLANT FOR CENTRAL OF GEORGIA.

The Recently Completed Facilities at Macon, Ga., for Preserving Ties and Timber by Three Alternative Processes.

During the early part of December, 1912, the Central of Georgia started to operate its new wood preserving plant at Macon, Ga. Before the construction of this plant the officers of the road made extensive investigations throughout the country as to the best manner in which to preserve their ties and, since from 50 to 60 per cent. of the ties they were using were oak and cypress, and the rest inferior long leaf yellow pine, they decided to treat the pine ties with the empty cell creosote process, the oak ties with zinc chloride, and all piling, bridge and trestle timbers with the full cell creosote process.

They decided to locate the plant at Macon, Ga., which is near the center of the system and makes a very good receiving and distributing center. It is just outside the city on the main line to Atlanta, where the company owned about 80 acres of available property, high and dry, with good drainage. The creosote storage tanks were located at Savannah, so that the tank steamers from Europe, which bring in the principal supply for this plant, could discharge directly into the storage tanks. A total storage capacity of 1,000,000 gal. is provided in two tanks.

The present yard consists of seven tracks, leading from the main ladder, all arranged for both the 36 in. gage and the standard gage equipment. The main ladder is laid with 70-lb. rails and the storage tracks with 56 lb. The plant is located at the opposite end of the yard from the main line connection,



Layout of Timber Treating Plant for Central of Georgia at Macon, Ga.

with the loading platform between the ladder and the cylinder building.

The boiler house and storage tanks are located 100 ft. and 140 ft., respectively, from the cylinder house in opposite directions in order to reduce the fire risk. A 6-in. fire line is also provided around the storage yard, which is connected to a 1,000 gal. fire pump and a 50-ft. tank having a capacity of 50,000 gal. All buildings are of steel construction.

The loading platform is located about half way between the cylinder house and the ladder tracks. It is 300 ft. long, with

Storage Tanks, Working Tanks, Cylinder House, Water Tank and Boiler House at Central of Georgia Treating Plant.

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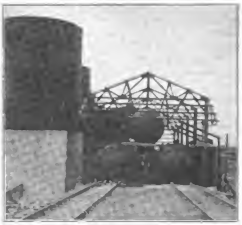
The Loading Platform.

One of the Shelter Houses for Hose Reels Along the Fire Protection Line.



End View of Cylinders.

Piling Timbers with Locomotive Crane.

Side View of Cylinders and Measuring Tanks Under Construction.

three-rail tracks on each side which are 42 ft. center to center. This platform is 4 ft. high with walls of reinforced concrete retaining an earth fill. On this fill are laid three 36-in. gage tracks. Between the cylinder house and the loading platform there is located a track scale in order to check the treatment from time to time as may be necessary. This is a narrow gage scale of 50 tons capacity of the Fairbanks type, with registering beam for recording exact weights.

The creosote is transported to the plant from the storage tanks at Savannah in 10,000-gal. tank cars, which are set in on track No. 3, over a cylindrical underground tank. When the creosote has been heated to the proper temperature, the bot-

Rear View of Boiler House, Cylinder House and Storage Tanks at Macon Plant.

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tom connection of the tank car is opened and the creosote drops by gravity into the underground tank in a few minutes. Two general service pumps located in a pit at one end of this tank pump the creosote to the two storage tanks, and from them to the working tanks as it is needed. This arrangement has proved to be economical for handling hot creosote with the least trouble. The storage tanks have a capacity of 150,000 gal. each, and the working tanks 44,000 gal. each.

Fused zinc chloride in drums is delivered in box cars which are also set on track No. 3. The drums are stored in the zinc chloride room, where they are emptied directly into a concrete mixing sump near the underground tank from which the chemical is syphoned into No. 1 overhead tank as needed in the treatment.

The cylinders are 7 ft. in diameter by 116 ft. long, made of ¾ in. flanged steel plate and designed for a working pressure of 200 lb. per sq. in. The cylinders are set up on concrete foundations so arranged that a man can walk under them. The cylinders have a combination pressed steel and cast steel door on each end, which are strong, light and easy to handle. Just above the two working cylinders is located an air and creosote reservoir or Rueping cylinder and on the inside of the building, adjacent to the cylinders, are two 7,000 gal. measuring tanks, which are direct connected to the pressure pumps, cylinders and outside measuring tanks. The two working tanks just outside of the building, are set up on reinforced concrete piers, and these tanks are so arranged that the Rueping cylinder, as well as the measuring tanks in the building, can be filled by gravity.

The piping is so arranged that the zinc chloride treatment can be carried on in either cylinder while the Rueping or full cell process is being carried on in the other. For maintaining the pressure on the cylinders there are two pot valve pressure pumps designed for a working pressure of 300 lb. per sq. in. A Deane vertical uniplex vacuum pump is used to create a vacuum in the cylinder, and an Imperial type air compressor having a capacity of 650 cu. ft. of free air per minute furnishes compressed air to operate the Rueping process and blow back the creosote to the working tanks. One end of the cylinder house is partitioned off to form a shop and generator room which contains a 10 k. w. generator and switchboard furnishing light to the plant and yard.

The boiler house contains two 150 h. p. Scotch marine internal furnace boilers, having a working pressure of 130 lb. per sq. in. In this boiler house there is also located the fire pump mentioned above, a boiler feed pump, and a Hoppes feed water heater. The steam line from the boiler house to the cylinder house and the return exhaust line are carried in overhead steam pipes, making a very neat arrangement.

A Porter locomotive weighing 47,000 lb. is used for handling the narrow gage tram and bolster cars as well as the standard gage cars in the yard. The locomotive is of 36 in. gage with special cast steel bumpers on each end.

C. K. Lawrence, chief engineer, and J. B. Maddock, engineer of bridges and buildings of the Central of Georgia, had supervision over the building of this plant, and Grant B. Shipley, Pittsburgh, Pa., was the consulting engineer. The plant is operated under the direction of Mr. Lawrence, J. H. Stewart being the superintendent in charge.

NEW LINE FOR GERMAN EAST AFRICA.—The German East African Central Railway will, it is announced, be opened for traffic this summer, two years before the arranged time. The line will run from the coast at Dares-Salaam, and cross the colony in a westerly direction to Tabora, one of the most important trading centers in the East African lake district. The length of the railway will be nearly 550 miles. The German government has determined to push on with the building of the remaining portion of the line as far as Ujiji, on Lake Tanganyika.

AN ACREAGE TABLE.

By JAMES G. WISHART,

Chief Draftsman, Chicago, Rock Island & Pacific, Chicago.

The table of acreages shown herewith is for use primarily in figuring railroad right-of-way. This property is usually of uniform width, the majority of it being 100 ft. wide. Where this is the case, the acreage for strips in lengths of even hundreds may be found directly in the first double column of the table. The acreage for lengths less than 100 ft. can be taken directly from the second and third double columns. By adding together quantities taken from two of these columns, the acreage

AREAS OF 100 FT. STRIPS OF LAND FOR LENGTHS GIVEN IN ACRES.

Length.	Area in Acres.	Length.	Area in Acres.	Length.	Area in Acres.
100	.2296	1	.002296	51	.117086
200	.4591	2	.004591	2	.119375
300	.6887	3	.006887	3	.121671
400	.9183	4	.009183	4	.123967
500	1.1478	5	.011487	5	.126262
600	1.3774	6	.013774	6	.128558
700	1.6070	7	.016070	7	.130854
800	1.8363	8	.018365	8	.133149
900	2.0661	9	.020661	9	.135445
1,000	2.2957	10	.022957	60	.137741
1,100	2.5252	11	.025252	1	.140036
1,200	2.7548	12	.027548	2	.142332
1,300	2.9844	13	.029844	3	.144628
1,400	3.2140	14	.032140	4	.146924
1,500	3.4435	15	.034435	5	.149219
1,600	3.6731	16	.036731	6	.151515
1,700	3.9027	17	.039027	7	.153811
1,800	4.1322	18	.041322	8	.156106
1,900	4.3618	19	.043618	9	.158402
2,000	4.5914	20	.045914	70	.160698
2,100	4.8209	1	.048209	1	.162993
2,200	5.0505	2	.050505	2	.165289
2,300	5.2801	3	.052801	3	.167585
2,400	5.5096	4	.055096	4	.169880
2,500	5.7392	5	.057392	5	.172176
2,600	5.9688	6	.059688	6	.174472
2,700	6.1983	7	.061983	7	.176767
2,800	6.4279	8	.064279	8	.179063
2,900	6.6575	9	.066575	9	.181359
3,000	6.8870	30	.068870	80	.183654
3,100	7.1166	1	.071166	1	.185950
3,200	7.3462	2	.073462	2	.188246
3,300	7.5757	3	.075757	3	.190541
3,400	7.8053	4	.078053	4	.192837
3,500	8.0349	5	.080349	5	.195133
3,600	8.2644	6	.082644	6	.197428
3,700	8.4940	7	.084940	7	.199724
3,800	8.7236	8	.087236	8	.202020
3,900	8.9532	9	.089532	9	.204316
4,000	9.1827	40	.091827	90	.206611
4,100	9.4123	1	.094123	1	.208907
4,200	9.6419	2	.096419	2	.211203
4,300	9.8714	3	.098714	3	.213498
4,400	10.1010	4	.101010	4	.215794
4,500	10.3306	5	.103306	5	.218090
4,600	10.5601	6	.105601	6	.220385
4,700	10.7897	7	.107897	7	.222681
4,800	11.0193	8	.110193	8	.224977
4,900	11.2488	9	.112488	9	.227272
5,000	11.4784	50	.114784	100	.229568
5,100	11.7080				
5,200	11.9375				
5,300	12.1671				
5,400	12.3967				
5,500	12.6262				
5,600	12.8558				
5,700	13.0854				
5,800	13.3149				
5,900	13.5445				
6,000	13.7741				

for any strip 100 ft. wide up to 6,100 ft. long can be determined directly. The acreage of right-of-way in other widths than 100 ft. can be determined by taking the acreage for a 100 ft. width and multiplying it by the proper width expressed decimally. The acreage of irregular tracts can be found by first reducing them to parallelograms. This table will be found especially valuable as a time saver in valuation work, tax reports, etc., where the right-of-way acreage is required to be shown in quarter sections.

PREVENTING TRACK BOLTS FROM RUSTING.—To prevent the nuts rusting on track bolts, the track walkers on the Pittsburgh & Lake Erie are supplied with a brush and a can of inferior grade lubricating oil. About once a year they oil the nuts with the brush as they make their regular track inspections. It is found that this practice very largely eliminates the necessity of cutting the nuts with a chisel when disconnecting the rail, and the proportion of bolts fit for further use after removal is much above the average.

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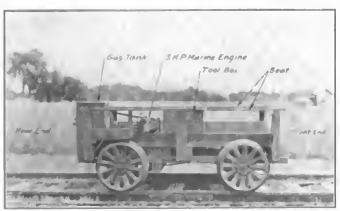
A "HOME-MADE" MOTOR CAR.*

By W. K. Walker,
Division Engineer, Missouri Pacific, Wichita, Kan.

As carpenter gangs are the highest paid laborers in regular maintenance work, it is necessary to get all work in their line done in the least time possible. On a line in a prairie country, with maintenance work consisting mainly of light repairs, such as renewing a few caps, stringers, sway braces, etc., one will readily realize that a bridge gang consisting of a foreman and eight bridge carpenters spends considerable time in going from one bridge to another. The repairs required for each structure are determined by a supervisor, a bill of material is made out and the material for each structure is unloaded from a local freight train ahead of the work. The carpenter gang follows and makes the needed repairs.

About 18 months ago I designed a home-made motor car to transfer the men from job to job quickly. The wheels, axles and boxes of an ordinary push car were used, to which was fastened a frame, 5 ft. wide x 6 ft. 6 in. long. On each side of the frame was placed a running board for the men to sit on when going to or coming from work. Located in the center and near the rear end of the car is a 5 h. p. marine engine which drives the car



A Home Made Motor Car.

by a chain drive and sprocket wheel connected to the front axle. The car has two speeds. The slow speed, from five to eight miles an hour, is used when making the heavier pulls and the high speed, from 20 to 25 miles an hour, is ordinarily used in going to and from work. The engine is water cooled and has dry battery ignition. The car is so arranged that a push car can be coupled behind it. No trouble is experienced in carrying nine men on the car and pulling the push car loaded with tools, etc., while the car is frequently used in transferring stringers, caps, etc., from place to place. Cost of the car was as follows:

Engine complete	$65.00
Labor and material constructing car	40.00
Other small parts	15.00
Total	$120.00

With a car of such small cost doing the work it does, one familiar with bridge work in a prairie country can very readily realize the saving from the investment. The cost of operation for oil and supplies is approximately two cents per mile traveled. From a close record of work accomplished by the car, I find that since it has been in operation an average daily saving of $2 has been made.

Snow Sheds on Transandine Railway.—The Chilean government has decided to spend $1,459,950 on the snow sheds, for better protection of the Transandine Railway from Los Andes to the tunnel through the mountains to the Argentine side. Traffic has been badly blocked during the winter months ever since the road was opened in April, 1910.

*Received in the contest on Bridge Kinks, which closed June 25, 1912.

COST OF RAILROAD CONSTRUCTION.

The following figures of cost of railroad construction west of the Rocky mountains have been compiled from the known cost of over one thousand miles of new railroad recently built on different lines, and while they are not an exact guide for estimates, or for work where conditions are special, they show an excellent average for modern railroad construction, with heavy rails, steel bridges over all important streams, high class ballast, timber lined tunnels and 3,500-ft. sidings 8 miles apart.

Engineering—Including general preliminary reconnoissances and locations with ample revisions, average per mile	$2,530
In heavy mountainous country	5,215
In moderately mountainous country	2,990
In fairly level country	1,190
Grading—With unit prices for solid rock 80 to 90 cents; loose rock, 38 to 42 cents; earth, 16 to 20 cents, per cubic yard; clearing, $45 to $50 per acre; grubbing included in grading. Average per mile of main line	22,100
In heavy mountainous country	120,500
In rolling country	7,860
In fairly level country	6,840
Tunnels—Average per lineal foot	94
In serpentine, fairly wet, lined	96
In hard limestone, dry, no lining	78
In rotten granite, shale, volcanic rock, wet, lined	92
In earth and broken limestone, wet, lined. Lining—Maximum, $24; minimum, $8.65.	151
Bridges, trestles and culverts—Average per mile	3,160
In heavy mountainous country	8,800
In fairly level country, no large streams, no high trestles, no steel spans	570
In rolling country, no large streams	1,260
Ties—Spaced 2,880 per mile of track; average	2,270
Rails—85-lb.	5,100
Frogs and switches	160
Track fastenings and other materials	850
Ballast—9 in. below the tie. Maximum, $660; minimum, $573.	610
Track laying and surfacing	1,160
Telegraph and telephone lines—Per mile	165
Station buildings and fixtures—Exclusive of all large stations	220
Engine house and turntables—Per mile of line	450
Machinery and tools for engine house	175
Water stations	575
Fuel stations	160
Legal expenses	400
Stationery and printing	47
Insurance and taxes	300

The foregoing table omits a number of items of cost which would be of no value if reduced to a per mile basis, and others which are special to each railroad. Readers who are interested in new railroad projects will do well to note that these figures of actual cost largely exceed the irresponsible and optimistic estimates which are generally given by promoters.

FACILITIES FOR CURVING RAIL.

By M. Ganley,
Roadmaster, Atchison, Topeka & Santa Fe, Argentine, Kan.

As more attention is being given each year to the proper curving of rail before placing it in the track, the importance of well arranged facilities for doing this work is increasing. The following arrangement has been found to work very satisfactory. A roadmaster can usually find some isolated track in a terminal opposite which he can build a platform about 70 ft. long and 10 or 12 ft. wide. This platform should be built level with the floor of a flat car and can be made of old car sills or other convenient material. A roller rail bender is bolted down about in the middle of the platform and a small sationary engine with a hoisting drum is placed at one end. An iron hook is fastened to the rope line leading to the drum.

When rail is to be curved, a carload of rail is set alongside the platform at the end opposite the engine and the rail is unloaded. One rail is then placed in the bender and the bender adjusted for the required curvature. The rails are then pulled through the bender one at a time by the hoisting engine and drum.

A gang of 18 men and a foreman have curved 180 rails in a day in this way. If the rail was being curved out on the road, the work would not be done as uniformly and the progress would be very much slower. Before undertaking to curve rails, the exact length and degree of curve for which the rail is intended should be furnished the foreman by the engineering department. The foreman can then curve and load it.

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SERVICE TESTS OF TIES IN EXPERIMENTAL TRACK.

Results Indicate That Treatments Have in General Increased the Durability of These Ties Over Similar Untreated Material.

The Forest Service in co-operation with various railways now has in service eight test tracks in various parts of the country in which the life of various kinds of ties and fastenings is being very carefully watched. With the exception of those ties in the track of the Chicago, Milwaukee & St. Paul which were treated in the experimental cylinders in the Forest Products Laboratory all the treated ties were prepared in commercial plants. The results of these tests are published in a bulletin of the Forest Service by Howard F. Weiss, director of the Forest Products Laboratory.

GULF, COLORADO & SANTA FE TRACK.

The oldest experimental track is that of the Santa Fe between Pelican and Cleveland, Tex., in which 5,477 ties were placed in February, 1902. The results of this test have been reported annually in these columns, the last report appearing in the issue of July 26, 1912. This test was designed to obtain information, first, as to the durability of ties made from untreated beach, hemlock, black, red, Spanish, turkey, white and willow oak, loblolly, longleaf and shortleaf pine, and tamarack; and second, as to the efficiency of the Allardyce, Burnett, Hasselmann and Wellhouse processes, and of preservative treatments with Beaumont oil, with spirittine, and with zinc chloride in combination with Beaumont oil and with English creosote. From this test the conclusions are drawn, first that zinc chloride is an effective preservative for ties subjected to the severe conditions under which these were laid; second, that a fairly heavy impregnation of zinc chloride is advantageous; third, that a light injection of creosote apparently adds to the effectiveness of zinc chloride treatments; fourth, that treatment with preservatives will not yield good results unless the ties are sound in the first place and the treating is properly done; fifth, that the great variation in durability of the different species in nearly all of the treatments indicates that some of the species were not properly treated, and sixth, that species which, when untreated, decay most rapidly appear to give the greatest relative increase in service when treated.

NORTHERN PACIFIC TRACK AT PLAINS, MONT.

There were 2,650 hewed ties placed in the main line of the Northern Pacific in 1907 in gravel ballast with good drainage conditions. This line is single track with a very heavy traffic. The objects of the tests were to ascertain the durability of green and air-seasoned untreated Douglas fir and western larch ties; the durability of burnettized Douglas fir and tamarack ties, and the efficiency of the flanged, flat, and wooden tie plates when used with cut or screw spikes. The ties were treated with a 6 per cent. solution, receiving an injection of 0.786 lbs. of dry zinc chloride per cu. ft. After being in the track four years an inspection showed that none of the ties indicated any marked difference in relative durability; Douglas fir ties were not checking as badly as the western larch ties; ties treated with zinc chloride were more rail-worn than untreated ties of the same species; untreated larch ties were more rail-worn than untreated Douglas fir ties, but were not as badly worn as the treated ties of either species; the flat metal plates were causing the ties less damage than any of the other plates used; flanged tie-plates caused more checking and brooming than flat ones. Wooden plates did not prove serviceable, as they worked out from under the rail and split badly; they did not prevent wear, of the ties; and, because of lack of support under the head, the screw spikes tended to become bent by the lateral thrust of the rail.

NORTHERN PACIFIC TRACK AT MAYWOOD, WASH.

About 2,280 sawed ties were placed in the main line of the Northern Pacific near Maywood, Wash., in the fall and winter of 1906-7. One 2 deg. and one 5 deg. curve are included in this test. The track is well drained, with gravel ballast. The objects of the test were to determine the durability of green and air-seasoned untreated Douglas fir and western hemlock ties; the durability of creosoted Douglas fir ties; the efficiency of flat tie-plates in preventing wear; and the relative efficiency of screw and cut spikes as rail fastenings. Four hundred and fifty air-seasoned Douglas fir ties were treated by the full-cell process. An inspection in June, 1911, showed that the green, untreated hemlock ties were beginning to deteriorate quite rapidly; the Douglas fir ties seemed to be better than the hemlock regarding checking, rail wear, brooming and decay; and, the creosoted Douglas fir ties were decidedly more rail cut than the untreated ties.

CHICAGO & NORTH WESTERN TRACK NEAR JANESVILLE, WIS.

About 3,040 hewed ties were placed in the main line of the Chicago & North Western, in December, 1907, to determine the natural durability of eastern hemlock and tamarack ties; the comparative efficiency of the Burnett, Wellhouse and open-tank creosote processes; the comparative efficiency of flat and flanged metal tie-plates and creosoted wooden plates; and of cut and screw spikes used with treated ties. The ties were treated with a 4 per cent. solution of zinc chloride, receiving an average injection of 12 lbs. per cu. ft. Those treated in open-tank with coal tar creosote absorbed about 15 lbs. per tie. On an inspection made in May, 1911, it was found that approximately 15 per cent. of the untreated hemlock and 13 per cent. of the untreated tamarack ties were so badly decayed that they were unserviceable, and that in addition, about 8 per cent. of the hemlock and 30 per cent. of the tamarack were affected with decay to a lesser extent; only two of the treated ties showed any evidence of decay; about 44 per cent. of the hemlock and 60 per cent of the tamarack ties which were untreated and unprotected by plates were rail cut to a depth varying from one-fourth to one-half inch, and practically all showed rail wear to some extent; there was no apparent difference in the condition of the ties equipped with flat plates and cut spikes, and those equipped with flat plates and screw spikes; many of the flanged plates were still only partially embedded in the ties and gravel was found under a good many of them; the damage to the ties with wooden plates appeared to be less than to those otherwise protected, but some of the plates were missing and many were split and damaged; lack of support under the outer portion of the head of the screw spikes had, in some cases, resulted in the spikes bending outward from the rail.

INDIANAPOLIS, COLUMBUS & SOUTHERN TRACTION COMPANY, NEAR TAYLORSVILLE, IND.

About 945 hewed ties were laid in the Indianapolis, Columbus & Southern Traction Company's tracks, in September, 1909. The roadbed was well drained; with gravel ballast. The object of the test was to secure the comparative efficiency of red and black oak ties treated with coal-tar creosote by the full-cell process, zinc creosote, and "asphaltic crude oil," using low pressures. Those ties treated with creosote were boiled in the oil at a temperature not exceeding 225 deg. F. from one to four hours, after which a pressure not exceeding 45 lbs. per sq. in. was applied until the desired absorption was obtained. Those treated with creosote and zinc chloride were first heated to 212 deg. F., after which they were impregnated with a 4½ per cent. solution of zinc chloride under a pressure of not more than 45 lbs. per sq. in. In the treatments with "asphaltic crude oil" the injection was very light. On account of the viscous nature of the oil it was not possible to apply pressure exceeding 20 lbs. per sq. in. with the apparatus used. After being in the track

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two years an inspection showed no badly decayed ties, although approximately 2 per cent. of those treated with about 14 lbs. of creosote per cu. ft., and approximately 12 per cent. of those treated with creosote and zinc chloride were slightly affected by decay; and a number of the ties of each treatment were more or less split on the ends. In practically all such cases, however, the exposed portions of the ties appeared thoroughly sound and well treated, and it is probable that the greater part of the splitting existed at the time of treatment. Only two of the ties showed any rail wear, and this was so slight as to be negligible.

OTHER TEST TRACKS.

Early in 1910, 920 sawed ties were placed in a track of the Birmingham Southern at Ensley, Ala., in slag ballast and poor drainage. The test was designed to secure information regarding the natural durability of longleaf pine and white oak ties and also the comparative efficiency of "cresol-calcium" and coal-tar creosote in protecting shortleaf pine, loblolly pine and red-oak ties from decay when treated by the low pressure process. These ties have been in too short a time to enable any conclusions to be drawn.

In July, 1910, 100 ties were placed in the main track of the Wenatchee Valley & Northern near Delmont, Wash. The ties were hewed on two faces with the bark on the other two and have not been in sufficiently long to furnish any results.

In August, 1911, 1,711 hewed and sawed ties were placed in the main line of the Chicago, Milwaukee & St. Paul near Hartford, Wis., on a well drained roadbed with gravel ballast. On about half of these ties are placed flat steel plates with a boss under the spike heads for screw spikes. The rest are unplated and the rail is fastened with cut spikes. The object of the test was to determine the natural durability of red oak and hard maple ties; the efficiency of the Burnett, Card, zinc-creosote, full-cell creosote, Rueping, and crude-oil treatments in protecting red oak and maple, and the kyanizing process in protecting spruce ties from decay; and the efficiency of flat-bottom plates when laid with screw and cut spikes in protecting ties from mechanical wear. Because of the short length of time this track has been in, it has not been possible to secure any results up to the present time.

In general, the results from these various test tracks indicate that with one exception, the treatments have increased the durability of the ties over those of similar untreated material. It is not economical to tie-plate ties with low decay resistance, such as loblolly, hemlock, beech and tamarack, if laid untreated, as they will decay, before they fail from mechanical wear. The increased resistance to decay secured from preservatives, makes it desirable to protect treated ties from deterioration by mechanical agencies. The experience gained thus far is not conclusive as to the best form of plates to use. Wooden plates, when simply laid under the rail, have not proved satisfactory, while flanged metal plates have a decided tendency to split the tie. The metal plates with flat or slightly corrugated bottom have thus far given the best results.

ROCK ISLAND LINES' ANNUAL TRACK INSPECTION.

The results of the annual track inspection of the Chicago, Rock Island & Pacific, which was made in December, 1912, has recently been made public. Prizes of $100 were awarded to the roadmasters whose track showed the greatest improvement on one division, or a group of divisions, while a prize of $50 was awarded the foreman making the greatest improvement on each roadmaster's subdivision. On this basis prizes of $100 each were awarded to roadmasters G. W. Kohn, Peoria, Ill.; T. H. O'Brien, Atlantic, Ia.; A. Burke, St. Joseph, Mo.; C. H. Gruver, Albert Lea, Minn.; J. Dulin, Oskaloosa, Ia.; J. Singleton, Des Moines, Ia.; V. B. Simpson, Eldon, Mo.; J. G. Hutchison, Clay Center, Kan.; C. B. Lane, Dalhart, Tex.; J. J. Breheny, Fairbury, Neb.; M. Dunnean, Goodland, Kan.; J. A. Trainer, Booneville, Ark.; R. T. Gollehon, El Dorado, Ark.; D. Bogue, Haileyville, Okla.; G. Woods, El Reno, Okla., and W. H. Gruhlkey, Amarillo, Tex. Forty-nine prizes of $50 were also awarded to section foremen.

THE TREATMENT OF DOUGLAS FIR WITH CREOSOTE OIL.*

By G. A. Coleman,
Coleman Creosoting Co., Seattle, Wash.

It is well known that Douglas fir is more difficult to treat than most eastern and southern pines. It is not surprising, therefore, that early operators, failing or having only indifferent success with the methods used for softer woods, should cast about for a more efficient treatment. As a result of these efforts but little new has been brought out. Two systems, nevertheless, have survived—the steam and vacuum process, refined and adapted to new conditions, and a new timber; and the boiling process. Good work can be done by the latter when conditions are ideal, but the great variety in the grain and density, and condition of seasoning of timber, especially piling, when treated in commercial quantities, renders the work very irregular, so much so, that in common practice from 5 to 8 per cent. of the treated material has to be returned for re-treatment. By the steaming process fairly uniform work can be obtained, as the effect of steaming is to render the timbers equal as to moisture, so that during the vacuum, the real drying period, the seasoning goes forward uniformly.

Unless first water seasoned, sun baked or air seasoned, timber cannot be successfully treated by the boiling process, as no part of the treatment has any effect on that hardened condition characteristic of Douglas fir. Results show that piling taken directly from the boom to the retorts will frequently have a penetration of 1½ in. on the under or wet side after treatment by the boiling process, while the upper or dry side will have almost no penetration. The effect of steaming is somewhat similar to that of water seasoning. Early operators undoubtedly failed with the steaming process, because of plants poorly equipped for maintaining adequate temperatures under the vacuum, and attempted to make up the deficiency by excessive steaming, sometimes as long as 24 hours, which is far beyond the point of safety. There is a critical point somewhat beyond the time of being heated through, beyond which steaming should not be carried, and which must necessarily vary with the dimensions of the timber. Yet, that wood may be subjected to a high temperature for a short period without serious injury is often demonstrated in the burning of mill constructed buildings. Large wooden columns in a fire of several hours will sometimes be half consumed, and yet under the charred surface the wood will retain practically all of its original strength. Wooden columns of sufficient size are preferred to unprotected iron by insurance companies on account of this remarkable quality.

There is quite a difference of opinion between operators upon the Pacific coast regarding the relative merits of these two processes. The plant with which the writer is connected uses either, as specified by the purchaser, but has been able to obtain the best results by the steam and vacuum process. This is evidenced by the fact that out of 14,000 piles treated during the past seven months by this plant, but 1,100 have been treated by the boiling process. Timber can be severely injured by either process if care is not taken, but the best tests we have so far made of wood treated by the boiling process show a depreciation of 23 per cent.; while one test showed 33 per cent. This depreciation is excessive and is no doubt accounted for by the long boiling period of 30 to 48 hours in oil heated to a temperature of 225 deg. Fahr.

It is announced that the Forestry Department will soon pub-

*Abstract of a paper read before the ninth annual convention of the American Wood Preservers' Association, held in Chicago, January 21-23, 1913.

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lish a report upon 9 in. x 16 in. timber treated by this process which will give us further information on this important point. Recent preliminary tests by the same laboratory on creosoted piling steamed six and seven hours, which is common practice, showed the excellent result of less than 10 per cent. depreciation, while an over-steamed test which showed a depreciation of 38 per cent. immediately after treatment, while yet soft, on further seasoning, recovered to 90 per cent. of its original strength.

It is not necessary, however, to extend the steaming beyond the point at which the timber becomes thoroughly heated through and uniform in moisture content. After the steaming, a vacuum, the most refined drying process known to the industrial arts, is begun and maintained at temperatures well below the boiling point until the wood is dry enough to receive the oil. The low average temperature at which this system of treatment is carried on undoubtedly accounts for the comparatively slight depreciation. That the fuel consumption per cubic foot of treated material is fully 25 per cent. less gives added evidence of the less heat units applied. In conclusion, therefore, in the opinion of the writer, two points recommend the steaming process, uniformity of penetration and a minimum depreciation.

ERECTING HOOKS FOR HANDLING DECK PLATE GIRDER SPANS.

By N. W. McCallum,
Supervisor of Structures, New York Central & Hudson River, New York City.

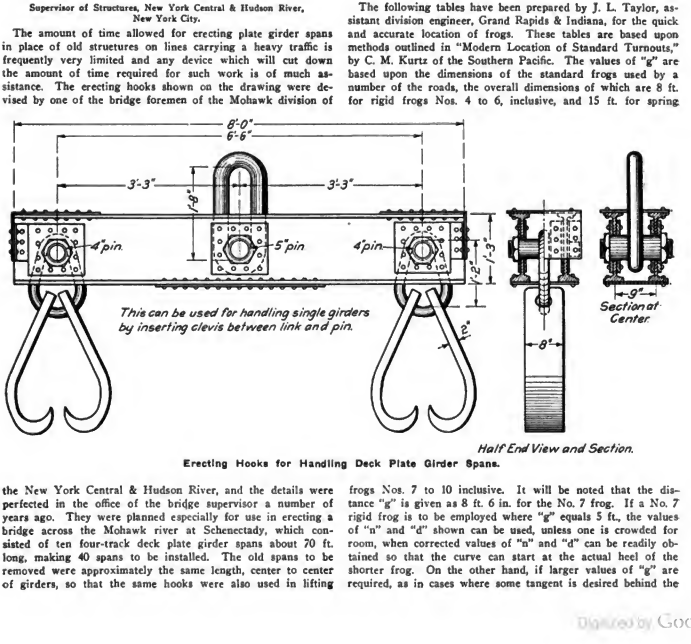
The amount of time allowed for erecting plate girder spans in place of old struetures on lines carrying a heavy traffic is frequently very limited and any device which will cut down the amount of time required for such work is of much assistance. The erecting hooks shown on the drawing were devised by one of the bridge foremen of the Mohawk division of the New York Central & Hudson River, and the details were perfected in the office of the bridge supervisor a number of years ago. They were planned especially for use in erecting a bridge across the Mohawk river at Schenectady, which consisted of ten four-track deck plate girder spans about 70 ft. long, making 40 spans to be installed. The old spans to be removed were approximately the same length, center to center of girders, so that the same hooks were also used in lifting them out. Since that time these hooks have been used in placing all other deck plate girders on this division. They have also been used for handling single girders by knocking out the end pins and putting in a clevis on the link carrying the hooks.

The device consists essentially of a built up steel section with a supporting link at the center and with two clamps on each end to pick up the girders. These clamps are spaced 6 ft. 6 in. between centers, the standard width center to center of girders for deck plate girder bridges on this road, for spans of approximately the length referred to.

Most of the deck girders are shipped already assembled. The steel is put in place with a wrecking crane, the top link of the balance beam hooks being passed over the hook on the load block of the crane. Each pair of hooks of the balance beam engages the top flanges of each girder of the assembled span. If the spans are too long to handle with one wrecking crane, two are used, one at each end, with a set of balanced beam hooks for each. These hooks save from seven to ten minutes time on each lift over the old method of handling such spans with chains, the saving depending, of course, on the size of the span and the weight of the chains.

A SHORT METHOD FOR LOCATING FROG POINTS.

The following tables have been prepared by J. L. Taylor, assistant division engineer, Grand Rapids & Indiana, for the quick and accurate location of frogs. These tables are based upon methods outlined in "Modern Location of Standard Turnouts," by C. M. Kurtz of the Southern Pacific. The values of "g" are based upon the dimensions of the standard frogs used by a number of the roads, the overall dimensions of which are 8 ft. for rigid frogs Nos. 4 to 6, inclusive, and 15 ft. for spring frogs Nos. 7 to 10 inclusive. It will be noted that the distance "g" is given as 8 ft. 6 in. for the No. 7 frog. If a No. 7 rigid frog is to be employed where "g" equals 5 ft., the values of "n" and "d" shown can be used, unless one is crowded for room, when corrected values of "n" and "d" can be readily obtained so that the curve can start at the actual heel of the shorter frog. On the other hand, if larger values of "g" are required, as in cases where some tangent is desired behind the



Erecting Hooks for Handling Deck Plate Girder Spans.

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TABLE OF TURNOUT MEASUREMENTS.

g = 5' 0" m = 19.90
b = 3.91 s = 4.26
f = 14° 15' 00"

No. 4 Frog

Curve Deg. Min.	n	d
15	90.03	—5.86
15 30	87.01	—5.50
16	84.17	—5.14
16 30	81.51	—4.81
17	79.01	—4.50
17 30	76.65	—4.20
18	74.42	—3.92
18 30	72.31	—3.66
19	70.31	—3.41
19 30	68.42	—3.17
20	66.62	—2.95
20 30	64.91	—2.74
21	63.28	—2.53
21 30	61.72	—2.34
22	60.24	—2.15
22 30	58.82	—1.98
23	57.47	—1.81
23 30	56.18	—1.64
24	54.94	—1.49
24 30	53.75	—1.34
25	52.60	—1.20
25 30	51.51	—1.06
26	50.45	—0.93
26 30	49.44	—0.80
27	48.46	—0.68
27 30	47.52	—0.56
28	46.61	—0.45
28 30	45.74	—0.34
29	44.90	—0.23
30	43.29	—0.03
31	41.79	0.15
32	40.39	0.33
33	39.07	0.49
34	37.84	0.65
35	36.67	0.79
36	35.57	0.93
37	34.53	1.06
38	33.54	1.18
39	32.61	1.30
40	31.73	1.41

g = 5' 0" m = 23.75
b = 3.69 s = 4.43
f = 11° 25' 16"

No. 5 Frog

Curve Deg. Min.	n	d
12	50.29	—3.78
12 30	86.52	—3.40
13	83.93	—3.06
13 30	79.81	—2.73
14	77.31	—2.43
14 30	74.93	—2.16
15	72.42	—1.90
15 30	69.99	—1.65
16	66.71	—1.42
16 30	64.57	—1.21
17	62.55	—1.01
17 30	60.63	—0.82
18	58.80	—0.64
18 30	57.16	—0.47
19	55.56	—0.31
19 30	54.03	—0.16
20	52.59	—0.01
20 30	51.21	0.13
21	49.90	0.26
21 30	48.65	0.38
22	47.46	0.50
22 30	46.32	0.61
23	45.23	0.72
23 30	44.19	0.83
24	43.19	0.93
24 30	42.23	1.02
25	41.31	1.12
25 30	40.43	1.20
26	39.58	1.29
26 30	38.77	1.37
27	37.98	1.45
27 30	37.23	1.52
28	36.50	1.60
29	35.11	1.74
30	33.82	1.87
31	32.62	1.99
32	31.49	2.10
33	30.43	2.20
34	29.43	2.30
35	28.50	2.40

g = 5' 0" m = 28.50
b = 3.54 s = 4.34
f = 9° 31' 39"

No. 6 Frog

Curve Deg. Min.	n	d
12	74.63	—1.06
12 30	71.48	—0.80
13	68.57	—0.55
13 30	65.87	—0.33
14	63.37	—0.12
14 30	61.04	0.07
15	58.87	0.26
15 30	56.82	0.43
16	54.93	0.58
16 30	53.14	0.73
17	51.45	0.87
17 30	49.86	1.01
18	48.36	1.13
18 30	46.95	1.25
19	45.60	1.36
19 30	44.33	1.47
20	43.12	1.57
20 30	41.97	1.66
21	40.87	1.75
21 30	39.83	1.84
22	38.83	1.93
22 30	37.88	2.00
23	36.97	2.08
23 30	36.10	2.15
24	35.27	2.22
24 30	34.47	2.29
25	33.70	2.35
25 30	32.96	2.41
26	32.25	2.47
26 30	31.57	2.53
27	30.91	2.59
27 30	30.28	2.64
28	29.67	2.69
29	28.51	2.79
30	27.44	2.88
31	26.43	2.96
32	25.49	3.04
33	24.60	3.11
34	23.77	3.18
35	22.98	3.25

g = 8' 0" m = 33.25
b = 5.93 s = 8.08
f = 8° 10' 16"

No. 7 Frog

Curve Deg. Min.	n	d
10	73.46	0.11
10 30	69.59	0.38
11	66.06	0.63
11 30	62.85	0.86
12	59.90	1.07
12 30	57.20	1.27
13	54.70	1.45
13 30	52.38	1.62
14	50.23	1.76
14 30	48.23	1.91
15	46.36	2.04
15 30	44.62	2.17
16	42.98	2.28
16 30	41.45	2.40
17	40.00	2.50
17 30	38.63	2.60
18	37.35	2.69
18 30	36.13	2.78
19	34.98	2.85
19 30	33.88	2.94
20	32.84	3.01
20 30	31.86	3.08
21	30.92	3.14
21 30	30.02	3.21
22	29.16	3.27
22 30	28.35	3.33
23	27.57	3.38
23 30	26.82	3.44
24	26.10	3.49
24 30	25.41	3.54
25	24.75	3.58
25 30	24.12	3.63
26	23.51	3.68
26 30	22.93	3.72
27	22.36	3.76
27 30	21.82	3.80
28	21.30	3.84
28 30	20.79	3.87
29	20.30	3.91
30	19.38	3.94

g = 8' 6" m = 38.00
b = 5.79 s = 8.14
f = 7° 9' 10"

No. 8 Frog

Curve Deg. Min.	n	d
1	795.79	—38.80
1 20	526.84	—27.45
1 40	419.93	—20.96
2	348.59	—16.51
2 20	297.63	—13.32
2 40	259.42	—10.93
3	229.69	—9.07
3 20	205.92	—7.59
3 40	186.46	—6.37
4	170.25	—5.36
4 20	156.53	—4.50
4 40	144.78	—3.77
5	134.59	—3.13
5 20	125.68	—2.57
5 40	117.81	—2.08
6	110.81	—1.64
6 20	104.56	—1.25
6 40	98.92	—0.90
7	93.84	—0.58
7 20	89.21	—0.29
7 40	84.98	—0.03
8	81.11	0.22
8 20	77.55	0.43
8 40	74.26	0.64
9	71.21	0.83
9 20	68.38	1.01
9 40	65.75	1.17
10	63.29	1.33
10 20	60.99	1.47
10 40	58.84	1.60
11	56.82	1.73
11 20	54.91	1.85
11 40	53.12	1.96
12	51.42	2.07
12 20	49.82	2.17
12 40	48.30	2.26
13	46.86	2.35
13 20	45.49	2.44
13 40	44.19	2.52
14	42.95	2.60
14 20	41.76	2.67
14 40	40.64	2.74
15	39.56	2.81
15 20	38.53	2.87
15 40	37.54	2.93
16	36.59	3.00
16 20	35.68	3.06
16 40	34.66	3.30
17	33.98	3.41
20	27.71	3.55

g = 8' 6" m = 42.75
b = 5.68 s = 8.18
f = 6° 21' 35"

No. 9 Frog

Curve Deg. Min.	n	d
1	626.50	—29.58
1 20	467.83	—20.77
1 40	372.63	—15.48
2	309.11	—11.93
2 20	263.84	—9.43
2 40	229.84	—7.54
3	202.40	—6.08
3 20	182.25	—4.90
3 40	164.94	—3.94
4	150.52	—3.14
4 20	138.32	—2.46
4 40	127.86	—1.88
5	118.79	—1.37
5 20	110.86	—0.93
5 40	103.87	—0.54
6	97.66	—0.20
6 20	92.08	0.11
6 40	87.07	0.39
7	82.54	0.64
7 20	78.42	0.87
7 40	74.66	1.08
8	71.22	1.27
8 20	68.05	1.45
8 40	65.12	1.61
9	62.38	1.76
9 20	59.80	1.90
9 40	57.55	2.03
10	55.37	2.15
10 20	53.32	2.26
10 40	51.41	2.37
11	49.61	2.47
11 20	47.91	2.56
11 40	46.31	2.65
12	44.81	2.74
12 20	43.38	2.82
12 40	42.03	2.89
13	40.75	2.96
13 20	39.53	3.03
13 40	38.37	3.09
14	37.27	3.15
14 20	36.22	3.21
14 40	35.21	3.27
15	34.25	3.32
15 20	33.34	3.37
15 40	32.46	3.42
16	31.62	3.47
17	29.99	3.60
18	27.22	3.71
19	25.58	3.85
20	23.71	3.91

g = 8' 6" m = 47.50
b = 5.58 s = 8.22
f = 5° 43' 29"

No. 10 Frog

Curve Deg. Min.	n	d
1	563.31	—23.00
1 20	420.43	—15.85
1 40	334.70	—11.37
2	277.56	—8.71
2 20	236.73	—6.67
2 40	206.12	—5.14
3	182.31	—3.95
3 20	163.26	—2.99
3 40	147.68	—2.21
4	134.69	—1.57
4 20	123.70	—1.02
4 40	114.28	—0.55
5	106.13	—0.14
5 20	98.98	0.22
5 40	92.68	0.54
6	87.06	0.82
6 20	82.07	1.07
6 40	77.56	1.29
7	73.48	1.50
7 20	69.77	1.68
7 40	66.38	1.85
8	63.28	2.01
8 20	60.42	2.15
8 40	57.79	2.28
9	55.35	2.40
9 20	53.08	2.51
9 40	50.97	2.62
10	49.00	2.72
10 20	47.16	2.81
10 40	45.44	2.90
11	43.82	2.98
11 20	42.29	3.05
11 40	40.85	3.13
12	39.49	3.19
12 20	38.21	3.26
12 40	36.99	3.32
13	35.84	3.38
13 40	33.70	3.49
14	31.70	3.59
14 20	31.76	3.58
14 40	30.85	3.63
15	29.99	3.67
15 20	29.16	3.71
15 40	28.37	3.75
16	27.62	3.79
17	25.52	3.89
18	23.66	3.98
19	22.00	4.07
20	20.50	4.14

g = 12' 0" m = 71.25
b = 5.54 s = 11.82
f = 3° 49' 06"

No. 15 Frog

Curve Deg. Min.	n	d
0 30	751.28	—19.90
0 40	566.51	—13.54
0 50	446.04	—9.72
1	369.24	—7.18
1 10	315.23	—5.36
1 20	274.35	—4.00
1 30	241.55	—2.94
1 40	217.12	—2.09
1 50	196.31	—1.40
2	178.96	—0.82
2 10	164.79	—0.33
2 20	151.71	0.09
2 30	140.81	0.45
2 40	131.28	0.77
2 50	122.86	1.05
3	115.38	1.30
3 10	108.69	1.52
3 20	102.66	1.72
3 30	97.21	1.91
3 40	92.26	2.07
3 50	87.73	2.22
4	83.59	2.36
4 10	79.77	2.49
4 20	76.25	2.60
4 30	72.99	2.71
4 40	69.96	2.81
4 50	67.14	2.91
5	64.51	3.00
5 10	62.05	3.08
5 20	59.75	3.15
5 30	57.58	3.23
5 40	55.54	3.29
5 50	53.62	3.36
6	51.80	3.42
6 10	50.08	3.48
6 20	48.46	3.53
6 30	46.91	3.58
6 40	45.44	3.63
6 50	44.05	3.68
7	42.72	3.72
7 10	41.45	3.76
7 20	40.25	3.80
7 30	39.09	3.84
7 40	37.98	3.88
7 50	36.93	3.92
8	35.91	3.95
8 30	33.11	4.04
9	30.62	4.13
9 30	28.39	4.20
10	26.38	4.27

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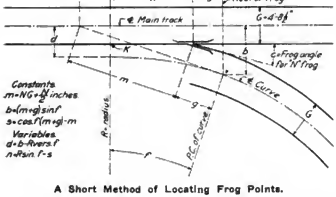
main track frog, corrected values of "n" and "d" are easily obtained as follows:

Corrected "d" = "d" (from table) + additional length × sin f.

Corrected "n" = "n" (from table) — additional length × cos f.

If corrected "n" is a minus quantity, the frog point is located on the side of "k" opposite that shown in the illustration. In maintenance work where the main or ladder track is a tangent, the accompanying tables are complete in themselves for either office or field work. In staking out new tracks, the parallel tangent distant "d" from the center of the main tangent can be used for the base line and intersections for diverging tracks can be made directly on this parallel tangent. Even when it is



A Short Method of Locating Frog Points.

desired to locate a turnout in a track already built to connect with a diverging fixed tangent, the intersection between the two tangents can be made directly at a point distant "d" from the center of the main tangent, reducing the field work necessary to ascertain the tangent distance for the assumed curve for the given intersection angle, as all other necessary distances are readily secured from the tables.

REMOVING SNOW SLIDES BY BLASTING.

At this season of the year when snow becomes a serious obstacle in the operation of trains, especially in the mountains, the following information relative to the use of dynamite, which was used for clearing the tracks in one instance, is of timely interest.

As a result of a slide across the line of one of the western railways the snow was banked about 40 ft. over the rails for a distance of about 600 ft. Because of similar slides at other points along the line, the forces clearing the track were unable to reach this particular slide for a period of 24 hours. At the time the slide occurred the weather was mild and the snow very soft, but it turned cold and the snow froze hard. When the rotary plow reached this point it was able to make little progress. It was suggested that the snow be moved by dynamite and although there were some fears of damage to the track, authority was given to try this method. Three 1¼ in. steel bars each 18 ft. long were welded together and forced through the snow to a distance of about 35 ft., or almost down to the track. Four or five cartridges of 40 per cent. dynamite were placed in this hole and fired by electricity as a springing charge. This hole was then loaded with 62 kegs of blasting powder and exploded, as a result of which the snow was removed to within about a foot of the track. Two or three similar shots cleared the remainder of the slide in about three hours' time so that the rotary could complete the work and open the line. Careful examination showed that the track had not been damaged. As a result of this experiment, the road has since used several carloads of blasting powder for this service with a large saving in time and money.

THE SECTION FOREMAN PROBLEM.*

By B. A. West.
Roadmaster, Atchison, Topeka & Santa Fe Ry., Pueblo, Colo.

I have been employed as track laborer, section and extra gang foreman and roadmaster, holding the latter position for the past 13 years, so I think I realize fairly well the problem of the future supply of track foremen. I have now as laborers Mexicans, Italians, Greeks and a very few Americans. My practice in training foremen is about as follows:

While around section, yard and extra gangs I carefully note the action and methods of the men in doing their work, the handling of their tools and the interest they take. Whenever a man impresses me as capable I carefully question the foreman regarding the length of time he has worked, his habits, his education, his family, his willingness and his ambition. If I am satisfied with the answers to these questions I place him on some important section, or in a yard where he can be employed steadily and where he can learn track work most rapidly and best. Whenever the regular foreman is called away this man is left in charge of the gang, or if material is needed this man is sent for it, and if he proves capable in these small duties I place him in a gang where a sub-foreman is needed. I have it understood by all foremen as well as laborers that the instructions of sub-foremen are to be obeyed just the same as those of the foremen. By selecting Americans from among our laborers I find that they have acquired to a certain extent the language of the foreigners and understand their method of working and their temper. They can direct such laborers to much better advantage than foremen who might be transferred from another part of the road and who had never had experience with these particular foreigners.

It is evident to me that the railways must depend almost entirely upon the foreigners for laborers in the track department, and for this reason the future supply of track foremen will have to be drawn largely from that class. In selecting men for foremen I make no distinction between the native white and the foreigner, and if a foreign laborer shows efficiency and intelligence and is more suitable than any available American, I place him as foreman. I always place a foreigner in charge of a gang of his own nationality. I always caution a foreign foreman to keep himself neat and make the men in his gang do the same, to keep their cars and bunk houses cleaned up, and to refrain from carrying dangerous weapons or quarreling with each other. I impress upon him the neeessity for overcoming the local prejudice against foreign labor, and I find that such foreign foremen in many instances get better results out of their men than an American hobo foreman who has never handled foreigners. The only drawback to making good foremen out of foreigners is their inability to read and write, making it hard for them to keep their labor distribution and reports correctly. When they learn the language I find foreign foremen just as competent as American foremen, in fact, some of them are better bookkeepers than the Americans.

Foremen should be kept posted at all times by quarterly meetings with the heads of the maintenance department; if not quarterly, these meetings should be held at least semi-annually. The men should be educated to transfer material and keep a correct record of the transfer, to make light repairs to depots or stock chutes, to set fixed signals, to patch holes in depot platforms, to replace window panes in depots, section or bunk houses, to note material required for repairs in stock yards or on chutes, to unload material for water-treating plants, and similar small jobs by which they could easily save the company more than the amount of their wages. The men also might properly be trained to take care of bonded track and to maintain automatic signals and crossing bells. I have seen a $3-a-day man sent out to fix a window pane who had to spend the en-

* Received in the contest on The Section Foreman Problem, which closed March 25, 1912.

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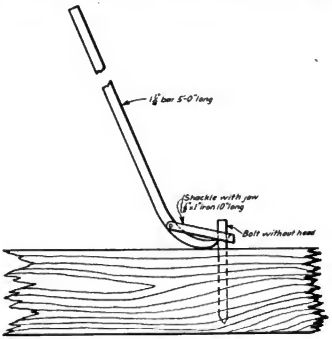
tire day on a job which could have been done in twenty minutes. I have seen five or six men at $2.75 a day sent out to unload a part of a car of treated water supplies and spend an entire day at it when a foreman and his gang could have done the same work in an hour's time. My suggestion is to educate foremen to do this work, and pay them a few dollars per month to induce them to make the effort necessary to learn to handle this work. Roadmasters and supervisors should be educated as well as the foremen. It might not be practicable to place all of the departments under one supervising head, but I suggest that there are at least several departments connected with maintenance of way that could be so combined with a resulting increase in efficiency.

A BOLT PULLER.*

By H. C. Swartz,

Master of Bridges and Buildings, Grand Trunk, St. Thomas, Ont.

The shackle bar is of use for withdrawing bolts without heads, as shown in the illustration. By pressing down on the bar the toe of the bar and the shackle grip two sides of the bolt and the harder the bar is pressed down the tighter is the



Shackle Bar for Withdrawing Bolts from Timber.

grip. By raising the bar slightly the shackle is loosened and a new grip can be secured. Where the bolt is too far down in the timber to secure a grip, a little adzing will usually enable the device to secure a hold on the bolt.

TIMBER FOR CREOSOTED BLOCK PAVING.†

By Harry G. Davis,

Manager Paving Department, Chicago Creosoting Co., Chicago, Ill.

There are several commercial woods in the Central West available for paving purposes, any of which are sufficiently strong for the purpose, and selection can be made from these as determined by the more technical features of wood preservation, such as the adaptability of the wood to treatment, and its power to withstand decay after treatment. These woods are Southern yellow pine, tamarack, hemlock and maple. The writer has had no opportunity to study Norway pine. One street paved in Chicago with black gum is not considered a sufficiently conclusive experiment to warrant one in forming a definite opinion as to that wood.

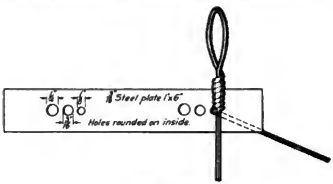
The writer knows from actual experience that each of these woods is adapted to treatment. Observations made at our plant during the past year show that maple is most easily treated, followed closely by tamarack and hemlock, all three greatly outclassing yellow pine in this respect. There is no doubt that hard maple is the strongest of the four, followed next by yellow pine, and then by tamarack and hemlock. But each is sufficiently strong for paving purposes.

A WIRE SPLICER.*

By H. C. Swartz,

Master of bridges and buildings, Grand Trunk, St. Thomas, Ont.

The wire splicer shown on accompanying drawing is used to splice wires without taking out the temper as is apt to be the case when the wire is wound without pinchers. This splicer is of special use in connection with semaphores where the wire has to be



A Wire Splicer.

covered and passes through pipes filled with oil, it being necessary to connect up the hardened wire in the pipes with the regular semaphore wire at either end. It is also useful in making "tell tales" for overhead bridges and for making coil springs.

PROPER USE OF TOOLS TO AVOID INJURY.†

By E. K. Coggins,

Chief Clerk to Roadmaster, Southern Railway, Knoxville, Tenn.

Many of the so-called unavoidable accidents that result in personal injury to maintenance of way employees would never happen if the foreman or man directly in charge of the work would perform his duty in taking the proper precaution to look after the safety of the men working under him. It very often happens that a section laborer or bridge man gets a badly smashed hand or loses one or more fingers, and the report of the accident simply shows that the party was injured while handling or setting a lever or ratchet jack. The fact is not brought out in the investigation that he was a new man who had not been instructed and that the injury could have been avoided if the foreman had taken a moment to explain the proper and safe way to handle the jack, had shown him that if the trigger or trip was sprung the jack would fall and had told him how easily he could be hurt if not careful.

Railroad companies spend a great deal of money to provide the proper tools and equipment for safe handling of heavy material, and a great many personal injuries could be prevented

*Submitted in the contest on Tools, which closed August 25, 1912.

†Abstract of a paper read before the ninth annual convention of the American Wood Preservers' Association, held in Chicago, January 21-23, 1913.

*Received in the contest on Tools, which closed August 25, 1912.

†Received in the Safety contest, which closed October 25, 1912.

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by the proper use of the same. Men are crippled every day by the careless handling of rail or heavy bridge timbers by hand, when the injuries could easily have been prevented and time and money saved in the work by using rail tongs, timber hooks, dollies, etc., which, if not on the ground, have probably been left on the cars or at the tool houses.

PREPARING FOR THE SEASON'S WORK.

By ENGINEER.

It is almost a truism that there is great economy in having work done at the proper time. When it is delayed the amount to be done increases rapidly, so that it takes more work to accomplish the same results. This is as true in railroad work as in any other line of industry, and in this article we would call attention to the great importance of having maintenance of way work done in the proper season. If it is neglected or postponed, its cost is increased, delays to operation are occasioned by inferior track and other delays result from the necessity for doing the work when the volume of traffic has greatly increased.

The coming month is the season of preparation for active spring work in the maintenance department which should start as soon as the frost is out of the ground. In the southern part of the country, where work can go on the entire year, this preparation is not so important, but in the northern and central states where it is still too cold for active work on the track, preparation should be made by deciding on what is to be done and making arrangements to carry it forward as soon as the weather will permit.

The larger items of new construction, improvements and repairs should have been fully decided on before this, so that in a general way the amount to be done during the coming season is known. It remains to decide on the details and determine what smaller repairs shall be made. The amount of ballast to be used on each division and branch should have been allotted; the number of ties each section is to have, and the amount of rail relaying to be done should have been fully investigated and settled by the higher officers; and maintenance forces should be making preparations for going ahead with all work, so that it will be completed in its right order.

The proper officer should make requisition for all material required, stating when and where it will be needed, so that the supervisor or roadmaster, the master carpenter and men in charge will know when to expect it and the supply department will have advance information and will not be behind in having the material on hand. The ordering of material may be emphasized as the first and most important work for this season of the year. If plans are not finished they should be completed at once and all officers who will have to do with handling the work should be fully advised as to what is to be done, and consulted as to the best method of doing it. All officers in charge of forces, supervisors, roadmasters, master carpenters, signal and telegraph superintendents, should have all tools examined to see that they are in shape for the season's work. Those needing it should be sharpened and repaired, useless tools should be discarded and needed additional tools ordered for all regular or extra gangs they expect to put to work. All gangs should be organized, on paper at least, so that when the time comes it will only be a question of giving the orders to get the work under way. It should not be necessary to make unforeseen shifts of foremen from one place to another, or of men, because it was not known they would be wanted. Work trains should be anticipated and trainmasters should arrange for them.

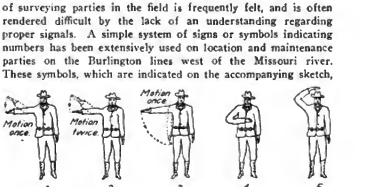
The supervisor should go over his track in detail with the section foremen to spot all weak places; to note what ties should be replaced and what rails should be taken out (except where a general renewal is to be made); to see that farm and highway crossings need to be put in good shape, especially when any have been moved on account of flangers; to see that fences and gates are ready for the heavier use they will get in the spring and that the section foremen are alive to the necessity of closely watching places that are shimmed so as to get the shims out and keep the track surfaced up promptly as the frost goes out. Just as the frost goes out, the track should be very closely watched, as in a few hours what was apparently a very well surfaced and safe piece of track may become a very rough and unsafe piece. Thick shims should be replaced by thinner and constant attention is needed to keep the track smooth. Experience has taught foremen the localities where this is likely to happen, for there are other localities where shims are unknown and this trouble is not serious.

Drainage should be looked after, so that when the spring thaws and rains come no damage will be done, and so that the track will not be soft and troublesome. Ditches, culverts and bridges should be cleaned and put in shape. The master carpenter should go over all his bridges and see what is needed at each of them, whether the piles are all sound and whether any of the timbers need renewing. Buildings should all be examined and repairs decided on, screens repaired or ordered, painting decided on, platforms gone over and needed repairs listed, sidewalks, streets, driveways and all plankings and pavements examined with a view to keeping them in good condition.

With these ordinary repairs decided on and material ordered arrangements should be made for getting men as early in the season as work can be begun. In the more southerly states, rail laying, putting in ties and ballasting may begin during March, but in the northerly states that is likely to be too early. Preparation should be made, however, to have the men ready to start the heavy work as early in the season as the weather will allow. "The early road catches the hobo." The best men are out early and the cheapest work is that done in the very early spring.

HAND NUMBER SIGNALS FOR ENGINEERS.

The need of communicating between two or more members of surveying parties in the field is frequently felt, and is often rendered difficult by the lack of an understanding regarding proper signals. A simple system of signs or symbols indicating numbers has been extensively used on location and maintenance parties on the Burlington lines west of the Missouri river. These symbols, which are indicated on the accompanying sketch,



Hand Number Signals.

are quickly learned, easily given and easily read, so that communication is rendered easy between a transitman and head chainman, or between other members of a party. These signals are shown on a blue print 3¼ in. x 7 in., suitable for mounting in a loose leaf book with other similar blue prints showing track and switch layouts, or the print can be pasted in the back of a field book. We are indebted to F. T. Darrow, engineer of maintenance of way, Burlington lines west of the Missouri river, for this information.

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CAUSES OF INJURY IN THE MAINTENANCE OF WAY DEPARTMENT.*

By E. H. Barnhart,
Assistant Division Engineer, Baltimore & Ohio, New Castle, Pa.

On the division with which I am connected there are 380 miles of main track maintained by 55 foremen under four supervisors. During the past year the minimum number of men employed in any one month was 465, and the maximum number 1,110. There were 42 personal injuries and one death to maintenance of way employees working on or about the track on the division during the year. Comparing the personal injuries with the average number employed during the year, one out of every 8,659 men was killed while one out of every 206 was injured.

It is interesting to note, in this connection, the comparison of injuries to those working under American foremen and those working under foreign foremen. Of the 55 foremen mentioned above, 11 men, or 20 per cent., are foreign born. Of the 42 personal injuries, 14 occurred to men working under foreign foremen. Thus, while only 20 per cent. of the foremen are foreigners, 33 1/3 per cent. of the total number of injuries occurred under their supervision.

An analysis of the manner in which these personal injuries occurred is pertinent here, and, from this analysis, conclusions may be drawn and remedies applied. For purposes of analysis, these causes will be classified under general heads, viz.:

Tools slipping, including misplacing jacks, bars, etc.	7
Flying spawls from tools, account using defective tools	4
Handling heavy material, men not working together	15
Careless use of hand cars—running too fast, men falling off, etc.	6
Weather conditions, slipping on ice, etc.	3
Foot caught in interlocking	1
Trackwalker riding local freight to where gang was working	1
Falling through car door while unloading material	1
Jumping from train on piece of coal	1
Miscellaneous	3

From the above analysis it is seen that the first five causes are responsible for about 80 per cent. of the personal injuries occurring during the year.

In my opinion there are five principal causes contributing to between 80 and 90 per cent. of the accidents to maintenance of way employees.

First.—Trackmen working on track do not pay proper attention to the work or are not careful to observe the movement of trains. It may seem strange that I should place this first, in view of the above analysis. Local conditions, however, are responsible for there being no accidents due to this cause. Of the main track mileage maintained, only about 26 per cent. is curved track, thus affording a good view to approaching trains. Another reason is due to the fact that, during October of last year, the Baltimore & Ohio published a book of rules in eleven different languages for the government of employees working on or about the tracks. These were distributed among foremen who were required to receipt for them. Rule 4 of this book reads as follows: "On the approach of a train, employees who are working on or about the track must move to a place of safety, standing clear of all running tracks. They must not walk or stand on the track except when necessary for the proper performance of their duties." We have been endeavoring to impress upon the foremen the importance of this rule, and, while all are not strictly observing it, the results shown above are very encouraging. This rule should be strictly enforced wherever possible on double track railroads.

Second.—Improper handling of heavy materials, such as rails, ties, etc. Thirty-five per cent. of our personal injuries during the past year occurred from this cause. Good results could be obtained if the foremen would designate some one of the laborers to act as spokesman when handling heavy material and require all of the men to lift or let go at his word. It would be well, also, to caution each man when it is necessary to handle any material. Constant care and watchfulness on the part of the foreman is needed, especially with the very large number of foreigners employed.

Third.—Improper handling of tools was responsible for 16 per cent. of the personal injuries. Here, again, the foreman should exercise constant care and watchfulness in the placing of jacks and in the use of mauls, claw bars, etc. Foremen cannot caution their men too frequently about exercising extreme care in the handling of tools. Supervisors should also be constantly on the lookout, in their frequent trips over the road, for the improper use of tools which are liable to cause injury to laborers.

Fourth—Careless use of hand cars caused 15 per cent. of the personal injuries. Our men all have instructions not to use hand cars in a fog; not to go around dangerous curves without proper protection and to keep themselves posted about the movement of trains whenever near a telegraph office. But, with all the instructions issued, foremen, and more especially foreign foremen, are very careless in the operation of hand cars. The one employee was killed as the result of the foreign foreman not informing himself about the movement of trains and an overdue first class train struck the hand car, throwing the man under the car.

Fifth.—The use of chisels with worn heads; handles with wind shakes, etc., was responsible for 12 per cent. of the accidents. A more rigid inspection of the tools in use by the supervisor or roadmaster would, I believe, remedy this condition. Our foremen have instructions to send a chisel to the repair shop for dressing as soon as it begins to wear. The injuries from this cause occurred in the earlier part of the safety campaign and I believe our foremen are beginning to realize that it does not pay to use defective tools.

It will require personal attention on the part of the supervisor or roadmaster, more especially with the foreign foremen who cannot understand written or typewritten instructions, to get the desired results. If we can reduce the number of injuries from one out of every 206 to one out of every 720, it will amply repay the extra effort put forth. It not only helps the head of the department, but the foremen are in shape to do better work and the company gets more efficient service.

*Received in the Safety contest which closed October 25, 1912.

A HAND DERRICK FOR LIFTING HEAVY TIMBERS.

By W. V. Parker,
Chicago, Rock Island & Pacific, Amarillo, Texas.

The hand derrick shown in the accompanying illustration has been successfully used by a bridge gang on one division of the Rock Island for the past year, and has been found to be very convenient for handling stringers, caps, floor beams and other

Small Hand Derrick for Lifting Heavy Timbers.

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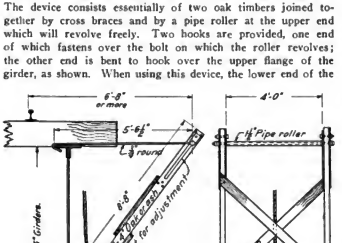
heavy members. The crab weighs 425 lbs. By using one snatch block, two men can easily raise timbers weighing 1,750 lbs. Four men are the entire force required to operate the crab while handling heavy timbers; replacing eight or ten men otherwise required. To prevent the crab from tipping, a rail clamp may be used which fastens over the ball of the rail on the side opposite the load. These clamps have not been used with this crab, however, and are not recommended, as their use prevents the moving of the crab. Rather, when necessary to counterbalance the load, old ties, guard rails, or other timbers are placed on the opposite side of the car, as shown in the photograph. The cost of this device, including labor and material is from $10 to $15.

A DEVICE FOR RENEWING TIES ON VIADUCTS.

By H. H. HARMAN,

Engineer of Bridges, Bessemer & Lake Erie, Greenville, Pa.

The device shown in the drawing has been found of much assistance when renewing ties on high viaducts, of which there are a number on our line. While the dimensions given are for the standard height of girders used on the Bessemer road, they can, of course, be changed to suit any other depth of girder. The device consists essentially of two oak timbers joined together by cross braces and by a pipe roller at the upper end which will revolve freely. Two hooks are provided, one end of which fastens over the bolt on which the roller revolves; the other end is bent to hook over the upper flange of the girder, as shown. When using this device, the lower end of the



A Frame to Assist in Renewing Ties on Viaducts.

frame is lowered into position on the outer lower flange angle of the girder by means of a rope, as shown, and the hooks are inserted over the top of the girder. When removing a tie it is forced out until the end reaches the roller, from which point it can then be very readily moved out to clear the outer rail and can either be dropped into the ravine below or be moved back on the track. A new tie is inserted in its place in the same way.

The use of this device enables ties to be put in much faster and with less danger of accident to the men than is ordinarily the case. The ties can be moved readily and the men are not required to lift out beyond the girders with the risk of falling to the ground. The device can be easily picked up and moved from place to place by two men.

NEW TRANSANDINE RAILWAY.—Engineers have now completed the plans for the new Transandine Railway the Chilean government intends to construct through the Maipo river valley, placing Santiago in direct communication with Buenos Ayres, Argentina, the journey taking only 30 hours.

THE FOREMAN PROBLEM.*

By JOHN C. PIERSON.

The men who hold the position of section foremen do not do so because they are satisfied, but usually because they are too old to start anything else. They usually have the idea that they are driven for all the work that is in them to be put aside when they can no longer stand the pace. In the first place, then, the railways should do something to overcome this feeling among the men. It is almost impossible for a man to support himself and family on the wages of the trackman. Foreigners may be able to do this, but as very few of them have the education required for a foreman, Americans must be secured to offer a supply for the foremen of the future. There is very little to induce a man to serve an apprenticeship as a laborer at $1.50 a day, with no prospects of rising higher than a section foreman at a salary of $65 to $75 per month, when he could become a brakeman earning $75 to $100 a month from the start. The brakeman's work is not as hard as that of the trackman, and a track foreman has fully as much responsibility as any conductor. The section foreman's salary should be raised high enough to attract young men to enter this branch of work.

The opinion is too prevalent that it takes no skill to be a good trackman. It requires at least four years for a man who is interested in his work to become efficient in building and maintaining track, and very few men in the average section gang have interest enough to enable them to learn it in this time. Railway companies are generally opposed to labor organizations, but these organizations set the wages that railway companies pay. Track labor is not organized, in accordance with the wishes of the company, yet in the face of the men's compliance with the company's wishes they are made to take any wages that the company sees fit. Since the welfare of the trackmen lies entirely in the hands of the company some effort should be made to make them more contented. One way of stimulating interest is by frequent meeting of the men and officers to establish close relationships. The payment of higher wages is opposed to economy, but the time is coming when the saving of money cannot enter into the question of securing foremen. The two things to consider, then, in securing efficient track foremen are (1) to endeavor to show the men that the company is interested in their welfare, and (2) to pay laborers more money, or at least place the foremen on wages which will induce young men to enter the force with that position in view.

A LOCAL SAFETY COMMITTEE.†

By F. E. CRABBS,

Roadmaster, Chicago & North Western, Chicago, Ill.

In the Chicago terminal I have organized a section foremen's safety committee composed of four yard foremen. These foremen meet at my office once every month where all reports from the division and central safety committees are read. Any accidents reported by these committees are gone over and the best ways of avoiding such occurrences on our own division are considered. After all of these matters have been discussed the committee starts on an inspection of the terminal. When the inspection is finished a report is made to me as chairman of the committee, and it is surprising what these men find that I fail to see in my daily walk over the terminal. They find the foreman of each section and talk matters over with him in a friendly way, explaining how easy it would be for a man to stumble over a rail, old tie or pile of rubbish; that the push car has been left too close to the track or a foot block is missing here and there. It is interesting to note how quickly the foreman will get busy and have the repairs made before the roadmaster comes on

*Received in the contest on The Section Foreman Problem, which closed March 25, 1912.

†Received in the contest on Safety, which closed October 25, 1912.

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the ground, as he realizes that he has overlooked an unsafe condition. The committee has found places where the clearance was dangerously close, such conditions being remedied at once by moving the tracks.

We actually find that our laborers are becoming educated to the "Safety First" movement and are more careful that they do not get injured in their work. They are more watchful for their fellow employees and are doing their work better as they become more familiar with the safety plan. We have one man who inspects every switch in each yard every morning, makes any necessary repairs and renews any defective foot blocking as a matter of safety. We also have one man in each yard who goes over the entire yard twice a day picking up drawbars and car doors, or any scrap he may find. When rails, frogs, switches or ties are removed from the track they must be piled a safe distance from the track and material is removed from between tracks entirely as a safety precaution.

Every roadmaster should get into the habit of talking with his foremen and laborers along these lines, saying, for example: "As a matter of safety you should fix that joint, look after the line of that track at a certain place, see that the blocking in a certain switch is replaced, or that some obstruction is removed before and not after someone is injured."

Last, but not least, the officers higher up should be the advisers to all. The danger is growing greater and greater and the good will and advice of the officials tendered the employee in the way of safe operation will do much to reduce accidents.

SNOW ENGINEERING.

By J. W. Foute,
Division Engineer, Erie, Salamanca, N. Y.

During the winter months snow is the greatest enemy to the successful operation of railways in the colder latitudes, and as such it is fought year after year. Yet, in spite of the large annual expenditure for the removal of snow and ice, no consideration seems to be given to the snow problem when new lines are constructed. Proper provision is made to prevent washouts and land slides. The drainage problem is taken care of by the construction of bridges and culverts, banks are sloped, riprap is installed, and every means is provided to prevent delays to operation. Air currents are as real and material as water currents, and in each particular location a study of them will result in determining the direction of the prevailing winter wind.

On every division the snow drifting points are known and dreaded, and it is an annual task for the maintenance officers to endeavor to maintain uninterrupted traffic from November to March. Even when the road is kept open, the cost of the removal of snow and ice and the loss due to low tonnage and slow time is enormous. With such known hazards to successful operation should it not be the policy of our railways to eliminate snow dangers during construction, instead of meeting them annually and battling with them more or less successfully?

Berm ditches are made along the upper slopes of cuts and drainage ditches at the bottom to properly carry off the water of the open season. The construction forces should also excavate ditches and throw up embankments to act as permanent snow bunkers where it is known that the track will be swept with winter winds that will surely pile the snow in huge drifts to stop or seriously delay traffic and reduce tonnage. All timber should be conserved along the property with a view of using the natural resources for the deflection of the winds and the prevention of drifts, and in some cases trees and hedges should be planted where the sweep of the wind is unobstructed. It would repay railways about to be constructed through a country subject to snow, to have a winter study made in addition to the usual location, with a view to avoiding serious snow conditions.

We are all familiar with the problem presented when a cut drifts full of snow. Preventive remedies could have been applied during construction by removing the side hill bank entirely or by conserving the timber adjoining the cut, yet in few cases are these means used. The expense of making such provisions after construction is the chief deterrent, and our railways are content to use such means as they have at hand to keep trains moving. The rotary snow plow has eliminated many of the serious delays of the past and modern methods are now in use at terminal points, yet we see the old methods of the broom and salt used by a great army of men as of old.

Reduction of unit costs at last has become recognized by a rather extravagant railway world as necessary and essential for economical operation, but nevertheless the huge army of snow fighters are engaged in the annual battle with the elements. The snow army should be reduced. In many terminals the force has been cut in two by the steam heating of switches and by the use of hydro-carbon. Hydro-carbon is particularly effective at interlocking plants, in moderate snows. Moderate snows at terminals where switching movements are frequent are as serious as severe storms are on the line. Interlocking plants are kept open by ordinary means with the greatest difficulty in a drifting storm, but a small force of men using hydro-carbon to burn out the snow can keep a plant in operation when a large force armed with brooms would be almost powerless.

Steam heating of switches is a powerful and efficient automatic snow remover, and can be used with effect in terminals where an ample steam plant is available. By its use the points are kept clear of snow and in perfect working order. The expense of installing and the removal and storage each spring is offset by the saving effected during the winter months.

Both methods are used successfully and their application should be general in busy terminals. The impracticability of their use at outlying points, however, demands that a more serious study of the prevailing winds be made and the application of the remedy to permanently deflect, as far as possible, the drift bearing winter winds. Years of battling with snow should be a strong argument for the recognition during location of the importance of making proper provision in the construction of a new railway for means to eliminate as far as possible the snow hazards now encountered.

THE FOREMAN PROBLEM.*

By V. P. Drugan,
Assistant Supervisor, Baltimore & Ohio, Philadelphia, Pa.

The railways will have to make their own foremen from the material at hand, and the factors that enter into this are efficient methods in track work, organization and rewards. In standardizing methods of work, it will be found that one foreman on every supervisor's territory is able to do work of some certain kind in a better and quicker manner than the foreman of the adjoining section, while this last mentioned foreman is superior to the first foreman in some other branch of track work. Obviously, if there were a medium of exchange by which the foremen could acquire the best methods of each other, gradually eliminating the poor methods, both the foremen and the companies would be benefited. It is suggested that a supervisor's assistant could make studies and comparisons of these methods so that eventually there would be a standard method for performing each item of track work. On every section there are generally several men whose ability and industry surpass that of the others. The best one of these should be given an increase of from 20 to 25 per cent. above the others, with the title and duties of leading laborer or assistant foreman. After he has received sufficient training in this position, and as the opportunity arises through increase in force, he should be transferred

*Received in the contest on the Section Foreman Problem, which closed March 25, 1912.

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to an extra gang made up of the pick of the men on the subdivision. This gang would form an admirable nucleus for expansion during the busy seasons, and this increase would offer ample opportunity to study the ability of the men in handling others, as the foreman would have to depend upon them to a large extent in handling the large force of green men. At the time of force reduction, the former green men should be culled over, and the good ones distributed to various sections.

The matter of rewards can be handled by the railways by a more liberal policy toward the men in the way of passes. A man who has qualified for the extra gang should be given a card pass good over his sub-division, and when he becomes a foreman a pass for himself and family would go a long way towards insuring a satisfied, contented man.

The operation of this method would increase the rating of that portion of the extra gang under observation for foremen and would add to the cost of supervision. An economic study, however, will show that the results of the studies of the assistant supervisors will eventually make for a saving of labor and an increase in efficiency more than sufficient to justify this increased cost.

ANNUAL CONVENTION OF THE AMERICAN RAILWAY ENGINEERING ASSOCIATION.

The "stated meeting" of the Railway Signal Association will be held at the Congress hotel, Chicago, March 17, while the fourteenth annual convention of the American Railway Engineering Association will be held at the same place on March 18-21, inclusive. The various committees of the Railway Signal Association will present progress reports at the meeting on the first day, while on the three following days, 19 regular and two special committees will present reports to the latter association. A new feature of the convention of the Engineering Association will be a reception by the president and officers in the Gold room of the hotel to the members and guests. The annual banquet will be held on Wednesday evening. Another new feature this year is the extending of the convention to cover four days. The regular sessions will conclude on Thursday afternoon as formerly, and Friday will be devoted to the inspection of the exhibits of the Railway Appliances Association.

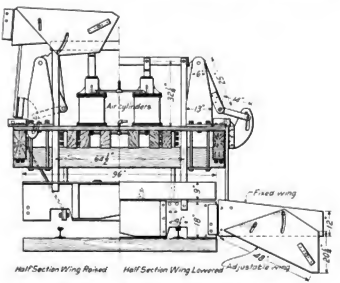
The annual exhibit of road, track and signal appliances in connection with this convention will be held at the Coliseum and the Armory during the entire week beginning Saturday, March 15. From the large number of reservations for space made to date, it is expected that this exhibit will exceed that of any previous year, both in number of exhibitors represented and in space occupied.

THE CAFFERTY-MARKLE BALLAST SPREADER.

A new spreader for distributing ballast was used at various points on the eastern lines of the Atchison, Topeka & Santa Fe last summer with satisfactory results. It is designed to follow an ordinary ballast plow to remove the larger portion of the material remaining between the rails, to throw the ballast off the ends of the ties outside of the rail and to shape the shoulder. The spreader is built on a flat car, carrying an ordinary ballast plow.

The middle portion extends down between the rails almost to the top of the ties with two independent wings over the ends of the ties. It is operated by air from two vertical cylinders placed on the platform of the car, which are directly connected to the train line. When in use the central portion is held in place by vertical rods extending through the cross beam of the car body to heavy timbers supporting the floor. When out of service it is raised vertically clear of the rails by the air cylinders. The side wings are operated separately from the center board and are adjustable vertically and horizontally. When not in use they are revolved about bell cranks on the platform and fold back over the air cylinders. When working on double track, the inner wing can be replaced with a longer one to level off the material between the tracks.

This spreader has been used in both stone and gravel ballast,



Half Sections of the Cafferty-Markie Spreader.

and it is said that it removes more than 80 per cent. of the material from between the rails and off the ends of the ties. The actual saving in the handling of ballast is estimated at from 15 to 25 per cent., depending on local conditions. The records which have been kept for comparative purposes so far, indicate that

The Spreader Working in Stone Ballast.

this saving per mile of single track ballasted may reach as high as $65. This spreader has been developed and patented by J. F. Markle, Chanute, Kan., and T. S. Cafferty, Union, N. Y.

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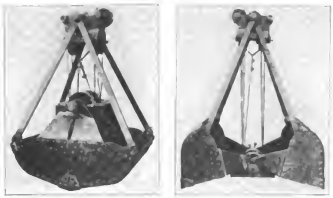
A NEW STYLE BUCKET.

A new style bucket has recently been brought out for use in extra heavy digging, such as iron ore, slag, rock, clay, etc. This bucket has been constructed with a view to low maintenance cost. The shells consist of plates fastened together with angles. The sheaves are placed at right angles with the top and bottom castings, thereby forming a housing which prevents the rope from



Closed. Open.

New Browning Bucket.

running off. The cable is reeved so that the load is on the center sheave in preference to the outer ones. The large main bearings are of steel with bronze bushings. This bucket is made in the ordinary sizes and is manufactured by the Browning Engineering Co., Cleveland, O.

NOTES ON ANALYSIS AND TESTING OF COAL TAR CREOSOTE.*

By L. B. Shipley,
Barrett Manufacturing Co.

This paper deals with three subjects which are under investigation in the research laboratories of the Barrett Manufacturing Company: Distillation tests of oils, comparative volatility of oils and extraction of oils from treated wood. The distillation tests compare the three methods which embrace the various types of distillation: American Railway Engineering Association retort methods, described in Bulletin 65 of the association; National Electric Light Association, report of committee on Preservative Treatment of Poles and Crossarms, 1911; and Forest Service of the Department of Agriculture, described by Dean & Bateman, circular 112, "Analysis and Grading of Creosotes." The retort method and that of the N. E. L. A. give approximately the same results, while the Forest Service method gives considerably more distillate at 200 deg., 210 deg. and 235 deg. than do the others, a result which might be expected.

S. R. Church, in the Proceedings of 1912, page 117, described a series of tests to determine the relation that exists between the evaporation of an oil and its distillation range. These tests have shown that the relative evaporative loss from an open dish and from treated wood is comparable. The next logical step, and one which we are now arranging to carry out, is to make use of an experimental cylinder for a similar series of tests, and thus closely approximate conditions which are met in practice.

Through the courtesy of the United States Wood Preserving Company, Norfolk, Va., one-foot sections of a pile were treated in an experimental cylinder during April, 1912, and in November, 1912, six months after treatment, during which time the sections were exposed to laboratory conditions in gunny sacks; they were quartered, and alternate quarters reduced to fine sawdust by means of a circular rip-saw. The oil was extracted with benzol in an extraction apparatus and the benzol then removed by distillation up to 210 deg. C., with the thermometer bulb in the liquid. Six different oils were used in these tests, two coal tar creosotes, two oil tar distillates, one of 50 per cent. coal tar creosote and 50 per cent. oil tar distillate, and one paving oil. The writer would draw from the results of these tests the following conclusions: The specific gravities are increased by evaporation in all cases except the paving oil. The tar acids do not appear to have evaporated any faster than the other portions of the oil. The extraction of an oil apparently gives a fair index of its original character.

* Abstract of a paper read before the ninth annual convention of the American Wood Preservers' Association, held at Chicago, January 21-23, 1913.

SINKING GOLD IN WATERWAYS.

Tens of millions of dollars have been wasted in appropriations made by Congress for the development of impracticable river and harbor projects; here a little and there a little for the political benefit of grafting Congressmen. On the two hundred miles of the Mississippi river between the Missouri and the mouth of the Ohio we have spent $15,000,000. Yet the traffic on this part of the river, including that of St. Louis, has steadily decreased, and in 1911 it fell to 191,965 tons. The United States has spent more in improving this stretch of the Mississippi river—200 miles—than the Central Government of Germany has spent for improving the Rhine from Strasburg to the frontier of Holland, about 355 miles, on which the annual traffic reaches the enormous aggregate of 40,000,000 tons. In Germany, France and Belgium the waterways are improved for the benefit of the people and the development of commerce. In the opinion of Senator Burton "we should not consider our rivers merely as weapons with which to hold the railroads in subjection." In the general River and Harbor Bill of 1910, which called for $52,000,000, 296 out of the 391 Congressional Districts in the United States received appropriations for this purpose. The Big Sandy river and its tributaries have cost the taxpayers $1,700,000, and "the annual traffic on these streams, exclusive of timber, amounts to 2,000 tons." "In interest alone on its investment, it costs the United States $20 for every ton of freight carried on these streams. Added to this is the annual cost of maintenance of $20,000, or $10 for every ton of traffic." The improvement of the Big Sandy was undertaken to furnish cheap transportation of coal. Last year not a single ton of coal was carried on the Big Sandy system. The Hennepin Canal, Trinity River in Texas, and the Muskingum River in Ohio, are similar examples. The Missouri River between Kansas City and the Mississippi has cost the taxpayers $11,500,000. In 1910 the traffic over this stretch of navigable water aggregated about as much as two ordinary freight cars would hold.

France has expended $450,000,000 on its waterways; the River Seine carries annually about 10,000,000 tons of freight between Paris and the ports of Rouen and Havre. The United States has expended $600,000,000 in river and harbor improvements, the most of which has been thrown away. In France the government requires the railroads to charge twenty per cent. higher freight rates than the waterways, and in Belgium and Germany competition between the railroads and the waterways is regulated and controlled through government ownership of the railroads. So long as the railroads in this country are suffered to put up or put down their rates accordingly as the waterways are effective or not it is not possible that, however the waterways may be improved, they will be able to serve the alleged purposes for which they have been improved. The Interstate Commerce Commission should have the power to fix both maximum and minimum rates on all interstate water and rail transportation; the waterways should be granted terminal facilities, should issue through bills of lading, and the railroads should be required to co-operate with the waterways so that the boat lines may assume their natural position as supplemental means of transportation to our rail lines.—*New York Times.*

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General News.

The Wabash Pittsburgh Terminal & West Side Belt Railroad has established a "Safety Committee," which will act in conjunction with the safety committee of the Wheeling & Lake Erie.

The man who, single handed, robbed ticket offices in daylight in New York, Buffalo, Cleveland, Pittsburgh and Philadelphia, was caught at Boston and has been sentenced to from six to ten years in the Massachusetts state's prison.

The Southern Pacific lines in Louisiana have organized a police force in charge of J. S. Webster, who has been appointed general special agent. Heretofore this service has been handled for the company by a private detective bureau under contract.

The Atchison, Topeka & Santa Fe was fined $200, and the Baltimore & Ohio $1,100 in the federal district court at Chicago on February 12, for violation of the federal hours of service law, and the Chicago & North Western was fined $200 for violation of the safety appliance law.

The Kansas Senate has adopted a resolution instructing the state public utilities commission to investigate the $100,000,000 bond issue of 1901 of the Union Pacific, and to take such action as in its judgment "may be deemed proper for the protection of the interests of the people of the state."

The general manager of the Pennsylvania Railroad has issued a circular calling attention to the necessity of special care on the part of track foremen in watching laborers who while at work on the track wear ear mufflers. With mufflers on the ears a man may not quickly hear an approaching train.

Port Nelson has been selected as the place for the northern terminus of the Hudson Bay Railway. This announcement was made by the Canadian Government at Winnipeg last week. Churchill, the rival location, has a better harbor, but Port Nelson is held to be ideal for a town site railroad terminus.

The Chicago & Alton has refused the demand of unions representing its employees at the Bloomington shops, that the working time in the shops be placed on a basis of eight hours a day, and five days a week instead of six days a week, in order that the full force may have an opportunity to obtain employment.

About 250 employees of the Lehigh Valley at Buffalo, N. Y., struck last Wednesday in response to a strike order, which, it is said, has been sent to all members of the International Association of Car Workers on the Lehigh Valley, about 2,000 men. The strikers demand shorter hours and a 20 per cent. increase in pay.

The governor of Massachusetts, in furtherance of his proposal to have a New England "railroad conference," has appointed for that purpose on behalf of Massachusetts Hon. M. P. Knowlton, of Springfield, former chief justice of the Supreme Court, and Rear Admiral F. T. Bowles, of Boston, late chief constructor of the navy.

The new "Overland Limited" express of the Chicago & North Western, announced last year, will be put in service April 1. The train will run between Chicago and San Francisco in 64 hours, and the extra fare will be $10. On the same date the new train of the Chicago, Milwaukee & St. Paul will be put on, running through in 72 hours.

The telegraphers of the Southern Railway have secured an increase in pay, said to be about 8 per cent. This announcement was made following a series of conferences said to have been facilitated by Judge Knapp, of the Commerce Court, and the acting commission of labor, G. W. W. Hangar, acting as a board of mediation under the Erdman law. The number of employees affected is said to be about 2,000.

On Thursday of last week the Delaware, Lackawanna & Western moved from Slateford Junction to Port Morris, a coal train said to be more than a mile long. The distance between these places, over the new cut-off line, is about 30 miles. The train consisted of 132 cars of coal, with three engines at the head and two at the rear. It is said that the train made "average freight speed," but the reporter very candidly adds that "the immense pull of the engines at the front of the train caused several couplings to break."

At Bridgeport, Conn., on Tuesday last, L. J. Carmalt, engineer of Maintenance of Way of the New York, New Haven & Hartford, was arrested on a charge of manslaughter, in connection with the derailment at Westport, October 3. He was released on $5,000 bail. The state's attorney proposes to have Mr. Carmalt tried with Messrs. Horn, Pollock and Woodward, who were indicted about two months ago on the same charge.

The Bangor & Aroostook announced on Monday of this week that freight would be accepted for all points on the line. Since the strike of engineмen freight had been accepted only in carload lots. President Todd, in a published statement, named various attempts to delay or wreck trains, and announced that until the authorities put a stop to outrages the early morning and late afternoon passenger trains would not be restored; neither would freight trains be run at night. The strikers denied knowledge of anything connected with the outrages and said that none of the men who had left the road were allowed to go on the property of the company except as paying passengers.

The feeling, always prevalent in legislative bodies, that a state commission can do anything that it sets out to do, has received a recent illustration in the action of the lower house of the New York legislature, at Albany, which has adopted a resolution calling on the public service commission for an inventory and appraisal of the property of the New York Telephone Company. Chairman Stevens, replying to the resolution, says that to do the work with his present force would take 28 years. If the work must be done sooner, a little appropriation of $270,000 will be needed. The Telephone company has 364 exchanges in 49 different counties of the state, together with hundreds of pay stations in towns and villages where there are no exchanges.

The Interstate Commerce Commission has published the annual report of the District Electric Railway Commission, a body which, under the direction of the Interstate Commerce Commission, regulates in certain features the operations of street railways in the District of Columbia. The chairman of this district commission is John H. Marble, secretary of the Interstate Commerce Commission. The district commission has held 37 executive sessions and eight public sessions during the year, and has received 106 complaints. These complaints deal with the usual variety of subjects well known to everybody interested in street railway regulation. The orders of the district body have to be confirmed by the national body. These orders have to do with such things as changing the time interval between street cars from 1½ minutes to 1⅔ minutes. Forty-three orders were issued during the year.

Judge Mayer, in the United States District Court at New York City, February 15, authorized the appointment of a commission to go to London to take testimony concerning the action of the directors of the Grand Trunk in relation to the stoppage of work on the company's extension from Palmer to Providence, R. I. In the superior court at Concord, N. H., February 15, the Grand Trunk Railway Company filed a bill to test the legality of the Southern New England Railway Company, which was organized to build a line from White River Junction, Vt., southeastward toward Boston. The bill says that the signature of the Grand Trunk by the late Charles M. Hays, its president, is not binding on the G. T. company, but was Hays' unauthorized act. He did not have the power to bind the company to the purchase of shares of the capital stock of the proposed New Hampshire company. It is further alleged that the route set forth in the articles of agreement does not describe a route within the meaning or contemplation of the statutes.

The plans of the railways for the location of the proposed Union station in Chicago have encountered the opposition of the Chicago plan commission. A conference was held on Monday last between J. J. Turner, vice-president of the Pennsylvania Lines West, Darius Miller, president of the Chicago, Burlington & Quincy, A. J. Earling, president of the Chicago, Milwaukee & St. Paul, and B. A. Worthington, president of the Chicago & Alton, and members of the commission. The railways have selected a site for the proposed station between Adams, Jackson, Clinton and Canal streets, as described in the *Railway Age Gazette* of August 23, 1912, page 354, while the plan commission's scheme provides for the location of all new railway passenger stations south of Twelfth street. The commission's plan has been investigated by the roads for several

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years, and has been rejected as impracticable. While they have practically completed plans for building on the site between Adams and Jackson streets, the plan commission declined to approve the plan of the railways, but decided to appoint a committee of five to consider the question further, and to endeavor to reconcile the two plans.

From the Chicago Inter-Ocean, December 31, 1862.

George M. Pullman, of the firm of Pullman & Moore, house raisers, is experimenting with what he calls a "palace sleeping car." The wise ones predict it will be a failure.

Fatal Accidents in New York City.

Not all of the dangerous places in the world are to be found on the railroads, although, at times, one reading American newspapers might get the impression that such was the fact. No less than 2,712 violent deaths occurred in New York City during the calender year 1912, as reported by the board of Coroners; and railroad men will be interested in some of the details of this statement, showing the causes of the deaths. Railroads seem to be much more careful of people's lives than are the people themselves. Four hundred seventy-four of these deaths were suicides; and of the other causes in the list, some of the most prominent are the following:

Accidental falls and falling articles	726	Overlying	32
Accidental burns	267	Choked by food	13
Submersion	229	In subways (none in train accidents)	14
Accidentally overcome by gas	183	Explosions	14
Homicides by shooting	114	Machinery accidents	11
Automobiles	146	Kicked by horse	10
Horse drawn vehicles	108	Electric shocks	5
Surface street cars, electric	62	Accidental cutting	4
Surface street cars, horse drawn	10	On N. Y. C. & H. R. R. R.	3
Elevators	11	Accidental shooting	3
Accidental poison	52		

The number of persons killed in automobile accidents, 146, is 55 more than in the preceding year. Of the accidental falls, 97 were falls from windows, and of the 97 victims 36 were under 14 years of age. Of the 5,667 deaths reported to the coroner's office during the year, 149 were of persons never identified, and of these unidentified 64 were children.

Unfilled Tonnage of the Steel Corporation.

The report of the United States Steel Corporation shows that on January 31, 1913, the unfilled tonnage was 7,827,368 tons, compared with 7,932,164 tons on December 31, 1912, a decrease of 104,796 tons. The unfilled tonnage on November 30, 1912, was 7,852,883 tons; October 31, 1912, 7,594,381 tons; September 30, 1912, 6,551,507 tons; and January 31, 1912, 5,379,721 tons. The decrease shown last month was the first since March, 1912. The showing did not come as a surprise, for shipments during January were heavy, and it was generally known that the volume of orders was decreasing. This was partly due to the congested condition at the mills, making it impossible for them to accept new orders for early delivery.

Congestion on a Section of the Panama Railroad.

While the building of the Panama Canal has often been characterized as largely a railway traffic problem and railway men in this country have grown used to the reports from the Isthmus of exceedingly busy stretches of track, the changes in the operation of the main line of the Panama Railroad to be made on account of the removal of the construction tracks from the site of the Miraflores spillway will set a record for dense traffic on the Isthmus. The dirt trains from the south end of the Culebra cut have been crossing the site of the spillway to reach the dumps at Miraflores; but the excavation for the spillway has now so far progressed that it will be necessary to remove these tracks by the first of March. After considering the possibility of raising the tracks on bridges over the spillway this plan was abandoned and it was decided to send the dirt trains over the main line of the Panama Railroad through the tunnel at Miraflores. This tunnel is single track and in the 10 hours between 7 a. m. at 5 p. m. will be used by 6 regular passengers and 10 regular freight trains of the Panama Railroad; and during this time 80 dirt trains pass out of the south end of the cut and return into it. Approximately 175 trains will use the 1,050 ft. section of single track in 10 hours, which is at a rate of one every 3 minutes 26 seconds. A train 940 ft. long traveling at 10 miles an hour will require about 2 minutes and 20 seconds to traverse and clear the single track section, and successive trains will not be able to follow each other faster than one a minute. An interlocking plant will be built to work the switches at both ends of the tunnel.

"Safety First" on the Canadian Pacific.

The Canadian Pacific has ordered the establishment of safety committees throughout the company's lines. A sheet filled with mottoes of the "safety first" propaganda has already been prepared, in which points that have already been emphasized in the work of numerous safety committees are brought out in a new light by being written in the first person; for example:

I will not stand in front of a moving car, or engine, to board same.
I will always respect the blue flag, because the lives of my fellow-employees depend upon it.
I will not stand between the cab and the apron when coaling an engine.
I will not push a drawbar with my foot, or hands, when cars are moving, or when they are close together.
I will turn down boards with nails sticking out of same.
I will not adjust a coupler, turn an angle cock, or uncouple hose when cars are in motion.
I will not hold on to the side of a car when passing platforms, buildings, or obstructions close to the track.
I will not use 2 in. nails in building a scaffold where 4 in. nails would be safer.
I will not shove cars into a freight shed, or on team tracks, without first making sure that all men and teams are clear.
I will do all I can to stop the loss of life and lessen the injuries to my fellow-employees.
I will not kick cars into sidings, where boarding cars, or cars being loaded, or unloaded, are standing.
I will remember that it is better to let a train wait than to cause an accident.
I WILL NOT TAKE CHANCES.
I believe that Safety First is simply a habit and I will cultivate the habit.
The prevention of accidents is a duty I owe myself, my family, and my fellow-employees.
I believe that some accidents are not inevitable and I know the great majority of them can be prevented by care.
I will take out immediately sufficient accident and life insurance to protect myself and those dependent upon me.

Railway Etiquette.*

Middle Jersey is one broad grin because of the new rule of etiquette issued by the Pennsylvania Railroad for the guidance of trainmen on the division having its headquarters at Camden. It will be recalled that Camden was long the home of Walt Whitman, and that one of his intimates in those days was a plain young railway worker. . . . The fiat has gone forth that no employee shall address a passenger as "friend," "stranger," "comrade," "brother," "sister," "neighbor," or by "any other term of this character," such, one is permitted to conjecture, as "pard," or "countess." The conversation of the railway employee with the patron of the road shall be yea, yea and nay, nay, or the equivalent; which, according to the official prescription, is to be "Sir," "Madam," or "Beg pard-on."

No doubt these regulations will be obeyed with promptness and precision on through express trains; but there are a good many way trains running out of Camden; and Central Jersey, like Cape Cod, is as easy in manners as an old shoe. The first time Brakeman Bill Thompson says "Beg pardon" to his neighbor, Mrs. Sinnexson she will laugh in his face, and the book of etiquette will never again come between the pair. When the grizzled conductor whom everybody between Camden and Bridgeton has known for a lifetime, sits down a moment to rally some young woman from a way station about her new beau, like as not he will forget the book of etiquette, and call her "Sister Jennie"; and in all probability he will so far transgress the proprieties as to salute the benevolent, spectacled old gentleman from Vineland, with the easy and familiar "Hello, Doc!" Should the New England lines suddenly catch the Pennsylvania's notion of railway etiquette, journeys hereabouts would lose a good deal of their fine native flavor. It would be a pity were those amiable Cape conductors forbidden to pass a friendly word with the strange passenger whose receptive air seems to invite confidence and the jocular word.

*From numerous newspaper expressions on this absorbingly interesting topic we select that of the *Boston Transcript*.—Boston.

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W. J. Lampton, of New York, sends to the *Tribune* a half dozen verses, of which we copy four:

No more we'll hear the pleasant cheer
At all the wayside stops
Of brakemen or conductors kind:
"Well, neighbor, how's the crops?"

No more the word we oft have heard
Of "Partner, how d'y' do?"
And never shall we hear again:
"Say, friend, you're looking blue."

No more today, the good old way;
The rising now forbids.
And kindly trainmen may not ask:
"Well, sister, how's the kids?"

"Beg pardon," "Sir," or "Madam," now
The fetters of the free,
Makes travel on the P. R. R.
A cold formality.

Freight Traffic Across the Isthmuses.

The Bureau of Foreign and Domestic Commerce, Washington, has published a statement to the effect that the value of the freight carried across the isthmuses of Panama and Tehuantepec, eastbound and westbound, in the year 1912, amounted to $125,000,000. This is an estimate, based on statistics for five months ending with November, during which time the merchandise carried from the Atlantic to the Pacific over the Tehuantepec Railroad was 24½ millions; from the Pacific to the Atlantic 14½ millions; from the Atlantic to the Pacific over the Panama Railroad, five millions, and from the Pacific to the Atlantic over the Panama line, 3¾ millions.

For a few of the principal commodities the quantities for the five months are given, as follows:

EASTBOUND.	Panama.	Tehuantepec.
Barley, bushels	174,914	62,088
Fish, canned, tons	3,136	5,634
Fruit, tons	3,303	2,614
Sugar, tons	.....	100,963
Wines, tons	1,424	1,864
Wool, tons	834	3,385
WESTBOUND.	Panama.	Tehuantepec.
Iron and steel, tons	12,327	14,732
Printing paper, tons	302	587
Starch, tons	292	222
Tobacco, tons	16	664

Firemen's Wages.

The eastern railroads and the committee of their firemen have agreed to arbitrate the firemen's demands under the Erdman act. This decision followed the sending of a letter by the railroads' committee, on Tuesday last, to the government conciliators, which letter is printed below. Following the announcement that an agreement had been reached, Judge Knapp said that the firemen's committee had voted to join the other classes of employees and the officers of the railroads in asking Congress to modify the Erdman act. The railroads have selected W. W. Atterbury, vice-president of the Pennsylvania Railroad, as their member on the board of three arbitrators, and the firemen's committee has named Albert Phillips, third vice-president of the firemen's brotherhood. Mr. Phillips was born in California and began his railway service as a fireman on the Sacramento division of the Southern Pacific fifteen years ago. He was made an engineman in 1903. For the last three years he has devoted his time entirely to his position as an officer of the brotherhood.

In the course of the negotiations last week, Mr. Carter, chief of the firemen, was quoted as charging that the railroads desired to force the men to strike for the purpose of teaching the American people that freight rates must be increased; or to secure a compulsory arbitration law; or, thirdly, to scare President-elect Woodrow Wilson by celebrating his inauguration with the biggest strike that the country has ever had. Compulsory arbitration, said Mr. Lee, would provide for a commission which could raise wages 10 cents and then raise freight rates 20 cents, after the fashion of the acts of the coal strike commission.

Mr. Carter said the increase in pay asked for by the firemen would be only 15 per cent.; it would not be so large as had been claimed by the railroad argument. He said that they were only asking the same rates that were granted to the firemen of the western railroads in 1910. His reasons for objecting to an arbitration arranged voluntarily and not under the Erdman law were set forth as follows:

1. Awards are based on false evidence prepared by the railroads and considered by the arbitration board after hearings have been closed.

2. Testimony and documentary evidence are introduced and considered without witnesses being placed under oath, and with no legal means of penalizing witnesses for false testimony.

3. Awards are not based on testimony and evidence submitted, but on information secured by individual members of the board.

4. No opportunity is given to controvert false testimony considered by the board after hearings are closed.

Mr. Carter's charge of falsity in the records evidently is based on the statement made in the dissenting opinion of Mr. Morrissey in the engineers' arbitration.

Mr. Lee, chairman of the committee of railroad managers, replying to published statements of Mr. Carter, said that the firemen were making excessive demands because they hoped to show that they could get more out of the employers than could the engineers' brotherhood. There is keen rivalry between the two brotherhoods for membership of the engineers. The demand for two firemen on heavy engines will soon expand into a demand for two on all engines. As to false testimony, there was not a particle of testimony introduced by the railroads in the engineers' arbitration that would not have been introduced had sworn testimony been taken. The managers prefer to swear to their testimony, but past experience has shown that such procedure does not deter representatives of the Union from resorting to all kinds of sharp practice.

Letter of Railroads' Committee to Government Conciliators.

At the urgent request of you as representatives of the government, and under the strongest protest we are able to voice, the managers' committee agree to arbitrate the firemen's controversy under the Erdman act. The managers also desire to give notice at this time that they shall earnestly request that the hearings in this arbitration be open to the public.

As the managers have stood out to the limit against arbitration under the Erdman act, and as the government—or the public—is responsible for whatever the consequences may be, the managers reiterate their principal objections to the Erdman act; these were pointed out by the board of arbitration in the engineers' case:

"The responsibility which ultimately would rest upon a third member of an Erdman arbitration board was too great to impose on any one man.

"The operation of the act is to settle a dispute rather than to adjudicate a controversy.

"The arbitrators are three in number. Each side is represented by one arbitrator. It rests therefore upon the third arbitrator to bring the other two arbitrators as nearly as possible together, and if he cannot do so, he must decide between them. This is accomplished by splitting differences, and the case may be adjusted without adequate investigation of the facts involved, and the award may not rest upon a basis of equity.

"But the most fundamental defect of the Erdman act is that the interests of the public are not guarded by it."

The managers feel that the public will not tolerate a strike, and realizing their three-fold responsibility to the public, their men, and their shareholders, they only agreed to arbitration under the Erdman act when it seemed the only way to avert the calamity of a strike.

The firemen's brotherhood has no responsibility except to its members.

The question the public should seriously consider is whether, in compelling the railroads to arbitrate under a defective and inadequate law, and in thus securing temporary convenience and accommodation, they are not sacrificing their permanent welfare.

The managers' committee wishes to warn the public at this time of another and similar demand for increased wages made by the conductors and trainmen. We desire to put the public on notice as to the crisis that will confront them when these demands are considered by the railroads.

We also desire to call attention to the serious public danger of these recurring demands, backed up by repeated demands that the railroads arbitrate "under the law."

The whole situation is now in the hands of the government

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and the people. They have taken it out of the hands of the managers at a time when the latter hoped to make a stand for the public good.

Proposed Physical Valuation of Railways.

The Senate committee on interstate commerce at its hearings in Washington last week on the bill, H. R. 22593, providing for a valuation by the Interstate Commerce Commission, listened to Professor John R. Commons, of the University of Wisconsin; E. W. Bemis, of Chicago; President F. A. Delano, of the Wabash; Chairman Frank Trumbull, of the Chesapeake & Ohio and the Missouri, Kansas & Texas; and L. F. Loree, president of the Delaware & Hudson. Mr. Trumbull explained in detail a number of changes in the phraseology of the bill which the railroads desire to have made. Mr. Loree pointed out the wide disparity in prevailing methods of making valuations of railroad property, as set forth in a report presented to the National Association of Railway Commissioners at Washington last November. Actual instances are shown where engineers of equal competency differ 100 per cent. in their estimates of the value of certain properties. In view of the difficulty of the task and of the fact that the Interstate Commerce Commission is already overworked, Mr. Loree proposed that the bill now pending be amended to include the following: "To enable the commission to make such investigation and report it is authorized and directed to constitute and employ a Railway Valuation Board to consist of nine members, three of whom shall be selected by the Interstate Commerce Commission, three shall be nominated to the commission by the American Railway Association, and one each to be nominated to the commission by the Chief Engineer of the United States Army, by the Chief of the Bureau of Steam Engineering of the United States Navy, and by the president of the American Society of Civil Engineers." The Senate committee on February 17 voted to report the bill favorably.

Proposed Legislation.

Both houses of the Oklahoma legislature have passed a full crew bill. It requires all freight trains to be manned with a fireman, engineer and three brakemen.

Assemblyman Jones has introduced in the legislature of New York a bill to provide for reciprocal demurrage, and to compel railroads to carry freight and deliver it on time.

A bill has been introduced in the Iowa legislature requiring that all railway locomotives be equipped with headlights of not less than 1,500 c. p., measured without the aid of a reflector.

A bill has been introduced in the legislature of Indiana to require the engines of a double-header train always to be kept together; this to prevent the second engineman from being blinded by the smoke of the leading engine.

A bill providing for an extra brakeman on all passenger trains of six coaches or more, and on all freight trains of 25 cars or more, has been defeated in the lower house of the Texas legislature.

A bill has been introduced in the Texas legislature which designates the state railroad commission as a board of arbitration, with power to settle disputes between the railways and their employees regarding wages or conditions of service.

The Farmers' Union of Texas sent to all the members of the legislature a protest against the passage of any full-crew bill. They asked that no additional burden be placed on the producers of the state. The memorial said: "We are opposed to the bill now pending that will compel the railroads to employ additional men on their trains, thereby increasing the cost of operation about $1,000,000 a year. We believe that this increased expense is unnecessary and unjustified, and we know that every increased expense of operating the railroads is borne by the farmers and producers."

A bill to require all cabooses to be 24 ft. long has been introduced in the New York legislature. The bill goes into minute particulars, specifying the number and length of the berths to be provided for the men to sleep in. After July, 1920, it will be unlawful to use a caboose not complying with the statute.

A bill has been introduced in the Illinois legislature providing for the formation of a state board of control, composed of the railroad and warehouse commissioners, the governor, the attorney general, the secretary of state, the state auditor, and the state treasurer, to have mandatory jurisdiction over security issues of all railways operating in the state.

In the Senate of the Indiana legislature, three railroad bills have been voted down; one to require the interurban roads to have a fixed signal at small stations by which passengers could stop a car; one to prevent the overloading of street cars and one requiring locomotives to be so designed that the fireman and the engineman may at all times easily see each other. This last proposition is not dead, however, and it is expected that another bill will be introduced.

The legislature of Indiana has before it a bill to require the railroads of the state to pay their employees twice a month. P. S. Ahrens, treasurer of the Lake Shore & Michigan Southern, opposing the passage of the bill, told the Senate committee that he believed a majority of the employees did not care for it. He had been informed that in New York State most of the employees are more than willing to go back to monthly payments. Many employees do not draw their wages for the first two weeks of the month but let the money rest in the paymaster's office until the end of the month. A bill for a similar purpose has been introduced in Kansas.

Senator Crawford, of South Dakota, has introduced in Congress a bill providing that federal courts shall enjoin the enforcement of state laws only under severe restrictions. It provides that no interlocutory order or decree of a federal court to enjoin the enforcement of a state law or any order by an administrative body, pursuant to state law, shall be granted except under conditions specifically stated. No injunction could be granted by any United States court until the application has been presented to a Justice of the Supreme Court or to a Circuit or District Judge, and then only after having been considered by three Judges sitting together, one of whom must be a Justice of the Supreme Court, a majority determining the question presented. No injunction can issue except upon ten days' notice; but if it is shown that irreparable loss may ensue, a temporary restraining injunction may be issued for no longer than ten days, and may be dissolved upon a proper showing by the other side. Senator Crawford aims to thwart the railroads in their litigation to prevent the enforcement of two-cent fare laws in certain states.

Sixty-six bills affecting railways have been introduced in the Colorado legislature, including a full crew bill, a headlight bill, a bill requiring the installation of automatic block signals, and a bill repealing the anti-scalping law and making railway tickets subject to assignment and sale by the holder. At a meeting last week of committees representing the Denver Chamber of Commerce, the State Retail Dealers' Association, the Denver Real Estate Exchange, the Colorado Manufacturers' Association, and the Colorado Publicity League, called to consider bills before the legislature, officers of the railways presented arguments against many of the bills, and stated that if they were passed the people could expect little progress from the railways. A telegram from E. E. MacLeod, chairman of the Western Passenger Association, stated that if the railway ticket bill were passed it would naturally mean an advance in passenger fares to Colorado, and that at a recent meeting of western lines to consider summer tourist fares to Colorado for the season of 1913, action on the subject was postponed and the proposed rates to Colorado were held up pending advice of the final outcome. Telegrams were also received from Newman Erb, president of the Denver & Salt Lake, and Darius Miller, president of the Chicago, Burlington & Quincy, expressing the hope that the legislature would see fit not to enact laws disturbing or curtailing development.

Railway Business Association.

The members of the executive committee and the advisory committee of the Railway Business Association are as follows: Executive committee, E. L. Adreon, St. Louis, Mo.; J. C. Bradley, Buffalo, N. Y.; J. S. Coffin, New York; Walter H. Cottingham, Cleveland, Ohio; O. H. Cutler, New York; William C. Dodd, Newark, N. J.; Henry Elliot, East St. Louis; Irving T. Hartz, Chicago; F. T. Heffelfinger, Minneapolis, Minn.; W. B. Leach, Boston, Mass.; E. B. Leigh, Chicago; W. H. Marshall, New York; William McConway, Pittsburgh, Pa.; W. H. Miner, Chicago; A. H. Mulliken, Chicago; Rudolph Ortmann, Chicago; W. W. Salmon, Rochester, N. Y.; J. H. Schwacke, Philadelphia;

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James S. Stevenson, Detroit, Mich.; H. H. Westinghouse, New York, and W. W. Willits, Chicago; advisory committee, J. S. Coffin, O. H. Cutler, Irving T. Hartz, E. B. Leigh, W. H. Marshall, A. H. Mulliken, H. H. Westinghouse, W. W. Willits and the president and vice-president.

New York Railroad Club.

The next regular meeting of the New York Railroad Club will be held February 21, and will be devoted to further promotion of the Safety First campaign. A paper will be presented by J. W. Coon, of Baltimore, assistant to the general manager of the Baltimore & Ohio and chairman of the general safety committee of that road. It will be supplemented by lantern slide illustrations by C. W. Egan, general claim agent of the Baltimore & Ohio. This will be followed by a discussion.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held February 19, two papers were presented for discussion as follows: A Suggested Improvement in Building Water-Bound Macadam Roads, by J. L. Meem, Assoc. M. Am. Soc. C. E.; and Long-Time Tests of Portland Cement, by I. Hirai, M. Am. Soc. C. E. These papers were printed in the *Proceedings* for December, 1912.

American Institute of Consulting Engineers.

A meeting of the institute for the purpose of further discussing "Professional Relations," will be held at the Engineers' Club, New York, Tuesday, March 11, 1913, at 8 p. m. There will be an informal dinner at 6:30 p. m. at the same place.

Railway Club of Pittsburgh.

At the regular monthly meeting of the Railway Club of Pittsburgh, to be held at the Monongalela House, Pittsburgh, Pa., February 28, Gilbert E. Ryder, of the Locomotive Superheater Company, New York, will read a paper on The Operation and Maintenance of Superheater Locomotives.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesday, except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warfield T. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koch, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Rue Servais, Commission, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-23, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. D. Woodworth, Lima, Ohio. Annual meeting, August 19, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilhelm, Cleveland Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, St. Louis, Mo.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES' ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 1st Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—G. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Ayer, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. D. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—E. B. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—B. D. Minnix, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—H. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—Jason Rogers, Nicholas Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—Frank Kidd, Ramapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting, December; monthly meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosetress, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

The government has filed suit in the Commerce Court against the Erie Railroad charging violation of law in granting passes to representatives of trans-Atlantic steamship companies. The steamship lines are not subject to the act to regulate commerce and they have no arrangement with the railroads for carrying freight on through bills of lading.

The five principal express companies, reporting to the Interstate Commerce Commission, in accordance with the order of the commission, have presented estimates of the probable diminution in their receipts if the reduced rates proposed by the commission were to be adopted. The estimates are based on the actual traffic carried on a single day in October last. The companies say that the losses would amount to from 22 per cent. to 31 per cent. of their gross receipts. The loss for 12 months would be several times greater than the net returns from operation for the last fiscal year. The greatest loss is said to be that on shipments weighing less than 40 lbs., and especially on those weighing less than 20 lbs. each. The companies say that a reduction on interstate traffic would force some reductions on intrastate traffic, and that if the commission's proposed scheme of reduction were applied to all of the intrastate traffic the loss would be about two-thirds that of the estimated loss on interstate traffic.

The New York, Westchester & Boston, the electric road opened from New York to New Rochelle and White Plains last May, and whose officers have intelligently cultivated the friendship of the public, has issued a notice calling the attention of passengers to the fact that they may send complaints and criticisms direct to the president of the road. The notice, posted in the stations and cars, reads: "For the safety and convenience of the public it is necessary that rules be enforced. The enforcement of these rules may temporarily inconvenience a few. For the convenience of our patrons who desire to make complaints or suggestions relative to the service, station agents and conductors are provided with blanks which may be obtained on application and which when filled out and signed may be forwarded to the president." An officer of the road, speaking of the new notice, observes, with truth, that it will steady the employee in the performance of his duties. When a question arises with a passenger, both the passenger and the employee will more readily see that a prolonged argument will be unsatisfactory on both sides.

To Make New York a Way-Station?

"In our own particular branch of business the most important thing for us is to secure rebilling from New York to points beyond, on the through rate from the originating point of shipment on the same terms that are allowed the western terminals. The Pennsylvania and Lehigh Valley railroads have in a modified form made New York a rebilling point. Grain can now be rebilled from the Pennsylvania and Lehigh tracks, but not from the elevator. In practice this privilege, while incomplete, is valuable, for it somewhat enlarges our power of distribution. In principle it is admirable, for it admits our contention that New York is entitled to rebilling and those roads have the thanks of the trade. What we require is rebilling from the elevators as well as from docks. That would enable us to carry a stock always available for New England delivery."—*E. T. Cushing, before New York Oats Trade.*

INTERSTATE COMMERCE COMMISSION.

The commission has further suspended from February 5 until August 5 certain schedules contained in Leland's tariff, which advance rates for the transportation of fence posts from stations in Arkansas to Kansas City, Mo., and other points.

The commission has suspended from February 12, until August 12, the schedules in W. H. Hosmer's tariff which contain new rules governing allowances made by carriers for stoves and lining of cars used in the transportation of potatoes.

The commission has suspended from February 12, until June 12, the schedules in certain tariffs, which advance rates for the transportation of excelsior from St. Paul, Minn., and other points to Chicago, Kansas City, Mo., and other points.

The commission has suspended until June 14, 1913, certain tariffs which contain advances in rates on grain from certain points in South Dakota and adjoining territory to Chicago and Milwaukee, Wis., ranging from ½ to 3½ cents per 100 lbs.

The commission has suspended from February 13, until August 13, a supplement to the tariff of the Galveston, Harrisburg & San Antonio, which provides for the withdrawal of rules and regulations governing the reconsignment of lumber at El Paso, Tex.

The commission has suspended from February 18 until August 18, certain schedules in the tariff of the El Paso & Southwestern, which advance rates for the transportation of coal from Dawson, N. Mex., to certain stations located on the Wichita Falls & Northwestern.

The Interstate Commerce Commission has suspended from February 19 to August 19, a certain freight tariff filed by the Pere Marquette; supplement No. 12 to tariff No. 2594. In this tariff the road proposed to advance "break bulk" rates on grain from Milwaukee and other points to Atlantic seaboard points.

The commission has issued a notice, dated January 7, tentatively endorsing the changes made in the car demurrage rules by the American Railway Association at its last meeting, in November. The commission recommends that these rules be incorporated in all interstate tariffs, but reserves the right to inquire into the legality or reasonableness of any rule which may be complained of.

The commission has suspended until June 10, items in certain tariffs which advance rates for the transportation of brooms 10 cents per 100 lbs. in carloads from Chicago and Peoria, Ill., St. Paul, Minn., etc., Missouri River points and points in Mississippi River territory to Denver, Col., and other points taking same rates. The present rate from Chicago to Denver is $1.10 per 100 lbs., and the proposed rate is $1.20 per 100 lbs.

The commission has suspended until March 31, the schedules in supplements to the tariff of the Texas & Pacific, which advance rates 2 cents per 100 lbs. for the transportation of lumber from Alexandria, La., to New Orleans, La., when for beyond, and also advance by a like amount rates on certain kinds of lumber from Louisiana points to Cairo, Ill., St. Louis, Mo., and other points. Similar advances in tariffs of other carriers are under suspension by previous orders in the same docket.

The commission, by order No. 5518, announces that it is going to make a general inquiry into the practices of all railroads in the issuance of freight bills. Complaint has been made that unjust and unreasonable regulations are in force. The commission will inquire particularly as to whether such bills show the route, name of initial carrier, junction points, full statement of charges accruing enroute, for reconsignment, switching, storage, etc., and as to whether the bill presented to the consignee always shows the name of the consignor and the date of arrival of goods.

Complaint Dismissed.

Wichita Wholesale Furniture Company v. St. Louis, Iron Mountain & Southern et al. Opinion by the commission:

The complainant contends that the rate of 50 cents per 100 lbs. for the transportation of furniture in carloads from Fort Smith, Ark., to Wichita, Kan., is unreasonable. The commission found that the evidence was not conclusive. (26 I. C. C., 107.)

Texhoma Mill & Elevator Company v. Chicago, Rock Island & Pacific et al. Opinion by the commission:

Complainant contends that the rate of 2½ cents per 100 lbs. for the transportation of grain in carloads from Texhoma, Okla., to Texhoma, Tex., is unreasonable on the ground that the service performed is merely a switching service. The commission found that the complainant's shipments were made as through interstate movements to points beyond Texhoma, Tex., and that as the through rate was not complained of, the rate between the two points in question could not be found unreasonable. (26 I. C. C., 54.)

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1912.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses					Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.				
Alabama Great Southern	309	$293,791	$132,205	$470,792	$52,183	$107,385	$12,119	$146,017	$8,446	$326,350	$144,442	-$956	$16,815	$126,671	—$5,189
Ann Arbor	245	126,334	46,474	186,103	26,068	27,999	4,136	66,867	7,811	126,911	58,092	1,166	13,930	45,328	—956
Arizona Eastern	366	171,041	38,672	221,953	24,178	18,605	2,459	59,317	7,536	112,095	109,858	145	4,660	105,343	47,982
Atlanta, Birmingham & Atlantic	66	106,433	65,012	194,781	51,277	43,976	14,741	110,679	17,095	232,820	61,961	.....	13,375	48,586	—25,192
Atlantic City	167	57,353	48,826	113,493	15,445	14,016	2,965	83,513	1,935	156,974	—43,481	—2,998	9,000	—55,479	—37,974
Baltimore & Ohio Chicago Terminal	27	.....	1,775	143,180	18,801	29,477	844	80,202	4,710	134,034	9,146	847	19,115	—9,122	4,837
Belt Ry. Co. of Chicago	21	.....	.....	283,122	14,100	33,849	510	125,389	5,011	178,859	104,263	.....	8,222	96,041	5,434
Boston & Maine	2,244	2,350,098	1,194,530	3,561,894	511,287	423,227	28,108	2,064,824	111,823	3,369,272	192,622	15,373	187,490	220,503	—202,547
Butte, Anaconda & Pacific	46	94,960	8,406	111,284	11,234	21,825	761	56,171	3,218	93,209	18,075	.....	2,639	15,436	—7,908
Canadian Pacific Lines in Maine	251	111,850	46,722	184,622	13,748	14,011	6,123	66,693	5,684	111,259	73,363	.....	10,000	63,363	—9,932
Central of Georgia	1,135	749,216	384,324	1,246,296	166,629	193,214	34,292	422,849	38,124	855,158	391,138	6,421	67,444	330,115	—9,572
Central Vermont	411	224,219	76,003	326,332	34,336	71,044	7,666	173,975	9,860	296,883	29,449	56	12,200	17,305	—36,111
Charleston & Western Carolina	141	136,034	38,057	182,479	26,641	15,743	2,910	67,167	4,500	116,961	65,518	.....	5,000	60,518	18,191
Chicago & Eastern Illinois	1,175	982,398	268,722	1,358,570	169,433	289,545	25,198	530,881	39,189	1,054,246	304,274	—2,205	50,000	252,069	—98,866
Chicago & Erie	270	345,899	66,805	458,661	64,323	105,013	20,737	240,697	9,749	440,519	18,142	—1,196	13,333	3,613	—34,153
Chicago, Indiana & Southern	359	367,031	20,286	394,958	46,116	82,970	8,119	138,483	9,636	285,324	109,634	—316	24,706	84,612	8,938
Chicago, Peoria & St. Louis	255	115,185	27,523	152,795	30,148	39,272	7,003	82,063	6,300	164,786	—11,991	.....	4,300	—16,291	—21,189
Chicago, Terre Haute & Southeastern	155	165,234	18,858	198,278	19,916	27,923	3,532	64,258	8,340	121,969	67,609	—201	10,000	57,408	11,457
Cincinnati, New Orleans & Texas Pacific	337	727,251	180,889	956,181	92,951	204,767	23,195	370,972	19,456	611,341	344,840	—1,801	29,800	313,239	71,588
Cincinnati Northern	143	114,617	17,623	133,080	10,062	7,826	2,282	57,603	2,777	90,558	42,522	.....	6,362	36,160	24,919
Cleveland, Cincinnati, Chic. & St. Louis	2,011	2,092,512	696,898	3,038,365	347,178	617,507	71,840	1,282,980	61,786	2,381,291	657,074	—2,255	125,243	529,576	—72,716
Colorado Midland	338	114,021	17,542	153,702	15,312	34,781	7,089	64,428	5,644	127,204	26,398	3,261	10,000	19,659	17,290
Colorado & Southern	1,023	633,509	99,992	790,180	90,450	161,536	9,541	232,887	22,631	517,116	273,064	—1,493	29,175	242,397	—5,105
Delaware & Hudson Co.—R. R. Dept	854	1,718,346	711,236	1,994,287	130,485	332,186	19,466	667,143	58,860	1,208,293	785,994	—1,026	61,764	723,200	—81,420
Erie & Rio Grande	2,560	1,560,944	379,845	2,031,602	172,277	367,407	45,024	698,380	56,113	1,339,201	692,401	—5,598	93,750	593,053	133,108
Denver, Northwestern & Pacific	215	77,637	13,873	95,594	13,603	12,006	1,885	37,892	6,865	77,251	18,343	.....	3,500	14,843	2,955
Detroit, Toledo & Ironton	441	130,978	13,414	164,748	16,720	29,259	2,590	81,252	5,892	146,579	7,219	.....	1,000	6,219	—7,817
Detroit & Toledo Shore Line	79	116,012	.....	116,292	757	4,945	1,123	33,905	2,170	42,900	73,392	.....	4,830	68,562	—3,533
Detroit River Tunnel	2	.....	.....	110,760	2,298	2,623	.....	9,598	73	14,592	96,258	.....	3,008	93,250	—131,350
Duluth, South Shore & Atlantic	628	335,610	78,525	446,779	39,296	31,963	1,699	102,198	9,134	194,275	252,561	—172	17,913	234,475	—12,465
Erie	1,988	3,187,938	756,270	4,310,517	455,935	811,526	101,243	1,548,509	86,409	3,003,622	1,306,895	—95,433	152,835	1,058,627	12,771
Galveston, Harrisburg & San Antonio	1,338	755,415	293,713	1,102,467	112,919	238,063	35,526	449,263	30,773	866,544	236,923	—5,446	30,702	200,775	151,007
Georgia	307	171,527	87,252	277,495	32,885	42,743	11,419	124,881	8,270	220,198	57,297	.....	2,657	54,670	—47,776
Georgia, Southern & Florida	395	121,389	81,711	240,423	29,388	40,875	7,835	89,975	8,966	177,039	63,384	.....	13,634	49,750	—6,105
Grand Rapids & Indiana	578	277,648	144,231	458,464	52,419	66,695	12,865	193,481	16,661	342,121	116,343	49	26,312	90,080	16,313
Gulf, Colorado & Santa Fe	1,596	992,203	287,252	1,355,113	231,318	176,464	24,134	480,733	30,807	943,456	411,657	.....	44,800	366,777	—4,424
Hocking Valley	352	496,503	75,949	604,024	56,198	100,775	9,946	199,136	14,458	389,463	204,561	.....	44,400	160,161	—4,786
Houston, East & West Texas	190	85,903	34,439	128,615	34,477	16,464	2,375	40,518	3,913	97,747	30,868	.....	3,818	27,050	—362
Houston & Texas Central	799	395,955	175,668	616,197	100,796	116,749	17,254	268,834	17,338	500,971	115,226	—357	21,892	92,463	30,366
Indiana Harbor Belt	105	.....	.....	272,961	32,907	32,660	2,769	130,668	6,389	205,393	67,568	577	5,754	62,391	—11,688
Kanawha & Michigan	176	196,331	32,401	234,590	32,399	51,716	2,684	72,197	6,493	165,489	69,101	—27	8,468	60,606	—20,249
Kansas City Southern	827	677,456	158,222	916,957	92,916	102,158	25,347	320,645	33,677	574,743	342,214	.....	39,279	302,935	81,665
Louisiana & Arkansas	255	117,140	23,831	146,226	19,103	19,953	2,403	70,203	5,103	86,459	59,727	.....	8,314	51,413	15,851
Louisiana Western	208	127,278	66,444	201,937	28,176	33,475	5,382	59,337	6,435	132,806	69,131	—865	11,714	56,552	28,783
Minneapolis, St. Paul & Sault Ste. Marie	3,576	1,998,852	568,320	2,703,904	187,675	341,435	52,363	858,948	56,291	1,496,712	1,207,192	10,227	108,268	1,109,151	425,195
Missouri, Kansas & Texas System	3,817	1,879,429	926,087	2,971,492	345,943	302,097	61,008	1,116,007	111,527	1,936,492	1,035,000	—6,953	133,842	894,205	294,131
Mobile & Ohio	1,114	814,706	441,787	1,301,047	105,797	204,712	36,702	366,910	31,511	750,537	550,510	—3,025	29,859	248,826	—13,467
Morgan's La. & Tex. R. R. & S. S. Co.	404	354,077	111,005	487,450	65,049	53,257	10,227	177,450	11,945	317,928	169,522	—2,024	21,105	146,393	—62,840
Nashville, Chattanooga & St. Louis	1,221	1,039,658	272,689	1,367,619	177,099	147,578	41,603	514,441	40,524	1,022,374	—60	25,414	25,414	25,474	30,283
New Orleans, Texas & Mexico	277	126,392	19,146	154,222	21,683	19,181	3,415	63,875	7,127	115,281	38,941	.....	4,000	34,941	68,537
New York, Chicago & St. Louis	565	915,403	132,511	1,085,032	41,625	106,984	58,638	481,761	18,068	707,076	377,956	—2,166	21,584	354,206	—97,282
New York, Ontario & Western	566	587,366	87,138	705,240	77,351	119,984	10,215	292,062	20,819	520,371	184,869	906	18,167	167,608	38,796
New York, Susquehanna & Western	1,149	1,150,702	45,917	1,250,620	57,311	74,896	1,533	1,000,169	4,719	1,141,910	88,710	—3,041	14,673	70,996	—11,361
Northwestern Pacific	401	100,852	132,206	267,700	49,605	39,273	3,342	109,482	13,367	215,073	42,627	.....	12,579	30,048	—1,982
Ohio R. & Land Co	1,011	48,826	24,554	78,072	9,555	6,613	922	19,858	7,409	44,378	34,594	33,088	2,516	64,166	—12,520
Oregon Short Line	1,822	1,320,116	398,881	1,837,256	217,753	216,692	29,228	498,496	39,992	1,002,160	835,596	—464	225,823	609,309	—39,474
Oregon-Washington R. R. & Nav. Co	1,919	976,299	409,799	1,491,255	243,844	178,102	56,907	563,392	51,669	1,093,814	397,441	—5,225	120,509	271,707	36,965
Pecos & Northern Texas	479	171,315	46,050	228,292	30,340	41,048	4,144	70,790	6,209	152,231	75,561	.....	4,464	71,097	33,339
Peoria & Eastern	352	255,241	70,604	345,622	30,131	61,541	4,307	131,328	6,520	233,927	112,095	.....	15,548	97,147	—12,241
Pere Marquette	2,330	1,121,025	322,032	1,566,646	235,003	215,614	32,726	657,295	33,875	1,174,513	392,133	—9,762	56,935	325,436	30,624

Average mileage operated during previous period—2 246; ³ 1,110; ⁴ 852; ⁵ 2,556; ⁶ 623; ⁷ 1,995; ⁸ 587; ⁹ 1,603; ¹⁰ 3,770; ¹¹ 3,399; ¹² 562; ¹³ 152; ¹⁴ 404; ¹⁵ 99; ¹⁶ 1,762.

— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total. inc. misc.	Maintenance—Way and structures.	Maintenance—Of equipment.	Operating expenses—Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Philadelphia & Reading	1,015	$3,531,828	$581,793	$4,326,309	$374,581	$617,855	$39,139	$1,427,373	$65,242	$2,554,193	$1,802,116	$30,232	$86,364	$1,746,474	$118,754
Pittsburgh & Lake Erie	223[a]	1,369,401	148,027	1,576,936	168,797	165,094	13,318	384,298	26,369	757,858	819,078	—327	31,789	786,962	324,220
Port Reading	21	123,562	.....	123,982	8,419	548	30	37,594	231	46,822	77,160	3,203	6,000	72,363	—5,921
Rutland	495	164,853	96,828	299,479	44,621	62,219	8,088	127,784	8,871	251,583	47,896	.....	12,825	35,071	—23,114
St. Joseph & Grand Island	319	37,846	32,646	121,114	6,096	21,158	4,395	55,143	8,323	113,075	8,039	—100	4,574	3,365	29,273
St. Louis, Brownsville & Mexico	510	151,968	78,415	246,454	36,452	22,834	4,693	118,533	9,938	192,450	54,004	.....	7,947	46,057	6,159
St. Louis Southwestern	906[f]	600,688	163,970	818,870	96,686	99,780	36,766	161,379	24,798	419,409	399,461	—726	24,136	374,549	48,477
St. Louis Southwestern of Texas	703	320,932	113,559	462,232	57,606	76,103	17,866	179,192	22,667	393,434	68,798	—216	12,205	56,367	—36,167
San Antonio & Aransas Pass	727	287,008	119,684	429,727	55,996	54,667	5,938	163,287	10,150	290,038	139,689	.....	12,000	127,689	23,170
San Pedro, Los Angeles & Salt Lake	1,135[m]	549,199	275,331	889,219	141,584	117,385	17,231	293,635	19,822	624,093	265,126	—1,479	34,022	229,625	150,282
Southern in Mississippi	281	77,563	50,285	136,769	23,233	10,677	2,136	50,627	4,943	91,616	45,153	.....	6,762	38,391	172
Southern Kansas of Texas	125	106,510	13,219	132,192	9,118	2,853	1,240	40,040	3,559	79,357	52,841	.....	4,500	47,870	32,509
Southern Pacific	6,322[n]	4,497,018	2,712,834	7,817,598	998,553	1,177,445	161,091	2,298,775	213,341	4,848,205	2,969,393	209,399	421,246	2,757,046	164,604
Spokane, Portland & Seattle	356[p]	269,907	139,162	439,054	54,502	36,892	6,342	109,161	13,184	219,753	219,301	—232	33,466	185,121	—31,312
Tennessee Central	294	98,161	35,794	141,697	27,987	14,560	5,897	57,111	6,626	112,181	29,516	.....	4,265	25,251	7,781
Texas & Pacific	1,885	1,265,336	490,988	1,846,993	155,997	233,270	37,093	809,522	47,123	1,283,005	563,988	—13,284	91,840	458,864	—45,695
Texas & New Orleans	458	231,178	106,398	363,350	68,039	84,291	8,858	148,946	13,170	323,504	39,846	10,506	14,010	36,342	36,903
Toledo & Ohio Central	442	369,337	50,627	441,662	52,357	82,498	7,214	180,574	9,342	335,895	105,772	—940	26,033	78,799	—7,325
Toledo, Peoria & Western	248	71,464	42,595	119,759	31,888	22,798	2,262	44,351	3,593	104,892	14,867	.....	4,800	10,067	229
Toledo, St. Louis & Western	453	323,476	32,418	378,697	23,899	42,191	15,901	130,499	8,732	221,212	157,485	.....	14,800	142,685	56,703
Trinity & Brazos Valley	463	289,641	49,089	353,550	47,824	41,635	9,956	155,386	15,222	270,023	82,927	.....	4,588	78,339	47,182
Vandalia	827	681,405	204,013	984,540	82,592	232,058	23,864	373,134	16,995	732,839	251,701	.....	36,947	214,754	42,503
Virginia & Southwestern	240	117,646	15,812	137,276	21,700	34,017	2,166	39,482	3,749	101,114	36,162	.....	5,500	30,662	4,554
Wabash	2,515	2,117,117	638,000	2,672,611	346,147	457,275	82,811	1,212,014	69,836	2,165,283	507,030	—3,133	71,655	432,242	23,675
Western Maryland	543	487,198	71,487	594,827	90,372	95,401	14,081	283,677	21,039	504,570	90,257	.....	20,000	70,257	—112,949
Western Pacific	937	378,767	95,328	490,144	72,128	44,658	33,086	210,943	24,084	386,899	103,245	—1,520	21,027	80,648	67,391
Wheeling & Lake Erie	459[m]	517,797	49,638	606,081	104,055	124,382	7,261	208,338	24,991	469,017	137,064	1,662	38,198	100,635	—19,355
Yazoo & Mississippi Valley	1,374	761,313	322,908	1,144,923	127,032	152,284	15,560	446,133	26,580	767,598	377,325	495	37,000	340,818	47,099
SIX MONTHS OF FISCAL YEAR, 1913.															
Alabama Great Southern	309	$1,709,005	$686,345	$2,621,389	$309,090	$552,452	$75,024	$815,003	$55,449	$1,807,015	$814,371	—$3,089	$88,357	$722,925	$42,452
Ann Arbor	292	706,231	312,121	1,087,272	139,159	136,633	25,018	374,436	46,559	721,795	365,977	1,658	83,579	284,056	—61,231
Atlanta & Eastern	366	983,852	225,920	1,272,124	130,250	85,817	15,300	312,543	54,459	680,207	591,917	563	45,187	635,626	276,172
Atlanta, Birmingham & Atlantic	662	1,195,251	367,382	1,665,879	264,951	255,113	96,272	649,623	70,446	1,336,405	333,474	.....	81,100	252,374	—156,107
Atlantic City	167	395,715	802,975	1,272,902	184,387	78,467	18,563	608,830	9,002	899,249	373,653	—22,473	34,000	297,180	—64,059
Baltimore & Ohio Chicago Terminal	77	.....	12,944	950,837	144,760	128,784	4,422	417,080	26,895	731,691	218,876	5,374	114,692	109,558	57,231
Belt Ry. Co. of Chicago	21	.....	.....	1,612,899	10,475	202,315	2,057	65,948	34,110	314,905	616,394	.....	94,000	522,394	15,203
Boston & Maine	2,244	14,716,769	8,998,586	25,614,278	3,158,384	3,701,984	213,491	11,406,498	601,802	19,082,159	6,532,119	96,069	1,071,222	5,556,966	531,816
Butte, Anaconda & Pacific	46	525,142	26,820	656,093	87,180	128,278	4,399	207,989	18,624	546,966	111,125	.....	12,638	98,487	—6,455
Canadian Pacific Lines in Maine	233	342,805	160,574	549,750	197,031	73,734	35,190	236,717	28,908	571,580	—21,830	.....	60,000	—81,830	—50,694
Central of Georgia	1,918	4,592,941	2,102,456	7,325,372	1,025,251	1,240,902	212,958	2,421,997	235,732	5,136,840	2,188,532	37,993	299,675	1,926,850	—160,587
Central Vermont	411	1,380,220	639,394	2,188,349	266,419	359,795	51,488	1,047,740	49,948	1,775,390	413,959	1,953	73,200	341,712	—103,575
Charleston & Western Carolina	341	696,341	198,709	942,617	131,136	144,157	19,925	356,369	27,956	679,553	254,064	.....	50,000	194,064	—76,252
Chicago & Eastern Illinois	1,275	6,145,221	1,603,954	8,404,080	1,099,109	1,681,784	148,749	3,040,984	256,371	6,226,997	2,177,083	—13,851	261,000	1,902,232	—371,496
Chicago & Erie	270	2,999,272	400,068	3,663,305	523,147	596,572	124,294	1,605,496	64,337	2,714,143	949,162	3,683	78,645	874,827	—231,297
Chicago, Indiana & Southern	359	1,982,669	162,499	2,210,029	291,149	542,291	48,271	710,588	51,463	1,643,762	566,267	4,214	103,706	466,775	240,056
Chicago, Peoria & St. Louis	255	693,041	189,963	930,415	151,516	205,522	47,070	425,145	34,246	858,499	71,916	.....	25,800	46,116	—57,528
Chicago, Terre Haute & Southeastern	351	896,470	112,077	1,033,942	173,067	191,740	18,546	319,068	46,513	748,979	285,014	—1,241	60,000	223,773	—42,315
Cincinnati, New Orleans & Texas Pacific	352	2,903,594	961,847	5,270,959	525,534	1,177,185	136,547	1,182,163	114,702	3,193,151	1,296,808	—3,052	128,800	1,623,956	—16,496
Cincinnati Northern	245[t]	642,489	121,301	801,891	113,388	122,494	15,428	308,298	20,061	584,669	217,222	.....	32,862	184,360	74,811
Cleveland, Cincinnati, Chic. & St. Louis	2,011	12,219,002	4,325,004	18,019,424	2,961,351	3,151,349	472,872	6,593,980	347,207	12,576,759	5,442,665	—4,397	620,343	4,818,025	583,068
Colorado Midland	338	855,319	163,659	1,115,479	138,574	174,917	43,389	467,369	33,211	887,461	228,018	1,153	53,600	175,969	—6,151
Colorado & Southern	1,073[s]	3,491,568	796,760	4,576,916	633,277	986,191	63,854	1,318,960	130,224	3,132,506	1,444,410	—4,433	175,000	1,264,927	—81,827
Delaware & Hudson Co.—R. R. Dept	854[t]	10,105,174	1,785,265	12,308,009	1,003,647	1,703,416	145,747	4,081,199	378,119	7,762,323	5,045,737	58,267	385,866	4,681,604	82,150
Denver & Rio Grande	2,560[t]	9,974,566	2,578,819	13,553,609	1,903,427	2,287,958	294,356	4,236,194	345,093	8,964,208	4,589,401	16,119	462,500	4,123,020	826,464
Denver, Northwestern & Pacific	215	452,426	188,156	669,492	99,441	100,164	11,716	204,678	25,133	441,132	228,360	.....	21,000	207,360	—19,946
Detroit, Toledo & Ironton	441	763,987	90,349	920,327	184,068	100,612	16,299	410,704	31,620	743,303	177,024	—11	36,900	141,013	25,201
Detroit & Toledo Shore Line	79	650,385	.....	652,853	88,438	35,918	6,934	179,436	13,001	345,029	307,824	.....	28,260	279,564	17,927
Detroit River Tunnel	2	.....	.....	595,768	12,857	16,868	.....	50,152	238	80,115	515,653	.....	25,508	490,145	—128,047
Duluth, South Shore & Atlantic	628[t]	1,099,087	541,102	1,723,231	377,537	195,647	63,066	642,001	69,101	1,348,252	375,469	5,367	107,914	272,922	—145,725

Average mileage operated during previous period—[a] 215; [f] 842; [m] 1,116; [n] 6,191; [p] 551; [s] 457; [t] 246; [t] 1,110; [t] 852; [t] 2,556; [t] 623.
— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

SIX MONTHS OF FISCAL YEAR, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues— Freight.	Passenger.	Total.	Maintenance of— Way and structures.	Equipment.	Operating expenses— Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Erie	1,988[8]	$20,824,452	$5,099,509	$28,071,256	$3,374,445	$4,756,111	$575,493	$9,011,749	$514,130	$18,231,838	$9,837,418	—$88,594	$874,145	$8,874,679	$665,953
Galveston, Harrisburg & San Antonio	1,538	4,457,491	1,604,671	6,374,532	563,840	1,302,192	194,357	2,349,544	186,137	4,596,070	1,778,462	—30,510	200,530	1,547,422	246,885
Georgia	307	978,738	468,345	1,535,845	200,649	290,630	69,721	272,871	49,468	1,388,339	167,346	.....	17,593	149,753	—387,355
Georgia, Southern & Florida	395	667,235	430,418	1,266,776	154,534	248,111	45,716	593,857	57,032	1,009,250	257,526	.....	70,214	187,312	—72,545
Grand Rapids & Indiana	578[5]	1,650,017	1,054,169	2,930,553	356,962	413,372	71,359	1,170,657	93,917	2,106,267	833,286	166	143,219	690,233	47,847
Gulf, Colorado & Santa Fe	1,596[5]	5,454,124	1,688,211	7,546,599	1,132,710	1,016,366	143,955	2,542,926	191,934	5,027,891	2,518,708	.....	243,461	2,275,247	651,673
Hocking Valley	352	3,397,652	509,246	4,180,894	425,850	814,416	53,869	1,179,989	85,181	2,559,305	1,621,589	.....	237,600	1,383,989	121,673
Houston, East & West Texas	190	680,439	190,350	911,611	141,415	88,214	12,782	210,814	21,905	485,730	225,881	.....	12,452	213,432	—11,335
Houston & Texas Central	789	2,463,650	1,039,603	3,714,606	456,663	615,270	106,980	1,394,521	98,534	2,671,968	1,042,638	—8,845	117,022	936,771	137,348
Indiana Harbor Belt	105	.....	.....	1,278,186	200,326	162,218	658,894	.....	36,481	1,084,174	194,012	16,294	24,534	476,769	131,291
Kanawha & Michigan	176	1,460,433	203,907	1,701,312	232,246	299,404	14,011	472,824	38,171	1,056,656	644,656	—124	54,114	590,418	—46,752
Kansas City Southern	827	4,076,579	900,747	5,510,720	547,245	699,779	153,860	1,749,157	190,123	3,340,464	2,170,256	.....	218,488	1,951,768	480,072
Louisiana & Arkansas	255	650,530	179,573	810,985	132,026	126,642	14,754	222,247	29,452	525,121	285,964	.....	23,502	261,962	63,541
Louisiana Western	208	723,240	343,575	1,128,183	122,067	188,350	39,972	339,655	33,377	722,415	406,198	1,824	46,356	361,666	122,735
Minneapolis, St. Paul & Sault Ste. Marie	3,976[5]	12,426,074	3,666,011	16,936,243	1,762,805	1,888,246	322,447	4,848,444	314,635	9,136,577	7,799,666	112,964	864,967	7,047,663	1,828,259
Missouri, Kansas & Texas System	3,817[8]	11,665,061	4,993,296	17,624,286	2,334,919	2,126,918	367,200	5,974,569	512,213	11,315,819	6,308,467	—31,895	662,643	5,613,929	1,673,925
Mobile & Ohio	1,114	4,981,547	2,592,790	6,136,991	713,160	1,164,627	223,174	2,194,142	153,208	4,436,167	1,699,954	—8,568	170,154	1,512,286	—13,458
Morgan's La. & Tex. R. & S. S. Co.	404	1,766,716	572,122	2,468,850	413,382	376,025	73,607	976,817	63,512	1,903,543	567,307	—11,406	112,289	443,612	—206,393
Nashville, Chattanooga & St. Louis	1,231	4,558,284	1,638,956	6,630,519	1,005,187	1,167,587	237,711	2,501,919	176,815	5,089,219	1,541,300	—3,301	152,496	1,385,503	86,525
New Orleans, Texas & Mexico	277	634,439	109,761	897,080	145,663	73,275	19,729	341,255	36,173	616,195	280,885	.....	12,382	178,589	68,537
New York, Chicago & St. Louis	561[5]	5,384,303	580,083	6,496,966	660,928	732,491	313,968	2,603,251	100,730	4,411,368	2,087,598	—9,088	291,583	1,876,927	148,856
New York, Ontario & Western	506	3,724,952	1,068,264	5,046,361	639,852	731,585	68,430	1,768,991	101,216	3,310,074	1,736,287	—5,395	109,000	1,621,892	336,201
New York, Susquehanna & Western	154[10]	991,341	302,951	1,447,599	190,457	180,489	11,566	611,671	27,215	1,021,908	425,691	2,298	96,964	331,015	—209,267
Northwestern Pacific	401[12]	821,857	1,093,067	2,050,419	275,398	226,730	72,036	664,819	77,829	1,296,032	754,387	.....	75,474	678,913	55,817
Oahu Ry. & Land Co	101[16]	411,147	135,357	585,046	55,274	37,460	3,553	123,229	27,651	247,167	337,879	18,517	36,016	320,380	40,969
Oregon Short Line	1,827[5]	8,725,904	2,710,693	12,110,534	1,188,859	1,217,461	171,123	2,834,028	242,902	5,714,378	6,396,146	10,592	832,227	5,574,461	501,590
Oregon-Washington R. R. & Nav. Co	1,919	6,451,683	2,896,713	9,464,104	1,054,028	1,098,189	276,535	3,409,099	229,398	6,154,579	3,297,025	—19,512	235,410	3,042,140	320,225
Pecos & Northern Texas	479	1,008,853	272,876	1,373,441	160,906	248,026	21,691	401,502	37,361	870,086	503,355	.....	26,260	477,095	223,501
Peoria & Eastern	351	1,412,594	594,014	1,975,236	236,894	336,129	77,107	741,233	44,123	1,303,846	619,575	.....	48,748	570,827	120,022
Pere Marquette	2,330	6,159,180	2,316,523	9,249,849	1,377,906	1,323,603	207,283	3,698,120	216,361	7,023,375	2,226,474	14,849	342,019	1,899,304	—154,675
Philadelphia & Reading	1,015	20,927,433	3,726,323	25,902,270	2,357,926	4,074,151	256,114	7,991,363	367,081	15,046,635	10,855,585	204,370	518,139	10,541,816	2,161,376
Pittsburgh & Lake Erie	223[8]	8,824,987	903,740	10,091,683	960,669	1,402,141	88,275	2,145,894	150,282	4,747,261	5,344,422	—1,824	186,789	5,155,309	1,290,248
Port Reading	21	1,323	.....	1,323	5,596	2,449	185	120,368	1,103	276,628	541,407	38,890	46,000	532,297	158,533
Rutland	468	1,058,730	689,920	1,995,236	236,915	372,625	51,812	754,837	40,496	1,456,685	538,551	.....	79,870	458,681	—19,452
St. Joseph & Grand Island	319	568,252	219,476	862,200	171,547	158,288	28,823	362,850	33,162	712,762	149,938	—1,275	36,553	112,110	3,864
St. Louis, Brownsville & Mexico	510	889,239	453,982	1,432,727	231,920	153,036	29,401	647,872	55,698	1,117,927	314,800	.....	35,447	279,353	—66,328
St. Louis, Southwestern	906[5]	2,364,949	876,112	4,461,876	513,513	525,272	115,617	1,185,967	115,646	2,481,015	1,919,991	—4,560	142,426	1,772,005	1,271,240
St. Louis Southwestern of Texas	703	1,872,566	649,055	2,678,826	467,458	440,965	77,265	981,185	115,950	2,122,598	556,028	—1,207	63,705	491,116	—12,932
San Antonio & Aransas Pass	532	1,600,476	775,459	2,535,198	297,798	325,467	36,295	1,035,081	54,911	1,794,904	1,140,814	.....	71,000	1,068,814	198,421
Sao Pedro, Los Angeles & Salt Lake	1,135[18]	3,234,489	1,578,356	5,180,250	578,079	830,693	184,661	1,622,523	114,925	3,330,881	1,849,369	—10,051	195,333	1,644,485	1,162,511
Southern in Mississippi	281	380,810	202,297	679,589	161,766	52,936	14,271	250,275	24,711	503,959	175,630	.....	40,570	85,060	—56,130
Southern Kansas of Texas	128	673,768	116,950	820,375	57,669	156,098	23,167	233,652	21,575	483,161	338,214	.....	12,202	326,012	196,694
Southern Pacific	9,276[5]	41,029,742	16,597,595	51,806,355	5,235,235	6,643,614	1,008,964	13,151,109	1,258,965	27,441,419	23,396,058	926,201	2,548,148	22,074,001	2,446,534
Spokane, Portland & Seattle	556[19]	1,674,045	921,578	2,800,805	296,953	230,802	47,209	645,079	76,103	1,296,645	1,504,160	3,254	320,400	1,182,014	8,532
Tennessee Central	294	878,304	233,109	1,153,028	183,510	85,940	36,243	293,531	42,424	640,548	514,480	.....	25,587	488,943	26,065
Texas & New Orleans	458	3,387,205	592,909	2,106,813	357,667	487,935	46,641	816,277	69,351	1,777,871	331,942	12,595	76,548	267,989	18,992
Texas & Pacific	1,885	6,793,946	2,483,540	9,902,070	1,269,458	1,502,078	203,630	4,291,540	277,086	7,543,792	2,361,278	—20,006	339,687	2,003,585	1,466,753
Toledo & Ohio Central	443	2,423,730	350,142	2,943,963	405,795	519,653	41,620	967,436	54,800	1,989,304	954,659	—4,538	127,660	822,461	139,590
Toledo, Peoria & Western	248	429,081	264,253	724,813	128,480	142,290	14,930	254,832	20,901	560,784	164,479	.....	28,800	135,679	35,779
Toledo, St. Louis & Western	451	1,782,095	201,554	2,111,696	307,625	291,430	69,246	708,467	55,217	1,431,985	680,711	.....	88,800	591,911	89,747
Trinity & Brazos Valley	463	1,326,810	311,969	1,698,417	251,192	192,108	60,197	693,219	73,627	1,270,843	428,574	.....	25,513	403,061	147,546
Vandalia	838	4,073,197	1,272,270	5,979,004	750,016	1,099,403	152,509	2,091,271	110,696	4,203,895	1,775,195	.....	187,226	1,537,969	486,538
Virginian & Southwestern	240	772,176	93,784	890,337	136,304	207,187	11,533	246,093	20,693	622,009	268,328	.....	31,600	236,928	—40,791
Wabash	2,515	11,480,632	3,999,656	16,879,943	2,205,746	2,805,159	513,942	6,515,170	387,151	12,427,168	4,452,775	—24,965	429,431	3,998,379	441,405
Western Maryland	543	3,038,980	559,648	3,792,296	615,874	534,669	93,460	1,548,597	81,404	2,874,094	918,202	.....	120,000	798,202	—438,559
Western Pacific	937	2,512,600	727,415	3,140,520	479,315	268,248	180,696	1,219,429	150,210	2,297,898	1,042,622	—2,939	121,844	917,839	363,196
Wheeling & Lake Erie	459[21]	3,776,170	361,324	4,367,738	571,433	780,049	49,513	1,318,939	92,731	2,809,655	1,558,083	15,129	184,236	1,388,976	105,098
Yazoo & Mississippi Valley	1,374	3,867,050	1,439,460	5,684,384	1,034,164	752,998	92,800	2,172,115	162,966	4,254,643	1,429,741	339	222,000	1,208,080	85,926

Average mileage operated during previous period: [1] 1,995; [2] 587; [3] 1,603; [4] 3,770; [6] 3,999; [7] 562; [9] 152; [11] 404; [13] 99; [14] 1,762; [15] 215; [17] 842; [20] 1,116; [22] 6,191; [23] 551; [24] 457.

— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF EXPRESS COMPANIES AS REPORTED TO THE INTERSTATE COMMERCE COMMISSION.

MONTH OF JULY, 1912.

Name of Company.	Miles of line covered. Steam roads.	Other lines.	Express revenue.	Gross receipts from operation.	Less express privileges. Dr.	Total operating revenues.	Operating expenses. Maintenance.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit —).	Taxes.	Operating income (or loss —).	Increase or decr. (—) comp. with last year.
Adams Express Co.	32,520[1]	4,786	$2,741,036	$2,779,285	$1,371,724	$1,407,561	$64,514	$10,626	$1,105,874	$84,673	$1,265,685	$141,876	$16,634	$125,242	$175,246
American Express Co.	57,335[2]	3,203	3,700,604	3,863,799	1,817,884	2,045,915	55,881	34,925	1,624,802	159,062	1,874,670	171,245	31,071	140,174	57,119
Canadian Express Co.	6,559[3]	847	285,625	292,453	138,790	153,663	—197	3,127	116,046	7,364	124,340	29,323	2,750	26,573	—1,153
Canadian Northern Express Co.	4,344[4]	22	57,849	59,654	23,140	36,514	268	334	17,463	1,585	19,650	16,864	403	16,461	3,905
Globe Express Co.	2,904	...	79,923	81,045	40,461	40,584	893	1,659	25,131	3,980	31,663	8,921	800	8,121	2,150
Great Northern Express Co.	8,645[5]	405	310,224	313,819	187,545	126,274	2,104	2,444	74,946	4,449	83,943	42,331	4,714	37,617	16,477
Northern Express Co.	7,457[6]	277	323,217	326,561	173,469	153,092	1,965	3,216	83,735	8,325	97,241	55,851	4,500	51,351	7,184
*National Express Co.	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Southern Express Co.	32,148[7]	821	1,146,437	1,169,128	578,864	590,264	15,976	8,939	425,849	60,976	511,740	78,524	13,317	65,207	26,352
United States Express Co.	28,817[8]	3,983	1,763,841	1,790,089	888,536	901,552	40,701	11,731	830,549	50,260	933,241	—31,688	10,213	—41,901	—41,596
Wells, Fargo & Co.	64,468[9]	25,825	2,930,306	2,976,424	1,456,216	1,519,708	61,838	32,634	1,123,914	84,629	1,303,015	216,693	30,000	186,693	93,626
Western Express Co.	4,888[10]	12	123,280	125,518	64,913	60,605	753	977	41,726	2,816	46,272	14,333	977	13,356	15,970

Operated in previous periods; Steam Roads—[1] 32,918; [2] 54,304; [3] 6,400; [4] 3,370; [5] 8,466; [6] 7,310; [7] 31,735; [8] 28,965; [9] 47,356; [10] 4,843. Other Lines—[1] 3,754; [2] 2,561; [3] 830; [4] 337; [5] 315; [6] 846; [7] 3,943; [8] 17,334; [9] 8.

*Merged with American Express on July 1, 1912.

MONTH OF AUGUST, 1912.

Name of Company.	Miles of line covered. Steam roads.	Other lines.	Express revenue.	Gross receipts from operation.	Less express privileges. Dr.	Total operating revenues.	Operating expenses. Maintenance.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit —).	Taxes.	Operating income (or loss —).	Increase or decr. (—) comp. with last year.
Adams Express Co.	32,578[1]	4,786	$2,831,524	$2,869,243	$1,434,112	$1,435,131	$75,740	$10,403	$1,113,702	$86,107	$1,285,952	$149,179	$16,634	$132,545	$59,406
American Express Co.	57,337[2]	3,467	3,787,029	3,952,708	1,902,161	2,050,547	67,661	37,332	1,628,160	157,432	1,890,585	159,962	31,032	128,930	—32,141
Canadian Express Co.	6,559[3]	847	278,191	284,345	134,554	149,791	5,781	1,812	115,710	7,448	129,961	19,430	2,750	16,680	—10,272
Canadian Northern Express Co.	4,344[4]	22	57,027	58,707	22,811	35,896	401	276	17,549	1,516	19,742	16,154	404	15,750	5,423
Globe Express Co.	2,863[5]	...	90,728	91,883	45,256	46,627	980	1,727	26,761	4,198	33,666	12,961	800	12,161	5,388
Great Northern Express Co.	8,647[6]	405	345,163	349,203	209,645	139,558	1,183	2,481	78,918	4,502	87,089	52,469	5,045	47,424	24,066
*National Express Co.	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Northern Express Co.	7,457[7]	277	318,511	321,993	172,263	149,730	1,003	3,122	85,798	5,210	95,133	54,597	4,500	50,097	16,178
Southern Express Co.	32,195[8]	791	1,047,845	1,070,960	531,391	539,569	15,554	7,707	422,283	66,202	511,746	27,823	13,482	14,341	—23,056
United States Express Co.	28,883[9]	4,035	1,769,653	1,796,269	855,096	941,173	41,033	16,537	816,409	50,617	924,596	16,577	13,062	3,515	—112
Wells, Fargo & Co.	64,486[10]	25,825	2,881,799	2,931,830	1,416,675	1,515,155	70,145	34,586	1,144,260	80,334	1,329,325	185,830	30,000	155,830	—82,753
Western Express Co.	4,888[11]	12	128,080	130,360	66,751	63,609	460	981	43,412	2,863	47,716	15,893	936	14,957	14,642

TWO MONTHS OF FISCAL YEAR, 1913.

Name of Company.	Miles of line covered. Steam roads.	Other lines.	Express revenue.	Gross receipts from operation.	Less express privileges. Dr.	Total operating revenues.	Operating expenses. Maintenance.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit —).	Taxes.	Operating income (or loss —).	Increase or decr. (—) comp. with last year.
Adams Express Co.	32,578[1]	4,786	$5,572,560	$5,643,529	$2,805,836	$2,842,693	$140,254	$21,030	$2,219,576	$170,778	$2,551,638	$291,055	$33,268	$257,787	$234,652
American Express Co.	57,337[2]	3,467	7,487,634	7,816,508	3,720,045	4,096,463	123,542	72,258	3,252,962	316,494	3,765,256	331,207	62,103	269,104	44,977
Canadian Express Co.	6,559[3]	847	563,817	576,799	273,744	303,055	5,585	2,148	231,756	14,812	254,301	48,754	5,500	43,254	—11,226
Canadian Northern Express Co.	4,344[4]	22	114,876	118,360	45,950	72,410	669	610	35,012	3,100	39,391	33,019	807	32,212	9,328
Globe Express Co.	2,863[5]	...	170,651	172,928	85,717	87,211	1,873	3,387	51,891	8,178	65,329	21,882	1,600	20,282	7,539
Great Northern Express Co.	8,647[6]	405	655,386	663,022	397,190	265,832	3,287	4,925	153,864	8,956	171,032	94,800	9,759	85,041	40,543
Northern Express Co.	7,457[7]	277	641,729	648,553	345,732	302,821	2,968	6,339	169,532	13,534	192,373	110,448	9,000	101,448	31,695
Southern Express Co.	32,195[8]	791	2,194,281	2,240,088	1,110,255	1,129,833	31,530	16,646	848,132	127,178	1,023,486	106,347	26,799	79,548	3,297
United States Express Co.	28,883[9]	4,035	3,533,496	3,586,358	1,743,632	1,842,726	81,734	28,268	1,646,958	100,877	1,857,837	—15,111	23,275	—38,386	—41,583
Wells, Fargo & Co.	64,486[10]	25,825	5,812,105	5,908,254	2,873,391	3,034,863	131,983	67,221	2,268,174	164,962	2,632,340	402,523	60,000	342,523	10,872
Western Express Co.	4,888[11]	12	251,361	255,878	131,664	124,214	1,213	1,959	85,138	5,679	93,989	30,225	1,912	28,313	30,612

Operated in previous periods: Steam roads—[1] 32,945; [2] 54,325; [3] 6,400; [4] 3,370; [5] 8,904; [6] 8,466; [7] 7,310; [8] 31,818; [9] 28,965; [10] 63,641; [11] 4,843. Other Lines—[1] 4,707; [2] 2,561; [3] 830; [4] 339; [5] 315; [6] 846; [7] 3,965; [8] 17,314; [9] 8.

*Merged with American Express on July 1, 1912.

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Reparation Awarded.

George A. Hornel & Company v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner McChord:

The commission found that the rate of 20 cents per 100 lbs. for the transportation of fresh meat and packing house products from Austin, Minn., to Chicago was unreasonable to the extent that it exceeded 18.5 cents per 100 lbs. for the transportation of fresh meat between the two points in question, and 16.5 per 100 lbs. for the transportation of packing house products. (26 I. C. C., 112.)

J. J. Newman Lumber Company v. Mississippi Central Railroad et al. Opinion by the commission:

The complainant alleges misrouting by defendant and consequent exaction of excessive charges for the transportation of 12 cars of yellow pine lumber from McCallum and Sumrall, Miss., to St. Albans, Vt., thence reconsigned to Worcester and Fitchburg, Mass., and Willimantic, Conn. The commission found that the New Orleans & Northeastern negligently routed these shipments via a route other than the cheapest available route and so deprived the complainant of the privilege of reconsignment at the joint through rate of 37 cents per 100 lbs. to Worcester, Fitchburg and Willimantic. (26 I. C. C., 97.)

C. M. Papillo v. Atlanta & West Point et al. Opinion by the commission:

The complainant contends that the rate of 93 cents per 100 lbs. for the transportation of household goods in carloads from West Point, Ga., to Waco, Tex., is unreasonable. Reparation is sought. The rate in question is not a through rate but is based on the lowest combination. The complainant called attention to the rate of 77 cents per 100 lbs. on household goods from points east of Chicago and north of the Ohio river to California and Nevada points, and also showed that the rates from West Point to Waco were lower on vehicles, furniture, cooperage, vegetables, etc., than applied on household goods. The commission found that the present rate is unreasonable to the extent that it exceeds 77 cents per 100 lbs. (26 I. C. C., 65.)

Rates on Canteloupes and Potatoes Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of canteloupes, potatoes and other fruits and vegetables from Ruston, La., and other points to Chicago and other points. Opinion by Commissioner McChord:

The defendants showed that the present rate arrangement had been reached in haphazard manner and that it needed readjustment. The commission decided that the proposed increases are reasonable. The order of suspension was vacated. (26 I. C. C., 101.)

Sugar Rate Reduced.

W. J. Echols & Company et al. v. Atchison, Topeka & Santa Fe et al. Opinion by the commission:

The complainant contends that the carload rates on sugar via sea-and-rail route from points in Atlantic seaboard territory to Fort Smith, Ark., are unreasonable. These rates vary from 45 to 50 cents per 100 lbs. The commission found that these rates were unreasonable and prescribed lower rates for the future. The new rates are in each case six cents lower than the rates now in effect. (26 I. C. C., 110.)

Pulp Wood Rates Reduced.

Rhinelander Paper Company v. Minneapolis, St. Paul & Sault Ste. Marie. Opinion by the commission:

The complainant contends that the rate of 6 cents per 100 lbs. for the transportation of pulp wood in carloads from Trenary, Delta Junction and Manistique, Mich., to Rhinelander, Wis., and the rate of 7½ cents per 100 lbs. for the transportation of pulp wood in carloads from Whitedale, Bovee and Christiansen Spur, Mich., to Rhinelander are unreasonable. The complainant contends that as Ladysmith, a point 87 miles west of Rhinelander, enjoys a differential of one cent under Rhinelander on movements from Minnesota, Rhinelander should be accorded an equal differential under Ladysmith on movements from Michigan. The defendants concede that Rhinelander is entitled to a differential of one cent under Ladysmith on traffic from Michigan points and have recently published tariffs naming the same rate of 6 cents per 100 lbs. from the first three stations, but reducing the rate of 7½ cents per 100 lbs. from the latter three stations to 6½ cents per 100 lbs. and making the rate to Ladysmith from all these stations a differential of one cent higher than to Rhinelander. The commission found that the rates now in effect are not unreasonable. Reparation was awarded on shipments which moved from the latter three stations under the rate of 7½ cents per 100 lbs. (26 I. C. C., 104.)

Common Brick Rates Not Advanced.

In re investigation and suspension of advances in rates by carriers for the transportation of building brick and other articles in carloads from Orchard Park and Jeanette, N. Y., to Canadian points. Opinion by Commissioner McChord:

The advances complained of in the tariff average about 35 cents per ton and in some cases are as high as 65 cents per ton. The defendants contended that the commission in the *Stowe Fuller case*, 12 I. C. C., 213, ruled that all classes of brick should take the same rate. The commission declared, however, that that case did not relate to common brick and that common brick should enjoy a lower rate than paving and fire brick. The commission decided that the defendants did not show that the proposed increases were reasonable and ordered them to withdraw the suspended tariffs. (26 I. C. C., 129.)

Mixed Carload Rate.

West Point Manufacturing Company v. Chattahooche Valley et al. Opinion by the commission:

The complainant contends that the provision of the defendant's tariff governing the shipment of cotton duck and denims from southeastern territory to Pacific coast terminals is unreasonable, in that it prohibits the shipment of mixed carloads of cotton duck and denims with cotton sheeting, drills and bagging. The commission found that all these goods were shipped in the same kind of packages and that duck and drills weighed about the same to the carload and took the same rates. The commission decided that the rule in question was unreasonable insofar as it deals with mixed carloads of duck and drills, and ordered that in future the rate on mixed carloads of cotton duck and cotton drills should be the carload rate. Reparation was awarded. (26 I. C. C., 79.)

STATE COMMISSIONS.

Myer Hurley, a member of the Public Utilities Commission of Kansas, is general chairman of the Brotherhood of Locomotive Engineers for the Atchison, Topeka & Santa Fe, a position which he has held for fourteen years. The *Santa Fe Magazine* for February contains a portrait of Hurley. He was appointed commissioner January 23, last. For six years Mr. Hurley was chairman of the board of trustees of the grand lodge of his brotherhood. He began railway service in 1879 as a fireman on the Louisville & Nashville, and has been on the Santa Fe 25 years.

COURT NEWS.

In the federal court at Trenton, N. J., February 14, the government filed a suit against the Delaware, Lackawanna & Western Railroad and the Delaware, Lackawanna & Western Coal Company, charging violation of the anti-trust law in the agreement between the two defendants for marketing coal. The government charges that the railroad by its great facilities, resources and power is able to buy so much of the coal produced by independent operators that it can control the price of more than 90 per cent. of the entire production along its lines, so that at non-competing points it can arbitrarily fix the price of all anthracite coal. The business of the railroad is declared to have been immensely profitable, the majority of the stock of the company being held, in large blocks, by less than twenty-five individuals. A still smaller number of men dominates its affairs by their unity of purpose and effort.

The suit will be of interest to all anthracite roads. Besides the Lackawanna, the Lehigh Valley has organized and distributed the stock of a coal sales company in the same way. The Delaware & Hudson sells its coal to the Hudson Coal Company, but the stock of the latter is owned by the D. & H. The Reading is believed to be liable to attack by the government under both the Sherman law and the commodities clause of the Interstate Commerce law.

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Railway Officers.

Executive, Financial and Legal Officers.

James Imbrie, vice-president of the Brinson Railway, with office at New York, has been elected chairman of the board and John H. Hunter has been elected vice-president. The general offices will be transferred from Springfield, Ga., to Savannah.

Operating Officers.

G. B. Perdue has been appointed trainmaster of districts 27 and 28 of the Grand Trunk, with headquarters at Durand, Mich.

A. Syverson has been appointed superintendent of the Ann Arbor, with office at Owosso, Mich., to succeed W. D. Holliday, resigned; effective February 14.

A. B. Warner has been appointed superintendent of the Chicago, Rock Island & Gulf, with headquarters at Ft. Worth, Tex., succeeding C. L. Ruppert.

John W. Walters has been appointed trainmaster and roadmaster of the St. Louis, Brownsville & Mexico, with office at Kingsville, Tex., succeeding E. S. Heyser, resigned.

J. H. Reich, car accountant of the New Orleans, Texas & Mexico, has been appointed superintendent of that road, and the St. Louis, Brownsville & Mexico, with headquarters at Houston, Tex.

C. J. Wilson has been appointed superintendent of the Duluth, Winnipeg & Pacific, with headquarters at Virginia, Minn., to succeed C. W. Houston, resigned to engage in private business.

E. S. Heyser, trainmaster and roadmaster of the St. Louis, Brownsville & Mexico, has been appointed general superintendent of the San Benito & Rio Grande Valley, with headquarters at San Benito, Tex.

S. P. Coughlin has been appointed assistant superintendent of the Houston East & West Texas and the Houston & Shreveport, with headquarters at Houston, Tex., succeeding H. J. Mickseh, transferred.

G. C. Randall has been appointed superintendent of transportation of the Colorado & Southern, in charge of freight and passenger train movements, car distribution and assignment of locomotives, with headquarters at Denver, Colo.

C. L. Ruppert, superintendent of the Chicago, Rock Island & Gulf at Ft. Worth, Tex., has been appointed superintendent of the Oklahoma division of the Chicago, Rock Island & Pacific, with office at El Reno, Okla., in place of J. McGie, deceased.

F. M. Conner, assistant trainmaster of the Cincinnati, Hamilton & Dayton, at Hume, Ill., has been appointed trainmaster, with headquarters at Indianapolis, Ind., succeeding E. W. Hoffman, promoted, and C. W. Havens succeeds Mr. Conner.

J. A. Sormerville, superintendent of terminals of the Missouri Pacific at Kansas City, Mo., has been appointed superintendent of transportation of that road and the St. Louis, Iron Mountain & Southern, with headquarters at St. Louis, Mo. He succeeds E. F. Kearney, who recently was made general superintendent of transportation of the Missouri Pacific system.

J. P. Burrus, superintendent of the Fort Worth division of the International & Great Northern, at Mart, Tex., has been appointed superintendent of the Gulf division, including Taylor sub-division, with headquarters at Palestine, succeeding T. C Radey, resigned; and S. E. Burkhead, inspector of transportation and stations of the Texas & Pacific, has been appointed superintendent of the Fort Worth division of the International & Great Northern, with headquarters at Mart, succeeding Mr. Burrus.

C. E. Hix, car accountant of the Seaboard Air Line at Portsmouth, Va., has been appointed to the new position of superintendent of transportation. The assistant general manager will in future have jurisdiction over the maintenance of way, operating and telegraph departments, and the following officers will report to and receive instructions from him: Engineer maintenance of way, superintendent of transportation, superintendent of telegraph, car accountant, fuel inspector and division superintendents on all except maintenance of way matters, upon which they will report to the engineer maintenance of way.

Frederick H. Hammill, division superintendent of the Chicago & North Western at Boone, Iowa, has been appointed assistant general superintendent, with office at Boone, with jurisdiction over the East Iowa, West Iowa, Iowa & Minnesota, Northern Iowa and Sioux City divisions. F. J. Byington, assistant division superintendent at Baraboo, Wis., has been appointed superintendent of the West Iowa division, with headquarters at Boone, Ia., in place of Mr. Hammill. J. W. Layden, trainmaster at Baraboo, succeeds Mr. Byington as assistant superintendent of that place. J. H. Hull succeeds Mr. Layden as trainmaster. J. S. Rice has been appointed trainmaster of the East Iowa division at Belle Plaine, Iowa, in place of A. Syverson, resigned.

John A. Shepherd, whose appointment as superintendent of terminals of the Missouri Pacific at Kansas City, Mo., has been announced in these columns, was born April 21, 1874, at Homer, Ill. He was educated in the common schools and began railway work in September, 1893, as a telegraph operator for the Wabash, remaining with that road for ten years as train despatcher and chief despatcher. He was then until October, 1905, assistant superintendent for the Terminal Railroad Association of St. Louis, in charge of freight movement. On the latter date Mr. Shepherd became superintendent of the Western Maryland, with headquarters at Hagerstown, Md., and in May, 1911, he was promoted to general manager, with office at Baltimore, Md., which position he held until February 1 this year, when he was appointed superintendent of terminals of the Missouri Pacific, as noted above.

W. A. Cooper, whose appointment as manager of sleeping, dining and parlor car and news service of the Canadian Pacific, with office at Montreal, Que., has been announced in these columns, was born on March 22, 1871, at Montreal. He began railway work in February, 1886, as secretary to assistant general manager of the Grand Trunk, and in June, 1891, was appointed chief clerk in the office of the general superintendent of the Eastern division of the Canadian Pacific. Three years later he was made inspector of sleeping, dining and parlor cars and news service of the Canadian Pacific, and in July, 1897, was made assistant superintendent of the same department. In December, 1905, he was promoted to superintendent, and in August, 1908, became general superintendent, which position he held at the time of his recent appointment as manager of the same department, as above noted.

Stanley Saunders Russell, whose appointment as general superintendent of transportation of the Central Vermont, with headquarters at St. Albans, Vt., has been announced in these columns, was born on October 18, 1874, at Rednersville, Ont., and was educated in the public schools and at Belleville College. He began railway work in November, 1891, in the office of the assistant superintendent of the Grand Trunk at Belleville, and the following year was transferred to Toronto. In August, 1896, he was appointed secretary to the superintendent at Toronto, and in March, 1898, he became chief clerk to the joint superintendent of the Grand Trunk and the Wabash at St. Thomas. From June to December, 1902, he was private secretary to the vice-president and general manager of the Central Vermont at St. Albans, and from January, 1903, to December of the following year was chief clerk to the superintendent of transportation, and then became chief clerk to the general manager. In October, 1911, he was made

S. S. Russell.

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superintendent of car service, which position he held at the time of his recent appointment as general superintendent of transportation of the same road, as above noted.

Clinton Lloyd Bardo, assistant to general manager of the Lehigh Valley, at South Bethlehem, Pa., has been appointed general manager of the New York, New Haven & Hartford, with headquarters at New Haven, Conn., succeeding B. R. Pollock, resigned. Mr. Bardo was born at Montgomery, Pa., in 1867, and began railway work in 1885 as an operator on the Pennsylvania Railroad. The next year he worked as operator on the Philadelphia & Reading and then went to the Tidewater Oil Co. as operator and supply agent in the construction department at Mauch Chunk, Pa. In 1887 he went to the Lehigh Valley as operator, and was later made train despatcher. In 1892 he was appointed assistant trainmaster of the Wyoming division and after a few months was made trainmaster of that division. He was transferred to the New York division in 1901, and in 1904 went to the New York, New Haven & Hartford as freight trainmaster of the New York division. He was appointed assistant superintendent of this division in 1905, and on June 1, 1907, was appointed superintendent of the Grand Central Station and Electric division of the New York Central & Hudson River, leaving that road on March 15, 1911, to become assistant to general manager of the Lehigh Valley, with headquarters at South Bethlehem, Pa., which position he held at the time of his recent appointment as general manager of the New York, New Haven & Hartford, as above noted. Mr. Bardo has been appointed also general manager of the Central New England.

S. E. Burkhead, who has been appointed superintendent of the Fort Worth division of the International & Great Northern, with headquarters at Mart, Tex., was born on July 24, 1873, at Sparta, Tenn., and was educated at Southwestern University, Georgetown, Tex. He began railway work with the International & Great Northern on May 15, 1889, as machinist apprentice, and remained in the service of that company until December, 1909, holding the positions of locomotive fireman, locomotive engineman, inspector of transportation for the entire line, assistant superintendent, Gulf division, and chairman of the rule committee introducing the rules of the American Railway Association. From December, 1909, to September, 1911, he was with the Denver & Rio Grande, first as assistant superintendent of the First division Colorado lines, and then as superintendent of the Salt Lake division, Utah lines. In December, 1911, he went to the Texas & Pacific as trainmaster, Eastern division, and was later chairman of the rule committee, introducing the rules of the American Railway Association, and then superintendent of terminals at Fort Worth, Tex., until his appointment as inspector of transportation and stations of the same road, which position he held at the time of his recent appointment as superintendent of the Forth Worth division of the International & Great Northern, as above noted.

S. E. Burkhead.

F. M. Melin, division superintendent of the Chicago, Milwaukee & St. Paul at Milwaukee, Wis., has been transferred to Aberdeen, S. D., as superintendent of the Hastings & Dakota division, succeeding J. T. Gillick, promoted. J. M. Oxley, division superintendent at Chicago, has been appointed division superintendent, with headquarters at Ottumwa, Iowa, in place of J. A. MacDonald, who has been appointed superintendent of the Northern and LaCrosse divisions, with headquarters at Milwaukee, succeeding Mr. Melin. E. W. Morrison, assistant division superintendent at Milwaukee, succeeds Mr. Oxley as superintendent of the Chicago division. N. P. Thurber has been appointed assistant superintendent of the Prairie du Chien and Mineral Point divisions, with office at Milwaukee. W. B. Foster, superintendent at Tacoma, Wash., has been appointed general superintendent of the Puget Sound lines, with headquarters at Seattle, Wash. P. C. Hart, who formerly was general superintendent of the Chicago, Milwaukee & Puget Sound, and who recently was promoted to general manager of the Chicago, Milwaukee & St. Paul lines east of the Missouri river, with headquarters at Chicago, has been in the service of the St. Paul road since 1876. He began railway work as section man, and has since filled the positions of telegraph operator, station agent, brakeman, conductor, chief clerk in the superintendent's office, trainmaster, superintendent of terminals, division superintendent, superintendent of construction, and general superintendent, until his recent promotion as general manager on February 1. J. T. Gillick, whose appointment as assistant to the general manager, with office at Chicago, has already been announced, was born in June, 1870, at Glencoe, Minn. He began railway work in 1884 with the Chicago, Milwaukee & St. Paul, and has been successively telegraph operator, train despatcher, trainmaster and division superintendent.

P. C. Hart.

Traffic Officers.

John Gray has been appointed a freight agent of the Grand Trunk, with office at Toronto, Ont.

J. B. DeCamara has been appointed commercial agent of the International & Great Northern, with office at Laredo, Tex.

F. Duval Armstrong has been appointed general agent of the Frisco Lines at New Orleans, La., succeeding I. T. Preston, deceased.

C. H. Pearson has been appointed assistant general freight agent of the Alabama Great Southern, with headquarters at Birmingham, Ala.

J. T. Baird has been appointed commercial agent of the Central of Georgia, with office at Oklahoma City, Okla., succeeding Tinsley Smith, transferred.

J. O. Goodsell, traveling passenger agent of the Union Pacific, with headquarters at Detroit, Mich., has been appointed city passenger agent at Chicago.

Gordon Edwards has been appointed traveling freight agent of the Delaware & Hudson Company, with office at Pittsburgh, Pa., succeeding F. C. Snyder, deceased.

W. F. Freeman has been appointed soliciting freight agent of the Georgia Southern & Florida, with office at Atlanta, Ga., succeeding W. B. Butler, resigned.

E. L. Kemp, assistant superintendent of the Illinois Central at Louisville, Ky., has been appointed local freight agent at Chicago, succeeding L. F. Barron, resigned.

L. K. Bemis has been appointed traveling freight and passenger agent of the Illinois Central, with headquarters at Salt Lake City, Utah, succeeding R. E. Watson, resigned.

J. A. Sullivan, local freight agent of the Wabash at Detroit, Mich., has been appointed division freight agent, with office at Detroit, succeeding E. H. B. Cull, deceased. Effective February 15.

Joseph L. Sheppard has been appointed assistant general freight agent of the Illinois Central and the Yazoo & Missis-

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sippi Valley, with headquarters at Memphis, Tenn., to succeed Fred H. Law, transferred.

F. W. Robinson, assistant to director of traffic on the Harriman Lines, with office at Chicago, has been appointed assistant traffic manager of the Oregon-Washington Railroad & Navigation Company, with headquarters at Portland, Oregon.

Fred H. Law, assistant general freight agent of the Illinois Central and Yazoo & Mississippi Valley, at Memphis, Tenn., has been appointed assistant general freight agent, with headquarters at St. Louis, Mo., succeeding J. S. Weitzell, who has been granted leave of absence on account of ill health.

E. S. Johnson, commercial agent of the Macon, Dublin & Savannah, at Miami, Fla., has been appointed commercial agent, with office at Jacksonville, succeeding M. H. Dorsett, resigned to accept service with another company. W. F. Mundee has been appointed contracting freight agent, at Jacksonville. The office of commercial agent at Miami has been abolished, but the commercial agent at Jacksonville will have an office in Miami during the perishable season.

Edward Emery, traveling passenger agent of the Baltimore & Ohio at Denver, Colo., has been appointed traveling agent of the passenger department, with headquarters at Baltimore, Md., and he will now be an inspector of passenger service. He will inspect and report on passenger and ticket offices, station buildings and train service, as well as the prompt and careful handling of baggage. He will inculcate ideas as to neatness, and as to alertness to the interests of travelers and in presenting the advantages of the Baltimore & Ohio. Mr. Emery entered Baltimore & Ohio service in the baggage department at Pittsburgh in October, 1903, and was later advanced to ticket clerk and city ticket agent there.

In addition to the representatives local to the Union Pacific, Oregon Short Line and Oregon-Washington Railroad & Navigation Company, comprising the Union Pacific System, the following will solely represent Union Pacific System Lines: Willard Massey, New England freight and passenger agent, Boston, Mass.; E. A. Shewe, general agent, Butte, Mont.; W. H. Connor, general agent at Cincinnati, Ohio, and Cleveland; J. W. Turtle, traveling passenger agent, Des Moines, Ia.; J. C. Ferguson, general agent at Detroit, Mich.; H. O. Wilson, general agent at Los Angeles, Cal.; L. L. Davis, commercial agent, Milwaukee, Wis.; H. F. Carter, district passenger agent, and D. M. Collins, district freight agent, both with headquarters at Minneapolis, Minn.; B. DeFriest, general eastern agent at New York City; H. V. Blasdel, agent of the passenger department, and A. V. Stevenson, agent of the freight department, both with headquarters at Oakland, Cal.; J. C. Percival, agent at Olympia, Wash.; S. C. Milbourne, general agent at Philadelphia, Pa.; J. E. Corfield, general agent at Pittsburgh, Pa.; L. M. Tudor, commerical agent, Pueblo, Colo.; B. F. Owlsey, agent at Port Townsend, Wash.; A. J. Dutcher, general agent at St. Louis, Mo.; James Warrack, district freight and passenger agent, Sacramento, Cal.; S. F. Booth, general agent at San Francisco, Cal.; F. W. Angier, agent of the passenger department, and L. M. Cheshire, agent of the freight department, both with headquarters at San Jose, Cal.; J. B. Courtright, traveling freight and passenger agent, Vancouver, B. C.; W. C. Knowles, traveling passenger agent, with headquarters at Cincinnati, in place of W. T. Holly, resigned, to go with another company.

Engineering and Rolling Stock Officers.

J. V. Murphy has been appointed roadmaster of the Houston & Texas Central at Ennis, Tex., in place of L. Acker, resigned.

C. R. Diemar has been appointed assistant engineer of the Baltimore & Ohio Southwestern, with office at Cincinnati, Ohio.

H. H. Gibson has been appointed chief engineer of the New Orleans Southern & Grand Isle, with headquarters at Algiers, La.

F. E. Watson has been appointed division engineer of the Chicago, Rock Island & Pacific at Trenton, Mo., succeeding R. Johnson.

Watson Townsend has resigned as assistant engineer of the Union Pacific, with headquarters at Omaha, Neb., to accept the position of city engineer of Omaha.

R. C. Hyde has been appointed master mechanic of the Louisiana division of the Chicago, Rock Island & Pacific, with headquarters at El Dorado, Ark., succeeding H. J. Osborne, resigned.

J. G. Sheldrick, resident engineer of the Minneapolis, St. Paul & Sault Ste. Marie at Superior, Wis., has been appointed division engineer of the Superior-Duluth division, with headquarters at Superior.

H. H. Eggleston, assistant supervisor of bridges and buildings of the Baltimore & Ohio Chicago Terminal at Chicago, has been appointed supervisor of bridges and buildings of the Chicago Great Western at Des Moines, Iowa.

A. H. Hogeland, chief engineer of the Great Northern, has been appointed consulting engineer, with headquarters at St. Paul, Minn. R. Budd, assistant to the president, succeeds Mr. Hogeland as chief engineer, with office at St. Paul.

T. A. Summerskill has been appointed superintendent of motive power of the Central Vermont, with office at St. Albans, Vt.; and J. E. Fitzsimons, acting superintendent of motive power, at St. Albans, has been appointed master mechanic, with office at St. Albans.

H. E. Smith has been appointed general signal foreman of the terminals of the Louisville & Nashville and the Nashville, Chattanooga & St. Louis, at Nashville, Tenn., succeeding J. H. Clark, signal inspector, resigned, and the office of signal inspector is abolished.

H. R. Carpenter, assistant engineer of the Missouri Pacific at St. Louis, Mo., has been appointed engineering maintenance of way, with headquarters at St. Louis, Mo. F. K. Bennett, assistant engineer at St. Louis, has been transferred to Kansas City, Mo., in a similar capacity.

The office of chief engiher of the Kansas City, Mexico & Orient, formerly held by W. W. Colpitts, has been abolished. H. B. Holmes has been appointed resident engineer, with headquarters at Kansas City, Mo., and will have jurisdiction over matters pertaining to the engineering department.

B. R. Kulp has been appointed acting division engineer of the Chicago & North Western at Antigo, Wis., succeeding W. J. Jackson, who has been transferred to Madison, Wis., as division engineer in place of S. S. Long, who succeeds W. T. Main as division engineer at Chicago. Mr. Main will engage in private business.

P. D. Galarneau, superintendent of the St. Louis, Mo., shops of the Armour Car Lines, has been transferred to Meridian, Miss., in charge of the shops, also of the New Orleans and Mobile repair forces, succeeding A. B. Chadwick, resigned. C. H. Taylor, superintendent of the South Omaha, Neb., shops, succeeds Mr. Galarneau, and J. C. Rowe succeeds Mr. Taylor.

W. E. Anderson, master mechanic of the Colorado & Southern at Trinidad, Colo., has been transferred to Denver, Colo., as master mechanic of that road and the Atchison, Topeka & Santa Fe, succeeding H. W. Ridgway, who has been appointed superintendent of motive power, with office at Denver, Col., in place of H. C. Van Buskirk, who has resigned on account of ill health. J. M. Davis succeeds Mr. Anderson as master mechanic at Trinidad.

F. P. Sisson, resident engineer of the Grand Trunk at Detroit, Mich., has been appointed assistant engineer, and H. G. Batten has been appointed supervisor of bridges and buildings, both with headquarters at Detroit. O. H. Sessions has been appointed assistant engineer and G. Sanders has been appointed supervisor of bridges and buildings, both with headquarters at Battle Creek. The position of roadmaster having been abolished, the following now have the title of supervisor of track: H. Plowman, at Milwaukee Junction, Mich.; J. Mullen, Durand; J. Lockert, Grand Rapids; C. Hawkins, Pontiac; J. Nolan, Valparaiso, Ind.; J. Cotter, Battle Creek, Mich., and F. Tranzow, at Durand.

F. T. Chase, who recently was appointed master mechanic of the Missouri, Kansas & Texas Railway of Texas, with headquarters at Smithville, Tex., was born at Atlanta, Ga., August 25, 1862. He was educated in the common schools, and after serving an apprenticeship as millwright and machinist, began railway work in October, 1881, as a locomotive fireman on the Texas & Pacific. From April, 1882, to September, 1887, he was

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engaged in other business, on the latter date re-entering service as a machinist for the Missouri, Kansas & Texas of Texas. He was a locomotive engineer on that road for ten years from August, 1889, and a locomotive fireman from May, 1899, to August, 1900. He was then promoted to foreman of machinery at Smithville, Tex., which position he held until his appointment as master mechanic, as noted above.

William Garstang, superintendent of motive power and master car builder of the Cleveland, Cincinnati, Chicago & St. Louis, the Peoria & Eastern and the Cincinnati Northern, having requested to be relieved of a portion of his duties, has been appointed general master car builder, and S. K. Dickerson, formerly assistant superintendent of motive power of the Lake Shore & Michigan Southern, has been appointed superintendent of motive power, both with headquarters at Indianapolis, Ind. Mr. Garstang was born February 28, 1851, in England, and was educated in the public schools. He began railway work in 1863 as a machinist apprentice with the Cleveland & Erie, now the Lake Shore & Michigan Southern, at Cleveland, Ohio, where he remained six years. He was then for 11 years machinist and general foreman for the Atlantic & Great Western and the New York, Pennsylvania & Ohio; three years general foreman of the Cleveland & Pittsburgh division of the Pennsylvania Company; five years master mechanic of the Cleveland, Columbus, Cincinnati & Indianapolis, now the Cleveland, Cincinnati, Chicago & St. Louis. From 1888 to April, 1893, Mr. Garstang was superintendent of motive power of the Chesapeake & Ohio, and on the latter date became superintendent of motive power of the Cleveland, Cincinnati, Chicago & St. Louis.

W. Garstang.

Purchasing Officers.

Joseph J. Bennett has been appointed assistant purchasing agent of the Illinois Central, with headquarters at Chicago.

T. J. Lowe has been appointed fuel agent of the Canadian Northern and the Duluth, Winnipeg & Pacific, with headquarters at Winnipeg, Man.

Special Officers.

G. S. Ward has been appointed chief special agent of the Seaboard Air Line, effective March 1.

W. B. Wells, commercial agent of the Frisco Lines at Dallas, Tex., has been appointed industrial agent, with headquarters at St. Louis, Mo. E. F. Hundley succeeds Mr. Wells.

George K. Andrews has been appointed commissioner of agriculture, with supervision over the lines of the Missouri Pacific, with headquarters at St. Louis, Mo. L. A. Markham, commissioner of agriculture for the entire system, with headquarters at Little Rock, Ark., will hereafter have jurisdiction over the St. Louis, Iron Mountain & Southern only, and will retain his headquarters at Little Rock.

OBITUARY.

Robert Law, formerly for many years connected with the Burlington system, and afterwards vice-president and general manager of the Colorado & Northwestern, died on February 7, at Los Angeles, Cal., aged 61 years.

George Copland, vice-president, secretary-treasurer and auditor of the Lexington & Eastern, with headquarters at Lexington, Ky., died at that place on February 11. He was born on November 13, 1837, in Aberdeenshire, Scotland, and had been in the service of the Lexington & Eastern since 1894.

William Randall, auditor of freight and ticket accounts of the Chicago, Burlington & Quincy, with headquarters at Omaha, Neb., died in that city on February 7, at the age of 71 years. Mr. Randall had been in the service of the Burlington system since 1872, and had been auditor of freight and ticket accounts since 1875.

William Riley McKeen, who was president of the Terre Haute & Indianapolis, now the Vandalia, from 1867 to January 15, 1896, died at Terre Haute, Ind., on February 18. Mr. McKeen was born on October 12, 1829, in Vigo County, Ind. He was the father of Benjamin McKeen, general manager of the Pennsylvania Lines west of Pittsburgh, and of W. R. McKeen, Jr., consulting engineer of motor cars on the Union Pacific.

Albert S. Cheever, who was superintendent of the Fitchburg division of the Boston & Maine from November, 1902, for ten years, died on February 17, at his home in Somerville, Mass. He was born on September 17, 1857, at Chelsea, Mass., and began railway work as a clerk in the general superintendent's office of the Fitchburg Railroad, now a part of the Boston & Maine. After holding various subordinate positions in the chief engineer's office, he became assistant engineer, with headquarters at Fitchburg, and in May, 1887, was made division engineer in charge of the Western division of the same road. From November, 1890, to September, 1897, and from December, 1898, to July, 1900, he was chief engineer of the Fitchburg, and then until November, 1902, was assistant chief engineer of the Boston & Maine. He was appointed superintendent of the Fitchburg division of the same road in November, 1902, remaining in that position until November 17, 1912, when he was assigned to special work in the operating department.

NEW LINES FOR ARGENTINA.—The Buenos Ayres Great Southern Railway, already the longest system in Argentina, has outlined a comprehensive construction program for the year 1913. The principal undertaking is the new connection with Chile. This line has now been opened to traffic as far as Sennilosa, about 20 miles west of Neuquen, and about 180 miles from the Chilean border. The company will at once proceed with the remaining section. This will enter the Cordilleras, and an immense amount of rock blasting will have to be undertaken. Twenty tons of dynamite have already been sent to the spot where the blasting is to begin, while the staff of laborers has been materially increased, the contractors recognizing that they have before them one of the most difficult, as well as the most costly portions of the work. The company will also commence the construction of the branch line from Alvarez Jonte to Lezama. Other branch lines to be taken in hand within the course of the next few months will include one from San Vicente to Villanueva and another from Darwin to Conesa.

RAILWAY DEVELOPMENT IN ROUMANIA.—The project to grant a large credit to the railway authorities continues to be discussed and it is thought that the government will advocate such action soon after parliament reassembles, although only a part of what is wanted may be granted. The director general of railways has now made a report in which he urges the opening of the following credits: For the development of the system (new lines and new facilities), $25,600,000; for construction of a central station in Bucharest, $5,000,000; for improvement (double tracking, etc.) of existing lines, $1,400,000; making a total of $32,000,000. If these credits should be granted the expenses already incurred in the construction of various new lines would be liquidated at first, and other new lines would then be built. It is thought probable that one of the first lines to be built would be a double-track road from Bucharest to Craiova via Rosiori and Caracal, of which the estimated cost is $13,125,000. Other lines which would probably be among the first are those which would connect Bucharest with Jassy via Urziceni, Faurei, and Tecuci, and Jassy with Burdujeni via Harlau and Botoshani. The eventual construction is also contemplated of a number of strategic lines in Moldavia, the narrow spur of Roumania running to the north between Austria-Hungary and Russia, as well as the development of the urban system in and around Bucharest.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE NORFOLK & WESTERN is in the market for 60 locomotives.

THE BALTIMORE & OHIO is considering the purchase of a large number of locomotives.

THE OCEAN SHORE has ordered 2 mogul locomotives from the Baldwin Locomotive Works.

THE CHICAGO & WESTERN INDIANA is in the market for five additional switching locomotives.

THE VIRGINIA & RAINY LAKE has ordered 2 consolidation locomotives from the Baldwin Locomotive Works.

THE ATLANTIC COAST LINE has ordered 4 six-wheel switching locomotives from the Baldwin Locomotive Works.

THE CHICAGO, BURLINGTON & QUINCY has ordered 25 switching locomotives from the Baldwin Locomotive Works.

THE FEDERAL FURNACE COMPANY has ordered 1 six-wheel switching locomotive from the Baldwin Locomotive Works.

GUINLE & COMPANY, New York, have ordered 1 four-wheel switching locomotive from the American Locomotive Company.

THE PENNSYLVANIA LINES WEST have ordered 70 additional consolidation locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 26 in. x 28 in. cylinders, 62 in. driving wheels and in working order will weigh 254,000 lbs.

CAR BUILDING.

THE NORFOLK & WESTERN is negotiating for an additional 2,000 freight cars.

THE UTAH RAILWAY, Salt Lake City, Utah, is said to be figuring on 500 coal cars.

THE TOLEDO, ST. LOUIS & WESTERN is considering the purchase of 1,000 box cars.

THE ATLANTIC COAST LINE has ordered 1,000 box cars and 300 flat cars from the Barney & Smith Car Company.

THE BERWIND-WHITE COAL MINING COMPANY, New York, has ordered 100 gondola cars from the Cambria Steel Company.

THE HARRIMAN LINES, instead of having ordered 2,000 gondola cars from the Pressed Steel Car Company and 800 automobile cars, 10 cabooses and some box cars from the Standard Steel Car Company, as mentioned in the *Railway Age Gazette* of February 14, have ordered cars from those two companies as follows: 2,280 drop bottom gondola cars, 200 hopper bottom gondola cars and 203 tank cars from the Pressed Steel Car Company; 1,000 box cars, 800 automobile cars and 110 caboose cars from the Standard Steel Car Company. This company has also ordered 2,290 box cars from the American Car & Foundry.

IRON AND STEEL.

GENERAL CONDITIONS IN STEEL.—The volume of orders in the steel industry has shown a further falling off during the past week. This is partly due to the threatened strike of the firemen and partly to the fact that the change of administration is now near at hand. Production continues at the same high rate and prices are still firm. It is expected that the unfilled tonnage at the end of the current month will show a considerable decrease from the previous month as it is unlikely that the volume of orders placed will show a material increase in the near future.

ARGENTINE RAILWAY DEVELOPMENT.—The Argentine government's program for construction of new lines includes a proposal to survey a route for a railway joining up the northeast section of the North Argentine Railway with a point on the line between Rio Cuarto and Villa Dolores.

Supply Trade News.

Richard S. Buck has resigned his position with Sanderson & Porter, New York, to become chief engineer of the Dominion Bridge Company.

The H. W. Johns-Manville Company, New York, has moved its Newark, N. J., office to 329 Halsey street, where 4,000 sq. ft. of floor space is available.

A. B. Chadwick has resigned his position in the shops of the Armour Car Lines at Meridian, Miss., to go to the Grip Nut Company, Chicago, as superintendent of its plant at Whitney, Ind.

At a recent meeting of the directors of the Weir Frog Company, Cincinnati, Ohio, B. W. Rowe, the former president, was elected chairman of the board of directors, and O. DeG. Vanderbilt, Jr., was elected president in his place.

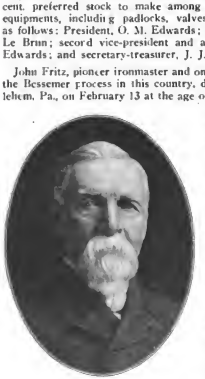
Erle C. Cowgill has resigned as secretary of The M-C-B Company, McCormick building, Chicago, to become general manager of a plantation company in Mississippi. His interest in The M-C-B Company was taken over by other members of the firm.

The Griffin Wheel Company, Chicago, has been reincorporated under the laws of Massachusetts, and has increased its capital stock from $10,000,000 to $21,000,000, of which approximately $15,000,000 has been issued. The company has been an Illinois corporation.

The Armour Car Lines are enlarging their car shops at Meridian, Miss. Additional trackage, machinery and buildings are being added to allow a force of 300 men to be at work rebuilding cars. These improvements are in charge of P. D. Galarneau, superintendent.

The O. M. Edwards Company, Syracuse, N. Y., has been incorporated with $1,000,000 common stock and $250,000 seven per cent. preferred stock to make among other things freight car equipments, including padlocks, valves, etc. The officers are as follows: President, O. M. Edwards; first vice-president, W. A. Le Brun; second vice-president and assistant manager, E. W. Edwards; and secretary-treasurer, J. J. Edwards.

John Fritz, pioneer ironmaster and one of the first to introduce the Bessemer process in this country, died at his home in Bethlehem, Pa., on February 13 at the age of 91. Mr. Fritz was born in Chester county, Pa., on August 21, 1822. He received his early education in a country school and became an apprentice in a blacksmith shop in 1838. In 1844 he went to a mill for rolling bar iron at Coatesville, Pa., still serving as an apprentice. After three months he was made a mechanic, and three months later he was given charge of the industry as ironmaster. In 1852 he was associated with a brother and two brothers-in-law in the establishment of a small foundry and machine shop at Catasauqua, and two years later he assisted in the construction of the Cambria Iron Works at Johnstown. In the same year he was made superintendent of that company. In 1860 he was called upon to design the plant of the Bethlehem Iron Company. He accepted, and when the plant was completed he was made superintendent and engineer. It was there that he helped perfect the Bessemer process, which was introduced in 1864. He was one of the very first to recognize its significance, and a large



John Fritz.

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measure of its success is due to him. In 1886 Mr. Fritz built for the Bethlehem company a plant for the manufacture of armor plate, which was the first plant of its kind in this country. He introduced processes from England and France for the manufacture of this product. He resigned his position as president of the Bethlehem Steel Company in 1893 and retired from active business. Mr. Fritz was a vice-president of the American Society of Mechanical Engineers from 1882 to 1884, and was president in 1895. He had also been president of the American Institute of Mining Engineers, and was an honorary member of the American Society of Civil Engineers. In 1893 he was awarded the Bessemer medal by the Iron and Steel Institute of England, and in the same year was elected an honorary member of that institute, one of the greatest honors an engineer can receive. His eightieth birthday was celebrated by a dinner given in his honor at the Waldorf-Astoria, New York, on which occasion the John Fritz gold medal for achievement in educational sciences in this country was founded. This medal is awarded annually by a committee of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Electrical Engineers. The first medal was conferred upon John Fritz himself. Mr. Fritz understood thoroughly every branch of the iron and steel industry, and his great value lay in his genius for organization, his ability to improve upon methods and his capacity for handling men.

Weber H. Arkenburgh has resigned his position as general signal inspector of the Chicago, Rock Island & Pacific, and is now in the publicity department of the Union Switch & Signal Company, Swissvale, Pa., with office at that place. Mr. Arkenburgh was born at Orange, N. J., in 1880, and after graduating from Williams College in the class of 1902 with the degree of A. B., entered railway service as a laborer in the signal department of the Delaware, Lackawanna & Western. Since that time he has been in the service of the Gulf, Colorado & Santa Fe, the Union Pacific, the Hall Signal Company, Garwood, N. J., the Long Island Railroad, and the Chicago, Rock Island & Pacific. In 1908 he did some special work on the Signal Dictionary for the *Railway Age Gazette*. Mr. Arkenburgh organized the Chicago Signal Club in 1910, was president part of that year, and vice-president the next year, and secretary and treasurer during 1912.

W. H. Arkenburgh.

TRADE PUBLICATIONS.

FROGS.—The P. & M. Co., Chicago, has issued a leaflet of tables of turn-out dimensions, together with instructions for their use by a short method for accurately locating frog points.

NATIONAL UNION OF RAILWAY MEN.—A cable despatch from London, February 14, says that under the title of the National Union of Railway Men the three principal unions of railway employees in Great Britain have been amalgamated. The new organization absorbs the Amalgamated Society of Railway Servants, the United Pointsmen and Signal Men's Union, and the General Railway Workers' Union. These societies have about 200,000 members. The despatch says that the executive officers of the new union will be invested with authority to begin and terminate strikes according to their own judgment, without taking a ballot of the members.

Railway Construction.

CENTRAL RAILWAY OF CANADA.—An officer writes that work will be continued in the spring on the line from Montreal, Que., west via Hawkesbury, Ont., Carleton Place, Fenelon Falls and Orillia to Midland, 342 miles. C. J. Wills & Son, Montreal, are the contractors. About 30 miles is ready for tracklaying. No grade will exceed 6/10 of 1 per cent. and no curve will exceed 8 deg. There will be 12 or more large bridges on the line, also freight and passenger terminals at Montreal and elevators and wharves at Midland. Arrangements are being made with the government to permit the Intercolonial to use the company's tracks through Ontario to the Lakes. Senator Owens is president, and F. Stuart Williamson, chief engineer, Montreal. (November 29, p. 1062.)

CHICAGO, BURLINGTON & QUINCY.—The contract for the line from Orin Junction to Powder River, Wyo., 108 miles, the closing link in the new route between Denver and Billings, has been let to Twohy Brothers, of Portland, Oregon.

FARMINGTON & OAKLAND INTERURBAN (Electric).—This company has asked for incorporation in Maine, with a capital of $300,000, to build from Farmington east via New Sharon, Mercer and Smithfield, thence south to Oakland, about 40 miles.

GREAT NORTHERN.—This company has made surveys for building an extension from Plentywood, Mont., west via Scobey.

HEMINGFORD & WESTERN.—Under this name a company is being organized in Nebraska to build from Hemingford, Neb., west to a point in eastern Wyoming. D. W. Butler, Hemingford, is to be president and general manager.

HOOPPOLE, YORKTOWN & TAMPICO.—Incorporated in Illinois with $100,000 capital and office at Hooppole. The plans call for building from Hooppole, in Henry county, Ill., northeast via Bureau county, to Tampico in Whiteside county, about 15 miles. The incorporators and directors include C. W. Groves, J. Ringel, G. R. Mathis and J. Tonkinson, of Hooppole; J. H. Cooley and J. W. Mathis, of Tampico, and R. H. Mathis, of Prophetstown.

MISSISSIPPI NORTHWESTERN.—An officer writes that the company expects to let contracts in about 90 days. The plans call for building from Biloxi, Miss., via Carthage and Yazoo City to Gaines Landing, Ark. The maximum grades will be 1 per cent. and the maximum curvature 6 deg. W. G. Seaver, president; J. M. Searles, chief engineer. (September 27, p. 599.)

NACOGDOCHES & SOUTHEASTERN.—This company, operating a 20-mile line from Nacogdoches, Tex., to Dunham, is planning to build a three-mile extension to a connection with the Angelina & Neches River. P. A. McCarthy & Sons, consulting engineers, Lufkin, have made surveys and estimates.

NIAGARA FALLS, WELLAND & LAKE ERIE (Electric).—According to press reports surveys will be started soon for a line to connect Fort Erie, Ont., with Fort Colborne and other towns in Ontario. The headquarters of the company will be at Welland.

NORTHERN PACIFIC.—A contract has been given to the Cook Construction Company for grading work on an extension from Stanton, N. Dak., west on 68 miles.

OKLAHOMA, NEW MEXICO & PACIFIC.—According to press reports surveys are now being made from Ardmore, Okla., west to Waurika, and grading work has been started. J. L. Hamon, Ardmore, is interested. (October 18, p. 775.)

OKLAHOMA PACIFIC.—An officer writes that arrangements are being made to secure capital and the prospects of building are favorable at this time, but the date of letting contracts for construction, etc., has not yet been decided upon. The projected route is from Denver, Colo., southeast through the Panhandle of Oklahoma and Texas and Oklahoma to Oklahoma City, thence through the northeast corner of Texas and the southwest corner of Arkansas to Texarkana, Ark., and across Louisiana to New Orleans, over 1,000 miles. The principal bridges to be constructed include one across the Red river near Texarkana, and one over the South Canadian river near Oklahoma City. The company expects to develop a traffic in lumber, livestock, grain, cotton, ore and coal. V. A. Clark is president, Arnett, Okla.

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Pacific Coast.—Incorporation has been asked for in the Dominion of Canada, to build from Hardy Bay to Suquash on Vancouver Island, B. C., about 12 miles. Also to operate steamship lines from Hardy Bay. Bernard & McKeown, Montreal, Que., are solicitors for the applicants.

Palmetto Railway (Electric).—Under this name a company is being organized in South Carolina, it is said, with a capital of $500,000. The plans call for building from Columbia, S. C., northwest via Prosperity, Newberry, Clinton and Laurens to Greenville, about 100 miles. A. J. Christopher, W. L. Gray and E. S. Hudgins, Laurens, S. C., are interested.

Quanah, Acme & Pacific.—An officer writes regarding the extension west of Roaring Springs, Tex., that nothing has been done toward extending the line beyond that place. Work was started last September on the extension from Paducah west to Roaring Springs, 40 miles, and at the present time over 1,000,000 cu. yds. of material has been moved and about 5,000 cu. yds. of concrete work completed. It is expected that the line to Roaring Springs will be opened about May 15. The Texas Building Company has contracts for grading, bridge and concrete work. The maximum grade will be 1 per cent. compensated for curvature and the maximum curves will be 4 deg. (February 7, page 271.)

Raleigh, Western & Atlantic.—Application has been made in North Carolina for a charter, it is said, to build from Bunn, N. C., southwest to Raleigh, thence northwest to Durham, about 50 miles. J. H. Pou, Raleigh, may be addressed.

Rio Grande Valley Traction.—According to press reports a contract has been given to Dudley & Orr, El Paso, Tex., to build from Washington Park, El Paso, to Ysleta, 10 miles. (January 17, p. 132.)

Toronto Eastern.—Construction is now under way, it is said, from Bowmanville, Ont., west to Pickering, 19 miles, and surveys are being made for an extension from Pickering west for 12 miles. E. W. Oliver is chief engineer, Toronto, Ont.

Tullahoma, Lynchburg & Fayetteville (Electric).—An officer writes that contracts are to be let about April 1 to build from Tullahoma, Tenn., on the Nashville, Chattanooga & St. Louis west via Cumberland Springs, Lynchburg and Mulberry to Fayetteville. The power will be generated at Manchester where the company will have a waterpower plant, using the waters of the Little and Big Duck rivers. There will be 14 small bridges on the line and a 218 ft. trestle. W. D. Cummings is engineer in charge, Manchester.

York & Oxford (Electric).—Incorporation has been asked for in Maine to operate a line from Sanford, Me., to a connection with the Boston & Maine and the Atlantic Shore Line, thence north through the towns of Alfred, Waterboro, Limerick, Cornish, Baldwin and Hiram to a connection with the Maine Central and the Bridgton & Saco River railroads, about 40 miles. The capital of the company is not to exceed $500,000.

RAILWAY STRUCTURES.

La Grange, Ga.—An officer of the Atlanta, Birmingham & Atlantic writes that bids are wanted for putting up a brick veneer passenger station one story high, 30 ft. x 116 ft., between Depot and Main streets in La Grange. The cost of the improvement will be about $12,000.

Lewistown, Mont.—The Great Northern is making plans for a station to be built at Lewistown.

Macon, Ga.—An officer of the Central of Georgia writes that the company has submitted a proposition to the authorities of the city of Macon to put up a passenger station to be 250 ft. long; also a freight station at the foot of Cherry street, in Macon. Definite plans to carry out these improvements have not yet been made.

Sudbury Junction, Ont.—The Canadian Northern has been authorized to build bridges in Ontario as follows: Across Jackfish river, mile 314 from Sudbury Junction; across Goose river (first crossing), district of Sudbury, mile 171 from Sudbury Junction; and across Kabinakagami river, district of Algoma, mile 286 from Sudbury Junction.

Railway Financial News.

Baltimore & Ohio Chicago Terminal.—This company has given the Minneapolis, St. Paul & Sault Ste. Marie a contract providing for the Soo, which now gets into Chicago over the Illinois Central tracks, to use the Grand Central Station of the Baltimore & Ohio Chicago Terminal.

Baltimore & Ohio.—The Public Service Commission of Maryland has applied to the circuit court of Baltimore for an injunction against the issue by the Baltimore & Ohio of $63,250,000 4 per cent. 20-year convertible bonds. The company has refused to ask permission of the Maryland Public Service Commission fearing that it may lose some of the benefits of an act of the Maryland legislature allowing exemptions by which the Baltimore & Ohio saves something in taxes.

Choctaw, Newcastle & Western.—B. R. Stevens, representing, it is said, the stockholders and creditors of this road, has filed an application in the superior court of Oklahoma for the appointment of a receiver, alleging indebtedness amounting to $9,000. This road runs from Alderson to Cambria, Okla., three miles.

Denver, Northwestern & Pacific.—The United States district court at Denver, Colo., has authorized the receivers to issue $750,000 6 per cent. receivers' certificates. The proceeds of the sale of these certificates are to be used to pay for new equipment.

Interborough Rapid Transit.—Stockholders are to vote on March 5 on the question of authorizing a mortgage to secure an issue of $300,000,000 5 per cent. 53-year bonds to provide for expenditures under the Rapid Transit contracts which are being finally passed upon by the New York Public Service Commission, First district.

Minneapolis, St. Paul & Sault Ste. Marie.—See Baltimore & Ohio Chicago Terminal.

Missouri, Kansas & Texas.—The bill which had been passed by the Texas legislature permitting the merger of the Texas Central with the M. K. & T. has been vetoed by Governor Colquitt on the ground that it is unconstitutional.

Pennsylvania Railroad.—President Rea has made the following statement

"The question of Pennsylvania Railroad financing for 1913 has not received the consideration of the board of directors and probably will not for some weeks to come.

"It is the policy of the Pennsylvania management to make public declaration of any purposes it may have in the direction of new financing at the earliest practicable moment after such policy is decided on. In all cases where an issue of new stock is to be made, such issue is always announced immediately after the meeting of the board of directors, which takes action on such propositions. It is not the policy of the management to comment on irresponsible reports concerning its intentions. The public may rely, therefore, on the fact that any statements concerning the Pennsylvania Railroad's financing which are not announced by the company are wholly speculative and supposititious."

Pittsburgh, Cincinnati, Chicago & St. Louis.—The Ohio Public Service Commission has authorized the issue of $4,000,000 consolidated mortgage bonds for new construction and equipment, and $3,000,000 consolidated mortgage bonds, to retire Steubenville & Indiana 5 per cent. bonds maturing January 1, 1914.

Seaboard Air Line.—This company has sold $6,000,000 3-year 5 per cent. notes secured by $10,000,000 refunding bonds. The proceeds of the note sale are to be used for additions and betterments and to reimburse the treasury for capital expenditures. (December 6, 1912, p. 1076.)

Southern Pacific.—The syndicate agreement made by Kuhn, Loeb & Co. with about 500 other participants, which provides for underwriting the stock of the Southern Pacific which is to be offered to Union and Southern Pacific stockholders, contains no provision by which participants agree to hold stock off from the market longer than April 5.

Texas Central.—See Missouri, Kansas & Texas.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 6,250 copies were printed; that of those 5,250 copies, 6,796 were mailed to regular paid subscribers and 158 were provided for counter and news companies' sales; that the total copies printed this year to date were 78,009 copies—an average of 8,668 copies a week.

VOLUME 54. FEBRUARY 28, 1913. NUMBER 9.

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*Illustrated.

THE practice of reserving without payment sleeping car accommodations that are not used is attaining such an extent as to suggest the advisability of curtailing or abolishing the privilege of reservation, in the interest of the public as well as of the railways. This is particularly true in the larger cities. A business man in Chicago expects to have to go to New York on some day next week. He telephones for a lower berth or a compartment, knowing that if he does not go the reservation will cost him nothing, even if he fails to notify the road to cancel it. Meanwhile, some one who wants to pay for accommodations is told that no space is available, and goes to another road, or another car is put on. If the first man does not go the road hauls empty space which might have been filled, possibly an extra car. If the second man unwillingly takes an upper berth and finds vacant lowers on the train he is inclined to criticize. It has become a common thing for frequent travelers to reserve accommodations that they have only an uncertain expectation of using, frequently on two or three roads for successive days, causing one, two or three roads to haul empty space or extra cars, and inconveniencing other people. While the practice of allowing sleeping car accommodations to be reserved in advance without payment was undoubtedly a real convenience to many travelers before it was abused, it is questionable if its continuance under present conditons can be justified. The added convenience of a few is gained at the cost of inconvenience to a larger number. If the man who benefits by the practice does not believe this let him reverse the situation, and apply for accommodations for an unexpected trip at a time when he will be obliged to wait for some one to cancel a reservation, or to go by another road. Two or three years ago the roads in the Western Passenger Association discussed a proposal to discontinue free reservations, but no action was taken. One leading western line now refuses to reserve accommodations until they are paid for, and it is probable that the subject will be brought up again. The conditions could be improved without hardship to any one by requiring payment for all reservations when made, with a provision for a refund if notice of cancellation were given within a reasonable time.

WHEN a strike by the firemen of the eastern railways was imminent, Victor Berger, the Socialist member of the House of Representatives from Milwaukee, Wis., introduced a bill for government acquisition of railways. The measure evidently was predicated on the theory that under government ownership railway strikes would be less likely. This is a theory often advanced by advocates of government ownership. It is a theory that the historical facts do not sustain. A bad strike took place on the state railways of Victoria in 1903. The prime minister notified the enginemen's and firemen's unions that they must withdraw from affiliation with the central labor organization, the Trades Hall. He feared such affiliation would embroil the railway employees in labor quarrels with which they had no concern. The answer to him was that unless his notice was withdrawn within 15 hours all the enginemen and firemen would strike; and this they did. The public sided with the government and the strike collapsed. This was followed by legislation, still in effect, which prohibits any employee of the Victorian government from taking any part whatever in politics except to vote for members of Parliament. An illustration of the fact that under government ownership railway employees may dictate to the management, instead of the management to the employees, was afforded by an incident that occurred in Italy soon after government operation of railways was resumed in that country in 1905. Discipline at Rome was bad. The Minister of Public Works decided to transfer there the district manager at Milan and give him authority over the whole States System. This officer had the reputation of a severe disciplinarian. When the railway employees heard of the change they sent a deputation to the Minister of Public Works to notify him that they would all strike if the appointment were persisted in, and the Minister of Public Works yielded. The public's recollection of the great railway strike in France in 1910 must still be fresh. The two state railways, as well as the five large private railways, were involved. The resulting demoralization is graphically described in the report of the board which arbitrated the controversy between the eastern railways in this country and their locomotive engineers. The government took summary and effective action, which in similar circumstances could not be duplicated in the

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United States. The ministers on the very day the strike was declared ordered the employees to join their colors for three weeks' military training. The "military training" assigned was that of returning to their work on the railways. Disobedience would be punished by military law. The strike was broken. The next day trains were running into Paris. The advocates of government ownership who say, or imply, that under it strikes would not occur presume too much on public ignorance.

It appears certain that the present Congress will pass a bill for a valuation of railways (as amended by the Senate). The status of the proposed bill at the time we go to press is indicated by the report printed in another column. As the two houses seem to be in accord, further serious amendment is not to be expected. There is being manifested a desire by the more radical members of Congress to get through a measure giving instructions regarding the way the valuation shall be made that would tend to hold the amount of the appraisal down to the practical minimum. The decisions of the federal courts have not covered the entire subject of valuation. There are, however, certain points to be considered which the Supreme Court specifically mentioned in its opinion in the Nebraska rate case. These include the original cost of construction and of permanent improvements, the probable cost of reproduction and the market value of stocks and bonds. In subsequent decisions in public utility cases—for example, in the Consolidated Gas case—the court has said with equal definiteness that the value to be considered is the present value, and that if the value of a public utility has increased since it was built that is the concern's good fortune and it has a right to benefit by it. There are some people, including some members of Congress, who would like to have the proposed valuation based on the original cost of construction. In other words, they deny the right of a public utility to profit by the "unearned increment" in its real estate. Others would exclude from consideration the investment that has been made from earnings. Others would base the appraisal entirely on the physical machine, and make no allowance for "going value." All these proposals are at variance with the decisions of the Supreme Court. Nothing but harm can result from making a valuation that does not give full weight to all of the factors mentioned by the court. If any of these factors are left out the valuation will be made lower than the decisions warrant. The public will be given the impression that the value of the railway properties is less than it actually is. If the Interstate Commerce Commission should then try to regulate rates and earnings on the basis of the valuation the courts would reverse it. That large part of the public that wishes to see railway rates made as low as possible would be disappointed, and unfair sentiment against the courts as well as against the railways would be increased. Much of the present hostility to the courts has been developed by the action of Congress and the state legislatures in passing laws of the most doubtful constitutionality, thereby "putting it up to the courts." The property of public utilities is just as private in its ownership as any other property. The constitutional provisions safeguarding property apply to it just as much as to other property. These constitutional safeguards can be removed by amending the Constitution. Until they are removed it is just as much the duty of the law-makers to observe them as it is of the courts. The stockholders of railways have nothing to fear from a valuation based on the same factors that would be included in the valuation of any other kind of property. They have no reason to fear the immediate effect of attempts to confiscate their property, because the courts usually defeat them. But all owners of property have reason to fear attempts by law-making bodies to pass legislation which the courts in obedience to constitutional mandates must nullify, and in the process of nullifying which they incur an odium and a public hostility that bodes ill for American institutions in general.

C. E. RUSSELL VS. THE INTERSTATE COMMISSION ON RAILWAY CAPITALIZATION.

CHARLES EDWARD RUSSELL, returns to the attack on the railways in an article in *Pearson's* for March. He continues to discuss railway accidents, and in this article strives to show that the decrepit condition into which, as he alleges, the railways of the United States have fallen is due to the increasing burden of their capitalization. He gives a table purporting to show the capitalization from 1902 to 1911 and concludes with the statement, "meantime, I may say that my figures are taken from the Interstate Commerce Commission reports." The figures he gives are from the Commission's reports, but they are for the gross capitalization, which includes duplications due to intercorporate ownership of stocks and bonds, and which the Interstate Commerce Commission has expressly and repeatedly repudiated as representing the actual capitalization of the railways. That his misrepresentations are typical of those put in circulation by critics of railway capitalization in this country is our excuse for noticing them.

Mr. Russell gives $67,936 as the average capitalization per mile in 1906. In its statistical report for 1907, page 17, the Interstate Commerce Commission quoted as follows from its own report on the "Intercorporate relationships of railways in the United States as of June 30, 1906":

> If, however, the problem be to state the amount of securities which are an actual or a contingent claim upon the revenues of the railways of the country considered as a whole, it is evident that the phrase "in the hands of the public" must exclude from outstanding capital all railway holdings. This has been done by the present investigation and results in a reduction of the amount which general discussions have heretofore accepted as measuring the claim of railway securities on railway revenues from $67,936 per mile of line to $58,050 per mile of line.

Mr. Russell gives $70,628 as the average capitalization for the year 1907. The Commission in its Statistics of Railways for 1907, page 76, said:

> The net amount outstanding in the hands of the public on June 30, 1907, if assigned on a mileage basis shows a capitalization of $58,298 per mile of line. *This figure represents correctly the average capitalization per mile of the railways in the United States, meaning by that phrase the amount of active capital to be supported by freight and passenger rates.*

Mr. Russell gives $72,482 as the average capitalization in 1908. The Commission in its Statistics for that year, page 68, said:

> It appears that out of the aggregate amount of $16,767,544,827 of railway securities which are reported by the carriers only $12,833,591,510 are outstanding in the hands of the public on June 30, 1908. *This is equivalent to an outstanding capitalization of $57,201 per mile of line.*

Mr. Russell gives $74,475 as the capitalization per mile in 1909. The Commission in its Statistics for 1909, after referring to the gross capitalization, said on page 56:

> Excluding from this amount the capital reported as assigned to properties other than railway, the remainder, $13,711,867,733, is equivalent to an average of $59,259 per mile of line. It is this figure which measures the amount of railway securities in the hands of individuals and corporations other than railway corporations.

Mr. Russell gives as the average capitalization in 1910, $77,189 The Commission in its Statistics for 1910, page 52, said:

> These statistical reports have for a series of years contained the statements of the average amount of *actually outstanding capital securities per mile of road*, and in continuation of that custom such an average as of June 30, 1910, is here stated. The figure found as of that date is $62,657.

In other words, the figures that Mr. Russell gives as being "taken from the Interstate Commission reports" exceed by $9,888 to $15,281 per mile the figures which the Commission specifically gives as its own figures for average capitalization. Mr. Russell admits that the way he calculates "is not exactly the way the expert railway jugglers figure capitalization." This neatly classifies the Interstate Commerce Commission. He adds that when the experts "have howled sufficiently on this point" he will explain it. It will require some explaining.

Mr. Russell is greatly grieved because, as he says, the railways maintain press bureaus "to influence public opinion," and he asks, "What part of the transportation business is the influenc-

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ing of public opinion?" His own articles are one of the best explanations of why railway press bureaus are necessary. When socialistic penny-a-liners hire themselves to muck-raking magazines to misstate the official statistics of the Interstate Commerce Commission regarding railways it becomes needful for the railway managements, in justice to their stockholders and to the public, to employ people to tell the truth about the railway business; and the public will have considerable difficulty in seeing wherein it is any worse for the railways to employ men to refute misrepresentations than it is for muck-raking magazines to employ men to write them.

RAILROAD LANGUAGE.

SHOW Your Tickets! That is a very simple injunction, known to everybody that ever traveled in America, and plain as day. When such a sign is displayed at the entrance to a train platform no one has to ask when, where, or to whom it applies. But in a large new station recently opened, "in a city of over 100,000 inhabitants" (to use the phraseology of certain legislative acts) the architect, or artist, or manager, or painter has adopted the following legend: "All Passengers Will Be Required to Show Transportation at the Gates." By thus using 57 letters instead of 15 the painter lengthens his job 280 per cent.; but it is hard to see any other advantage in the lengthening. That word "transportation," however, will show the rising generation how serenely we can ignore Mr. Roosevelt and others who would make a hobby of simplification. It might be a good idea to add to this sign a suffix informing boys and girls that, after passing through the gates, they will board "equipment" drawn by "power," instead of cars drawn by engines.

Railroad language is not always stilted or redundant. Often it fails of its purpose by reason of its brevity. A general passenger agent recently wrote the following letter (names fictitious):

Chicago, N. Y., February 31.

G. H. CUTTER:—

Dear Sir—In reply to yours of the 20th in regard to through car from Wobbledon to London. We discontinued these through cars some time ago because with so many branch lines and a car from each (and not enough business from any one line to fill a car) we were hauling unnecessary equipment on our already heavy main line trains. In addition to this was the loss of time for switching cars from branch-line trains to a main-line train, thus delaying a great number of people. Take a train from Edinburgh to London and put on a car from each branch as the train proceeds, and I am sure you will appreciate the necessity for our present rule. We feel that the arrangement in effect takes the best care of the great majority, and I trust that you will agree with us in this.

Yours truly,

JOHN SMITH,
General Passenger Agent.

It is a safe wager that Mr. Cutter was not satisfied with this response to his request, or demand. We do not assume that the railway ought to satisfy him; but it would be possible to come very much nearer to the ideal refusal: the refusal of the genius who, as we are often told, can make people swallow his refusals as cheerfully as they accept favorable responses from ordinary people. Traffic officers would do well in many cases to consult the legal department in small matters like this, as well as in things deemed more weighty. The passenger man's suavity and habitual desire to please, combined with the accuracy, philosophy and enthusiasm of the jury lawyer, would produce great results. Mere repetition, with variations, such as a lawyer uses to convince 12 men, could often be profitably used on one man; especially where that man is likely to publish your letter. Statistics of the actual number of passengers carried in each through car, for a series of months, might have softened Mr. Cutter (or might have shown that the experiment of through cars had better be renewed). Taking care of "the great majority" is a delicate point to handle. Probably Mr. Cutter does not belong to the majority; what does he care for that argument? However, we are not thinking of writing the general passenger agent's letter for him; the point is that if a request like Mr. Cutter's is to be refused, it is worth while to answer, very fully, every expressed and unexpressed question that may arise in the applicant's mind, even if the letter has to be amplified or rewritten repeatedly, and by different men.

Brevity is a fault in many of our train rules. One of the best codes of secondary rules (we mean those rules which are supplementary to the standard code and usually numbered from 600 upward) was that in force on the Cincinnati, New Orleans & Texas Pacific ten or 15 years ago, and it was three or four times as long as those of other roads. But, though apparently redundant, it was simple and clear. With proper numbering, paragraphing and headings a subject may be treated as clearly and effectively with 50 rules as with ten. Our fault is that we treat brevity as an absolute necessity, whereas its value is relative.

In the government report on the collision at Irvington, Ind., November 13, a paragraph of the rules of the road referring to signals was quoted as follows:

> The definition of a "fixed signal" covers such signals as slow boards, stop boards, yard limits, switch, train order, block, interlocking, semaphore, disk, ball, or other means for indicating stop, caution, or proceed.

Fixed signals out of order had not been carefully reported, and this neglect had become general and was acquiesced in by the officers; and apparently this imperfect way of stating that a switch target and a switch light are to be treated as fixed signals had its influence in causing this laxity. In contrast with this brevity, look at the detail with which the Union Pacific explains to employees the care of gasoline motor cars used by track foremen, a matter which, probably, is of far less importance, or at least one much less directly connected with the safety of trains. The following is a fac-simile, with the type reduced one quarter in size, of some of these U. P. rules:

EXAMINATION QUESTIONS

1 . . What inspection should be made before attempting to start out with a motor car?

2 . . What precautions must be observed in handling gasoline?

3 . . . Before leaving a car for any length of time what are the several things that should be attended to?

6 . . . Explain briefly what a carburetter is for and how it works.

7 . . Why are gasoline engines provided with a timer?

11 . . When a car has been prepared ready to start and several attempts to start it have failed to produce any results, what are the first two or three things you would look for to determine what is wrong?

Taking the Union Pacific style as a model these signal rules would be set forth somewhat as in the next fourteen lines:

The following are the different kinds of fixed signals in use—

Slow Boards
Stop Boards
Yard Limit Boards
Switch Targets
Train Order Signals
Block Signals, Manual
Block Signals, Automatic
Interlocking Signals
Interlocking Signals, Dwarf
Semaphore Signals
Disk Signals
Ball Signals.

Will not every train-rule examiner endorse this suggestion? On most roads the examiner on train rules is allowed a fair chance only in a part of his work. He ought to have more aid from the printing press. As the development of these simple propositions may be independently taken up by any officer, there would seem to be no good reason for not having the best help

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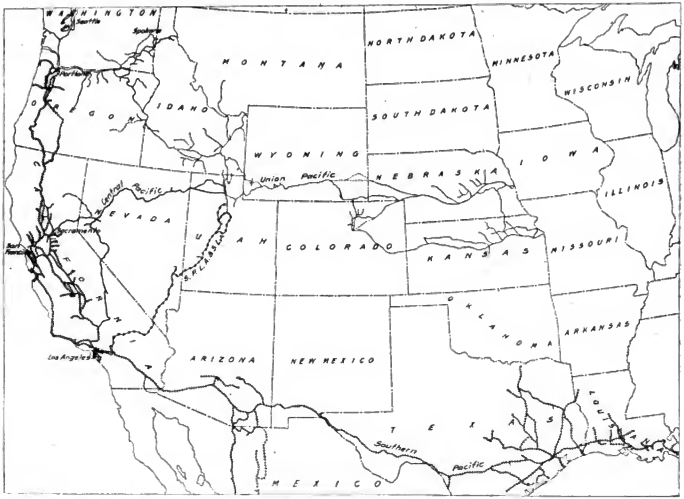
of the printer—the really skilful printer—on every road, and in every superintendent's office.

The language of other train rules, of train orders, of "blue envelopes," of reports of investigations, and other things will be taken up at another time.

SOUTHERN PACIFIC.

RANKING in importance, as an asset, with territory traversed by a railroad are the loyalty and esprit de corps of its organization, and in its separation from the Union Pacific, the Southern Pacific retains not only the form of the Harriman Lines organization, but also the personnel; it loses the Central Pacific, but it retains a territory that is increasingly important as a local territory, and with it the men and the operating and traffic organization that have contributed so much to make the mileage of 2,105 miles. Excluding this Central Pacific, which forms a main line connecting San Francisco with the western terminus of the Union Pacific at Ogden, the Southern Pacific runs the entire length of the longest and one of the richest states in the Union. It has almost a monopoly of business in many parts of California; it forms a southern base line for all of the southwest, which is developing so rapidly, and runs across some of the richest parts of Texas and through a rapidly developing part of Louisiana, having tributary to its lines, to name but a few of the most important, Portland, San Francisco, Los Angeles, El Paso, Houston and New Orleans.

The Southern Pacific's liberality in its expenditures for maintenance and additions and betterments is proverbial. In the Harriman Lines dissolution the Southern Pacific has lost a very valuable piece of railroad property, a property, however,



The Central Pacific, which is to be sold to the Union Pacific but which formed part of S. P. last year, is shown by a heavy continuous line and the Union Pacific and its controlled San Pedro, Los Angeles & Salt Lake are shown by distinct symbols.

The Southern Pacific.

Harriman Pacifics a standard by which to measure all roads operating under western conditions. Of course, there are great stretches of territory along the main line from El Paso west to California that have not begun to develop at all locally, and this six or seven hundred miles of line has to be supported almost entirely from transcontinental business or by the rest of the system, but the Southern Pacific has tributary to its lines thousands of miles of as rich local territory as is to be found anywhere. The Southern Pacific and proprietary companies, including the Central Pacific, operates about 9,970 miles of first main track. Of this mileage the Central Pacific, which has heretofore been controlled by the ownership of all of the stock and operated under lease by the Southern Pacific, and which is now to be taken over by the Union Pacific, has a which was not necessarily an integral part of its system; and has gained on the other hand what may or may not prove to be far more serious—a competitor, where it formerly had a subsidiary.

The showing made in the fiscal year ended June 30, 1912, was in its gross results, of course, forecast months ago, and the annual report coming so long after the close of the fiscal year, as it does now, is liable to be misleading unless one forcibly gets back into the conditions of the 12 months ended June 30, 1912. Conditions, and especially conditions affecting railroad gross earnings, have changed so materially in the last eight months that a report which would have been considered as simply typical of those conditions if published in July, coming now when we have had six months of large gross earnings,

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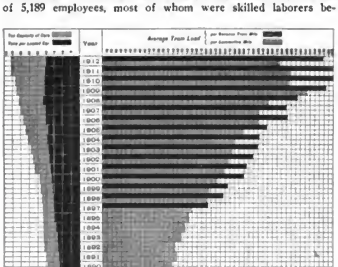
heavy crop movements, mild operating weather and almost unvaried reports of greatly improved industrial conditions, seems out of the average and bad.

Conditions in the 12 months covered by this report were unfavorable enough to try the best railroad organization in the country. Skilled labor in the Southern Pacific's territory has always been scarce and wages high, and under such circumstances it is hard to get an adequate conception of the difficulties imposed on a railroad company's organization by a strike of 5,189 employees, most of whom were skilled laborers be-



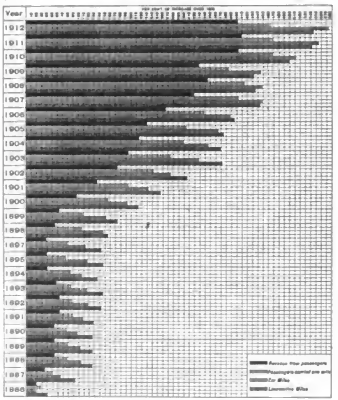
Ton Miles per Train and Car Mile.

longing to the machinists', boilermakers', blacksmiths', car repairers' and sheet metal workers' unions. A strike such as this affects not only expenses but gross revenue to a serious degree as well. Notwithstanding the strike, however, the Southern Pacific earned from operation $131,500,000, which is less by only .83 of 1 per cent. than total operating revenues in 1911. After the payment of operating expenses and taxes there was $39,400,000 net operating income, which is less by $3,350,000 than in 1911. After the payment of fixed charges there was a surplus of $21,700,000, out of which $16,360,000 was paid in dividends, leaving $5,240,000 surplus, comparing with a surplus in 1911 of $9,730,000.

The Southern Pacific carried more passengers and more freight in 1912 than in 1911, but received a lower ton mile and passenger mile rate, and, of course, paid out more in expenses per passenger and per ton of freight. As far as revenue alone is concerned, if the Southern Pacific had been without its Central Pacific in 1912 and had nothing whatsoever to compensate it for this loss, there would still have been a surplus, after the payment of dividends, of $513,436. The Central Pacific pays 6 per cent. dividends on its common stock to the Southern Pacific, which common stock dividends amounted to $4,036,530 in 1912, and 4 per cent. on the preferred, which amounted to $692,000 in 1912. The lease provides that anything over and above 6 per cent. earned on the common stock shall be divided equally between the Central Pacific stockholders and the lessee. In 1912, however, there was no surplus, so that the $4,728,530 received in dividends was the only direct income which the Southern Pacific got from its Central Pacific. If the government's theory that control of the Southern Pacific by the Union Pacific suppressed competition was right, there is then at least a fair chance that the strategic loss of the Central Pacific may be more than made up for by the greater freedom with which the Southern Pacific may solicit and obtain business in opposition to the Union Pacific.

Of course, the Southern Pacific is to be paid in cash for its Central Pacific stock, but the immediate return on the investment of this cash is hardly likely to amount to between $4,000,000 and $5,000,000 a year. The point is this, that with this cash the Southern Pacific will be in a position to make improvements and additions which it would otherwise have to make only through increasing its own interest charges. In the meantime, the growth of business should so add to the Southern Pacific revenue without correspondingly increasing gross that the loss from investment in Central Pacific can be made up. The explanation of the lower ton mile rate received in 1911 than in 1912 is to be found in a comparison of the tonnage of various commodities carried in the two years. The total tonnage carried in 1912 amounted to 26,950,000 tons, an increase of 3.08 per cent. over 1911. Of the 1912 total tonnage, 27.04 per cent. was furnished by products of mines, while of the 1911 tonnage but 26.20 per cent. was furnished by products of mines. On the other hand, products of animals, which in general yield a high average ton mile rate, except under certain conditions such as have obtained between Kansas City and Chicago, furnished but 3.72 per cent. of the total tonnage in 1912, as against 4.27 per cent. in 1911; however, merchandise, which on the Southern Pacific pretty certainly yields a high average ton mile rate, furnished 8.28 per cent. of the total tonnage, as against 8.22 per cent. in 1911; and products of manufactures furnished 16.59 per cent. of the total in 1912 and 16.94 per cent. in 1911. The average ton mile rate was 1.168 cents in 1912 and 1.186 cents in 1911.

The decrease in passenger revenue was due to a shorter



Showing by years the per cent. of increase over the calendar year 1885 in the gross revenues from the transportation of passengers, the number of passengers carried one mile, and the number of miles run by cars and locomotives in passenger-train service, of the Southern Pacific lines from January 1, 1885, to June 30, 1912.

Locomotive miles include revenue passenger-train miles, one-fourth of mixed train miles, and helping passenger-train miles but do not include miles run by motor cars.

Growth in Passenger Service and Traffic.

average haul per passenger and also to a slight decrease in the revenue per passenger per mile. There were 22,186,000 passengers carried in 1912 and 22,060,000 passengers in 1911. The average

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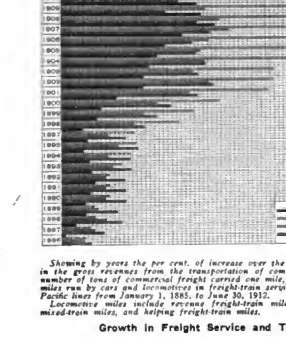
haul, however, was 74.25 miles in 1912 and 75.08 miles in 1911.

Operating statistics reflect the difficulties of operating conditions. The average revenue train load of revenue freight amounted to 382 tons in 1912 and to a little over 384 tons in 1911, which is a decrease of less than 1 per cent.; but total train load, including company freight, decreased from 474 tons in 1911 to 456 tons in 1912—3.84 per cent. With an increase of 1.30 per cent. in revenue freight and a decrease of over 16 per cent. in the ton mileage of company freight, resulting in a decrease in total tons of freight carried of 1.98 per cent., there was an increase of 2.09 per cent. in revenue freight train mileage and of 3.54 per cent. in freight revenue locomotive miles. The mileage of loaded freight cars remained almost the same in 1912 as in 1911, and the mileage of empty cars decreased by 5.35 per cent.

Of course, with a strike of machinists, repairs of locomotives per locomotive cost more in 1912 than in 1911, amounting to $3,893 (including both repairs and replacements) in 1912 and to $3,516 in 1911. On the other hand, other expenses for maintenance were cut down rather heavily. Maintenance of way and structures cost $1,411 per mile of main track in 1912 and $1,571 in 1911; repairs and replacements of passenger cars cost $871 in 1912 and $1,030 in 1911 per car; and repairs and replacements of freight train cars cost $98 in 1912 and $113 in 1911. This was a decrease of over 10 per cent. in maintenance of way, over 17 per cent. in amount spent for repairs of passenger train cars and of over 13 per cent. in amount spent for



Showing by years the per cent. of increase over the calendar year 1883 in the gross revenues from the transportation of commercial freight, the number of tons of commercial freight carried one mile, and the number of miles run by cars and locomotives in freight-train service, of the Southern Pacific lines from January 1, 1885, to June 30, 1912.

Locomotive miles include revenue freight-train miles, three-fourths of mixed-train miles, and helping freight-train miles.

Growth in Freight Service and Traffic.

repairs of freight train cars. The following table shows the per cent. of total operating revenues consumed by operating expenses:

	1912. Per cent.	1911. Per cent.
Maintenance of way and structures and maintenance of equipment	25.56	25.59
Traffic, transportation and general expenses	37.26	35.54

The Southern Pacific, under the plan which has been approved by the attorney general, will receive about $97,000,000 in cash for its Central Pacific stock. This, of course, is in addition to something over $14,000,000 in its own bonds with which the Union Pacific is to make up the balance of the purchase price of Central Pacific stock.

On June 30, 1912, the Southern Pacific had $10,420,000 cash and total current assets, including Union Pacific "bond purchase notes," of $54,420,000. Current liabilities amounted to $36,800,000, which included $12,000,000 due to the Union Pacific. Presumably this $12,000,000 will be subtracted from the cash to be paid by the Union Pacific to the Southern Pacific, so that the S. P. will receive about $85,000,000 cash. This will both put the company in a very strong position for working capital and permit it to spend large sums for additions and betterments and make advances to subsidiary companies for construction for some time to come without doing any new financing.

The following table shows the principal figures for operation in 1912 as compared with 1911:

	1912.	1911.
Average mileage operated	9,970	9,895
Freight revenue	$72,644,092	$73,677,293
Passenger revenue	40,269,238	40,614,400
Total operating revenue	120,433,056	121,911,028
Maint. of way and structures	14,464,208	15,889,130
Maint. of equipment	16,318,141	15,312,206
Traffic expenses	3,201,367	2,947,864
Transportation expenses	38,270,811	36,524,585
General expenses	3,397,583	2,848,676
Total operating expenses	75,652,106	74,521,660
Taxes	3,621,239	4,850,348
Operating income	39,412,888	42,764,978
Gross income	48,265,408	49,500,167
Net income	21,698,843	25,117,207
Dividends	16,361,187	16,361,426
Surplus	5,241,966	9,27,566

NEW BOOKS.

Economics of Railroad Construction. Second Edition. By Walter Loring Webb, C.E. Bound in cloth, illustrated, 332 pages, 5 in. x 8 in. Published by John Wiley & Sons, 43 E. 19 street, New York. Price $2.50.

The scope of this book which was first brought out six years ago is well explained by its title. It includes seventeen chapters covering such matters as organization, capitalization, valuation, and volume of traffic in the first part, operating expenses, motive power, car construction, track economics, train resistance in part two, and physical elements of a railway in part three. The book is written from the standpoint of the constructing or operating engineer and deals briefly with principles and their practical application. The present edition has been thoroughly revised and the chapters on operating expenses, distance, curvature and grade have practically been rewritten.

A Handbook of English for Engineers. By Wilbur Owen Sypherd. Leather binding, 4½ in. x 6½ in., 310 pages. Published by Scott, Foresman & Co., Chicago. Price $1.50.

The author of a "Handbook of English for Engineers" has entered a new field of text-book writing. There is an abundant supply of books containing grammatical and rhetorical rules and outlining courses of study in English composition, but it is believed that this is the first attempt to prepare such a book from the standpoint of the engineer, including in it only the forms of writing of particular use to the engineer and drawing all illustrations from engineering literature. In chapter one the author discusses the planning and presentation of technical papers, and includes brief sections on paragraphs, sentences and words, illustrating good usage and common faults. Chapter two is called "Mechanical Details Common to the Various Forms of Technical Writing," and covers by rules and illustrations the subjects of abbreviation, hyphenation, punctuation, numbers and capitals. The third chapter is devoted to the writing of business letters, showing proper forms and placing especial emphasis on applications for engineering positions. In chapter four the subject of reports is treated in a similar way, and chapter five takes up articles for technical journals with numerous illustrations drawn from standard technical papers. Three appendices are included, giving rules for the preparation of manuscript and the correction of proof, examples of faulty paragraphs and sentences, lists of words frequently misused and misspelled and a bibliography of the subject. The book has been designed by the author to meet the needs particularly of advanced engineering students and young engineering graduates.

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Letters to the Editor.

THE BUREAU OF RAILWAY ECONOMICS.

——, February 12, 1913.

To THE EDITOR OF THE RAILWAY AGE GAZETTE:

I was very much interested in the editorial in your issue of February 7, page 235, relative to the Bureau of Railway Economics.

It happens to be my work to handle the railroad news for a large metropolitan daily. The work of the Bureau of Railway Economics came to my attention immediately after the bureau was formed. I began at once to use its reports as fast as they came out and to prepare statistical matter for them. J. M. Connell, general passenger agent of the Santa Fe, with office at Topeka, Kan., wrote me soon after the establishment of the bureau asking that I look over the bulletins and press notices sent out by the bureau, and I replied that I had already been branded as a corporation hireling for using the bureau's matter, but that I considered it invaluable if the public was to have the truth about the railways.

Then came real trouble. The managing editor shut off my publicity for the railways by saying that any mention of the Bureau of Railway Economics must be eliminated because the American Publishers' Association had decided that the matter sent out by it was in the nature of advertising and that the bureau was unwilling to pay for its publication. To pay space rates for such matter would bankrupt even the railways themselves, and the good intentions of the railways, it would seem to me, have been mistaken by the publishers of the larger dailies for an effort to get a chance to air their grievances. It seems to me as though the railways are being hit with both ends of the stick, and I for one deplore the attitude of the press in refusing to give the Bureau of Railway Economics credit for the work that it has undertaken, and which is purely educational.

RAILROAD EDITOR.

THE PRESS ON ARBITRATION OF RAILWAY WAGES.

SPRINGFIELD, MASS., February 22, 1913.

To THE EDITOR OF THE RAILWAY AGE GAZETTE:

As you have said in your editorial of this week, discussing the demands of the firemen for higher wages, the railroads have during the past few years learned some serious lessons concerning the attitude of the public. One important lesson which they have just learned, in this present crisis, is that the public press will not support them, however strong may be their position. Every editorial on the firemen's controversy—not pronounced in its prejudice toward "labor"—has either been exceedingly cautious in its support of the railways or plainly lukewarm; and with some of the dailies which are supposed to be strong and independent this lukewarmness has become positive silence. So far as my observation goes not more than one prominent paper has spoken out vigorously.

No argument could be more forcible than that which the railroads have presented in support of their objection to the Erdman law. That a difficult question, involving the weightiest financial elements, and a multitude of intricate details unfamiliar to all non-railroaders, and the decision of which is sure to bring down on the head of the decider severe criticism, ought not to be settled by one man, is too obvious to need argument. Not an editor in the country could miss the point. Yet every editorial on the subject has borne the ear marks of the hackwriter—or the coward. Each writer saw what ought to be said but carefully avoided saying it; or else said it so faintly that the effect was as bad as though he had kept silent.

Railway employees have got wage increases for the past ten years by the splitting of differences; and they do not intend to give up that soft thing. The real trouble in the present situation is that, in the engineman's case in 1912, Reason decided that on most of the big roads an increase in pay was not deserved. If Reason is going to thus side with the bloated bondholder, the firemen want nothing to do with it!

The press bases its views on reason, but the writers seem unable to forget that their main affections must be showered on "labor," morning, noon and night. *The Republican*, of this city, usually fair and independent, did not find its voice to condemn the Erdman law until after the firemen had won their contention. Condemning the railroads for their misbehavior toward the public has become such a habit that to do them justice comes very hard. These same editors, who accept the firemen's contention that arbitration is the thing and the number of arbitrators a mere detail, have no trouble in discerning the foolishness of Congress in other matters; and yet the Erdman act is only a typical example of the half baked measures that the House of Representatives is hatching up at every session.

The sole arbitrator of the firemen's case will have a perplexing task, at best; but it is to be hoped that for once we may have the question of wages in train service thrashed out on the basis of actual conditions and pure reason, with the "weight" of cowardly and incompetent railway officers on the one hand, and of unprincipled labor advocates on the other, entirely eliminated.

G. E. A.

NEEDED—A DEFLECTABLE HEADLIGHT.

NEW YORK, February 13, 1913.

To THE EDITOR OF THE RAILWAY AGE GAZETTE:

That rigid headlights on locomotives are unsatisfactory on curves has long been known. They throw the light where it is not needed and leave the track ahead in darkness. This defect was emphasized a short time ago in causing the loss of a man's life. On his way home at night he dodged a train, and stepped into a frog which, according to the report, was located on a sharp curve; he was unable to withdraw his foot in time to escape a second train.

No doubt if the man had observed the rules of the company concerning trespassing he would not have been there, but the fact nevertheless remains that an easily controlled, deflectable headlight that would throw light straight ahead when in its normal position and to either side, at the will of the engineer, is highly desirable. It is believed that automobiles will soon be fitted with lights of this kind and that its use may be extended to the locomotive. To design and build such a contrivance would surely be simple.

W. F. SCHAPHORST.

ECONOMY OF LOCOMOTIVES.

BOSTON, MASS., February 15, 1913.

To THE EDITOR OF THE RAILWAY AGE GAZETTE:

The account given of German locomotive performance by Mr. Jacobs in a recent issue of the *Railway Age Gazette* (January 3, 1913, page 26) almost makes one feel that Mr. Brandeis may not have been so far off when he said that the railroads of this country could save $300,000,000 a year by intelligent effort. I refer to the coal consumptions per mile, which he gave, for different kinds of service. The trouble with this kind of statistics is that they are too general and are not based on any unit of work. The question is whether the German locomotives are worked as hard as ours and whether they are more carefully fired and operated.

If one studies the results of the tests of locomotives at the St. Louis Exhibition and on the testing plant of the Pennsylvania Railroad at Altoona, it is evident that the results are so good that they can scarcely be better in Germany. The steam used per indicated horse power per hour by the Atlantic type locomotive tested recently at Altoona is wonderfully small, and the evaporations per pound of coal of this and the locomotives tested at St. Louis were high, and unsurpassed. These two factors together make the economy, and the question is can

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German locomotives do any better. I do not think they can. The cause of their economy must then be due to gentle handling on the part of the engineer, care in firing, and working more nearly at the economical point of cut-off. It is possible to work a locomotive so hard when starting and climbing grades that the exhaust will eject enormous quantities of coal from the stack; and all of our road beds are black with coal. In this country, as I understand it, it is considered more economical, in total cost of haulage, to operate a locomotive as above indicated rather than to operate the locomotive itself economically. It would be very interesting if Mr. Jacobs could get his German figures into such shape that they could be compared with American figures on a unit of work basis.

F. W. DEAN.

TENDER DERAILMENTS.

STAMPS, Ark., February 3, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

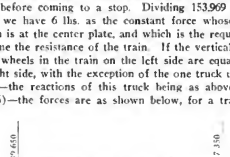
In the *Railway Age Gazette* of January 31, page 209, "G. E." states: "Since the tender frame and truck bolsters are held in the same relative positions, notwithstanding the location of the side bearings, it is difficult to see how the spacing of them can have any effect on tender derailments. The thousands of six-wheel trucks and of recent four-wheel trucks for steel cars, having side bearings far outside the journals, carrying loads with high centers of gravity, have reputations for safety which cannot be assailed."

The conclusion that the reputation for safety of trucks under passenger equipment with widely spaced side bearings, "cannot be assailed" is not convincing. If it is conceded that such trucks are the least likely to derail of any known, it does not necessarily follow that their safety is because of widely spaced side bearings, but rather in spite of it. Years of accumulated experience condemn widely spaced side bearings when in combination with a short truck wheelbase and insufficient truck spring capacity. The writer believes the distinction of the passenger truck to derail is primarily due to its long wheel base, which is effective in resisting a tendency of the truck to rotate in a horizontal plane, as more fully explained hereafter. Moreover, the center of gravity of a passenger car is lower ordinarily than that of either a tender or a loaded box car.

Referring to the remarks of Prof. Moore on the Westport wreck. His analysis of the vertical forces in a plane at right angles to the track is very interesting. A similar investigation of the forces in a horizontal plane parallel to the track, at the instant the vertical forces were as indicated in Fig. 6, will shed further light upon the subject. The energy of the train may be expressed as:

$$E = 66\,827\ V^2,$$

in which E is the energy in foot-pounds per ton and V the speed in miles per hour. Solving for E, with V at 48 miles an hour, we have for the energy per ton, 153,969 ft.-lbs. If the train resistance is, say, 6 lbs. per ton, and no other resistances are to be overcome by the energy of the train, it will run a distance of 25,344 ft. before coming to a stop. Dividing 153,969 ft.-lbs. by 25,344 ft., we have 6 lbs. as the constant force whose point of application is at the center plate, and which is the required force to overcome the resistance of the train. If the vertical reactions of all the wheels in the train on the left side are equal to those on the right side, with the exception of the one truck under consideration—the reactions of this truck being as above referred to (Fig. 6)—the forces are as shown below, for a train of 400 tons:



The 2,400-lb. force will tend to produce rotation of the truck in a horizontal plane parallel with the track, and about a point near the force of 49,650 lbs. In other words, the truck is certain to be slewed, and consequently derailed. For the force of 2,400 lbs. to produce no rotation in a horizontal plane, the vertical reactions (weights on the wheels) must be equal. When the weight of the car is carried on the center plate, this occurs, and it is the normal condition; but when the car body is rocking, the weight is alternately carried on the center plate and one side bearing, and on the center plate and the other side bearing. The farther the side bearings are spaced from the center plate, the greater the vertical reaction on that side for any given load and oscillation. With the weight carried on the center plate only, the reactions are equal, and the momentum of the car, acting through the center pin, is distributed in equal halves to each side; but when the car rocks, unequal vertical reactions occur; i. e., more weight is momentarily carried on one side than on the other. The greater the difference in the reactions, the greater is the tendency for the truck to slew.

This has often been demonstrated in the actual handling of cars which have been derailed by reason of the load being placed on one side of the car. The principle can also be demonstrated experimentally, and in the writer's opinion it is the cause of the great majority of our derailments.

F. W. GREEN,
General Manager, Louisiana & Arkansas.

UNREASONABLE FACILITIES.

LONDON, England, January 27, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I see that the Colorado Supreme Court has compelled the Colorado & Southern to continue to operate an unprofitable line, holding that the law imposes on the carrier "the duty of furnishing facilities to the public on its entire system, not a part," and that, having once undertaken to serve the public, a railway cannot abandon an unprofitable portion of its business without surrendering its charter.

What the precise wording of the statute under which the Colorado court proceeded, I have no means of knowing. But, on the assumption that the Colorado statute, like the act to regulate commerce, is founded upon our English act of 1854, and requires railway companies to afford to the public "*reasonable* facilities," the decision of the English courts is even more relevant than the action of the Mexican government (commented on in the *Railway Age Gazette*, p. 89) and may interest your readers.

Our railway commission in 1891 in the Winsford case took the same line as the Colorado court, and held that under the act of 1854, "if a railway company carry passengers at all, it must afford such facilities for them as are reasonable over the whole extent of their system. . . . The effect of the act is to deprive railway companies which have commenced a particular traffic of the power, which they previously had, of continuing or discontinuing it at their own discretion. . . . The fact that a branch does not yield a profit over working expenses does not afford a reason why it should not be worked." Three years later in the Darlaston case the same point came up. A company had discontinued passenger service and closed a station, because the bulk of the traffic had been diverted by a tramway, and they were losing money. The commissioners again ordered the station to be reopened and passenger traffic resumed; though they stated in their judgment "It is but too plain that the line must be worked at a loss, and we regret to impose this burden upon the defendants." The case was taken to the Court of Appeals, and the judgment of the commissioners reversed. Reasonable facilities, said that court, must be "reasonable as regards the company as well as the public": "to require a railway company to give facilities to the public which involve a heavy loss on themselves . . . seems to me to disregard the plain language of the act, and to assume a jurisdiction to compel a railway company to give unreasonable facilities which is contrary to the terms of the act.

And this is how the law in England stands today.

W. M. ACWORTH.

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ATTRACTIVE STATIONS FOR SMALL TOWNS.

New Passenger Facilities Provided at Five Points on the Buffalo, Rochester & Pittsburgh—Two General Standards.

The Buffalo, Rochester & Pittsburgh has built a number of stations in small towns and villages along its line for which two standard designs applicable to most locations have been worked out. The five stations recently built at Ridgway, Pa., and at Scottsville, Mumford, Springville and Orchard Park, N. Y., are typical of this form of construction. The class A station is 99 ft. 8 in. long, the main portion of the building being 28 ft. wide, and the baggage room end 26 ft. wide. There are separate waiting rooms for men and women, each of these being 23 ft. 11 in. x 25 ft. 10 in. in size. Settees are provided around the walls and drinking fountains are furnished in both rooms. The waiting rooms are connected by a broad corridor, one side of which leads to the main entrance in the rear of the building and the other faces the ticket windows. A train order room opening off the ticket office and a parcel room, which is included in the baggage room, are also provided. The class B station is 28 ft. x 67 ft. 8 in. over all, having a single waiting room and a freight room as shown in the accompanying floor plan. The Orchard Park station is a modification of the class A plan, being shortened to 73 ft. 8 in. by reducing the waiting rooms to 20 ft. 1½ in., and the baggage room to 14 ft. A broad porte cochere has been provided at this station and a long shelter covers the platform. The other details of the building are similar to the standard class A station.

Track Side of Class A Station at Ridgway, Pa.

Rear of Class A Station at Springville, N. Y.

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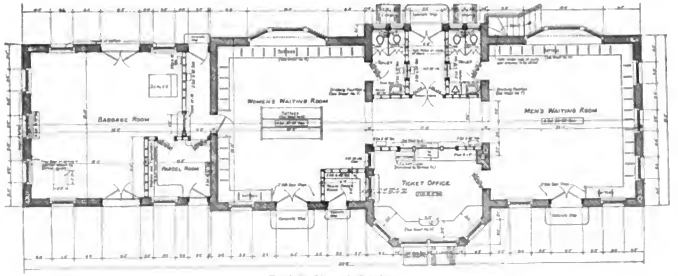
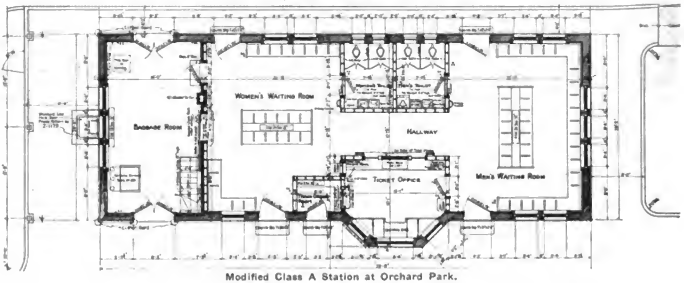
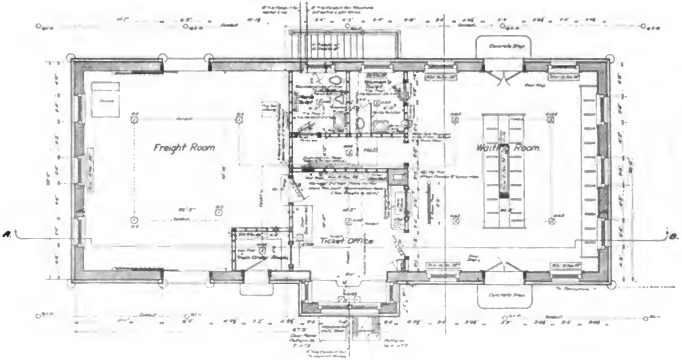


Typical Class A Station.



Modified Class A Station at Orchard Park.



Typical Class B Station.

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The buildings are of brick faced with red repressed brick, with the exception of the Orchard Park station, which is of red impervious brick with window sills and lintels of Litholite. Litholite has been used in the Scottsville, Mumford and Springville buildings for belting and window sills, and in the first two for keystones. In the Ridgway station corner quoins of Litholite are added to the trimming. The roofs are covered with red tile, the imperial Spanish style being used in three cases and the French style in the other two. The interior trim is of selected first grade red oak, all rooms except the baggage

Modified Class A Station at Orchard Park, N. Y.

or freight room and the toilet rooms being wainscoted with the same wood as the trim. The baggage and freight rooms are finished in yellow pine, the portion above the wainscoting being ceiled on studded partitions. In the Orchard Park station the studded partition in the baggage room is veneered with brick. In all of the rooms except the baggage and freight rooms the walls above the wainscoting are lathed, plastered and painted, the ceilings being calcimined. The floors, except in the baggage, freight and toilet rooms are of two thicknesses. First a ⅞ in. floor of hemlock is laid diagonally on the joists, then a layer of

Class B Station at Scottsville, N. Y.

waterproof building paper is laid, on which the floor surface of ⅞ in. x 2½ in. first quality comb grained Georgia pine is laid at right angles to the joists. The baggage and freight room floors are of 2 in. yellow pine flooring. The bases throughout the building with the exception of baggage, freight and toilet rooms are of sanitary composition cove 10 in. high, finished with plinth blocks at the door openings. The toilet room floors are small pattern hexagonal tile, the wainscoting in these rooms being of glazed tile 6 ft. high, with the tile cove base and round edge capping. All metal toilet room fittings are of nickel-plated brass. With the exception of the Ridgway station, the buildings are heated with hot water, steam being used in the former case. Gas and electricity are both provided for lighting in all except the Scottsville station, where electricity alone is used. At two points the water, gas and electricity were obtained from local companies, and in the other three cases the water for station use and for fire protection had to be secured from dug wells, the water being pumped into an elevated tank by a windmill in each case. Particular care has been taken in the adaptation of these buildings to their surroundings and unusually attractive parks, flower beds, broad walks and shrubbery have been provided in some cases.

The plans and specifications for these buildings were made in the office of E. F. Robinson, chief engineer. The concrete foundations, concrete curbs, sidewalks, brick platform, grading, track work, and where necessary the water supply and sewers were placed by company forces. The buildings above the foundation line were built by contract.

THE JACOBS-SHUPERT BOILER TESTS.

On page 76 of Dr. Goss' report* on the comparative tests of the Jacobs-Shupert and the radial stay boilers, the following summary is presented as to the tests of evaporative efficiency and capacity: "The results show that the Jacobs-Shupert boiler and the radial stay boiler, under all of the various conditions of the tests, operate at practically the same efficiency. There are indications that under very high rates of power, the Jacobs-Shupert boiler has some slight advantage."

The general statement as to equality of steaming capacity is what was to be expected. But in reviewing the report a criti-

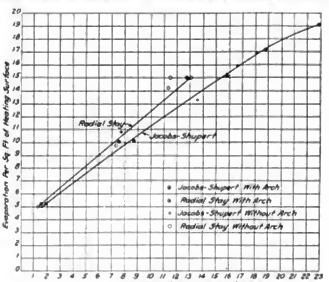

Fig. 1.

cism of the statement as to quality has been made on the basis that, while the actual amount of steam produced might be approximately the same, yet it is done with widely different blast conditions, and that, if a diagram be drawn, with ordinates equal to the evaporation per square foot of heating surface per hour and abscissae equal to the smokebox draft in inches of water, it will be seen that, taking the averages for all of the tests, the radial stay boiler required much less draft to produce the same rate of evaporation per square foot of heating surface than the Jacobs-Shupert.

Such a diagram is shown in Fig. 1. As examples it will here be seen that with 7.4 in. of draft the radial stay boiler produced the same rate of evaporation as did the Jacobs-Shupert

*An abstract of this report appeared in the *Railway Age Gazette* of February 7, 1913, page 251.

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at 8.7 in. Or the radial stay at 13.1 in. was on a par with the Jacobs-Shupert at 15.8 in.

If this were to hold it might mean that, while boiler efficiencies were the same, there would be a great reduction in engine efficiency as a direct result because of the increase of back pressure required to maintain the heavy draft.

Taking the results purely on the basis of draft and constructing diagrams using the draft in inches for abscissae, and evaporation per pound of coal fired for ordinates, we obtain a diagram that confirms Dr. Goss' conclusion that was quoted. Such a diagram is shown in Fig. 2. From this we see that the rate of firing with the Jacobs-Shupert boiler was less than with the radial stay on the basis of draft. Hence it is but natural that,

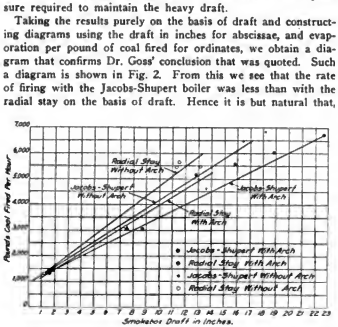

Fig. 2.

given more coal, the radial stay boiler should show a higher rate of evaporation with the same draft, as tested, than does the Jacobs-Shupert.

There is another point, minor and insignificant to be sure, that was ignored in the construction of diagram, Fig. 1; and that was the fact that, in all computations involving heating surface, it was the *developed* surface that was used (see Dr. Goss' report, page 42). As the Jacobs-Shupert boiler contained about 0.8 per cent. more total heating surface than the radial stay boiler, this tends to lower its line in the diagram of evaporation per square foot of heating surface.

But if we assume that the rate of evaporation is proportional

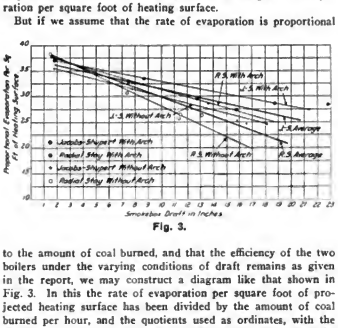

Fig. 3.

to the amount of coal burned, and that the efficiency of the two boilers under the varying conditions of draft remains as given in the report, we may construct a diagram like that shown in Fig. 3. In this the rate of evaporation per square foot of projected heating surface has been divided by the amount of coal burned per hour, and the quotients used as ordinates, with the draft in inches for the abscissae as before. This shows that the radial stay boiler was the more economical at low rates of draft, up to about 5.8 in., and that, thereafter, the Jacobs-Shupert boiler was the more economical; that is, gave a higher rate of evaporation, which is in exact accord with Dr. Goss' assertion reached by an entirely different route. This is given merely to call attention to the criticism that has been pretty extensively made, and to show that the diagram of Fig. 1 can only be considered when all of the modifying conditions are taken into account; in short, that, when taken by itself, it may give an entirely erroneous idea of the work of the two boilers.

CHROME-VANADIUM TENDER WHEELS.

For a number of years the Vandalia Railroad has been keeping comparative service records of chrome-vanadium and carbon steel wheels used under passenger tenders, which carry 7,500 gal. of water and 12 tons of coal, making an average load of each wheel on the rail of 17,875 lbs. when the tender is loaded. The average results show that about two and a half times as much mileage was obtained from the chrome-vanadium wheels per unit of wear and turning as from the carbon steel wheels. A summary of these records for 3½ years' service, up to June, 1912, is shown in the table.

Summary of Comparative Service Tests of Chrome-Vanadium and Carbon Steel Tender Wheels.

	Chrome-vanadium tender wheels.	Carbon steel tender wheels.	Per cent. in favor of chrome-vanadium wheels.
Coal capacity, tender, tons	12	12	...
Water capacity, tender, gals	7,500	7,500	...
Weight of tender in working order, lbs.	143,000	143,000	...
Average load per wheel on rail, lbs.	17,875	17,875	...
Class of service	Passenger	Passenger	...
Average mileage per 1/16 in. diam. wear	12,857	12,857	39
Average mileage per 1/16 in. diam. wear and turning	6,137	2,427	152
Maximum mileage per 1/16 in. diam. wear and turning	6,894	3,344	105
Minimum mileage per 1/16 in. diam. wear and turning	5,536	1,294	327

From the results thus far obtained the Vandalia has drawn the following conclusions as to the relative advantages of the chrome-vanadium wheels. The material is more uniform and a greater mileage is obtained per unit of wear; this results directly in less flange wear and a smaller amount of material wasted in turning the wheels in the lathe, with a consequent greater mileage per unit of wear plus turning. There is an entire absence of shelled or burned spots in the treads, as compared with the carbon steel wheels.

The results cover 10 mated pairs of carbon and 16 mated pairs of chrome-vanadium solid steel wheels. Contour charts were made of each wheel before and after each turning. The large amount of material removed in turning the carbon steel wheels was due in some instances to the wheels shelling or being burned. Up to the present time the chrome-vanadium wheels under observation have made over 300,000 miles, and it is expected that they will probably reach 400,000 miles. No trouble has been experienced in machining the chrome-vanadium wheels in a truck wheel lathe at a cutting speed of 15 ft. per minute.

Research work since the Vandalia wheels were placed in service has resulted in a new method of heat treatment. The wheel is heated to a certain temperature and is then spinned for a pre-determined length of time in a trough of water, with the tread immersed to a little below the limit of wear line of the wheel. It is then taken out and allowed to cool in the air, after which it is reheated for annealing. In this way the plate and hub are not affected by the immersion of the ring in the water, but undergo an annealing operation while the rim is being hardened. This results in a somewhat higher and more uniform hardness across the rim than is to be found in the wheels now in service on the Vandalia.

New Line for Brazil.—The government of the State of Minas, Brazil, has signed a contract with Col. José Caetano Pimentel for the construction and operation for 50 years of a railway to run from the Doce river, near the Bueno Brandao colony, to Urucu station on the Bahia-Minas Railway.

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LATEST ASPECTS OF THE "SAFETY FIRST" MOVEMENT.

Valuable Experiences and Lessons in Machine-Shop Safety, and Instructive Conclusions Concerning Discipline of Employees.

Two recent papers on "safety first" were by two of the best-informed and best qualified men now at work in that department of the railroad service, and we give below liberal extracts from their papers. The first was read at the New York Railroad Club, February 21, and the other at the Western Railway Club, Chicago, February 18.

J. W. COON'S PAPER.

J. W. Coon, assistant to the general manager of the Baltimore & Ohio, in speaking on "Safety on the Railroads," said:

Everyone who has studied the question of preserving human life on railroads will agree that there are ample rules and instructions in effect and that they are clearly drawn. It is impossible to correct present evils simply by securing greater alertness on the part of the officers or by originating additional rules. The great majority of railroad men are careful and competent. The mistakes are made by the few, but we must work with all, for we do not know the few who will cause the trouble.

Before a physician will give the patient medicine he must know where the trouble is. So in safety work. Before you can apply a remedy, you must know your weakest division, your poorest shop, yard, etc. General letters stating that personal injuries are increasing and something must be done will do about as much good as to attempt to persuade a healthy country boy on some hot Saturday afternoon that it is more pleasant to study his geography lesson than to visit the old swimming hole. You must be able to say to a given shop, "you are making the poorest showing on the system"; "your yard is making the poorest showing"; "your division is the last on the list," etc. To be able to do this, we keep a record of injuries to employees by shops, yards, divisions, etc.

Their standing was first figured on a basis of the number of employees. We found, however, that this was not exactly fair. To illustrate—a shop normally has one thousand men; business drops off and the allotment is cut. The master mechanic very naturally and properly endeavors to keep his organization together, and therefore reduces the number of hours worked per day, or works but five days a week. The danger of injury, in this case, would only be half as great, yet the number of employees would remain practically the same, and the shop would be making a good showing. We therefore figure the standing of each division, yard, shop, etc., by dividing the total wages earned by the number of injuries. Then if business falls off the wages will do so in a corresponding measure. In this way we can tell at a glance the point making the poorest showing.

The suggestions made by the local committeemen should be given every consideration. The division making the best showing will always be the one on which the superintendent and other local officers take personal interest in the work and follow out as many of the suggestions as possible. The superintendent is influenced by the interest displayed by his superior, so that it is essential that from the president down personal interest be taken by all the officers.

We have covered over 1,500 machines in the shops. We have put walkways on many bridges, especially where located near switches. Moved buildings and poles back to give clearances. Raised the hand railing on caboose cars as men have been jerked over the low ones, etc. All at the suggestion of the men. The men will take about the same interest they see the company taking. More essential even than to locate the sore is to ascertain what caused it. If your fatal injuries are due to train accidents you must give the problem special attention. Ascertain whether it is due to track, equipment or men.

We found, in carefully analyzing the fatal injuries to employees during the past year, that over 90 per cent. were due to causes that no expenditure of money in providing additional safeguards, etc., could possibly have prevented. They were due to failure of the human element. I do not say they resulted from carelessness; some were due to thoughtlessness, some to lack of familiarity with the movements and some to carelessness, even though possibly this was caused by over zealousness on the part of the employee in trying to do the work in too much haste.

Only 19 per cent. of all employees fatally injured in the past year were killed in train accidents, and this includes all the minor accidents, such as cars sidewiped in the yards, striking cars too hard, etc., and not entirely due to collisions or derailments, as many think; in other words, over 80 per cent. were fatally injured in other than train accidents.

It is sometimes said that men have to run by signals, on rainy or foggy nights, without being sure of their position; that otherwise they would be taken off the preferred run, or at least, criticized. I have been in the operating department of this road for twenty-five years, and have never yet known of an engineer being censured where he could not make time because of fog or extremely stormy weather. Often a message is sent an engineer asking the cause of the delay. Some might consider this as a criticism. It is not. It is necessary to make report of every delay, and it is to enable a local officer to do this that the message is sent. President Willard has said to every officer and employee that safety is to be the first consideration, comfort of passengers next and speed or punctuality last. We had had no accident to bring out this talk. He was merely outlining his policy to be followed by all. A copy of this talk was sent to each employee in the service.

We post on bulletin boards over the entire 6,000 miles of road, within two or three days of its occurrence, the cause of any fatal injury, and caution our men to avoid a similar accident. The monthly employees' magazine is read by our 60,000 employees. We carry on observation tests—sometimes improperly called "surprise tests." This work is the greatest aid in safety. Each division is required to make not less than a given number of tests. For example, a clearance card is made to show the wrong engine number or incorrect date to see if the crew are alert and detect these errors. A train order is improperly repeated to see if the despatcher or operator is vigilant. A signal light is removed or a signal improperly displayed to see if the rules requiring train to stop under those circumstances are observed. These are not "surprise" tests; they are limited to conditions met with every day and no "catch" features are permitted. These tests should be diversified—should be made with every employee in train service and a careful record should be kept. If an engineer fails he should be given another test of a different nature and this followed up to see if he profited by the lesson. If habitually careless he should not remain in train service. The value of these tests cannot be over-estimated. In fact I would advocate the appointment of one or more men, thoroughly familiar with railroad operation, whose business it would be to see that these tests were properly made, proper record kept and failures followed up. Let the inspector get on a freight train and ask the brakeman under what orders he is running to see if he goes over the train orders and is fully informed. Let him examine the lanterns to see if torpedoes are attached, that they are clean and ready for instant use. Let him talk to the men as to what constitutes proper flagging, etc.

For five years on the Baltimore & Ohio we have not killed a single passenger in a train accident, and during that time we have carried 85,000,000. We want the employees to be equally

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careful in their shop, yard or track work, where passengers are not involved. . . .

GEORGE BRADSHAW'S PAPER.

George Bradshaw, general safety agent of the New York Central Lines, in speaking before the Western Railway Club said:

Railroad men have always known that unsafe conditions and practices should be corrected, but the problem has been to find an effective way of correcting them and keeping them corrected. The public have been trying to find a way of doing this apparently simple thing for the last thirty years by the enactment of laws. Yet, every year the personal injury record among employees has been growing worse. The doctor has been giving us the wrong medicine.

Safety committees composed of officers and employees—whose duties are to discover and correct unsafe conditions and practices—now exist on almost 200,000 miles of railroad in the United States. The man who first conceived the idea is R. C. Richards of the Chicago & North Western. The most difficult thing in the world to find is a new thought. Mr. Richards belongs to that small class of great men who have originated ideas: and in future years railroad men the country over will honor him for the service he has rendered.

The New York Central took up safety work as a distinct branch of the service about two and a half years ago. It now has 60 division and shop committees comprising about 900 members, over a territory of about 12,000 miles. We began this work in the shops, where attention was chiefly directed to the guarding of machines. To do this is by no means an easy task. It requires general knowledge of machine operation, and familiarity with personal injury records covering varied and extensive conditions. The proper time and place to guard a machine is when the machine is being built and the man who should guard it is the man who made it. Our factory laws permit manufacturers to construct and distribute machines without giving any consideration whatever to safeguards, and then after machines have been distributed all over the country and perhaps put into use without safeguards, state inspectors are employed to ferret the machines out and have them guarded at the expense of the users. Wood is proper for covers, walk-ways and railings, but generally speaking should not be applied to machines or used to enclose parts of machines. Pipe railing may be used in front of switchboards, about pits, and around flywheels and pulleys in engine rooms where only those in charge have occasion to go. It should not be used for guarding flywheels and pulleys in shops. Woven wire is preferable for flywheels, pulleys and large gears because it allows free circulation of light and air, and permits a view at all times of movable parts of machine. It is also more easily and cheaply applied than heavy sheet metal. Wire not less than ⅛ in. diameter, with mesh not greater than 1 in., should be used. Smoke stack netting or expanded metal serves the purpose.

Safeguards for machines must not interfere with the operation of machine or inconvenience the operator; they should, as far as possible, be automatic so that their efficiency does not depend upon their being properly adjusted. They should be strong and firmly attached. Ordinarily a space of not less than 6 in. should be left between guard and floor to permit sweeping. They should be attached to the machine, floor, or other support so that they cannot be set aside. Doors or slides should close automatically where necessary.

It is seldom advisable to purchase patent safeguards, because a large percentage of such safeguards are not practicable. In almost every shop there is considerable scrap material which may be used to good advantage in the construction of guards and the very fact that guards are being made and applied in the shop is in itself an object lesson in safety.

We have prepared and put into effect standard specifications for safety devices. These specifications, illustrated by photographs and drawings, are printed in portfolio form and distributed to all officers having anything to do with machinery. These specifications have been developed as a result of experience in the construction of safeguards for many machines in various shops during the last three years. Many guards applied when this work was first begun, we have found as the result of further study to be not fully protective, unnecessarily expensive, or otherwise objectionable. We have, therefore, taken those guards which experience has shown to be the most effective, practicable and economical, and made them standard for all shops.

Mr. Bradshaw showed his audience a large number of pictures illustrating his statements. In one picture, for example, a guard covered only the upper part of some gears, leaving the lower portion exposed. An employee was caught and injured; and the exposed portion of the gears has since been enclosed. Other pictures showed a number of safeguards constructed according to the new standard specifications. In many of these woven wire was the principal material. In a woven wire guard for gears at the end of a lathe, the guard is attached to the machine by hinges in such a manner that it swings shut of its own accord. A careless employee cannot leave the guard out of its proper position.

The conditions corrected by safety committees do not as a rule involve a great deal of expense.

Unsafe conditions are not responsible for the greater number of preventable injuries. The record for two years shows that from 60 to 70 per cent. of the accidents which could have been avoided were due to unsafe practices on the part of employees. We do not make proper and sufficient investigation of the moral and mental qualification of the men we employ in the more responsible branches of the service. Under the system now prevailing on most roads, almost any man of prescribed age who can pass a physical examination can get a responsible position. In nine cases out of ten, we take the references given by the applicant, write them formal letters of inquiry and the butcher and the barber, the teamster and the trader do the rest. The duty of employing new men is generally delegated by officers to assistants, and by them further delegated down the line till it often happens that a clerk is the only one, other than the examining physician, who sees or knows anything about the applicant before he reports for duty.

Instead of this method, there should be on every road, a central employment bureau with branches at important points which should have sole authority in the employment of men. This bureau should encourage—if necessary should advertise for—applicants and should make a careful and thorough investigation of the antecedents and of the personal record of every applicant. We could and we should have in charge of our trains the finest body of men in the world. The work is attractive, even fascinating, the pay is good and the chances for advancement encouraging. The most popular toy in the world for boys is an engine and string of cars, and when these boys grow up, they all want to go railroading. We don't need them all, but we could, if we went about it in the right way, select the best of them. When a capable country boy comes timidly into a railroad office today and applies for a job, if we don't happen to need men at the time, the employing officer, or more likely his clerk says, "Can't do anything for you now." The boy goes away and gets a job clerking at ten dollars a week. A few months later there is a rush of business and we need men, but we have no waiting list—we don't even take names and addresses of applicants, and consequently we have to take anything we can get on short notice, and that often means the boomer and the loafer. Even this method wouldn't be so objectionable, if we gave every new man a careful and thorough training before allowing him to go to work, but we don't do that; that is, we don't carry it far enough.

It should be borne in mind that the attitude of the yardmaster and the roundhouse foreman toward the Safety Movement, being observed and understood by individual employees, is often more potent than that of the general manager, whose views are known by employees only in a general and indefinite way. If the yardmaster is permitted to remain indifferent to the necessity for

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compliance with instructions, their enforcement will be difficult and to a great extent impossible.

Mr. Bradshaw showed copies of numerous pamphlets which have been issued by him as circulars among the employees. He finds that employees are glad to receive this literature and that they read it attentively. He has almost completed a "Safety Exhibit Car" which will contain models of approved safety devices, safety literature, photographs and other things of interest. This car, in charge of a competent man, will be exhibited at all important points where employees will be given an opportunity to see what is being done for the prevention of injuries. Every employee on the system will be required to visit the car.

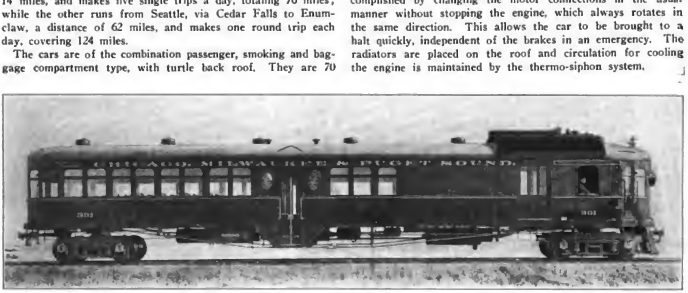
MOTOR CARS ON CHICAGO, MILWAUKEE & PUGET SOUND.

The Chicago, Milwaukee & Puget Sound has recently placed in service on branch lines in the state of Washington, two General Electric Company gas-electric motor cars. One of these is operating between Everett and Monroe, a distance of 14 miles, and makes five single trips a day, totaling 70 miles; while the other runs from Seattle, via Cedar Falls to Enumclaw, a distance of 62 miles, and makes one round trip each day, covering 124 miles.

The cars are of the combination passenger, smoking and baggage compartment type, with turtle back roof. They are 70 ft. 5 in. long, 10 ft. 5 in. wide, weigh approximately 50 tons, and have a total seating capacity for 77 people. The cab, containing the power plant apparatus, measures 11 ft. 11 in. long; next is the baggage room, 15 ft. long; then the smoking section, 10 ft. 11 in. long; and the passenger compartment, 27 ft. 5 in. long. A center vestibule with side entrance runs crosswise between the passenger and smoking compartments. The smoking section provides for 20, and the passenger compartment for 57 people. All-steel construction is used throughout, except in the case of the interior finish, which is of mahogany.

The generating unit is located above the floor line of the cab, where it is under the immediate observation of the engineer. It consists of an eight-cylinder, four-cycle gas engine of the "V" type, direct connected to a 600 volt, commutating pole, electric generator, designed to meet the special conditions the service demands. The engine can rotate at normal speed, irrespective of the speed of the car, which is started by compressed air taken from the main reservoirs of the air brake system, which are built with surplus capacity for this purpose. The main air compressor is driven from the crank shaft of the main engine, and is fitted with an automatic governor to maintain a constant pressure. An auxiliary equipment is also provided, consisting of a two-cylinder, four-cycle gas engine, direct connected to a single cylinder air compressor and lighting generator. The function of this set, which is started by hand, is to supply an initial charge of air for starting the main engine and in addition to deliver power for lighting the car.

The control is similar to that of any standard electric trolley car. Mounted on the axles of the forward truck are two GE-205, 600 volt, commutating pole railway motors of 100 horse power each, which by means of a special controller, are placed progressively in series and parallel connection. Two extra points are provided on the controller for final speed acceleration in parallel, whereby the motor fields are shunted and weakened. The resulting higher armature speeds permit the use of smaller pinions, and full utilization of the power input is secured throughout the entire speed range, from start to full speed. Energy is transmitted directly without the intervention of mechanical change speed gearing. The voltage is governed by varying the strength of the generator field by the movement of a single handle on the controller, and the resultant speed changes of the motors produce a smooth and rapid acceleration. Separate handles are provided for throttling the engine and for reversing the car. The latter is accomplished by changing the motor connections in the usual manner without stopping the engine, which always rotates in the same direction. This allows the car to be brought to a halt quickly, independent of the brakes in an emergency. The radiators are placed on the roof and circulation for cooling the engine is maintained by the thermo-siphon system.



Gas-Electric Motor Car for Branch Line Service.

The trucks are of the swing bolster type. The brake equipment includes hand brakes in addition to the combined straight and automatic air brakes. A high power Mazda incandescent headlight and reflector are provided and a hot water heater, coal fired, is installed for heating the car. A 150-gallon gasolene tank for the power supply is suspended under the car. While the engine is running the gasolene is pumped automatically, and when starting, by a hand pump.

These cars made the trip across the continent under their own power. Car 300 left Chicago on the Chicago, Milwaukee & Puget Sound tracks and covered the distance to Tacoma, Wash., 2201.2 miles, in ten days, daylight running. Necessarily, the special schedules of the motor cars while on the trip were subject to the exigencies of regular traffic requirements and numerous delays were encountered. The car in question averaged 220 miles a day, and on one day covered 315 miles. A run from Malden to Othello, Wash., 103 miles, was made in 2 hours 10 minutes, and in one case 20 miles of 2.2 per cent. grade were negotiated in 56 minutes with one stop.

RAILROAD CONSTRUCTION IN THE PHILIPPINES.—During the fiscal year ended June 30, 1912, 65 miles of new line were opened to traffic in the Philippine Islands, 33 miles were graded and track was laid on 43 miles.

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THE PRODUCTION OF SOUND RAIL INGOTS.

The American Institute of Mining Engineers Devoted an Entire Day to This Subject—Abstracts of Two Papers.

The sessions on February 19 of the meeting of the American Institute of Mining Engineers, held in New York, were devoted to the discussion of sound ingots for rail steel and a number of railway men participated in the discussion. Among the papers presented were two entitled "Comparative Notes on Steel Rail Rolling," by Robert W. Hunt, and "Piping and Segregation of Ingots of Steel and Ductility Tests for Open-Hearth Steel Rails," by P. H. Dudley, which are given below.

The discussion was presented under the following topics: First, Is the present method of getting rid of pipes by cropping a safe and reliable device for making sound steel? Second, Is it desirable to increase the amount of metal arbitrarily cropped off the top of an ingot, and, if so, what would be a fair excess price to pay for cropping off 20 per cent.? Third, Is it commercially practicable to make ingots without pipes or blow holes, and what additional expense of manufacture would be justified to accomplish this result? Fourth, What process for making pipeless ingots seems to promise the most commercial success, and why? The opinion was expressed by several that little piping was present in good mill practice, and it was felt that the proportion to be cropped from the top of the ingot should not be arbitrarily fixed, as that would work to the detriment of the better mills and would penalize them. The point was brought out that head failures in rails can be traced to the interior of the ingot, and that this class of failures is about 50 per cent. of the total. These failures are invariably due to segregation and are almost entirely confined to rails from the upper third of the ingot. While pipes are caused mainly by the use of silicon, titanium and aluminum, segregation is greatly reduced by them. There was considerable discussion over the use of aluminum and titanium, several men objecting strongly to aluminum.

COMPARATIVE NOTES ON STEEL RAIL ROLLING.

By Robert W. Hunt.

I have frequently stated that while the chemical composition of steel was important, even greater importance was connected with the mechanical and heat treatment of the metal. During the past year I encountered such a positive example of that fact that I deem it worth putting upon record.

A prominent railway system divided an order for open-hearth steel rails between two steel works, both of which are under the control of the same corporation, giving to one about 18,000 tons, and to the other 7,500 tons of the same section and to be made under the same specifications. The rolling results obtained in the two mills varied so widely that a study of the figures is intensely interesting and serves to illustrate the advantages obtained by careful ingot casting, and quite as pertinently the possible benefits of careful subsequent heating and rolling with moderate reductions in the rolling process. The smaller order was rolled complete in four instalments during the same months that the larger order was being made in eight separate instalments; but, to permit of exact comparisons, the totals of the four instalments (completing the order with the mill which I will call A) are given with the totals of the first four instalments of the larger order, made by the mill designated as B. These rolling results are:

	Mill A.	Mill B.
Number of rollings	4	4
Total number of rails rolled	18,278	27,832
Percentage of rails cut to short length because of flaws near ends, etc.	0.7	7.6
Percentage of rails made second quality for flaws, etc.	0.9	6.3
Percentage of rails scrapped for flaws, etc.	0.6	4.5
Percentage of rails scrapped for failure at drop test	None	3.4

It should be stated that the above figures cover all the reasons for putting the rails in the classes stated. Thus a part of the percentage of rails cut to short lengths may have been because of bad drilling or bad sawing. Such classification, however, in this case is entirely proper, as neither mill suffered from unusual or abnormal difficulties in any way, and the figures indicate ordinary performance uninfluenced by unusual errors of either workmanship or mechanical troubles in rolling.

Emphasis should be laid on the fact that both mills were working to exactly the same specifications, and producing a section which has been in use for several years and in large tonnage. It is an 85 lb. section having 36.7 per cent. of the metal in the head, 22.2 per cent. in the web, and 41 per cent. in the base, being, therefore, well proportioned for the avoiding of torn flanges or other rolling difficulties, sometimes encountered with sections having thin flanges.

The chemical composition and drop-test specified with the average results obtained, were

	Specified.	Average Obtained. Mill A.	Mill B.
Carbon, per cent	.55 —.70	.60	.61
Phosphorus, per cent., not over	.045	.023	.023
Manganese, per cent.	.65 —.95	.83	.74
Silicon, per cent.	.075—.18	.13	.14
Sulphur, per cent., not over	.055	.029	.039

	Specified— Min.	Max.	Obtained— Mill A— Min.	Max.	Mill B— Min.	Max.
Deflection on 4 ft. supports with 2,000 lb. top falling 20 ft.	1.75 in.	3.25 in.	2.3 in.	3.2 in.	2.2 in.	3.8 in.
Average deflection			2.7 in.		2.8 in.	

	Mill A.	Mill B.
Number test pieces breaking on first blow	0	9
Number test pieces showing pipe or segregation when nicked and broken	3	9
Number heats rejected because of two pieces failing at drop test	0	2
Number heats rejected for exceeding deflection limits at drop test	0	4
Number heats rolled	119	173

Both mills took advantage of the full range permitted in the chemical limits, and the success reached in obtaining consistent carbon results is shown by the table below.

Permitted Carbon:	.55	.56	.57	.58	.59	.60	.61	.62	.63	.64	.65	.66	.67	.68	.69	.70	Total Heats
Number of Heats:																	
Mill A.	..	1	2	4	5	17	17	14	13	14	11	8	9	4	..	..	119
Mill B.	20	8	9	14	12	16	14	14	14	15	7	7	10	6	6	1	173

It will be noted that Mill A's results were more consistent than B's.

The chemical compositions obtained at the two mills agree so closely that some other reason must be sought to explain the divergent physical results obtained in the product, and, therefore, data on the actual performance of the mill operations is important. The principal items are:

	Mill A.	Mill B.
Number of furnaces making the steel	6	27
Average size heats cast	196,000 lbs.	182,500 lbs.
Maximum weight heats cast	214,000 lbs.	220,000 lbs.
Minimum weight heats cast	128,000 lbs.	155,000 lbs.
Average time metal held in ladle before casting	4 min.	3½ min.
Maximum time metal held in ladle before casting	11 min.	52 min.
Minimum time metal held in ladle before casting	1 min.	2 min.
Average number of ingots per heat	20	23
Maximum number of ingots per heat	22	28
Minimum number of ingots per heat	13	20
Average time between casting and stripping	43 min.	1 hr. 7 min.
Maximum time between casting and stripping	2 hr. 15 min.	5 hr. 55 min.
Minimum time between casting and stripping	24 min.	15 min.
Average time between stripping and charging in soaking pits	16 min.	46 min.
Maximum time between stripping and charging in soaking pits	1 hr. 6 min.	11 hrs.
Minimum time between stripping and charging in soaking pits	3 min.	10 min.
Average time between charging in soaking pits and blooming	2 hr. 20 min.	2 hr. 47 min.

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	Mill A.	Mill B.
Maximum time between charging in soaking pits and blooming	4 hr. 30 min. *b*	6 hr. 5 min. *a*
Minimum time between charging in soaking pits and blooming	1 hr. 30 min.	1 hr. 0 min.
Number of cold heats charged	8	None
Per cent. top discard	10 to 13	10 to 12
Time in reheating furnaces	20—50 min.	None *c*
Average weight ingots	9,740 lbs.	7,970 lbs.
Size of ingots	22 in. x 26 in.	20 in. x 24 in.
Number passes in blooming mill	21 to 25	9
Size of bloom produced	7 x 9	8 x 8
Number passes in rail mill	11	9
Total passes	32 to 36	18

a One heat in pits 24 hrs.
b One heat in pits 25 hrs.
c Mill B rolls direct, does not reheat.

It will be especially noticed that both mills were casting large heats, approximating 85 tons. These were made by almost identical methods, using the usual scrap and pig iron process, the iron being taken from mixers as required, and varying in proportion to the scrap used. As far as possible at both mills, this mixer metal was used for recarbonizing in the furnace, but many heats had coke or coal added to the ladle on tapping, in addition to the usual ferro-manganese and ferro-silicon. While the heats at mill A were slightly larger than at B, the difference is not of importance, but it is pertinent to note that there are but 6 furnaces represented at mill A as against 27 furnishing rail steel at B; and consequently, there were probably but two steel melters working at A as against at least six at B. The personal equation may, therefore, have played an important part in making the steel.

Equally noticeable is the fact that while the average for the time intervals of the various operations at the two mills is not much different, still the range between the maximum and minimum for B is consistently greater than for A. There can be but little doubt but that a delay between casting and stripping ingots and between stripping and charging in the soaking pits is likely to be seriously reflected in the soundness of the ingots, and of at least equal importance, is the necessity for teeming the steel at uniform temperature. A variation of 50 minutes in the time heats were held in the ladle prior to casting must have caused variable teeming temperatures, and produced many blowholes in some of the ingots. Admitting the presence of blowholes near the surface of the sides of the ingots, and remembering the oxidizing action in the soaking pits, it is not surprising that heavy reductions in the blooming mill had an extremely detrimental effect on the product. This is reflected, no doubt, in the large number of rails containing flaws found at mill B.

Appreciating, therefore, the probable difference in the ingots produced at the two mills and the actual difference in the blooming practice, the principal other variable existing was in the reheating of the blooms at mill A. There the ingots were cut into four blooms, which were then given a wash heat in reheating furnaces, after which they were rolled into two rails in a rail train of 11 passes. At mill B the rail train consisted of 9 passes with no reheating of the blooms.

It is interesting to note the reported history of the heats rejected at mill B. Two heats were rejected at the drop test because two of the three test pieces broke on the first blow of the tup. The steel of the first heat was reported as being somewhat low in temperature when tapped. While pouring, the nozzle froze up, and while the ingots were in the soaking pits an average of four hours and 20 minutes, they bloomed cold and rough. The second heat was quite the opposite, the tapping temperature being high, and while casting the stopper head was finally lost, but the heating and the blooming were normal.

Analysis of rejected heats gave:

C	P	Mn	Sil.	S	Remarks
.70	.015	.74	.11	.034	Two pieces broke
.57	.020	.65	.08	.035	Two pieces broke
.55	.014	.65	.08	.036	Deflection over limit
.55	.017	.65	.09	.037	Deflection over limit
.60	.026	.71	.11	.041	Deflection over limit
.57	.026	.75	.08	.051	Deflection over limit

Four heats were lost at the drop test, because they exceeded the deflection limits. On the first, all conditions were reported normal, save that the ingots were held in the pits for an average time of 24 hours. The second heat tapped cold, the pouring nozzle froze, and the ingot tops were spongy. The third tapped hot, but otherwise, and like the fourth, had normal conditions.

PIPING AND SEGREGATION OF INGOTS AND DUCTILITY TESTS.

By P. H. DUDLEY,
Consulting Engineer, New York Central Lines.

The piping and segregation of ingots of steel is a comprehensive subject, and must be studied with reference to the different grades of soft, medium, and hard steel, rather than in a general manner, as though applicable to all grades. Ingots of rail-steel containing from 0.50 to 0.75 per cent. of carbon are of an entirely different character from those of softer steel when they are sufficiently deoxidized to form comparatively pure steel, as a well-defined shrinkage-cavity forms. This important fact should be remembered in discussing rail-steel, for the greater the degree of deoxidation, the larger will be the difference between the inclosed volume of hot fluid metal in the mold and the cooler resulting set metal, and the still proportionately lesser volume, should the ingot be allowed to become cold before equalizing the heat and rolling.

The exterior blowholes in the outside walls of the ingots can be prevented from forming by sufficient deoxidizers, as silicon, ferro-titanium, or their combination, and aluminum. The latter has been extensively used, but all of its oxidation-products do not always escape from the metal, and it should not be used when the steel is to be subjected to the present heavy wheel loads. The silicon-content for rail-steel now ranges from 0.10 to 0.20 per cent., to make it sound and prevent small blowholes from forming in the setting metal.

When sufficient deoxidizers are used to purify efficiently the steel, then, as must be expected, a small cavity starts to form in the top under the cap of the ingot in the setting steel, and its development should be retarded by stripping the ingot and promptly charging into the reheating furnace.

The sides of the contours of the shrinkage cavities in well-deoxidized steel are parabolic in form, and of proportionately greater volume and depth in the long type of ingots than in those which are short and stubby, but of larger volume and base.

When the mills began to make 33 ft. rails and teemed them in the same ingot molds which had been used for 30 ft. rails, and then rolled them in four 33 ft. 100 lb. rails, a great many ingots were not stripped, weighed and charged into the reheating furnaces with sufficient promptness to prevent a number of piped rails, as the requisite mill practice to check them was not then comprehended under the changed manufacturing conditions.

The segregation was also large, and in 1908 I confined the rolling of Bessemer and open-hearth rails for the New York Central Lines in the United States mills to three 33 ft. rail-length ingots for those of about 19 in. square upon the base. It was also stated in the specifications for the New York Central Lines that short, stubby ingots of from 2.5 to 3 times the length of the width of the base were required for rails. Ingots of about 8,200 lbs. weight, teemed in molds 20 x 24 in., have been extensively made for six lengths of 33 ft. 100 lb. rails, and, in good mill practice, with practically complete elimination of piped rails. The blooms, however, are cut, and only rolled in three rail lengths at a time. Ingots 25 x 30 in., of about 12,000 lbs. weight, have been used for eight 33 ft. basic open-hearth 100 lb. rails where the ordinary rail mill equipment had not been installed. The ingots were bloomed and then shipped to a rail mill to be reheated and rolled, and but a few piped rails were found during manufacture. The rails in the track fulfill the requirements of safety and severe service.

Only 25 piped rails are known to have been found in service in the track in 65, 70, 75, 80, 95 and 100 lb. sections out of about 1,100,000 30 ft. rails, of which the length of the ingot

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was not over but under three times the width of the base.

THE DROP AND EXHAUSTED-DUCTILITY TESTS.

The exhausted-ductility tests for the purification of the steel were introduced into the specifications for the New York Central Lines in 1910 to secure rails of sufficient toughness to withstand the low temperatures in the Mohawk valley of from 20 deg. to 30 deg. below zero, though 40 deg. is often reported by the trackmen. The ductility which is possible for a given composition, size of ingots, section, and other steps of manufacture, has been practically ascertained, and it is to see by the exhausted-ductility tests whether or not it is secured.

It requires but a moment to stamp the crop of the rail with the 6 in. spacing bar of seven points before placing the butt on the supports of the drop-testing machine. The elongation of each of the six marked inches on the test-butts after the drop, is measured by a flexible rule, and the increase in hundredths of inches per inch, indicates the per cent. of elongation. It takes but a moment to test the butt, and the exhausted-ductility is obtained in three or more blows, though it is measured after each blow, and recorded.

The term ductility in the specifications for the New York Central Lines, is used in the sense of tenacity and toughness of the steel, the exhausted ductility being its measure. This also becomes a soundness test for seams, segregation, slag inclusions and other foreign matter in the web or head of the rails, and is better than the special nick test in other specifications.

The elongation and exhausted ductility tests of stel rails are made concurrently with the manufacture at the plant under the drop-testing machine on four or 5 ft. lengths of the top erop of the rail bars, the results being tabulated as shown by the appended blanks for ductility and elongation tests, a copy being furnished to the manufacturers.

The butts are tested within three hours after the ingots of a melt are teemed and rolled, and the facts as to the full ductility of the steel as made and rolled are available for the manufacture of subsequent melts. The utilization of such knowledge of each melt has enabled the manufacturers to make rails of greater uniformity, homogeneity, safety, and economy of the output than was believed possible before such tests were installed. The practical non-breakage of such rails in the track for the winter of 1911-12, shows that a high quality was secured in their manufacture.

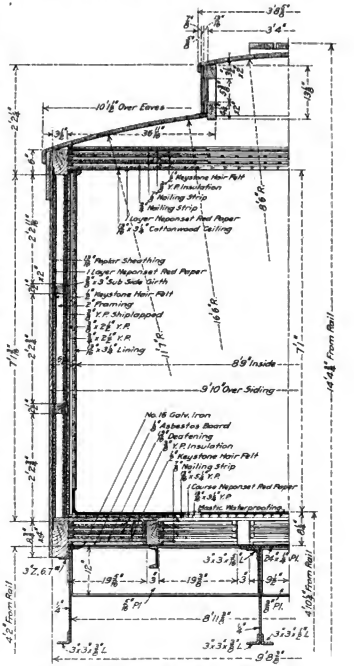
When the ductility tests were first proposed, the most experienced steel men did not think it was possible to secure such uniform results per melt of steel. It was considered by some of the presidents of the steel mills that when dealing with the larger melts of from 60 to 80 tons in a ladle, the temperature might be just right for teeming the first ingot, but too low for the middle ingot to give the full ductility of the chemical composition and to reduce its percentage for the last ingot teemed of the melt. However, the heavy body of slag over the top of the molten steel in the ladle did not allow sufficient heat to escape to modify the ductility in well-made steel from the first to the last ingot poured.

The examination of the results from more than 200,000 tons of steel now shows that it is possible to secure nearly uniform results from each melt. It is found that there is some difference in the ductility which may be obtained, according to the section which is being rolled. The well-designed sections of not too great width of base compared to the height, finish with nearly the full ductility of the metal.

The manufacturers have examined the tabulated results of their product and some have adopted the system of testing and keeping the same records for all rails made for their own information, whether required by their customer or not, as is required by the New York Central Lines. The American Railway Engineering Association has followed the New York Central Lines and adopted nearly their ductility and elongation tests in their specifications.

REFRIGERATOR CARS FOR EXPRESS SERVICE.

Wells, Fargo & Company have received from the American Car & Foundry Company the first of an order of 75 steel underframe refrigerator cars for express service. These cars, which are equipped for operation in passenger trains, are 50 ft. in length over end sills, weigh, complete, 86,000 lbs., and have a capacity for 60,000 lbs. of lading and 14,000 lbs. of ice. They are mounted on four wheel trucks, which have 5½ in. by 10 in. journals and are spaced 34 ft. between centers.



Half Section Through Express Refrigerator Car.

The underframe has two center and two side sills of the fishbelly type, 24 in. deep at the center for a distance of 8 ft. The center sills are 13¼ in. deep at the body bolster, are spaced 14 in. apart and are built up of web plates ¼ in. thick with outside angles at the top, and outside and inside angles at the bottom. A top cover plate, 24 in. by ¼ in., runs their entire length. The side sills have ¼ in. web plates, the

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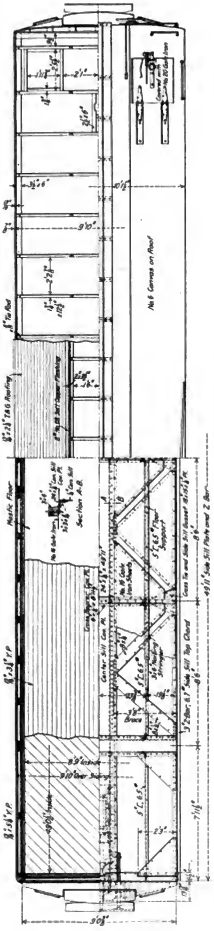

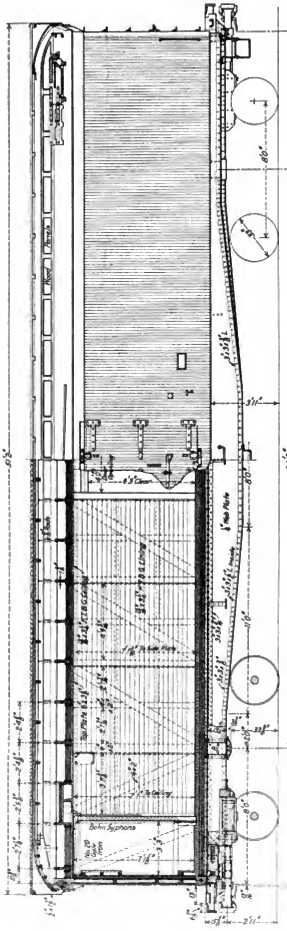

General Arrangement of Wells Fargo & Company Express Refrigerator Car.

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bottom member being an angle and the top a 3 in. Z-bar, the outside flange of which forms a support for the wooden superstructure.

The end sills are of cast steel, with a flange cast on the upper side to prevent shifting of the car body on the underframe. The body bolsters are built up of ⅜ in. pressed steel members, spaced 8 in. back to back, with top and bottom cover plates 14 in. x ⅝ in., extending between the side sills. Between the bolsters are three built up crossties, consisting of 5/16 in. pressed steel members with top and bottom cover plates. Between the side and center sills a 5 in. channel extends the full length of the car. The underframe is braced by diagonal plates, 8 in. wide, extending from the side to the center sills, and ¼ in. gusset plates connecting the side sills to the body bolsters and end sills.

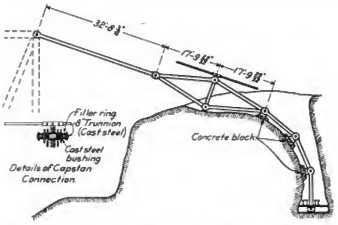
Particular attention has been given to the insulation. On top of, and riveted to the underframe members, is a layer of No. 16 galvanized iron, over which a course of ⅛ in. asbestos paper is applied. There is an air space between this and the 13/16 in. deafening floor, on top of which is a layer of ½ in. Keystone hair felt held in position by ⅞ in. wood furring. To the latter is nailed a single course of ⅜ in. yellow pine, which supports the second course of ½ in. Keystone hair felt, the latter also being held in position by ⅞ in. nailing strips. These in turn support another course of ⅜ in. yellow pine, on top of which is laid the third course of ½ in. Keystone hair felt. This insulation is all located below the main floor, between 3 in. by 6 in. yellow pine nailing sills. Resting on the four nailing sills and the two 4 in. by 8¼ in. side sill fillers, is a course of 13/16 in. by 5¼ in. yellow pine forming the sub-floor. A layer of Neponset red paper is applied between this and the main floor, which is of 13/16 in. by 3¼ in. yellow pine. Over the main floor, except at the ice bunkers, is placed waterproofing and Mastic flooring, made by the H. W. Johns-Manville Co., and this also extends up the sides of the car for 6 in. This permits the floor of the car to be cleaned by flushing with water. The insulation of the sides, ends and roof is similar to that of the floor, three courses of ½ in. Keystone hair felt and a layer of Neponset red paper being used; and it will be noticed that three air spaces are provided.

The Bohn system of refrigeration is used, and also the Bohn all-steel collapsible bulkheads. The hatch covers are placed in the lower deck of the roof, and each bunker has a capacity for 7,000 lb. of ice. The ice grates are made of white oak bars and when not in use can be folded back in a 3-in. recess in the end of the car, thus leaving the ends flush.

The roof is of the monitor or clere-story type, conforming to passenger equipment construction, and a dummy vestibule mechanism is used with Fowler semi-elliptic springs at the end plates. The buffing device is of the Miner friction type and is so applied that the mechanism can be lowered for repairs when necessary. The following special equipment is used: Draft gear, Miner; couplers, McConway & Torley; coupler centering device, American Car & Foundry Company; air brakes, Westinghouse, high speed, schedule, L. N.; hand brakes, Lindstrom; slack adjuster, American Brake Company; truck frames, Commonwealth Steel Company; journal boxes and lids, Symington; wheels, Carnegie Steel Company, 33 in. rolled steel; brake beams, Diamond special; springs, Standard Steel Works; door insulation, La Flare. The cars are constructed throughout to meet M. C. B. standards and the U. S. safety appliance requirements.

THE CROOKED RIVER ARCH BRIDGE.

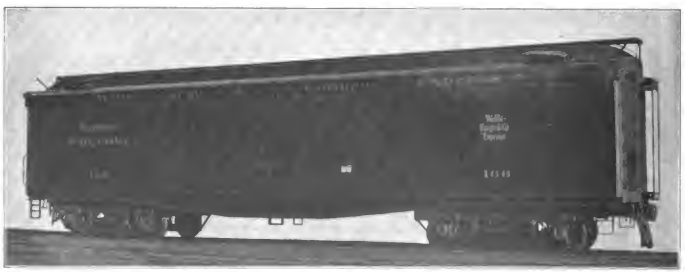
In connection with the bridge work on the Oregon Trunk, described in the *Railway Age Gazette* of March 22 and 29, 1912, the arch bridge which was constructed to carry this line across Crooked river canyon has features which make it unusually interesting. Its location is unique, in that it spans the gorge at a height of 320 ft. above water at a point where the canyon



The Erection Device for Lowering the Cantilever Arms.

walls are only 350 ft. apart. So far as is known, the only other bridge in this country that carries traffic at a higher elevation above water is the Pecos river viaduct, and the difference is only a matter of inches.

Those who read the description referred to will recall that



Wells Fargo Refrigerator Car for Express Service.

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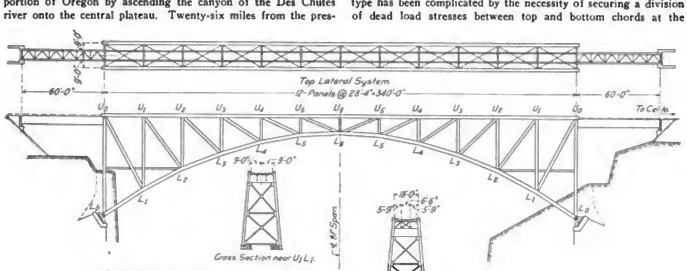
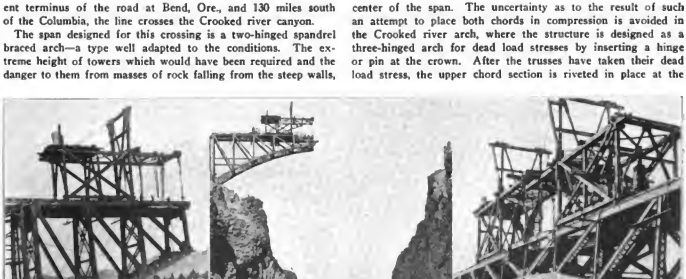
the line leaves the Spokane, Portland & Seattle, or North Bank road, at Fallbridge, on the Columbia river, crosses that stream on the Celilo bridge and penetrates southward into the central portion of Oregon by ascending the canyon of the Des Chutes river onto the central plateau. Twenty-six miles from the present terminus of the road at Bend, Ore., and 130 miles south of the Columbia, the line crosses the Crooked river canyon.

The span designed for this crossing is a two-hinged spandrel braced arch—a type well adapted to the conditions. The extreme height of towers which would have been required and the danger to them from masses of rock falling from the steep walls, the sections of the first two panels of top chord were the only ones governed by erection stresses.

The erection of former American arches of the two-hinged type has been complicated by the necessity of securing a division of dead load stresses between top and bottom chords at the center of the span. The uncertainty as to the result of such an attempt to place both chords in compression is avoided in the Crooked river arch, where the structure is designed as a three-hinged arch for dead load stresses by inserting a hinge or pin at the crown. After the trusses have taken their dead load stress, the upper chord section is riveted in place at the crown at a temperature of 60 deg., which converts the arch into the stiffer two-hinged type for live load and temperature stresses. This same idea has been recently used in a 523.5 ft. arch erected by German engineers across the Sanaga river in Africa with very satisfactory results.



Elevations and Plans of Crooked River Arch Bridge.



Traveller Erecting the Third Panel. Erecting the Fifth Panel on the North End. Placing the Last Top-Chord Member.

The standard loading for all bridges on the Oregon Trunk made a single span crossing preferable to a viaduct. The necessity for erection without falsework and the possibility of securing foundations capable of taking unlimited thrust, led to the selection of an arch span. The type chosen could be erected as a cantilever with practically no changes in the members from the section required for service stresses. In this particular design

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is two 188.5 ton engines followed by 5,000 lb. per ft. for the trusses, and one 214 ton engine followed by the same uniform load for the floor system. All bridges are for single track.

The Crooked river span is 340 ft. long and is divided into 12 panels. The trusses are 72 ft. deep at the ends and 12 ft. at the center, the bottom chord following a parabolic curve. The top chords are 18 ft. center to center, and as the trusses are battered 1 in 12 for greater stability, the Lo points are 30 ft. apart. A massive, three-web, cast steel shoe at this point carries a horizontal pin 13 in. in diameter. The pin holes in the bottom chords connecting at this point are bored on the skew necessitated by the batter of the trusses.

Field work on the bridge was begun while the construction work was proceeding along the road, in order that the foundations would be ready for the steel as soon as rails were laid to the bridge site. This largely increased the cost of the foundation work, as all material supplies had to be hauled in by wagon from Shaniko, 65 miles away. A cableway was set up on the bridge axis to elevate rock and water for the concrete from the bottom of the canyon. After blasting out the weathered rock on the face of the canyon walls down to good quality basalt, the pedestals were built. These were constructed of 1:2:4 concrete, with crushed stone and screenings for aggregate. A machine mixer was used so that the piers might be of uniform quality and monolithic construction.

The erection device, shown in one of the accompanying drawings, consisted of a chain of four eyebars from the Uo point of the arch to the ground and from there running in a curve to the grillage beams set in the bottom of shafts excavated 30 ft. into the solid rock. These shafts were filled with concrete after setting the grillages and bars. To provide for the control of the position of the semi-spans, in closing the arch, an adjustment toggle was placed in the eyebar chain. This consisted of a large parallelogram of eyebars, with a 6½ in. screw working in the short diagonal in such a way as to increase or shorten the length of the figure. There was enough movement in this toggle to provide for raising the arms 15 in. at the crown, or lowering them 8 in. from normal position, in making the connection. The screw was turned by a capstan head, in which were inserted long bars against which the men pushed. Before erection had proceeded

Adjusting Cantilever Arms Before Closure.

far enough to put much load on the anchorages, the toggles were adjusted to give an elevation of 9 in. to the outer end of the arm.

After placing this device and filling the shafts with concrete, the erection contractor built a trestle out to the arch pedestals and assembled his traveler. This was of timber, 76 ft. long over all and with an overhanging boom of 32 ft. Two 8 in. x 16 in sticks comprised each side of the boom, and were guyed back over a transverse bent by 1¼ in. steel rods. The engine deck was built on the rear end of the boom timbers and was high enough to enable the derrick car to pass underneath. This rig traveled on two rails, laid on short cross ties on the top chords. The complete traveler weighed about 45 tons. Its rigging consisted of six sets of 1¼ in. manila falls and one set of wire falls.

After lowering the 10½ ton shoes to place, the bottom chord was set and the pin driven, after which the end post was placed and the pin driven to connect to the anchorage chain. The diagonal UoL1 was then placed, thus making the panel self-supporting. The remaining members of the panel in the truss and floor system were placed and the traveler run forward to repeat the operation. Riveting was started on all principal truss connections except bottom chord splices in each panel as soon as completed. This was done because of high erection stresses and to reduce the number of drift pins and temporary bolts required for erection.

After five panels of the north arm had been placed, work was started on the south side of the canyon. Materials for the

The Completed Arch.

traveler, falsework and anchorage were carried over the gorge on the cableway, and as soon as the traveler had been constructed, the transfer of bridge material was begun. In doing this the members were lowered into the canyon from the north end and then by hooking on a tackle from the south traveler they were drifted across the stream. The tackles from the north traveler were then removed and the material hoisted and erected. In this way all steel for the south arm was transferred safely and with but little delay to erection.

When the five panels of each arm were finished, the bottom chords and diagonals of the two center panels were put in place, and the two semi-spans lowered to bearing on the center pin by means of the erection device. The structure was then a three-hinged arch. To bring it to its final condition of two-hinges, the center section of the top chord, which was two panels in length and unpunched at both ends, was set in place. The first time the temperature of the steel reached 60 deg., the ends of the chord were center-punched through the holes in the splice plates attached to the adjoining chords, and drilled. One end was then riveted up and the other left until the temperature of the steel had again reached 60 deg., when it was quickly riveted up.

The bridge was designed in the office of Ralph Modjeski, chief engineer of bridges of the Oregon Trunk, Ralph Budd being chief engineer. It was fabricated by the American Bridge Company and erected by the Missouri Valley Bridge and Iron Company. W. R. Weidman was resident engineer, with Ralph Harris and Clement E. Chase, assistants in charge of substructure and superstructure respectively. We are indebted to Mr. Chase for the information contained herein.

Brazilian Surveys Approved.—The president of the state of Sao Paulo, Brazil, has signed a decree approving the definite surveys of the first section of five miles of the line from Jaboticabal to Rio Pardo.

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SPEED RESTRICTIONS ON THE CHICAGO & NORTH WESTERN.

The Chicago & North Western recently made practical tests of its speed restrictions of the movements of trains over crossovers, turnouts, junction turnouts, and on certain signal indications at interlocking plants, and as a result has established additional safeguards and rules to govern the speeds of trains. These are as follows:

(1) When a signal to proceed is displayed by a dwarf, or low-speed signal located at the bottom of a home signal, or across the track from it, a train may proceed at a speed not to exceed 15 miles per hour.

(2) The speed of a train moving over a crossover; turnout from a main track to a siding, or to a diverging route at a junction, must not exceed 15 miles per hour, with certain exceptions, the points at which exceptions are permitted being indicated on the current time table by special rules, which give in each case the speed in miles per hour that may be attained at any particular point or turnout at which the above rules do not apply.

In formulating the rules for the speed restrictions at definite points, or for turnouts of varying degrees, the question arose as to whether the restrictions were sufficient to insure absolute safety and smooth operation for the train or whether they were greater than necessary. That is to say, did the restrictions call for lower speed than was essential for the safe and smooth operation of trains over the certain turnouts or stretches of track? In order to satisfy themselves on this point, the general officers of the road conducted a series of speed tests over the crossovers and turnouts in question. A train composed of a high-speed locomotive and several cars was employed for this purpose. A speed indicator was installed in the locomotive for the guidance of the engineman and another one in the observation car on the rear of the train for the convenience of the observers, who were general officers and officers of the division on which the tests were being made. Telephone communication was also established between the locomotive and the observation car, a complete telephone outfit being located in the observation car.

Speed tests were made over leads and crossovers, over turnouts from No. 7 to No. 20, and at varying speeds over each number of turnout, these varying from five miles per hour over No. 7 turnouts to over 50 miles per hour over No. 20 turnouts.

The train was run through each turnout several times at different speeds, and always once or twice at a higher rate of speed than was considered at all, or was later decided upon for that number of turnout.

Careful records were made of the different speeds over each turnout and the behavior of the train noted in each case. It was found throughout the test that it is very difficult to judge the speed of a train while riding on it. Everyone in the large party on the train was inclined to judge its speed when moving at 20 miles or less per hour as less than was actually the case, and when the train was running at 35 miles or more per hour it seemed to be running at a higher rate of speed than that.

The speeds of trains under these restrictions are checked frequently to find out how closely enginemen are able to judge them, and, as an additional precaution, a more general use of speed recorders which will accurately indicate to enginemen the speed at which they are running will be adopted.

THE PHILIPPINE RAILWAY COMPANY.—On June 30, 1912, this company had in operation 59 miles of line in the island of Cebu, Philippine Islands, and 74 miles of line in the island of Panay, a total of 133 miles of line. The lines of this company in the island of Cebu cost $3,317,000, or about $65,283 per mile. The lines in Panay cost $5,065,000 or $68,444 per mile.

THE RAILWAY VALUATION LAW.

It is now expected that Congress will pass a railway valuation law at the present session. The Senate on February 24, passed House Bill 22593 after extensive amendment, and it is believed that the House will readily accept the changes that have been made. The bill as it leaves the Senate provides for valuation not only of physical property, but also of franchises and other intangible values; and provision is made also for investigating the history of past financial operations.

In the bill as reported by the Senate committee and passed by the Senate, the principal section (to be Section 19a of the Interstate Commerce law) is as follows:

"That the commission shall, as hereinafter provided, investigate, ascertain, and report the value of all the property owned or used by every common carrier subject to the provisions of this act. To enable the commission to make such investigation and report, it is authorized to employ such experts and other assistants as may be necessary. The commission may appoint examiners who shall have power to administer oaths, examine witnesses and take testimony. The commission shall make an inventory which shall list the property of every common carrier subject to the provisions of this act in detail, and show the value thereof as hereinafter provided, and shall classify the physical property, as nearly as practicable, in conformity with the classification of expenditures for road and equipment, as prescribed by the Interstate Commerce Commission.

"First. In such investigation said commission shall ascertain and report in detail as to each piece of property owned or used by said common carrier for its purposes as a common carrier, the original cost to date, the cost of reproduction new, the cost of reproduction less depreciation, and an analysis of the methods by which these several costs are obtained, and the reason for their differences, if any. The commission shall in like manner ascertain and report separately other values, and elements of value, if any, of the property of such common carrier, and an analysis of the methods of valuation employed, and of the reasons for any differences between any such value, and each of the foregoing cost values.

"Second. Such investigation and report shall state in detail and separately from improvements the original cost of all lands, rights of way, and terminals owned or used for the purposes of a common carrier, and ascertained as of the time of dedication to public use, and the present value of the same, and separately the original and present cost of condemnation and damages or of purchase in excess of such original cost or present value.

"Third. Such investigation and report shall show separately the property held for purposes other than those of a common carrier, and the original cost and present value of the same, together with an analysis of the methods of valuation employed.

"Fourth. In ascertaining the original cost to date of the property of such common carrier the commission, in addition to such other elements as it may deem necessary, shall investigate and report upon the history and organization of the present and of any previous corporation operating such property; upon any increases or decreases of stocks, bonds or other securities, in any reorganization; upon moneys received by any such corporation by reason of any issues of stocks, bonds, or other securities; upon the syndicating, banking and other financial arrangements under which such issues were made and the expense thereof; and upon the net and gross earnings of such corporations; and shall also ascertain and report in such detail as may be determined by the commission upon the expenditure of all moneys and the purposes for which the same were expended.

"Fifth. The commission shall ascertain and report the amount and value of any aid, gift, grant of right of way, or donation, made to any such common carrier, or to any previous corporation operating such property, by the Government of the United States or by any State, county or municipal government, or by individuals, associations or corporations; and it shall also ascertain and report the grants of land to any such common carrier, or any

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previous corporation operating such property, by the Government of the United States, or by any State, county, or municipal government, and the amount of money derived from the sale of any portion of such grants and the value of the unsold portion thereof at the time acquired and at the present time, also, the amount and value of any concession and allowance made by such common carrier to the Government of the United States, or to any State, county or municipal government in consideration of such aid, gift, grant or donation."

The rest of the bill, given in following paragraphs, is here reprinted as reported by the Senate sub-committee. Numerous changes in detail were subsequently made, but the only one that seems to be important is an addition providing that in appeals to the courts new testimony may be accepted by the court; and the court shall then stay proceedings and give the commission a chance to revise its valuation:

"Except as herein otherwise provided, the commission shall have power to prescribe the method of procedure to be followed in the conduct of the investigation, the form in which the results of the valuation shall be submitted, and the classification of the elements that constitute the ascertained value, and such investigation shall show the value of the property of every common carrier as a whole and the value of its property in each of the several States and Territories and the District of Columbia, classified and in detail as herein required.

"Such investigation shall be commenced within sixty days after the approval of this act and shall be prosecuted with diligence and thoroughness, and the result thereof reported to Congress at the beginning of each regular session thereafter until completed.

"Every common carrier subject to the provisions of this act shall furnish to the commission or its agents from time to time and as the commission may require maps, profiles, contracts, reports of engineers, and any other documents, records, and papers, or copies of any or all of the same, in aid of such investigation and determination of the value of the property of said common carrier, and shall grant to all agents of the commission free access to its right of way, its property, and its accounts, records, and memoranda whenever and wherever requested by any such duly authorized agent, and every common carrier is hereby directed and required to co-operate with and aid the commission in the work of the valuation of its property in such further particulars and to such extent as the commission may require and direct, and all rules and regulations made by the commission for the purpose of administering the provisions of this section and section twenty of this act shall have the full force and effect of law.

"Upon the completion of the valuation herein provided for the commission shall thereafter in like manner keep itself informed of all extensions and improvements or other changes in the condition and value of the property of all common carriers, and shall ascertain the value thereof, and shall from time to time, as may be required for the proper regulation of such common carriers under the provisions of this act, revise and correct its valuation of property, showing such revision and correction classified and as a whole and in each of the several States and Territories and the District of Columbia, which tentative valuations shall be reported to Congress at the beginning of each regular session.

"To enable the commission to make such changes and corrections in its valuations of each class of property, every common carrier subject to the provisions of this act shall report currently to the commission, and as the commission may require, all improvements and changes in its property, and file with the commission copies of all contracts for such improvements and changes at the time the same are executed.

"Whenever the commission shall have completed the tentative valuation of the property of any common carrier, and the tentative valuations of its property in each of the several states and territories and the District of Columbia, and before such valuation shall be considered in any proceeding involved in the act to regulate commerce, the commission, in addition to notices to petitioners and carriers required in such proceeding, shall give notice by registered letter to the said carrier, the Attorney General of the United States, the governor of any State in which the property so valued is located, and also by publication in three daily papers published in three of the principal cities through which the railroad of such common carrier runs; such notice shall state the valuation placed upon the several classes of property of said carrier, and shall allow thirty days in which to file a protest of the same with the commission. If no protest is filed within thirty days, said valuation shall become permanent.

"If notice of protest is filed the commission shall fix a time for hearing the same, and shall proceed as promptly as may be to hear and consider any matter relative and material thereto which may be presented in support of any such protest so filed as aforesaid. If after hearing any protest of such tentative valuation under the provisions of this act the commission shall be of the opinion that its valuation should not be made permanent, it shall make such changes as may be necessary, and shall issue an order making such corrected tentative valuation permanent. All permanent valuations by the commission and the classification thereof shall be published and shall be prima facie evidence relative to the value of the property in all proceedings under this act.

"The provisions of this section shall apply to receivers of carriers and operating trustees. In case of failure or refusal on the part of any carrier, receiver, or trustee to comply with all the requirements of this section and in the manner prescribed by the commission such carrier, receiver, or trustee shall forfeit to the United States the sum of five hundred dollars for each such offense and for each and every day of the continuance of such offense, such forfeiture to be recoverable in the same manner as other forfeitures provided for in this act.

"That the district courts of the United States shall have jurisdiction, upon the application of the Attorney General of the United States at the request of the commission, alleging a failure to comply with or a violation of any of the provisions of this section by any common carrier, to issue a writ or writs of mandamus commanding such common carrier to comply with the provisions of this section."

Amend the title so as to read: "An act to amend an act entitled 'An act to regulate commerce,' approved February fourth, eighteen hundred and eighty-seven, and all acts amendatory thereof by providing for valuation of the several classes of property of carriers subject thereto and securing information concerning their stocks and bonds and boards of directors."

NEW LINE FROM SHANGHAI TO PEKING.—China has opened her shortest cut from Shanghai, on the sea, to Peking. Early in December through traffic was opened from Pukow, on the Yangtze river (opposite Nanking) to Tientsin, and a journey is now possible from Shanghai to Peking in 40 hours as against 5 days by the previous shortest route. The only other line from the Yangtze to Peking is that from Hankow, about 755 miles long. The newly opened line from Pukow to Tientsin is 626 miles, and to that has to be added the 73 miles from Tientsin to Peking and the 193 miles from Shanghai to Nanking, making the total rail distance from Shanghai to Peking some 892 miles, which is broken only by the Yangtze river at Nanking. The first through trains to run over the line from Pukow to Tientsin left Tientsin and Pukow, respectively, on December 4, and two trains per week are now running from both places, leaving Pukow for Tientsin on Mondays and Fridays at 9 a. m., and arriving at Tientsin on the following days at 11:07 a. m.; and leaving Tientsin for Pukow on Wednesdays and Saturdays at 1 p. m., and arriving at Pukow on the following afternoons at 3:15 p. m. The trains are provided with dining cars and comfortable sleeping cars, and passengers may make the journey in comparative luxury.

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General News.

Miss Jane Fairman, who has been in the employ of the Illinois Central in the accounting department for 43 years, will be retired on a pension on March 31.

The Post Office Department reports that the number of parcels carried in the mails in the month of January was about 40 millions; and over one-tenth of these parcels were mailed in Chicago.

The freight house of the Illinois Central and the Yazoo & Mississippi Valley, at Jackson, Miss., was destroyed by fire on February 14. The loss, including the value of freight in storage, is estimated at $75,000.

The strike of the members of the International Brotherhood of Railway Car Men employed on the Missouri, Kansas & Texas, which was declared in September, 1911, was officially called off by officers of the union on February 18.

Counsel for President Chamberlin, of the Grand Trunk, has withdrawn the request that a commission be sent by the federal court to London to take evidence concerning the acts of the Grand Trunk directors in relation to the Southern New England Railway.

The legislature of Indiana has passed a law making it illegal for any person to drink intoxicating liquors on a passenger train or car, steam or electric, except in case of actual sickness of the person using the stimulant, and excepting also drinks taken in cars regularly licensed to sell intoxicating liquors. The penalty for violation of this law is from $5 to $25.

"Stop, look and listen"! at grade crossings is a legend that has long been familiar; but how many people comply with the injunction? Reckless drivers of carriages and automobiles seem to be more numerous than ever. The secretary of the National Highways Protective Society has caused a bill to be introduced in the New York legislature requiring that every vehicle stop within 100 ft. of a grade crossing, and making the violation of the rule a misdemeanor.

West Virginia has an "anti-trust" railroad law, signed by the governor this week, to go into effect July 1 next. The title of the act is: "To preserve competition among common carriers and to prevent monopoly of the business of common carriers, and protect interstate commerce from restraint and monopoly." The act prohibits any director, officer, agent, representative or attorney of any railroad company from acting as president, vice-president, director or general executive officer of any competing line. It also prohibits any railroad from consolidating its stock or franchise with that of any competing road.

The telephone since its introduction on American railroads, has, no doubt, prevented a considerable number of derailments; but it must now look to its laurels; there is a competitor in the field. C. Lagervall, section foreman on the Chicago Great Western, at Renova, Minn., recently discovered in a passing freight train a dragging brake beam, and, though he was quick to give a signal, he was unable to attract the attention of the trainmen. But his gasoline motor car was at hand, and, quickly mounting the car he followed the train to the next stop and there notified the conductor of the dangerous car.

The Postal Telegraph Company has had filed in the United States District Court at Chicago a suit to enjoin the International Brotherhood of Electrical Workers and its members from interfering with its wires. A grand jury investigation shows extensive depredations following the discharge of union employees in December. A mass of testimony revealed the cutting of wires and cable, destruction of wires by means of acid and other forms of violence. Restraint of interstate commerce is alleged. It is requested that the defendants be enjoined from obstructing interstate and government messages over the Postal, from cutting, burning or otherwise injuring its telegraph lines and from interfering by threats, intimidation, persuasion or force with employees or prospective employees of the company. The telegraph company has been powerless to prevent frequently recurring acts of violence, committed usually at night on its thirty-five miles of cables along the elevated railroad lines in Chicago or in underground conduits. These cables are particularly open to attack and difficult to guard.

The safety committee of the New York division of the Pennsylvania Railroad is to hold a meeting at Trenton, N. J., next Sunday evening and a theatre has been engaged, so as to provide ample room; and the general public is invited. There will be an illustrated lecture on railway accidents, their causes and remedies, by Messrs. J. O. Young and H. J. Fackenstall, enginemen, members of the committee. The road will run special trains from Jersey City and from Philadelphia. At Pittsburgh, Pa., March 10, there is to be a "safety first" rally which is expected to be the largest ever. This will be under the management of employees of the Buffalo, Rochester & Pittsburgh; the Baltimore & Ohio; the Bessemer & Lake Erie; the Wheeling & Lake Erie; the Pennsylvania, both east and west; the Philadelphia & Reading; the Western Maryland and the Wabash-Pittsburgh Terminal. The chairman will be R. L. O'Donnel, general superintendent of the Pennsylvania, at Pittsburgh.

A committee composed of Ralph C. Richards, chairman of the central safety committee of the Chicago & North Western, L. F. Shedd, general safety supervisor of the Chicago, Rock Island & Pacific, and W. N. Northcott, metropolitan secretary of the Railroad Young Men's Christian Association, has been appointed to carry out the plan of co-operation between the Y. M. C. A. and the railroads in promoting the "safety first" movement which was mentioned in a recent issue. Lectures are to be prepared by the heads of the safety departments of the various roads. These will be illustrated with photographs which can be shown by lantern slides, and will be delivered at various Y. M. C. A. headquarters; and also at noon and evening meetings wherever large numbers of employees can be reached. The Y. M. C. A. will give the use of its stereopticons, its buildings and all of its equipment for this purpose. It has devised an apparatus called a "shadow box," by the aid of which lantern slide pictures can be shown on a screen in daylight. The subjects of the lectures have been assigned as follows: "Car Shop Risks," by A. W. Smallen, chairman of the safety bureau, Chicago, Milwaukee & St. Paul; "Machine Shop Risks," by George Bradshaw, general safety agent, New York Central Lines; "Transportation Risks," by R. C. Richards, Chicago & North Western; "Yard Men's Risks," by L. F. Shedd, Chicago, Rock Island & Pacific; "Trespassers," by W. B. Spaulding, general claim agent, St. Louis & San Francisco; "Maintenance and Construction Risks," by J. D. M. Hamilton, claims attorney, Atchison, Topeka & Santa Fe.

Pure Drinking Water on Trains.

The Treasury Department has issued an order to the effect that the drinking water on all trains, cars and boats used in interstate commerce must be certified by state or municipal authorities as being incapable of conveying disease. Ice which is put into drinking water must be taken from a safe source, duly certified, and must be washed with water that is safe; and must be handled so as to prevent contamination. Water containers must be cleaned by scalding at least once a week.

A Railroad Clearing House to Be Established in Chicago.

The joint committee appointed by the executive committee of the Society of Railway Financial Officers and the Committee on Corporate, Fiscal and General Accounts of the Association of American Railway Accounting Officers, which met at Pinehurst, N. C., have, after full discussion, unanimously approved the general principle of clearing house settlement of adjusted balances between all railroads. In the discussion, it was found that 13 of the roads centering at Chicago are already organizing a clearing house. It was, therefore, decided to postpone further action by the joint committee until after the clearing house of the 13 Chicago roads had been actually tried out.

A Simple Issue.

Colonel Melvin O. Adams, president of the Boston, Revere Beach & Lynn, a road 15 miles long, speaking before the state legislative committee at Boston, now considering a proposed law to abolish the smoke nuisance, said:

"The narrow gage line, which has developed Winthrop so that it has grown faster than any town in the country except two boom towns out West, will have to send its equipment

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to the scrap heap if electrification is ordered. It will drive us into bankruptcy. Yet we carry 20,000,000 people a year to as delightful a breathing spot as there is in the world and carry them from congested Boston for a five-cent fare."

Western Pacific Opposes Union Pacific-Southern Pacific Dissolution Plan.

R. S. Lovett, chairman of the executive committee of the Union Pacific, Attorney General Wickersham, and Maxwell Evarts, general counsel of the Southern Pacific, appeared before four judges of the United States Circuit Court at St. Louis on February 24, and outlined the plan of dissolution of the Union Pacific and Southern Pacific, which has been announced. F. W. M. Cutcheon, general counsel of the Western Pacific, presented a vigorous opposition to that feature of the plan which provides for joint use of the Benicia cut-off between Oakland and Sacramento, arguing that the plan proposed would perpetuate a monopoly. He also opposed some features of the stock distribution plan. Mr. Evarts stated that the Southern Pacific was willing to perpetuate whatever rights the Western Pacific now has over the Benicia cut-off.

The "Merchants' Limited."

The Merchants', Limited express trains of the New York, New Haven & Hartford, leaving New York for Boston and Boston for New York, at 5 p. m., are now made up of new steel cars just out of the shops of the Borman Company. The New Haven road evidently has a new press agent. Describing this as "the most gorgeous train in America," he says:

"These new trains are practically indestructible. Made of steel they could go through a stone wall without being scratched. Reinforced underneath with two immense steel girders running the length of the car and attached at the end to a solid cast steel U frame forming the vestibule, no impact however great could telescope them. A rear end collision might tilt them up on end a bit but that would be all. So far as resisting powers go they are built like battleships."

Each train has four parlor cars and an observation smoking car. The interior finish is Mexican mahogany, except the smokers, in which it is cocoa wood. Each of the parlor cars has 36 chairs, the usual drawing-room having been omitted; and with doors open a passenger standing in the aisle may see from one end of the train to the other, except when the dining car interferes. At night the cars have indirect lighting, each having ten 100-watt lamps distributed along the center. These lamps, with ornamented brass shields beneath them, throw their light up against a white ceiling. The axle lighting system has storage batteries sufficient to supply lighting current for 10 hours. The cars are heated by steam. In the observation smoking car there is a buffet for making coffee.

The Boston & Albany.

A committee of the Massachusetts legislature, having under consideration a proposed law requiring the electrification of railroads in and near Boston, listened last week to a statement of J. H. Hustis, vice-president of the Boston & Albany, telling of the financial difficulties likely to be imposed on that road if electrification should be required. If electric propulsion were adopted it would have to be extended to South Framingham, 21 miles from Boston, and the cost would be over $6,000,000. Allowing for a normal increase in passenger traffic and considering all possible economies resulting from electric operation, Mr. Hustis estimated that there would be a net loss in operation of nearly $500,000 a year. To electrify completely, for freight as well as passenger, would make the cost materially greater than $6,000,000. To the suggestion that passenger fares might be increased, Mr. Hustis said that the increase over present rates would have to be 40 per cent. In view of the active competition of electric street car lines this would be out of the question. To the suggestion that the B. & A. should electrify because the New Haven intended to do so and because the B. & A. is controlled by the New Haven, Mr. Hustis said that each road must be considered by itself. The New Haven does not control the B. & A. It is sending westbound freight over the Boston & Albany, because this is more economical than to send by way of the Western termini of the New Haven; but the traffic agreement between the two roads is intended to make the Boston & Albany an independent operating unit. From nearly two years' experience the wisdom of this arrangement has been fully demonstrated. In this time the Boston & Albany has increased ton mileage 66 per cent., while increasing freight train miles only 21 per cent. Passenger and freight rates have not been increased on the Boston & Albany for 10 years, while yet labor and material have increased in cost tremendously.

Mr. Hustis, continuing, said:

"If the Boston & Albany service, both passenger and freight, today is not generally satisfactory to the public that it serves, then the fact is not known to its management. If the road is to continue to serve the public satisfactorily it must receive from the public that measure of confidence to which its service entitles it. Its management must be allowed reasonable latitude in which to provide for its development. It ought not to be fettered with legislation that will clog its natural growth and in turn react on the community that it is striving to serve. The road is satisfactorily handling a very largely increased traffic at rates which are substantially the same as twelve years ago, and with reasonable expedition, regularity and economy. It has suffered in its operating showing, as have all the railroads, in the enormous increases in expenses, yet its unit costs of operation compare favorably with those of other roads of similar character. The lessee company has, moreover, not allowed the yearly deficit since 1906 to stand in the way of appropriating more money for improvements.

"It has now reached a point where the volume of business, at the rates which have been in effect for more than a decade, just about enables it to meet its operating expenses, leaving practically no surplus. Any contraction in its volume of business, any reductions in rates, or any additional burdens (such as that proposed by compulsory electrification) would prevent the road from earning its guaranteed rental and there would again be an annual deficit, which on the date of the last report to the railroad commission aggregated $5,000,000."

Harriman Safety Medals.

The American Museum of Safety, New York, has appointed the following committee to award annually the medals, given by Mrs. E. H. Harriman, to the railroads which shall have done most to promote the "safety first" idea: Chairman, Arthur T. Hadley, president of Yale University; Samuel O. Dunn, editor of the *Railway Age Gazette;* Franklin K. Lane, chairman of the Interstate Commerce Commission; W. F. Allen, secretary of the American Railway Association, and the Commissioner of Labor. Three medals will be awarded each year as follows: A gold medal to the railroad company itself, a silver medal to the member of the operating department of that road who has done most to bring this condition about, and a bronze medal to the employee of the winning road who has been most conspicuous in the promotion of safety. It is planned to give with each medal an engraved certificate, which may be hung on the wall as the medals will be too valuable for public display. These certificates will bear the name of the giver, those of the members of the committee and that of the recipient. Forms are now being drawn up to be sent out to the roads. These will be submitted to the committee for its approval. The first medals will be awarded in January, 1914.

International Congress of Refrigeration.

The opening meeting of the third International Congress of Refrigeration will be held in Washington, D. C., September 15, 1913, and the business and scientific meetings will be held in Chicago beginning September 15. The preliminary announcements of the congress says that more than 40 countries will be represented by official government delegates, as well as by delegates from industrial associations, technical societies and institutions of learning, also by experts and practical men interested in the application of refrigeration to the various industries. Many different applications of refrigeration will be practically demonstrated by operating and stationary exhibits; so also will the materials by which refrigeration is produced, economized and transmitted, be shown and illustrated. Carloads of refrigerated fruit, vegetables, meat, etc., will also be exhibited just as they are transported under refrigeration. It is proposed

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to serve at the banquet only such foods and beverages as are customarily held in cold storage in America. The object of this congress is to provide an opportunity for drawing into concerted action the scientific and practical men of the world who are engaged in developing the science and art of refrigeration, thus affording the aid of properly organized efforts to the many industries that do or can derive benefits from refrigeration. J. F. Dickerson, editor of *Ice and Refrigeration*, Chicago, is secretary.

Southeastern Accounting Conference.

The annual meeting of the Southeastern Accounting Conference was held at Norfolk, Va., on February 6 and 7. Officers for the ensuing year were elected as follows: Chairman, W. L. Bird, auditor Norfolk Southern; secretary, M. B. Nichols, auditor of traffic Central of Georgia. The chairmen of the standing committees for the ensuing year are as follows: General Accounts and Subjects, M. P. Molloy, comptroller Cincinnati, New Orleans & Texas Pacific; Passenger Accounts, T. H. Wright, auditor passenger receipts Seaboard Air Line; Freight Accounts, William McGowan, auditor merchandise receipts Baltimore & Ohio; Disbursement Accounts, J. H. McEwen, auditor of disbursements Nashville, Chattanooga & St. Louis; Efficiency, W. D. Beymer, comptroller Central of Georgia. The next meeting will be held in Louisville, Ky., on October 9 and 10, 1913.

Chicago Transportation Association.

The sixth annual dinner of the Chicago Transportation Association was held at the Auditorium hotel on February 20. W. A. Garrett, vice-president of the Chicago Great Western, acted as toastmaster, and the speakers were J. N. Tittemore, Rev. W. T. Dorward and Harry F. Atwood.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DAMURAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; 4th meeting, June 23-27, Atlantic City.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Nealy, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Ct., Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—J. Thompson, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—J. K. Hilles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilkins, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES' ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, G. F. & P. A., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Unloo Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—C. S. Butterfield, 327 Summer St., Boston. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY EMPLOYMENT ASSOCIATION.—W. H. Moody, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—J. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robison, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Next meeting, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—T. Edmonds, 3868 Forest Park Blvd., St. Louis. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. A. Sallee, St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Remano Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; 2d Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—H. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings adjourned to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Maekie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Salt Lake City, Col.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except June, July and August.

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Traffic News.

The general deficiency bill, carrying $24,235,740 to supply deficiencies in appropriations has been reported, providing for the Commerce Court until Congress decides whether the tribunal shall be abolished.

The Chicago, Rock Island & Pacific is running a "diversified farming special" train over its lines in northwestern Missouri and northeastern Kansas, in co-operation with the Agricultural College of Missouri, and the St. Joseph Agricultural Congress.

A sixth demonstration farm has been established by the Missouri Pacific, at Areadia, Mo., on the grounds of the Areadia College adjoining the right of way of the railway. Eighteen acres will be placed under cultivation at once. A specialty will be made of fruits, especially apples.

W. L. English, who has recently been connected with the agricultural extension work of Clemson Agricultural College, South Carolina, has been appointed supervisor of agriculture of the St. Louis & San Francisco, and will have supervision over a large number of demonstration farms to be established in several states traversed by the Frisco lines.

The largest single shipment of automobiles ever sent out of Michigan was recently started from the Buick plant in Detroit, consigned to the Buick company's representatives in San Francisco, via the Pere Marquette, Chicago, Rock Island & Pacific, and Union Pacific. The train consisted of 75 cars drawn by two locomotives. The shipment consisted of 375 automobiles of factory eash value of $431,925.

The Bangor & Aroostook has notified the Interstate Commerce Commission of the cancellation of all joint freight tariffs with the Maine Central, the Boston & Maine, and the New York, New Haven & Hartford, because of the alleged arbitrary and discriminatory manner of these roads towards the Bangor & Aroostook. The B. & A. intends to bring suit against these roads for $75,000 or more, alleged to be overdue on traffic balances.

The Traffic Club of Cleveland was organized on February 15, by 78 traffic officers of railways, water lines, electric lines and industrial concerns. D. F. Hurd, of the Traffic Bureau of the Cleveland Chamber of Commerce, was elected president; W. A. Newman, general freight agent of the Lake Shore & Michigan Southern, vice-president; J. A. Coakley, division freight agent of the American Steel & Wire Co., second vice-president; W. V. Bishop, traffic manager of the Upson Nut Co., secretary, and C. M. Andrus, traffic manager of the Otis Steel Co., treasurer.

The express companies operating in Canada report to the Canadian government net earnings for the calendar year 1912 as follows:

Canadian Express Co. (owned and operated by the Grand Trunk)	$283,281
Dominion Express Co. (owned and operated by the Canadian Pacific)	645,288
Canadian Northern Express Co.	192,436

The gross receipts of the three companies for the year were $10,954,418. The business done by all the express companies, including the American companies operating to some extent in Canada, in financial paper during the year, such as money orders, travelers' checks, C. O. D. checks, telegraphic transfers and letters of credit, amounted to $56,965,122, as compared with $52,165,852 in 1911.

On March 3, the Denver & Rio Grande, in connection with the Colorado Agricultural College, will start a special agricultural demonstration train over its line on a nine day tour of the principal farming and stock raising sections of the Upper Arkansas, Eagle, Roaring Fork, Grand, Uncompahgre, North Fork and San Luis valleys in Colorado. This special educational train will consist of coaches for lecture purposes and baggage cars containing exhibits on agronomy, including alfalfa improvement, seed selection, seed improvement, bee culture, animal husbandry, including dairying and poultry raising, home economies, rural school betterment and other subjects of vital interest to the farming and stock-raising communities. This is the fifth year that the Denver & Rio Grande in co-operation with the agricultural colleges of Colorado and Utah has operated special demonstration trains through its agricultural districts.

Traffic Club of Chicago.

The nominating committee of the Traffic Club of Chicago has named the following as the regular ticket to be voted on at the annual election on March 25: President, Guy S. McCabe, general western agent, Pennsylvania Lines; secretary, W. H. Wharton, commercial agent, Nashville, Chattanooga & St. Louis; treasurer, Charles B. Hopper, general freight agent, Goodrich Transportation Company; first vice-president, W. M. Hopkins, manager transportation department, Chicago Board of Trade; second vice-president, Frank W. Smith, member Uniform Classification Committee; third vice-president, L. Richards, traffic manager, Quaker Oats Company. Directors for two years: F. B. Montgomery, traffic manager, International Harvester Company; V. D. Fort, assistant freight traffic manager, Illinois Central; C. E. Finch, general agent, American Express Company; H. K. McEvoy, assistant general passenger agent, Chicago & Alton.

Packing Boxes; A New Association.

Much interest has been aroused by a complaint filed with the Interstate Commerce Commission by the R. W. Pridham Company, of Los Angeles, Cal., against the Southern Pacific and 37 other railways, demanding the same rates eastbound on goods in fibre boxes as are given on shipments in wooden boxes. The case was heard at Los Angeles on January 28, and an adjournment was taken for the introduction of further testimony in Chicago at a later date. It is understood that this case will open up an investigation by the commission of the entire subject of the use of substitutes for wooden boxes. At a meeting held in Chicago last week the Association of Users of Fibre Board Containers was organized "to co-operate with the transportation companies and manufacturers of fibre cases in establishing and maintaining the high standard of shipment containers, and to at all times procure from the transportation companies fair and equitable recognition, regulation, and facilities for shipments in said containers."

At the annual meeting of the National Poultry, Butter and Egg Association, held in Chicago recently, the subject of packing cases was one of the principal topics of discussion, and the transportation committee was authorized to confer with the carriers and co-operate in devising ways and means for the elimination of economic waste, loss and damage in the handling of poultry, butter and eggs. The transportation committee then conferred with the General Managers' Association, of Chicago, which appointed a standing committee of three to co-operate with the transportation committee of the National Poultry, Butter and Egg Association.

The National Association of Box Manufacturers, at its annual convention in Chicago, February 18 to 21, also devoted much of the time of the meeting to the discussion of the packing box situation. J. E. Williams, chairman of the Uniform Classification Committee, addressed the association briefly on the possibilities of standardizing wooden boxes from the classification standpoint, and offered to assist the standardization committee of the association in any manner compatible with the duties of his office.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association in presenting statistical bulletin No. 137-A giving a summary of car surpluses and shortages by groups from November 8, 1911, to February 15, 1913, says: The total surplus on February 15, 1913, was 52,700 cars; on February 1, 1913, 62,045 cars, and on February 14, 1912, 50,886 cars. Compared with the preceding period; there is a decrease in the total surplus of 9,345 cars, of which 6,191 is in box, 4,654 in coal, and an increase of 98 flat and 1,402 miscellaneous cars. The decrease in box car shortage is general, except in groups 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), and 7 (Montana, Wyoming, Nebraska and the Dakotas). The decrease in coal car surplus is in all groups, except 7 (as above), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), and 9 (Texas, Louisiana and New Mexico). The increase in flat car surplus is in groups 5 (as above), 6

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(Iowa, Illinois, Wisconsin and Minnesota), 7, 8, 9 (as above), 10 (Washington, Oregon, Idaho, California, Nevada and Arizona), and 11 (Canadian Lines). The increase in miscellaneous car surplus is in groups 3 (Ohio, Indiana, Michigan and western Pennsylvania), 4 (the Virginias and Carolinas), 5, 6, 7, 8, 9 and 10 (as above).

The total shortage on February 15, 1913, was 30,517 cars; on February 1, 1913, 24,785 cars, and on February 14, 1912, 36,928 cars. Compared with the preceding period; there is an increase in the total shortage of 5,732 cars, of which 2,491 is in box, 2,476 in coal, 883 in miscellaneous, and a decrease of 118 flat. The increase in box car shortage is in groups 1 (New England Lines), 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 3, 5, 6 and 10 (as above). The increase in coal car shortage is in groups 2, 3, 5, 8 and 9 (as above). The increase in miscellaneous car shortage is in groups 1, 2, 3, 6 and 11 (as above). The decrease in flat car shortage is in groups 1, 4, 6 and 10 (as above).

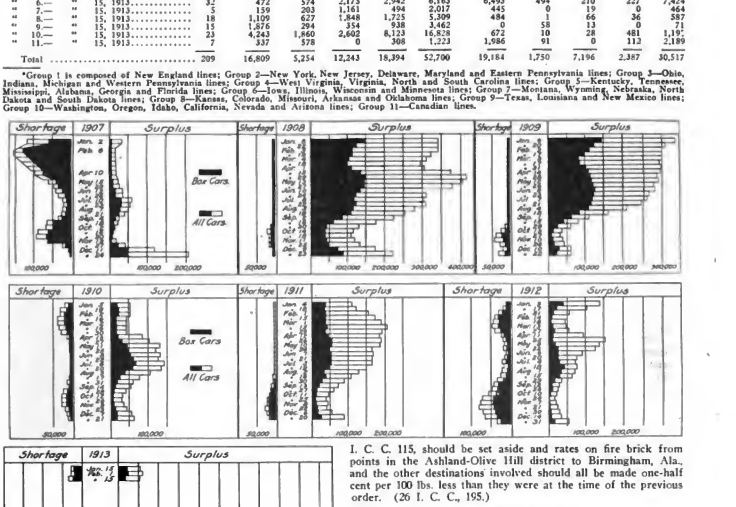
Compared with the same date of 1912; there is an increase in the total surplus of 1,814 cars, of which 5,383 is in box, 779 in coal, and a decrease of 2,542 flat and 1,806 miscellaneous cars. There is a decrease in the total shortage of 6,411 cars, of which 4,910 is in box, 1,408 in coal, 1,036 in miscellaneous, and an increase of 943 flat cars.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report, and the diagram shows total by weekly surpluses and shortages from 1907 to 1913.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses Box.	Surpluses Flat.	Surpluses Coal, gondola and hopper.	Surpluses Other kinds.	Surpluses Total.	Shortages Box.	Shortages Flat.	Shortages Coal, gondola and hopper.	Shortages Other kinds.	Shortages Total.
Group *1.—February 15, 1913	7	0	520	28	12	560	598	18	222	533	1,371
" 2.— " 15, 1913	32	817	38	636	169	1,660	203	12	3,533	5	3,753
" 3.— " 15, 1913	31	932	436	2,273	1,545	5,186	3,836	12	416	715	4,979
" 4.— " 15, 1913	11	6,471	93	1,019	1,431	9,014	932	536	2,025	200	3,693
" 5.— " 15, 1913	28	393	31	147	707	1,278	3,535	518	664	78	4,795
" 6.— " 15, 1913	32	472	574	2,175	2,942	6,163	6,493	494	210	227	7,424
" 7.— " 15, 1913	5	159	203	1,161	494	2,017	445	0	19	0	464
" 8.— " 15, 1913	18	1,109	627	1,848	1,725	5,309	484	1	66	36	587
" 9.— " 15, 1913	15	1,876	294	354	938	3,462	0	58	13	0	71
" 10.— " 15, 1913	23	4,243	1,860	2,602	8,123	16,828	672	10	28	481	1,191
" 11.— " 15, 1913	7	337	578	0	308	1,223	1,586	91	0	112	2,189
Total	209	16,809	5,254	12,243	18,394	52,700	19,184	1,750	7,196	2,387	30,517

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

INTERSTATE COMMERCE COMMISSION.

Fire Brick Rates Reduced.

Ashland Fire Brick Company et al. v. Southern† et al. Opinion by Chairman Lane:

The commission found that the previous order in this case, 22 I. C. C. 115, should be set aside and rates on fire brick from points in the Ashland-Olive Hill district to Birmingham, Ala., and the other destinations involved should all be made one-half cent per 100 lbs. less than they were at the time of the previous order. (26 I. C. C., 195.)

Coal Rate Reduced.

Board of Trade of Winston-Salem, N. C., v. Norfolk & Western.—

Town of Martinsville, Va., v. Norfolk & Western et al. Opinion by Commissioner Clements:

The commission found that the rate of $2.10 per ton for the transportation of coal from the Pocahontas fields in Virginia and West Virginia to Winston-Salem, N. C., was not unreasonable. The rate of $2 per ton from the same points of origin

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to Martinsville, Va., was found to be unreasonable to the extent it exceeds $1.80. (26 I. C. C., 146.)

Transit Case.

In re investigation into the substitution of tonnage at transit points. Opinion by Commissioner McChord:

This is the third supplemental and final report of the commission in this case. In the early part of last year the commission learned that the tariffs in many instances named transit privileges in such a manner as to conceal their real application. The commission issued an order, effective August 15, 1912, mentioned in the *Railway Age Gazette* of July 12, page 75, directed against the defendants publishing transit privileges on grain and grain products, requiring them to place certain restrictions around the privileges as published which were deemed necessary to meet the evils found accompanying the operation of the tariffs then in force. That order served to reveal the real nature of the privileges and rates as published, and it was found that the tariffs did not in reality contain the privileges they were supposed to contain. The result was that the tariffs were then enforced for the first time in a manner in which they should have been in force at all times. Shippers and millers, particularly in the Northwest and Southwest, at once complained that their business was seriously hurt. The commission immediately took up the case again and its conclusions were covered in the supplemental opinion of November 12, 1912, mentioned in the *Railway Age Gazette* of November 22, page 1007. In this opinion the commission showed that an intolerable situation had arisen due to the failure of the carriers to so publish their tariffs as to keep pace with the transit privileges and to openly publish every rate, practice or privilege that the carriers permit on their line. The commission then decided to hold further and more complete hearings on this subject. Consequently two conferences were held, at the first of which the shippers stated their side of the case, and at the second of which the carriers stated theirs. The gist of the propositions submitted at these conferences was a request for the authorization of substitution. The only limitation thereto was that one article or commodity should not be substituted for an entirely different article or commodity. In other words, it was desired to regard all wheat as wheat, all corn as corn, all hardwood as hardwood, etc. Both conferences requested that rule 76 of the Tariff Circular be abolished, and as it is true that all that the commission has said upon this subject of transit since that rule was adopted, has been based upon that rule, if it is superseded practically all the commission's subsequent requirements on the subject of transit will go with it, insofar as they constitute binding rules of action. As the previous administration of the commission upon the subject of transit was under circumstances quite different from those of today, and as much of what the commission originally set out to accomplish has now been accomplished, the commission feels that it is justified in adopting a different course of action. The substitute proposed by the carriers' conference contains substantially the same general thought as that of the shippers and is as follows:

"When rules and regulations have been established in tariff form clearly defining the purpose or purposes for and the terms under which transit privileges are granted, and providing also for the effective policing of the operations under the arrangement, a shipment may be stopped in transit and the same shipment or a proper equivalent (not invisible loss in weight), as set forth in said rules and regulations, may be forwarded at the through rate provided for by tariff from the original point of shipment to final destination plus the charge for transit privilege, if any. (This rule shall not be construed to authorize the publication of tariffs providing for the substitution of one commodity for a commodity of a different kind. That is to say, oats or the products of oats for corn, corn or the products of corn for wheat, wheat or the products of wheat for barley, or shingles for lumber.)"

The commission was assured, both on behalf of the carriers and shippers, that the carriers can lawfully publish tariffs specifically permitting substitution in so many words, and that in the absence of a showing that they are unreasonable or unjustly discriminatory, they would be entirely proper and no harm would be done. The proposed amendments to rule 76 are drawn with this idea in mind. The commission decided that rule 76 should be canceled, but that it should not publish as a ruling of the commission the requirements which were proposed. It further decided that the policy of making orders, drawing rules or expressing views as to what would or would not under certain conditions be considered a violation of law as to transit privileges, should not further be indulged in by the commission, but that it should be left to the carriers to establish their own rates, regulations and practices subject to the appropriate action on the part of the commission or the court in the event that these rates, regulations or practices are found to be in violation of the law. This report closes the so-called "transit" case, and the order heretofore entered in this proceeding will be revoked and conference rulings 181 and 203 and rule 76 of the Tariff Circular will be withdrawn (26 I. C. C., 204).

STATE COMMISSIONS.

The Texas railroad commission has issued an order requiring the absorption of all switching charges on less than carload shipments on which the earnings amount to $7.50 or more per car.

Charles Bradden, of Ryde, Pa., has asked the railroad commission of that state to authorize a railroad company to permit him to cross its tracks, but the commission refuses to do so, saying that the constant endeavor should be to keep people from crossing tracks.

The railroad commission of Pennsylvania has called the Erie Railroad to account for requiring duplex tickets to be mailed to New York city for redemption. The commission holds that the Erie, like other roads, should provide for redeeming these tickets at local offices.

The railroad commission of Louisiana has fined the Kansas City Southern $100 for not keeping passenger cars on the line between DeQuincy and Lake Charles, warm enough to make the passengers comfortable. The special offense was on Friday night, December 6, last.

Harvey C. Forney, of Dauphin, Pa., has asked the state railroad commission to take action to cure the chronic lateness of a train running to that town, but the commissioners tell him that the train in question is an interstate train and the commission cannot interfere with it, without running contrary to the authority of the Interstate Commerce Commission.

The Texas railroad commission, which recently made a revaluation of the property of the Galveston, Houston & Henderson, placing it at $2,985,576, has allowed an additional amount of $41,423 for the road's proportion of loss in the destruction of the Galveston Bay bridge, which makes the total valuation large enough to cover the outstanding stocks and bonds amounting to $3,000,000. The valuation will permit the company to refund its indebtedness.

The traveling men of Louisiana have won their campaign for linen covers on seats in passenger cars, or at least they have half won it. After conferences which, it appears, resulted in an agreement with the railroads, the state railroad commission has revised its order, which was appealed from by the railroads, and now requires linen or other washable covers to be used on the backs of all seats to the extent of not less than one half of the backs, beginning at the top. These must be kept in service, and in a clean and sanitary condition, from May 15 to October 15.

The railroad commission of Louisiana, having investigated the condition of the road bed and tracks of the Opelousas, Gulf & Northeastern decides that the road is not in safe condition for the proper operation of trains. "Trains may be run over this road at a very low rate of speed, with utmost caution, without greatly endangering the lives of passengers"; but the commission orders and commands the road, within nine months, to put the tracks in safe condition for the operation of freight and passenger trains (speeds not stated). The road extends from Melville to Crowley, 57 miles.

The railroad commission of Alabama has ordered the Louisville & Nashville to reduce passenger fares between all points in Alabama on March 6 to the basis of 2½ cents a mile. Following the order of the Federal Court last summer annulling the former tariff prescribed by the commission (2 cents a mile) the Louisville & Nashville and the other principal roads of this state restored their fares to the basis of 3 cents a mile, at the

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same time increasing freight rates as permitted by the decision of the court. The state commission at once began a new investigation of fares and now, following numerous hearings, has issued the present order.

The railroad commission of Oregon has ordered the railroads of the state to provide in all passenger cars bubbling drinking fountains, or free individual drinking cups for passengers, the fountain being preferred. Complying with the order of the federal government and a similar order issued by the Oregon State Board of Health, the railroads have done away with the common drinking cup, but have supplied nothing in its place; and the railroad commission finds that this omission to provide suitable and clean facilities whereby passengers may obtain drinking water from the tanks in the cars is unjust, unreasonable and inadequate. The order must be complied with in sixty days.

The Board of Railway Commissioners of Canada has decided in favor of the Canadian railways in the pulp wood rate case. The proposed rates which were filed by the most important Canadian railways increased the rates on pulp wood to New York points one cent per 100 lbs. The leading paper manufacturers in New York opposed the increase, and in this were supported by leading Canadian pulp wood dealers. The United States paper manufacturers contended that the new rates would increase the cost of the wood to them by from 35 to 45 cents a cord and increase the cost of their finished product 50 cents a ton; the Canadian wood dealers contended that they would be the losers. The new rates will not become effective until August 15.

The New York State Public Service Commission, second district last week received from the New York Central and the New York, New Haven & Hartford, petitions for rehearing of the cases in which the commission ordered reductions in fares to and from New York City; but on Tuesday, February 25, denied both. The petitioners asked that the operation of the order be suspended. They declared that the order would confiscate property without due process of law and they disputed the finding of the commission that, as a matter of public policy, the season-ticket rates to New York City should be fixed at the lowest possible point. The New Haven road also complained because the rates prescribed would not be consonant with interstate rates over the same routes. The New York Central complained that the new rates were ordered before it had had suitable opportunity to be heard in remonstrance; that the case having been begun about two years ago, the conditions had changed since the last testimony was submitted; but the commission says that during a period of eight months the road has neglected to produce its evidence. The decision of the commission in this case was reported in the *Railway Age Gazette*, February 14, page 295.

The California Railroad Commission has rendered a decision in regard to the present dissolution plan of the Union Pacific and Southern Pacific which may be summarized as follows: The Southern Pacific is ordered to give all competing railroads an opportunity to use the Benicia Short Line from Sacramento to San Francisco if it grants this privilege to the Central Pacific. The Southern Pacific is ordered to give to all competitors certain rights to terminal facilities on San Francisco bay and industrial tracks at junction points. The Central Pacific and Southern Pacific are ordered to file joint rates not to exceed rates now in force within the state. Julius Kruttschnitt, chairman of the board of the Southern Pacific, in commenting on the California commission's decision, said in part: "If the decision of the commission is upheld by the circuit court of St. Louis, the Union Pacific-Southern Pacific dissolution plan must go by the board and negotiations will have to be begun from the beginning. In a word, an entirely new plan will have to be devised. The commission's decision includes many conditions that the Union Pacific has all along been unable to accede to and which the Southern Pacific in its turn has found impossible to accept." [See an item in general news in regard to developments before the circuit court at St. Louis.]

Cost of Railroad Commissions.

The railroad commissioners of Tennessee, calling attention to the small salaries paid to men holding that office in that state—$2,000 to each commissioner, with only $4,500 for secretary, stenographer and traveling expenses—give the following list of other states in which the appropriation for railroad-commission expenses is larger than in Tennessee:

Wisconsin	$99,819	California	$37,000
Oklahoma	73,000	Minnesota	35,000
Nebraska	66,511	Oregon	32,700
Massachusetts	64,912	Virginia	29,100
Arkansas	64,000	Georgia	28,700
Pennsylvania	47,000	North Carolina	24,340
Ohio	38,300	Alabama	19,100
Illinois	37,200	Kentucky	17,360
Texas	37,280	Tennessee (total last year)	11,400

In the state of New York, which does not appear in this list, there are two commissions of five members each, and each one of the ten commissioners receives a salary of $15,000 a year.

Louisiana Flagging Rule; Order for Examination of Men.

The Railroad Commission of Louisiana, after notice and a general investigation has issued an order, No. 1517, relative to the proper protection of trains by flagmen. The commission concludes that on many of the railroads the flagging rule is inadequate and unsafe. The rule now prescribed is said to be in effect on the Southern Pacific in Louisiana, and "its efficiency has been proven beyond question." This rule with a few modifications is as follows:

"*Ordered*, That when a train stops or is delayed, under circumstances in which it may be overtaken by another train, the flagman must go back immediately with stop signals a sufficient distance to insure full protection. When recalled he may return to his train, first placing two torpedoes on the rail, when the conditions require it. The front of a train must be protected in the same way when necessary by front brakeman. If the front brakeman is not available the fireman must act in his place.

"(a) Between sunrise and sunset the flagman shall immediately after he leaves his train light a red fusee and carry it with him back one-quarter of a mile to the point where he places the first torpedo and must leave a burning fusee at the same point as the first torpedo.

"A sufficient distance to insure full protection requires that flagman shall go back to a point one-fourth mile from the rear of his train, where he must place one torpedo on the rail. He must then continue to go back at least one-half mile from the rear of his train and place two torpedoes on the rail, not more than six rail lengths apart; he may then return to within one-fourth mile from the rear of his train, and remain there until recalled. If a passenger train is due he must remain until it arrives. When he comes in he will remove the torpedo nearest to train, but the two torpedoes must be left on the rail as a caution signal to a following train.

"The recall of flagman is the most critical period, and when there is not a clear view of at least one-half mile, train must be moved forward a sufficient distance to insure safety before flagman is recalled. During foggy or stormy weather or in the vicinity of obscure curves or descending grades, or when other conditions require it, the flagman will increase the distance. When a train is flagged by a flagman the engineman must obtain a thorough explanation of the cause, stopping if necessary.

"(b) Should the speed of a train be reduced and its rear thereby endangered, making it necessary to check a following train before a flagman can get off, a lighted red fusee must be thrown on the track at intervals to insure the safety of the leading train.

"(c) When a flagman is sent out with specific instructions affecting the rights of trains, such instructions must be in writing.

"(d) When a flagman is sent to a station on a train, he will ride on the engine and engineman must stop and let him off at the first switch."

The commission orders the roads to print, distribute and enforce the rule, and to instruct all men in charge of trains; to have flagmen examined every six months on this and other rules. The examining officer must give the man a certificate and keep a record of all examinations. Every flagman must have served an apprenticeship as a flagman 30 days, and must have made at least two trips as learner over the line on which he is to serve.

COURT NEWS.

The Supreme Court of the United States this week sustained the Barker act of Arkansas, which requires railroads to furnish freight cars on request of shippers. The court ordered that the suit of the Iron Mountain road in the federal courts of that

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state be dismissed. The court declined to annul the law as being a regulation of interstate commerce.

The Supreme Court of Wisconsin has rendered a decision sustaining the constitutionality of a law passed by the Wisconsin legislature in 1911, requiring railways to keep upper berths in the sleeping cars closed when they are not sold and the lower berths are occupied. The decision reversed a decision of the Dane county Circuit Court in a test case.

The Circuit Court at Baltimore, Md., holds that the Baltimore & Ohio cannot legally make a proposed issue of bonds—$62,500,000—without first securing the approval of the state public service commission; but says that the commission has not the authority to substitute its judgment for that of the directors of the railroad; it only has power to see that bonds are not issued for a fictitious or dishonest purpose.

The Supreme Court of the United States in a decision handed down this week by Justice Hughes, holds that grain in transit, stopped at Chicago for inspection, grading, etc., is, when removed from the railroad carrier to a private grain elevator, subject to the local state tax on grain placed in elevators. The decision applies only to the case in point and not to the general law that grain in transit, not at rest, is not subject to local tax.

Judge Martin, in the United States District Court at New York, February 19, dismissed indictments against George W. Sheldon and Henry W. Ackhoff, customs brokers, charged with having received rebates from the Lehigh Valley Railroad. It was shown that defendants had for nearly 30 years been salaried employees of the road and that the alleged rebates were really commissions given for extra services rendered. The prosecution had claimed that the money paid by the road had gone to shippers.

The federal court for Alaska has set aside certain indictments against an alleged "transportation trust" on the ground that the charges of discrimination presented by the government prosecutor must first be laid before the Interstate Commerce Commission. The attorney-general at Washington questions the soundness of the district court's view, and has applied to the Supreme Court of the United States to have the decision overruled. The attorney-general says that the Interstate Commerce Commission has exclusive primary jurisdiction in controversies between carriers and shippers, but not in controversies between the government and carriers or shippers.

The Supreme Court of the United States this week decided that irrespective of the provisions of the Interstate Commerce law, a person accepting gratuitous transportation from a railroad still is under the protection of state law prescribing the liability of carriers for injury or death by negligence. The decision was in the case of the heirs of Charles A. Schuyler, assistant chief clerk of the railway mail service, stationed at Ogden, Utah, killed in a train accident while riding free on his "commission" as a mail employee, in a mail car. The Southern Pacific claimed that he was a trespasser because its employees had no right to admit him to the car and, therefore it was not liable for his death. The court held Schuyler's heirs entitled to recover under state law.

The Commerce Court has rejected the motion of the Interstate Commerce Commission to dismiss the petition of the lumber tap lines in the Southwest. The court held that it has authority to review the decision of the commission and that it will proceed with the case. This case has been through unusual changes. An order was entered forbidding the trunk lines to make joint rates and through routes with the tap lines, it being held that the tap lines were owned by industrial companies and were merely plant facilities. The decision of the case was held to be a rebate. The tap lines appealed to the court, but were denied relief because the court decided that it did not have jurisdiction over a negative order of the commission. Representatives of the tap lines went to Congress and attempted to have the powers of the court altered so that it could review the law in any decision of the Interstate Commerce Commission. Congress took no action, but the commission in the meantime altered the form of the decision, whereupon the case was again taken to court. On the filing of this case the commission and the government both made a motion that the petition should be dismissed for want of jurisdiction. The court now holds it has jurisdiction and announces itself ready to proceed with the case.

Lemon Rate of $1 Sustained.

The Commerce Court has dismissed the appeal of the Atchison, Topeka & Santa Fe and other transcontinental lines, against the order of the Interstate Commerce Commission establishing a blanket rate of $1 per 100 lbs., on lemons from the Pacific coast to eastern destinations. The decision is in consonance with a former opinion of the Commerce Court, in which a similar order of the commission was annulled. The earlier decision of the commission had been based not on a finding that the rate of $1.15 was unreasonable in and of itself, but on the view of the commission that the shippers needed the reduction in order to meet Sicilian competition.

The Commerce Court, following a decision of the Supreme Court in a lumber case, held that the commission had no power to take into consideration the matter of Sicilian competition, but that it was its duty in the first place to determine whether the $1.15 rate was intrinsically unreasonable. When the commission reconsidered the case it found that, entirely apart from the matter of competition the $1.15 rate was unreasonably high, and it thereupon proceeded to reduce the rate.

The Commerce Court now holds that inasmuch as there was substantial testimony that $1 is a reasonable rate, and as there was no evidence to sustain the charge of arbitrary conduct on the part of the commission, and that as it was clear that the $1 rate was far in excess of the out-of-pocket expense of carrying the lemons, the railroads could not complain on the ground of confiscation, even if the rate did not yield its full proportion of the entire operating expenses of the roads.

Mileage Coupons in Georgia.

The county court at Atlanta, Ga., has issued an injunction against the enforcement of the recent order of the Georgia State Railroad Commission requiring the railroads to accept mileage coupons for passage on trains, from passengers getting on at certain stations within that state. The court approves the rule of the railroads requiring all such coupons to be presented at the ticket office, to be changed for trip tickets. The court thinks that the conditions printed on the mileage books are reasonable, and that there is no good ground for making the rule in Georgia different from that in other states, these coupons being valid in other states as well.

The traveling salesmen made a persistent demand for the suspension of the rule requiring coupons to be exchanged. In their response to the traveling men the railroads issued a statement which said, in part:

"An interchangeable mileage book may be used for obtaining transportation over any line party to the arrangement. The coupons from these books are equivalent to cash, and to safeguard their transmission to the treasurer of each railroad company, the requirement is made for the exchange of the coupons at ticket windows for transportation, thus causing the mileage coupons to be placed in the hands of bonded ticket agents who must account to the auditing department of each line for their value.

"The object of this requirement is to have one man, the ticket agent, handle the money and sell tickets, either for cash or coupons from an interchangeable mileage book, and thus make a record of what the company has sold; another man, the conductor, to collect the tickets, and thus make a record of their use, and thereby have an additional check against the agent, who must account for the purchase price either in cash or coupons. . . . Where the conductor lifts the coupons on the train he does not have the same facilities for safeguarding coupons, and should they become lost, the railroad honoring the mileage book would have no means of securing proper compensation.

"Attention is invited to the check system in department stores; the cash registers in small stores; the cashiers at hotels, restaurants, etc., and hundreds of other devices for the purpose of proper accounting.

"The exchange regulation has been the subject of judicial review before railroad commissioners and state courts, and the reasonableness of the requirements has been sustained."

MANILA RAILROAD, PHILIPPINE ISLANDS.—On June 30, 1912, the Manila Railroad Company had 450 miles of line in operation and 10 miles of line built, but not in operation. This company has been authorized to build 350 miles of new lines.

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1912.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses				Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decrease) as compared with last year.
		Freight.	Passenger.	Total.	Way & structures.	Maintenance of equipment.	Traffic.	Transportation.	General.	Total.				
Atlantic & St. Lawrence	167	$187,530	$30,242	$170,660	—$45,911	35,129	$5,953	$101,863	$6,863	$103,897	$66,763	.....	$16,152	$50,611	$43,492
Buffalo & Susquehanna *Railroad*	265	134,540	8,454	147,864	27,617	20,420	1,149	53,168	6,150	108,524	39,340	.....	2,800	37,140	—1,742
Buffalo & Susquehanna *Railway*	91	36,902	8,749	48,139	11,733	26,089	430	33,795	2,816	64,863	—16,724	—86	1,560	—18,230	—1,201
Detroit, Grand Haven & Milwaukee	191	167,997	52,284	265,474	43,048	27,681	2,266	124,406	5,394	207,795	57,679	—248	2,953	54,478	37,163
Grand Trunk Western	347	443,840	226,009	718,573	54,176	85,721	23,663	289,682	23,379	476,631	241,942	—1,551	29,477	210,514	—17,433
Louisiana & N. Aw. Co	153	164,232	25,589	201,052	19,039	23,598	5,313	81,535	7,167	137,242	63,810	3,800	58,310	22,450
New Orleans Great Northern	283	93,411	33,051	137,193	20,651	13,417	2,190	41,981	8,278	84,617	52,576	—49	49,166	3,361
Ulster & Delaware	129	56,586	17,278	77,998	4,420	15,296	896	38,111	2,762	61,503	14,495	232	3,390	11,427	5,099
Atlantic & St. Lawrence	167	$555,570	$180,215	$798,838	$170,203	$128,869	$25,486	$390,699	$32,039	$737,296	$61,542	.....	$12,721	$48,821	$34,722
Buffalo & Susquehanna *Railroad*	265	454,163	62,803	533,145	106,513	112,232	5,873	174,281	16,000	383,009	—51,119	$131	9,000	—59,988	—26,925
Buffalo & Susquehanna *Railway*	91	251,163	62,803	331,906	106,513	112,232	2,873	174,281	16,000	383,009	—51,119	$131	9,000	—59,988	—26,925
Detroit, Grand Haven & Milwaukee	191	799,997	373,284	1,359,866	366,662	153,585	41,929	631,267	29,895	1,223,338	135,028	—375	17,718	116,935	—150,440
Grand Trunk Western	347	2,313,840	1,220,009	3,791,253	450,446	507,757	125,107	1,510,864	96,767	2,690,940	1,100,913	—8,661	175,563	913,189	34,478
Louisiana & N. Aw. Co	153	781,150	115,668	1,001,351	139,467	111,078	24,141	389,064	27,219	703,671	297,880	.....	13,000	264,880	—44,345
New Orleans Great Northern	283	377,173	187,473	830,996	131,665	95,758	14,384	251,914	39,656	533,377	297,619	—398	12,212	285,009	17,516
Ulster & Delaware	129	363,254	245,755	640,783	85,683	77,320	8,394	252,491	14,926	438,814	201,969	336	15,800	186,505	—16,454

Railway Officers.

Executive, Financial and Legal Officers.

H. W. MacKenzie, assistant to comptroller of the Seaboard Air Line at Portsmouth, Va., has been elected comptroller, succeeding T. W. Roby, deceased.

The offices of Rollin H. Wilbur vice-president and general manager, and E. M. Kuntz, auditor, of the Lehigh & New England, have been transferred from Philadelphia, Pa., to South Bethlehem.

J. C. Nelms, Jr., auditor of the Kinston, Carolina Railroad & Lumber Co., at Norfolk, Va., has been appointed auditor also of the Carolina Railroad, formerly the Kinston & Snow Hill, with headquarters at Norfolk.

A. D. Lightner, general agent of the executive department of the Frisco Lines at New Orleans, La., has been elected vice-president of the New Orleans, Texas & Mexico, with headquarters at New Orleans.

M. C. Byers, chief engineer of operation of the St. Louis & San Francisco, has been appointed assistant to the president of the Great Northern, with headquarters at St. Paul, Minn., effective March 1. F. G. Jonah, chief engineer of construction, will assume the duties of chief engineer of operation, also.

Edson J. Chamberlin, president of the Grand Trunk and the Grand Trunk Pacific with headquarters at Montreal, Que., who was recently elected president also of the Central Vermont has been elected president also of the Southern New England Railroad Corporation, the Southern New England Railway Company and the Central Vermont Transportation Company succeeding E. H. Fitzhugh, resigned.

Julius Krutschnitt, chairman of the executive committee and director of maintenance and operation of the Southern Pacific, with headquarters at New York, has been elected also president, director and ex-officio member of the executive committee of the Pacific Mail Steamship Company, succeeding R. S. Lovett. Hugh Neill, secretary of the Southern Pacific, with office at New York, has been elected secretary also of the Pacific Mail Steamship Company, succeeding Alex. Millar, resigned.

Operating Officers.

E. F. Boyle has been appointed an assistant superintendent of the Galveston, Harrisburg & San Antonio, El Paso division, with office at El Paso, Tex.

William Ward has been appointed assistant division superintendent of the Chicago, St. Paul, Minneapolis & Omaha, with office at Spooner, Wis.

D. Gilmour has been appointed superintendent of the Montreal, Que., terminals of the Grand Trunk, succeeding R. W. Scott, relieved on account of ill health.

J. M. Shea, general superintendent of the Seaboard Air Line, with headquarters at Portsmouth, Va., has resigned and his former position has been abolished.

J. T. Connor has been appointed assistant superintendent of the Galveston, Harrisburg & San Antonio, with office at San Antonio, Tex., succeeding J. E. McLean, resigned.

J. M. Teachworth has been appointed assistant superintendent of the Houston & Texas Central, Houston East & West Texas, and Houston & Shreveport, with headquarters at Houston, Tex., to succeed R. A. Crofton, resigned.

The officers of E. H. Shipman, superintendent, and J. R. Brown, car accountant, of the Lehigh & New England at Bethlehem, Pa., and W. E. Baily, trainmaster at Pen Argyle, have been transferred to South Bethlehem.

J. W. Walters has been appointed assistant superintendent of the St. Louis, Brownsville & Mexico, instead of trainmaster as previously stated, with headquarters at Kingsville, Tex. The office of trainmaster, formerly held by E. S. Heyser, is abolished.

William Haves, superintendent and general freight and passenger agent of the Kinston, Carolina Railroad & Lumber Company, at Kinston, N. C., has been appointed general superintend-

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ent also of the Carolina Railroad, formerly the Kinston & Snow Hill, with office at Kinston.

A. B. Warner, engineer of maintenance of way of the Third district of the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., has been appointed superintendent of the Southern division of the Chicago, Rock Island & Gulf, with office at Ft. Worth, Tex., succeeding C. L. Ruppert, promoted.

Traffic Officers.

Wendall H. Stallings has been appointed soliciting agent of the Louisville & Nashville with office at Birmingham, Ala., succeeding J. V. McCullough, resigned.

The office of T. J. Fretz, general freight and passenger agent, of the Lehigh & New England, has been transferred from Bethlehem, Pa., to South Bethlehem.

J. F. Dalton has been appointed general freight and passenger agent of the Carolina Railroad, formerly the Kinston & Snow Hill, with headquarters at Norfolk, Va.

Thomas J. Kay has been appointed traveling passenger agent of the Union Pacific system, with headquarters at Detroit, Mich., in place of J. O. Goodsell, transferred.

George R. Bierman, assistant city passenger and ticket agent of the Union Pacific at Omaha, Neb., has been appointed traveling passenger agent, with headquarters at Chicago.

C. E. Benjamin, general tourist agent of the Canadian Pacific, with office at Montreal, Que., has been appointed general passenger agent of the Pacific Steamship service, with office at Montreal.

H. B. Bryning, traveling immigration agent of the Northern Pacific, with office at Kansas City, Mo., has been appointed district passenger agent of the Chicago Great Western at Kansas City, to succeed L. F. McFarland, resigned.

W. H. Kirkwood has been appointed tariff inspector of the Louisiana lines of the Southern Pacific, with headquarters at New Orleans, La., in place of L. C. Bouchard, who has been appointed traveling freight and passenger agent, with headquarters at New Iberia, La., succeeding W. H. Stakelum, transferred to Lake Charles, La., as division freight and passenger agent.

George W. Boyd, who has been appointed passenger traffic manager of the Pennsylvania Railroad, with headquarters at Philadelphia, was born at Indianapolis, Ind., August 1, 1848. He began railway work in 1863 in the freight department at Indianapolis of the Cleveland, Columbus, Cincinnati & Indianapolis, now the Cleveland, Cincinnati, Chicago & St. Louis, and for several years he served as clerk of the freight department. In June, 1872, he was appointed cashier of the passenger department of the Pennsylvania Railroad, remaining in that position until January, 1874, when he was promoted to chief clerk. From January, 1882, to June, 1903, he was assistant general passenger agent of the same road and then was promoted to general passenger agent, which position he held at the time of his appointment as passenger traffic manager. Mr. Boyd has been an uncompromising foe of the ticket scalper and has often advocated anti-scalping laws before committees of Congress and the legislatures of many states. He has consistently maintained the principle that pleasure travel, under the personally-conducted system, is the legitimate business of the railroad companies, and does not belong to independent promoters.

G. W. Boyd.

W. S. Basinger, assistant to director of traffic of the Southern Pacific with headquarters at New York, and formerly holding the same position on both the Union Pacific and the Southern Pacific, has been appointed general passenger agent of the Union Pacific, with headquarters at Omaha, Neb., effective March 1. He was born in 1872 at Savannah, Ga., and graduated from the University of Georgia in 1890. The following year he became clerk in the auditing department at Kansas City, Mo., of the Kansas City, Fort Scott & Memphis, now a part of the St. Louis & San Francisco, and from 1891 to 1897, was a clerk in the freight department of the Union Pacific, at Kansas City. He then went to the Leavenworth, Kansas & Western, now a part of the Union Pacific, as general freight and passenger agent, and from 1903 to 1905, was superintendent, treasurer and secretary of that road with headquarters at Leavenworth, Kan. He was then trainmaster on the Union Pacific for two years, and was made assistant general passenger agent at Omaha, Neb., of the same road in 1907. From 1911 to 1912, he was assistant to director of traffic of the Union Pacific and the Southern Pacific at Chicago, and then at New York. On February 6 he resigned from the Union Pacific as assistant to director of traffic and now he goes back to the Union Pacific as general passenger agent as above noted.

James Roberts Wood, passenger traffic manager of the Pennsylvania Railroad, with headquarters at Philadelphia, Pa., whose retirement on March 1, under the pension rules of the company has been announced in these columns, was born at Auburn, N. Y., on February 9, 1843. He began railway work in 1869, as secretary to the superintendent at Creston, Iowa, of the Burlington & Missouri River, now a part of the Chicago, Burlington & Quincy. From this position he was advanced to trainmaster, which he held until 1871, when he was appointed general western passenger agent of the same road, with office at Chicago. In 1873 he became general ticket agent of the same road in Nebraska, and then for a short time was western land and passenger agent. His next position was general agent of the Michigan Central and the Chicago & West Michigan, at Grand Rapids, Mich. In 1876 he was appointed assistant superintendent of the Michigan Central, at Jackson, Mich., and in 1878 he returned to Chicago as assistant general passenger agent of the same road. A few months later he went to the Chicago, Burlington & Quincy, as general passenger agent of that system. He remained in this position until April, 1881, when he was appointed general passenger agent of the Pennsylvania Railroad, and on June 1, 1903, was promoted to passenger traffic manager, from which position he retires on March 1. In April, 1890, Mr. Wood was selected as chairman pro tempore of the Passenger Committee of the Trunk Line Association, and held the position until the election of a permanent chairman, in August of the same year, having declined the permanent chairmanship. He has also served a term as president of the American Association of General Passenger and Ticket Agents. It was upon Mr. Wood's initiative that the first "limited" train, in the sense of exclusive accommodations and high speed, was inaugurated in this country. He has aided and encouraged every reform which had for its object the elevation and expansion of the passenger business.

J. R. Wood.

George W. Boyd, general passenger agent of the Pennsylvania Railroad, with office at Philadelphia, Pa., has been appointed passenger traffic manager, to succeed J. R. Wood, who retires from active service on February 28, under the pension rules of the company. Coincident with the appointment of a new passenger

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traffic manager the passenger department has been reorganized. D. N. Bell and J. P. Anderson, formerly assistant general passenger agents, have been appointed general passenger agents. Heretofore, Mr. Boyd has been the only general passenger agent on the Lines East. Under the new organization, one general passenger agent will devote his time to developing travel local to the Pennsylvania Railroad and the other to building up the through passenger business. Division passenger agencies have been created at New York, at Philadelphia, at Harrisburg, at Pittsburgh, at Williamsport, at Buffalo and at Baltimore. To each one of the division passenger agents will be assigned a particular territory, and it will be his duty to give his personal attention to securing the comfort and convenience of the people in his territory. This plan, which requires the division passenger agent to make a study, more careful than ever made before, of the comfort and convenience of travel, will, it is thought, bring the management of the company into the closest possible touch with the traveling public. C. Studds, R. J. DeLong and R. M. Pile have been appointed assistant general passenger agents; O. T. Boyd, New York; F. B. Barnitz, Philadelphia; A. E. Buchanan, Harrisburg; E. Yungman, Pittsburgh; David Todd, Williamsport; B. P. Fraser, Buffalo, and William Pedrick, Jr., Baltimore, have been appointed division passenger agents, and the following have been appointed district passenger solicitors: R. L. Stall, W. P. Harriman and W. V. Kibbe, New York; F. E. Binns, Brooklyn, N. Y.; C. E. McCullough, Newark, N. J.; D. M. Sheaffer, Philadelphia, Pa.; A. C. Weile, Reading; C. A. B. Cooper, Erie; S. B. Newton, Altoona; T. L. Lipsett, Washington, D. C.; N. S. Longaker, Wilmington, Del., and C. R. Rosenberg, Atlantic City, N. J.

Engineering and Rolling Stock Officers.

R. M. Garnett has been appointed roadmaster of the St. Louis, Brownsville & Mexico, with headquarters at Kingsville, Tex.

The office of C. W. Brown, engineer maintenance of way of the Lehigh & New England, has been transferred from Bethlehem, Pa., to South Bethlehem.

W. H. Evans has been appointed district master mechanic, Second district, of the Canadian Pacific, British Columbia division, with headquarters at Vancouver, B. C.

D. S. Terry has been appointed a construction engineer of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Cincinnati, Ohio, succeeding F. W. Smith, resigned.

Hans Helland, superintendent of maintenance of way of the San Antonio & Aransas Pass at Yoakum, Tex., has been appointed construction engineer, with headquarters at San Antonio, Tex.

George McCormick has been appointed assistant general manager (mechanical) of the Galveston, Harrisburg & San Antonio, the Houston & Texas Central, the Houston East & West Texas, the Houston & Shreveport, and the Texas & New Orleans, and superintendent of motive power and machinery of the Morgan's Louisiana & Texas Railroad & Steamship Company and the Louisiana & Western Railroad, with headquarters at Houston, Tex., in place of J. W. Small, resigned.

H. W. Ridgway, who recently was appointed superintendent of the motive power and car department of the Colorado & Southern, with headquarters at Denver, Colo., was born July 17, 1866, at Delaware Water Gap, Pa. He was educated in the common schools and began railway work in November, 1881, as machinist apprentice with the Denver & Rio Grande. From May to December, 1887, he was successively journeyman and foreman of the Mexico Central at Mexico City, and then for four years was with the Denver & Rio Grande as a journeyman and gang foreman. He returned to the Mexico Central in 1893, and until 1901, was foreman and master mechanic. In February of the latter year he went to the El Paso & Northeastern as superintendent of machinery, and from April, 1903, to February 1, 1904, he was superintendent of the contract shop. He then became superintendent of shops of the Mexican Central at Aguascalientes, Mex., where he remained until December 1, 1905. On January 1, 1906, he was appointed master mechanic of the Colorado & Southern and the Atchison, Topeka & Santa Fe at Denver, Colo., from which position he has been promoted to that of superintendent of motive power and car department, as above noted.

Purchasing Officers.

James E. Kilborn has been appointed purchasing agent and storekeeper of the Rutland Railroad, and purchasing agent of the Rutland Transit Company, with office at Rutland, Vt., succeeding A. E. Douglas, resigned.

OBITUARY.

William Singer, Jr., formerly an attorney for the Southern Pacific, died at San Francisco, Cal., on February 12, aged 63 years.

Robert Bicknell Seymour, formerly chief engineer of the Chicago, Indiana & Southern, died at his home in Oak Park, Chicago, on February 23, at the age of 53 years.

Urias J. Fry, who had been superintendent of telegraph of the Chicago, Milwaukee & St. Paul system since 1888, died at his home in Milwaukee, Wis., on February 22, aged 65 years.

Henry A. Williams, assistant to general superintendent of the Southern Railway, died recently at his home in Columbia, S. C., at the age of 52. Mr. Williams began his railroad career as a brakeman.

John J. Cairns, passenger agent of the Chicago, Milwaukee & St. Paul, at Chicago, died in that city on February 18, as result of injuries received when he was struck by a train on the Northwestern Elevated Railroad the evening before. Mr. Cairns was 60 years old.

William N. D. Winne, comptroller of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, died on February 24 in Florida. He was born October 11, 1850, at Schenectady, N. Y., and was educated in the public schools of his native town and at Madison, Wis., and in private schools at Milwaukee. He began railway work in 1863 as junior clerk in the auditor's office of the Milwaukee & Prairie du Chien and continued with that road until its absorption by the Chicago, Milwaukee & St. Paul. From September, 1882, to September, 1890, he was assistant general auditor of the Chicago, Milwaukee & St. Paul. He became general auditor in 1890, and was appointed comptroller in July, 1910.

Patrick Tyrrell, ticket auditor of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, died on February 22 from a stroke of apoplexy. He was born on April 6, 1838, in Ireland and began railway work in 1855. From then until October, 1865, he held various positions as clerk on the Milwaukee & Mississippi, afterwards the Milwaukee & Prairie du Chien, now a part of the Chicago, Milwaukee & St. Paul. In October, 1866, he was appointed general bookkeeper of the Chicago, Milwaukee & St. Paul, remaining in that position until July, 1869, when he became auditor of the Western Union Railroad, also now a part of the St. Paul. From July, 1879, to September, 1882, he was general clerk in the auditing department of the Chicago, Milwaukee & St. Paul, and since September, 1882, had been ticket auditor.

Charles E. Gossett, general master mechanic of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., died at Rochester, Minn., on February 19, aged 44 years. Mr. Gossett was born on January 25, 1869, in Kentucky, and was educated at the Missouri State University. He had been in railway service since 1886, when he began as machinist helper with the Wabash, St. Louis & Pacific. From 1889 to 1901, he was a locomotive fireman on the Hannibal & St. Joseph, locomotive engineer on the same road, the Wabash and the Chicago, Rock Island & Pacific. He was then until March, 1905, road foreman of equipment of the latter road, when he was made master mechanic. In August, 1908, he went to the Iowa Central as master mechanic; two years later he was appointed master mechanic of the Minneapolis & St. Louis, and on January 1, 1912, he was promoted to general master mechanic of that road.

RAILROAD MILEAGE IN THE PHILIPPINES.—The construction has been authorized of 1,097 miles of new line in the Philippine Islands. The total mileage in operation is now 641 miles.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE CINCINNATI, NEW ORLEANS & TEXAS PACIFIC has ordered 10 mikado locomotives from the Baldwin Locomotive Works and 7 Pacific type locomotives from the American Locomotive Company.

P. WELCH has ordered 1 oil burning consolidation locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 28 in.; the diameter of the driving wheels will be 57 in., and the total weight in working order will be 170,000 lbs.

THE DETROIT TERMINAL RAILROAD has ordered 5 six-wheel switching locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 21 in. x 28 in. cylinders, 57 in. driving wheels, and in working order will weigh 170,000 lbs.

THE MISSOURI PACIFIC has ordered 7 Mountain type locomotives and 5 Pacific type locomotives from the American Locomotive Company. The dimensions of the cylinders of the Mountain type locomotives will be 27 in. x 28 in.; the diameter of the driving wheels will be 63 in., and the total weight in working order will be 294,000 lbs. The Pacific type locomotives will have 26 in. x 26 in. cylinders, 73 in. driving wheels, and in working order will weigh 258,000 lbs.

CAR BUILDING.

THE CHICAGO & WESTERN INDIANA is in the market for 300 ballast cars.

THE CHICAGO, ROCK ISLAND & PACIFIC has ordered 50 caboose cars from the Whipple Car Company.

THE RUTLAND has ordered 3 smoking cars, 2 coaches, 2 baggage cars and 1 mail and baggage car from the Osgood Bradley Car Company.

THE PENNSYLVANIA RAILROAD has ordered 1,000 refrigerator cars and 500 steel and wood gondola cars from the American Car & Foundry Company, and 805 steel and wood gondola cars from the Standard Steel Car Company.

THE CINCINNATI, NEW ORLEANS & TEXAS PACIFIC has ordered 100 gondola cars and 50 hopper cars from the Cambria Steel Company, 100 box cars from the American Car & Foundry Company and 5 dining cars from the Barney & Smith Car Company.

THE HARRIMAN LINES have recently placed a large order for freight cars, as mentioned in the *Railway Age Gazette* of January 31, February 14 and February 21. The correct division of this order is as follows: 2,280 drop bottom gondola cars, 200 hopper bottom gondola cars and 203 tank cars from the Pressed Steel Car Company; 1,000 box cars, 800 automobile cars and 110 caboose cars from the Standard Steel Car Company; 2,290 box cars from the American Car & Foundry Company; 2,050 single deck stock cars and 3,100 box cars from the Pullman Company; and 800 work cars and 500 flat cars from the Bettendorf Axle Company.

IRON AND STEEL.

THE CENTRAL OF NEW JERSEY is in the market for about 800 tons of structural steel.

GENERAL CONDITIONS OF STEEL.—The output of steel continues to be at the same high rate as in January, and if the total output for the current month falls below that of January, it will only be due to the fact that February is the shorter month. Orders for new business in some branches of the industry have recently shown increases since the first of January. The heavy orders for freight cars have also called for a considerable tonnage of steel. Rail buying during February has been smaller than usual, but this was to be expected after the unusually heavy contracts for 1913 delivery placed in the second half of 1912.

Supply Trade News.

F. R. Wadleigh has opened offices in the Bank of Commerce building, Norfolk, Va., as consulting engineer in all matters in connection with the preparation and purchase and use of coal.

William Thornburgh has been appointed general manager sales of the Standard Asphalt & Rubber Company, Chicago, with jurisdiction over the waterproofing, engineering, mastic floor and paving departments.

Michael Ehret, president of the Ehret Magnesia Manufacturing Company, Philadelphia, Pa., and chairman of the board of directors of the Barrett Manufacturing Company, New York, died at his home in Philadelphia on February 17, at the age of 75.

Leigh Best, vice-president of the American Locomotive Company, New York, in charge of finance, has been given full charge of the automobile department of this company in addition to his present duties. It is the purpose of the company to segregate the automobile department from the locomotive department so far as is practicable. Mr. Best was born at Chatham, N. Y., on November 4, 1867. He received a high school education and in 1882 entered the legal department of the New York Central Lines, with office in New York. Later he was made assistant to the president, while S. R. Callaway was president. In June, 1901, Mr. Callaway resigned his position to become president of the American Locomotive Company and brought Mr. Best with him as secretary of that company. Mr. Best retained that position until June, 1904, when he was made third vice-president in charge of financial, accounting, legal and corporate matters, which position he still holds. In future Mr. Best will divide his time between his present office at 30 Church street and his new office at 1886 Broadway.

As announced in last week's issue, at a recent meeting of the directors of the Weir Frog Company, Cincinnati, Ohio, O. DeG. Vanderbilt, Jr., was elected president, succeeding B. W. Rowe, who was elected chairman of the board of directors. Mr. Vanderbilt is a son-in-law of the late Col. L. C. Weir, who was once president of the Adams Express Company, and was later president of the Weir Frog Company, until his death in 1899. Mr. Vanderbilt's interest in the past have been in the East, and his headquarters at New York City, but he has spent the past four or five months in Cincinnati, taking active charge of extensive improvements and additions to the plant at Cincinnati, which will increase the capacity from 25 to 35 per cent. The company has increased its floor space for manufacturing about 16,000 sq. ft., and the space for the storage of raw material has been nearly doubled.

O. DeG. Vanderbilt, Jr.

TRADE PUBLICATIONS.

MIKADO LOCOMOTIVES.—Bulletin number 1012, issued by the American Locomotive Company, 30 Church street, New York, deals with the Mikado locomotives of the Chesapeake & Ohio. In comparison with locomotives of the consolidation type these show a saving in coal per ton mile of 14 per cent. and 9 per cent. saving in water per ton mile, while increasing the train loads 50 per cent. Drawings showing the side elevation and clearance diagram of the locomotives are given and also a dynamometer car record made with a train of 7,590 tons.

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Railway Construction.

BOSTON & MAINE.—Favorable action has been taken by the Vermont legislature on two bills of the Boston & Maine granting that company permission to construct two connecting links parallel with the tracks of the Central Vermont, a Grand Trunk subsidiary, to complete its line down the Connecticut river valley to Massachusetts. One bill passed by the house in concurrence with the senate provides for an extension of the Sullivan County Railroad from Windsor to White River Junction. The other bill, passed by the senate, provides for an extension of the Vermont Valley Railroad from Brattleboro to the Massachusetts line at South Vernon. These connecting links will probably not be built as long as the present agreement between the Grand Trunk and the Boston & Maine for the joint use of the existing lines remains in effect.

CANADIAN PACIFIC.—An officer writes that appropriations have been made for new lines and improvements on the western lines as follows: In Manitoba, a branch line from Snowflake westerly, 9 miles, and from Gimli to Tiverton, 26 miles; in Saskatchewan, branch from Weyburn, westerly, 145 miles, and a new yard at Assiniboia. In Alberta, additional tracks at Dunmore, at Calgary, at Strathcona, at Edmonton and at Wetaskiwin; also branch lines from Coronation to Sedgewick, 25 miles, and from Laconibe east to Kerrobert, Sask., 86 miles; Stirling easterly 25 miles, Suffield, southwesterly, 25 miles, and from Bassano to Empress, 118 miles. In British Columbia, standardization of the Kaslo & Slocan from Whitewater to Kaslo, 17 miles, and on the Kootenay Central, construction from Skookumchuck to mile 60, and from mile 42 to mile 60 south of Golden. New double tracks will be constructed as follows: Kemnay, Man., to Virden, 40 miles; Whitewood, Sask., to Broadview, 15 miles; Broadview, Sask., to Grenfell, 16 miles; Indian Head, Sask., to Regina, 44 miles; Chaplin, Sask., to Swift Current, 57 miles; Swift Current to a junction with the Swift Current northwesterly branch, 6 miles; Gleichen, Alta., to Shepard, 40 miles, and double tracking will be completed on the line between Vancouver, B. C., and Ruby Creek, 81 miles. Part of this latter work has been completed and is now in operation.

Bids are wanted by J. G. Sullivan, chief engineer Western lines of the Canadian Pacific, Winnipeg, Man., up to noon April 15, for the clearing, grubbing and grading of a division of the main line in the Selkirk mountains, from Six Mile Creek to Glacier, 17 miles. This work includes a double track tunnel about 28,000 ft. long. Plans and specifications are on file at the offices of J. G. Sullivan and of F. F. Busteed, engineer grade revision, Kamloops, B. C.

The Canadian Pacific has appropriated $16,000,000 for construction work to be carried out on its eastern divisions this year. Of this amount, about $10,000,000 will be used to complete work commenced last summer, including the new Lake Shore line, and extensions from St. Johns, Que., to Farmham Junction and branches in the east end of Montreal. The greater part of the new work will consist of double tracking the new eastern lines, involving the expenditure of nearly $6,000,000. The main line from Islington to Guelph Junction, on the London (Ont.) division, will be double tracked for 50 miles. It is also proposed to double-track some of the main line between Ramford, Ont., and Port Arthur, and eventually to double-track the entire line, 563 miles, in order to facilitate the handling of grain.

CHESAPEAKE & OHIO.—An officer writes that contracts have been let and work is now under way on a 7.9-mile extension up Island Creek, W. Va. This is all of the construction that is proposed at this time, in that section.

DETROIT, BAY CITY & WESTERN.—According to press reports a contract has been given to the Bay County Construction Company, Bay City, Mich., to build the ten miles branch north from Akron, Mich., to Sebewaing (November 15, 1912, p. 973).

GRAND TRUNK PACIFIC.—The programme of construction for 1913, it is understood, includes the completion of the British Columbia section of the main line. The gap between the eastern and western sections in British Columbia is now 426 miles, and work on this section is under way throughout its entire length. Track has been laid to the Shuswap river, 1,123 miles west of Winnipeg, Man., and 154 miles east of Fort George. A steel structure spanning this river will be placed in position as soon as footings upon which work has commenced have been completed. East of Prince Rupert track has been laid to mile 195 from the Pacific coast. Between that point and Aldermere several steel bridges will be erected, and some grading must be done. From Aldermere, easterly, the grade continues to the Endaka river, 341 miles from Prince Rupert; there is then a gap of 126 miles to Fort George, upon which clearing work is being done. The company will enter the towns of Brandon, Moose Jaw, Weyburn, Battleford and Calgary this year, and will push forward with all possible speed important extensions already undertaken. This includes finishing the Weyburn branch and Regina boundary line, securing terminals in Moose Jaw for the Regina-Moose Jaw branch, which is finished to a point just north of Moose Jaw, ballasting the Battleford branch, and the construction into Calgary of the line from Tofield. On the line from Regina to the international boundary, grading is finished as far as Frobisher, 136 miles from Regina, and track has been laid to Hill Hall, 106 miles, and 90 per cent. of the grading is completed on the remaining section between Frobisher and the United States. The grade on the Tofield-Calgary branch has been finished to Calgary. Track is laid as far as mile 176, and ballasting will soon be commenced along this line until Bow river is reached, and on the completion of a steel bridge at that point, track laying will be continued to Elbow river, at which point another steel bridge will be put in place. Concrete piers are ready for both bridges. Terminals are now being prepared and it is expected that the line will be opened for the operation of passenger trains into Calgary by next August.

GULF, TEXAS & WESTERN.—An officer writes that there is no truth in the report that an extension is to be built from Salesville, Texas, south to Mineral Wells, about eight miles. The company has just completed an extension from Jacksboro south to Salesville, and has trackage rights for passenger trains over the Weatherford, Mineral Wells & Northwestern to Mineral Wells, and for freight trains to Weatherford. (February 14, page 313.)

KERRY TIMBER COMPANY'S LINES.—According to press reports the Kerry Timber Company will build a logging line in Oregon from Wood's Landing on the Columbia river, south to the Nehalem valley, 30 miles.

MIDDLE TENNESSEE.—According to press reports this company has surveys made for an extension from Mt. Pleasant, Tenn., southeast via Pulaski to Huntsville, Ala., about 70 miles.

MONTOUR RAILROAD.—This company, which operates a line from Montour Junction, Pa., southwest to North Star 12.5 miles, has given a contract to John Marsch, Chicago, to build a 30-mile extension from North Star, through a coal section in Washington and Allegheny counties to a point south of Homestead. (January 31, page 231.)

NORTHERN CALIFORNIA RAILROAD & NAVIGATION COMPANY.—Incorporated in California with a capital of $1,100,000, to build railroads. The incorporators include G. W. Bartle, S. Swinson, O. G. Bartle, J. D. Rhodes, R. H. Hayworth and M. C. Messick.

OCILLA SOUTHERN.—This company will build an extension, it is said, from the southern terminus at Nashville, Ga., east about 50 miles to Waycross.

ST. LOUIS-KANSAS CITY (Electric).—President Nevin of this company, which was organized some time ago to build a double-track line from St. Louis, Mo., west to Kansas City, about 250 miles, is quoted as saying that work had been started and would be pushed to completion. The contract for building the line has been given to the National Contracting Company, Norfolk, Va.

SULLIVAN COUNTY.—See Boston & Maine.

TEMPLE, NORTHWESTERN & GULF.—According to press reports this is the new name of the Temple-Northwestern, which was organized some time ago to build from Temple, Tex., northwest via Gatesville, Hamilton and Comanche. Work on the line was suspended about two years ago, and it is understood will be resumed by May 1. A contract has been entered into by the new owners to begin construction within five months, and to complete the line to Gatesville, about 35 miles,

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within two years. Grading has been finished between Gatesville and Temple, and about four miles of track has been laid from Temple. Residents of Houston are back of the project.

TEMPLE-NORTHWESTERN.—See Temple, Northwestern & Gulf.

TENNESSEE ROADS.—According to press reports residents of Baileyton, Tenn., are back of a project to build a line from Baileyton, south to Greenville, about 15 miles. L. P. Campbell may be addressed.

TRANS-APPALACHIAN.—Incorporated in West Virginia, it is said, to build from Parkersburg, W. Va., southeast along the little Kanawha and Elk rivers to or near Marlinton in Pocahontas county, thence to a point in Virginia. The company proposes to develop timber lands in Pocahontas county, W. Va., and in Bath county, Va. The line may eventually be extended to a connection with the Chesapeake & Ohio at Covington, Va. H. M. Lockridge, Huntersville, W. Va., and R. S. Turk, Staunton, Va., may be addressed.

VERMONT VALLEY.—See Boston & Maine.

RAILWAY STRUCTURES.

CLINTON, IA.—The Chicago & North Western has prepared plans for new repair shops to cost approximately $500,000, on which work is to be started this spring.

CONCORD, N. C.—Construction work has been begun on the new passenger station for the Southern at Concord. It will be of brick construction with stone trimmings and tile roof and will be steam heated. It will be 128 ft. x 32 ft. 6 in. and will include ample waiting rooms and modern conveniences for passengers, as well as office, baggage and express rooms. The old passenger station has been moved and converted into a freight office. The improvements at Concord also include the construction of concrete platform, macadam driveway and necessary track changes. Contract for the construction of the new passenger station has been given to J. A. Jones, of Charlotte, N. C., and contract for the installation of heating system has been awarded to the Hess & Rogers Engineering Company, Washington, D. C. (December 27, p. 1285.)

DES MOINES, IA.—The Chicago, Rock Island & Pacific is planning to build new repair shops, a roundhouse and additional yards on the east side of the city.

FORT WILLIAM, ONT.—An officer of the Canadian Pacific writes that appropriations for new improvements include the following: In Ontario, a 6-stall addition to the roundhouse, increase in the elevator capacity, and extensions to freight car repair shed at Fort William; at Kenora 6-stall addition to the roundhouse. In Manitoba, 5-stall addition to the roundhouse at Minnedosa. In Saskatchewan, 4-stall addition to the roundhouse at Arcola; in Alberta, an overhead bridge at Strathcona; 6-stall addition to the roundhouse at Alyth; a 2-stall addition to the roundhouse and 50 ft. addition to the freight shed at Lacombe.

JACKSON, MICH.—The Michigan Central is planning extensive additions to its shops, including an addition 250 ft. long to the main shop building, a new 30-stall roundhouse and a new blacksmith shop.

JACKSON, MISS.—The Illinois Central is to rebuild at once its freight house which was destroyed by fire recently.

LEXINGTON, VA.—The Baltimore & Ohio has given a contract to J. J. Walsh & Sons, contractors, of Baltimore, Md., for the construction of a modern passenger station at Lexington. The present passenger station will be completely overhauled and remodeled and the freight house platform will be extended.

LOS ANGELES, CAL.—The Southern Pacific has begun the work of clearing the site for a large new passenger station to replace the present Arcade station.

STAUNTON, VA.—An officer of the Chesapeake & Ohio writes regarding the reports, that a freight station is to be built at Staunton, that while the question has been under consideration, nothing definite has yet been decided in regard to the construction of the station.

Railway Financial News.

CAROLINA RAILROAD.—This company has taken over the Kinston & Snow Hill.

DELAWARE, LACKAWANNA & WESTERN.—Harold S. Vanderbilt has been elected a director, succeeding S. S. Palmer, deceased.

DENVER & SALT LAKE.—This company, which is the successor of the Denver, Northwestern & Pacific, has sold $488,000 5 per cent. equipment trust certificates. The securities cover the purchase of 300 steel gondola cars, 100 box cars, two Mallet locomotives and 50 other pieces of equipment.

The Denver & Salt Lake will have about $7,500,000 first mortgage 5 per cent. bonds and $2,000,000 adjustment income bonds outstanding. When arrangements have been finally completed for taking over the road of the Denver, Northwestern & Pacific, the $10,000,000 stock of the new company will be held in a voting trust for five years.

DENVER, NORTHWESTERN & PACIFIC.—See Denver & Salt Lake.

GALVESTON, HENDERSON & HOUSTON.—E. T. Jeffries has been elected a director, succeeding George J. Gould, resigned.

Speyer & Co. have bought $2,000,000 first mortgage 5 per cent. bonds of 1913-1933 or 1938. This will provide for refunding an equal amount of first mortgage bonds maturing April 1, 1913.

KANSAS CITY, MEXICO & ORIENT.—D. J. Haff is quoted as saying that the chairman of the reorganization committee of the Kansas City, Mexico & Orient, who is now in London, will be in Kansas City next month, and that subscriptions are now being taken for funds to refinance the road, which is in the hands of a receiver, and as saying that it will require between $10,000,000 and $15,000,000 to refinance and complete the road.

KINSTON & SNOW HILL.—See Carolina Railroad.

NEW YORK, NEW HAVEN & HARTFORD.—De Ver H. Warner has been elected a director, succeeding his father, I. De Ver Warner, deceased.

PEORIA RAILWAY TERMINAL.—On March 1, the Chicago, Rock Island & Pacific, and the Chicago & Alton will take over the joint management of the Peoria Railway Terminal Company, which they have jointly owned for some time. President W. T. Irwin will retire, but will be retained in legal capacity. The roads will operate the terminal in alternate years, and the president will also be alternated, so that the first year the property will be operated by the Rock Island, and President B. A. Worthington, of the Chicago & Alton, will serve as president.

PITTSBURGH & LAKE ERIE.—The directors have declared an extra dividend of 5 per cent., payable March 31. This compares with extra dividends of 12 per cent. paid in March, 1912, 25 per cent. in 1911 and 40 per cent. in 1910. The regular dividends are 10 per cent. annually. In three previous years the extra dividend has been accompanied by stock offered to the stockholders for subscription. The company has made no stock offer so far this year.

SOUTHERN PACIFIC.—See the refusal of the California Railroad Commission to permit certain terms of the Union Pacific-Southern Pacific dissolution plan from being carried out under state commissions.

UNION PACIFIC.—See the refusal of the California Railroad Commission to permit certain terms of the Union Pacific-Southern Pacific dissolution plan from being carried out under state commissions.

BRAZILIAN-PARAGUAYAN RAILWAY CONNECTION.—According to statements made by its promoters, the proposed Paraguay Northeastern Railway, for which a concession was granted in 1911, is to run from Asuncion, Paraguay, northeasterly to the Paraguayan-Brazilian frontier, where it will cross the Parana river. From that point it is proposed to connect with the Transcontinental Brazilian line, which, crossing the states of Parana and Sao Paulo, connects with the main Brazilian system at Itapetininga.

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ANNUAL REPORT.

SOUTHERN PACIFIC COMPANY TWENTY-EIGHTH ANNUAL REPORT.

INCOME FOR THE YEAR.

The gross receipts and disbursements of the Southern Pacific Company in respect of its leased lines and of the Proprietary Companies in respect of lines not leased, and the other receipts and disbursements of the Southern Pacific Company and of such Proprietary Companies after excluding all offsetting transactions between them, were as follows:

	This Year.	Last Year.	+ Increase, — Decrease.
Average miles of railway operated—proprietary and non-proprietary:			
Lines East of El Paso.....	3,434.97	3,402.88	+32.09
Lines West of El Paso.....	6,535.43	6,492.19	+43.24
Total	9,970.40	9,895.07	+75.33
OPERATING INCOME.			
Revenue from transportation —rail lines	$120,433,055.64	$121,911,028.10	—$1,477,972.46
Revenue from outside operations	11,092,114.95	10,709,511.41	+382,603.54
Total	$131,525,170.59	$132,620,539.51	—$1,095,368.92
Operating expense—rail lines.	$75,652,106.32	$74,521,659.84	+$1,130,446.48
Expenses outside operations..	10,838,936.91	10,483,554.02	+355,382.89
Taxes (rail lines and properties dealt with as outside operations)	5,621,238.96	4,850,347.57	+770,891.39
Total	$92,112,282.19	$89,855,561.43	+$2,256,720.76
Net operating income over expenses and taxes.....	$39,412,888.40	$42,764,978.08	—$3,352,089.68
OTHER INCOME.			
Interest on bonds owned of Proprietary Companies (Table No. 4).....	$2,040,929.85	$1,051,971.39	+$988,958.46
Interest on bonds owned of companies other than Proprietary Companies (Table No. 5).....	2,670,683.49	2,935,575.94	—264,692.45
Dividends on stocks owned of companies other than Proprietary Companies (Table No. 6).....	1,066,968.44	781,796.08	+285,112.36
Income from lands and securities not pledged for redemption of bonds.....	740,146.64	956,529.03	—216,382.41
Income from sinking funds pledged for the redemption of bonds	219,314.11	93,532.54	+125,781.57
Rentals for lease of road, for joint tracks, yards, and other facilities	.....	106,412.43	—106,412.43
Balance of interest received on loans and of interest accruing to June 30, on open accounts other than with Proprietary Companies	1,995,762.27	728,454.03	+1,267,308.24
Miscellaneous income	118,574.56	80,917.41	+37,657.15
Total	$8,852,519.36	$6,735,188.87	+$2,117,330.49
Total net operating and other income	$48,265,407.76	$49,500,166.95	—$1,234,759.19
FIXED AND OTHER CHARGES.			
Interest on outstanding funded debt of Southern Pacific Co. and Proprietary Companies (Table No. 7)..	$23,559,447.38	$20,897,152.53	+$2,662,294.85
Sinking fund contributions and income from sinking fund investments	501,494.11	374,712.54	+126,781.57
Hire of equipment—balance.	642,158.52	250,481.77	+391,676.75
Rentals for lease of road, for joint tracks, yards, and other facilities	142,307.03	.....	+142,307.03
Land department expenses...	187,849.02	225,689.21	—37,840.19
Taxes on granted and other lands	347,528.70	319,517.29	+28,011.41
Miscellaneous expenses	60,585.98	34,121.52	+26,464.46
Taxes and other expenses of Southern Pacific Company.	245,899.01	291,703.42	—45,804.41
Additions and betterments payable from income of Southern Pacific Company.	25,232.60	123,033.79	—97,801.19
Reserve for depreciation of rolling stock owned by Southern Pacific Company and leased to other companies	854,060.67	866,547.65	—12,486.98
Total	$26,566,563.02	$23,382,959.72	+$3,183,603.30
Surplus over fixed and other charges.....	$21,698,844.74	$26,117,207.23	—$4,418,362.49

ASSETS AND LIABILITIES.

The combined assets and liabilities, excluding therefrom the stocks of the Proprietary Companies deposited against the issue of stocks and bonds of the Southern Pacific Company, also the offsetting open accounts between the Companies, on June 30, 1912, summarized, were as follows:

Capital Assets.		
Cost of road and franchises.....	$775,446,276.62	
New Mexico & Arizona Railroad Co. and Sonora Railway Co. securities.....	6,718,000.00	
Stocks and bonds owned by Southern Pacific Company (Tables Nos. 13, 14, and 15)	$379,704,317.62	
Deduct: Stocks and bonds deposited against issue of Southern Pacific Company stock and bonds.....	232,932,667.41	
		146,771,650.21
Stocks owned by Proprietary Companies (Table No. 20).....		330,316.77
Bay Shore Line terminals and other real estate		37,998,537.00
Timber treating plants, saw mills, and other property		349,879.89
Steamships and other floating equipment (Table No. 25).....		13,757,104.89
Rolling stock (Table No. 26).....		20,217,267.00
Advances for construction and acquisition of new lines		18,243,976.28
Advances for Oakland-Berkeley electric lines		9,001,020.46
Advances to Southern Pacific Railroad Co. of Mexico		39,026,799.19
Advances to electric lines in California and Oregon		9,773,315.12
Advances to Kern Trading & Oil Co.....		8,523,255.92
Advances to Pacific Fruit Express Co.....		1,214,923.37
Lands and other investments.....		2,859,564.49
Advances to Southern Pacific Land Co.....		3,560,000.00
Sinking funds		11,313,997.72
Trust funds		343,981.17
		$1,105,449,869.10
Current and Deferred Assets.		
Cash	$11,065,746.61	
Time loans and deposits.....	250,000.00	
Union Pacific Railroad Co. bond purchase notes	23,240,362.22	
Cash accounts	17,685,174.32	
Material and supplies.....	15,966,973.79	
Lands and other investments.....	404,844.38	
		69,116,101.32
Contingent Assets.		
San Antonio & Aransas Pass Ry. Co.....	$1,845,607.15	
Expenditures closing crevasse of Colorado River, protection of levees, etc.....	4,049,434.95	
Unadjusted accounts	900,355.81	
Land Contracts	1,232,689.10	
		8,028,087.01
Total		$1,182,594,057.43

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Capital Liabilities.

Southern Pacific Company, common stock	$272,672,405.64	
Southern Pacific Company, preferred stock called for redemption but not presented.	3,325.00	
Proprietary Companies:		
Common stock (stock deposited against Southern Pacific Company stock and bonds excluded)	73,137,411.00	
Preferred stock (stock deposited against Southern Pacific Company stock and bonds excluded)	12,000,000.00	
	$357,813,141.64	
Southern Pacific Company funded debt	$140,587,410.00	
Proprietary Companies funded debt	416,717,962.44	
Bonds of underlying companies	20,000,000.00	
	577,305,372.44	
Total stocks and bonds	$935,118,514.08	

Current and Deferred Liabilities.

Interest and dividends matured but not called for	$594,947.63	
Interest and dividends due July 1, and October 1	11,770,374.66	
Interest accrued to June 30, but not due	5,497,399.38	
Due to Union Pacific Railroad Co	12,000,000.00	
Vouchers and payrolls	10,032,203.07	
Other cash accounts	2,185,009.50	
Deferred liabilities	2,183,351.75	
	44,263,285.99	

Contingent Liabilities.

Insurance funds	$5,438,927.22	
Rolling stock and floating equipment depreciation and replacement funds	9,709,960.18	
Unadjusted accounts	3,113,770.97	
Principal of deferred payments on land contracts	1,955,786.71	
Fund for refunding outstanding old bonds of Southern Pacific R. R. Co	3,735,384.83	
Due to other Proprietary Companies	5,718,326.39	
		29,672,156.30
Difference between par value and charge on books of stocks and bonds of Proprietary Companies pledged against the issue of stocks and bonds of Southern Pacific Company		16,720,493.59
Balance to credit of Profit and Loss		156,819,607.47
Total		$1,182,594,057.43

The number of locomotives and cars of standard gauge owned, and the total and average capacity of freight-train cars at the close of the year were as follows:

Standard Gauge.	This Year.	Last Year.	+ Increase. — Decrease.	Per Cent.
Locomotives	1,873	1,858	+ 15	.81
Total weight, excluding tender (tons)	145,876	142,493	+ 3,383	2.37
Average weight, excluding tender (tons)	77.88	76.12	+ 1.76	2.31
Total weight on drivers (tons)	120,457	117,491	+ 2,966	2.52
Average weight on drivers (tons)	64.31	62.76	+ 1.55	2.47
Passenger-train cars	2,262	2,192	+ 70	3.19

EQUIPMENT.

The changes in equipment during the year were as follows:

	Condemned, Destroyed, Sold or Transferred to Another Class, and Credited to Equipment. †		Equipment.		Added and Charged to Free Asset, S. P. Co.		Total. †	
	Number.	Original Cost.	Number.	Cost.	Number.	Cost.	Number.	Cost.
Locomotives	33	$247,923.38	40	$263,468.73	8	$436,154.87	48	$699,623.63
Baggage cars	—		23		*11		12	
Baggage and mail cars	4		3		3		6	
Baggage and passenger cars	8		1		—		1	
Business cars	2		1		1		2	
Chair cars	1		—		52		52	
Dining cars	—		5		*5		—	
Other cars (electric)	—		—		10		10	
Passenger cars	43		—		61		61	
Postal cars	15		6		*7		*1	
Narrow gauge cars	14		14		1		15	
Total passenger-train cars	87	$401,772.01	53	$329,350.26	105	$1,270,471.72	158	$1,600,021.98
Ballast cars	10		230		*220		—	
Box cars	447		2		*17		*75	
Caboose cars	3		10		*10		—	
Flat cars	623		77		*61		16	
Fruit cars	14		—		—		—	
Furniture cars	17		—		—		—	
Gondola cars	31		—		—		—	
Gondola (D. B.) cars	1		—		—		—	
Gondola (H. B.) cars	19		—		*1		*1	
Logging cars	—		75		—		75	
Refrigerator cars	34		—		—		—	
Stock cars	25		—		—		—	
Tank cars	194		—		1		1	
Narrow gauge cars	200		195		—		195	
Total freight-train cars	1,618	$862,418.76	589	$357,300.29	*268	$140,112.68	271	$17,187.61
Work equipment	276	$103,934.09	375	$312,609.27	*15	$85,604.80	360	$227,004.38
Total	—	$1,616,048.24	—	$1,262,928.55	—	$1,280,969.02	—	$2,543,837.60

NOTE.—There is included in the above equipment belonging to Companies whose properties are operated under leases, viz.: 1 locomotive, 1 passenger and 2 freight cars added, the property of Hanford and Summit Lake Ry. Co.; 3 freight cars added, the property of Porterville Northeastern Ry. Co.; and 10 work cars added, and 1 locomotive, 9 passenger, and 23 freight cars vacated, the property of Sonora Ry. Co.

*Includes following narrow gauge equipment transferred between Proprietary Companies: 13 locomotives, 13 passenger cars, 195 freight cars, and 18 work cars. †Sold by Southern Pacific Company to Proprietary Companies.

The original cost and salvage value of equipment retired during the year, and the amount charged to operating expenses in respect thereof, were as follows:

	Total.	Locomotives.	Passenger-Train Cars.	Freight-Train Cars.	Work Equipment.
Original cost (estimated if not known)	$1,616,048.24	$247,923.38	$401,772.01	$862,418.76	$103,934.09
Proceeds from sale or salvage value	821,964.48	73,643.70	231,594.28	463,615.38	53,111.12
Charged to operating expenses	$794,083.76	$174,279.68	$170,177.73	$398,803.38	$50,822.97

The locomotives added during the year averaged 142.91 tons total weight of engine, without tender, and 122.45 tons upon drivers.

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STANDARD GAUGE.	THIS YEAR.	LAST YEAR.	+ INCREASE. — DECREASE.	PER CENT.
Freight-train cars	48,183	49,525	— 1,342	2.71
Total capacity (tons)	1,940,058	1,917,650	+ 22,408	1.17
Average capacity (tons)	40.89	40.41	— .25	.62
Work equipment	5,388	5,301	+ 87	1.64

The equipment owned by the respective companies is shown in Tables Nos. 25 and 26. The changes during the year, the capacity, and the service of all equipment, are shown in Tables Nos. 34, 35 and 36.

TRANSPORTATION OPERATIONS.

The results of the year's transportation operations compared with those of the preceding year are as follows:

	This Year.	Last Year.	Increase or Decrease.	Per Cent.
Average miles of railway operated	9,970.40	9,895.07	75.33	.76
OPERATING INCOME.				
Freight	$72,648,091.65	$73,677,292.78	—$1,029,201.13	1.40
Passenger	40,769,236.03	40,814,399.52	—545,161.49	1.34
Mail	2,472,768.90	2,474,263.34	—1,494.44	.06
Express	2,517,086.23	2,691,685.53	—174,599.30	6.49
Other transportation revenues	1,223,329.20	1,146,768.81	76,560.39	6.68
Revenues from operations other than transportation	1,302,541.63	1,106,618.12	195,923.51	17.70
Total, rail lines	$120,433,055.64	$121,911,028.10	—$1,477,972.46	1.21
Revenues from outside operations	11,092,114.95	10,709,511.41	382,603.54	3.57
Total gross operating income	$131,525,170.59	$132,620,539.51	—$1,095,368.92	.83
OPERATING EXPENSES.				
Maintenance of way and structures	$14,464,204.81	$15,889,129.82	—$1,424,925.02	8.97
Maintenance of equipment	16,318,140.51	15,312,205.79	1,005,934.72	6.57
Traffic expenses	3,201,366.63	2,947,063.58	254,303.05	8.63
Transportation expenses	38,270,811.05	36,524,585.10	1,746,225.95	4.78
General expenses	3,397,583.32	3,848,675.54	—451,092.22	11.72
Total, rail lines	$73,652,106.32	$74,521,659.84	$1,130,446.48	1.52
Expenses outside operations	10,838,936.91	10,483,554.02	355,382.89	3.39
Total operating expenses	$86,491,043.23	$85,005,213.86	$1,485,829.37	1.75
Net operating income	$45,034,127.36	$47,615,325.65	—$2,581,198.29	5.42
FREIGHT TRAFFIC. (Commercial Freight Only —Way-bill Tonnage.)				
Tons of freight carried	26,950,150	26,145,241	804,909	3.08
Tons of freight carried one mile	6,145,555,486	6,066,777,657	78,777,829	1.30
Ton miles per mile of road (a)	615.843	612.443	3.400	.56
Revenue per mile of road (a)	$7,123.32	$7,190.39	—$67.07	.93
Revenue per *revenue train* mile (a) (b)	$4.42	$4.51	—$0.09	2.00
Average revenue per ton per mile	1.168 cents	1.186 cents	—.018 cents	1.52
Average distance carried	228.03 miles	232.04 miles	—4.01 miles	1.73
PASSENGER TRAFFIC.				
Revenue passengers carried	40,329,011	39,989,058	339,953	.85
Revenue passengers carried one mile	1,787,640,025	1,808,133,603	—20,493,578	1.13
Revenue from passenger trains per mile of road (a)	$4,468.67	$4,570.09	—$101.42	2.22
Revenue from passenger trains per *revenue train* mile (a) (c)	$1.65	$1.78	—$0.13	7.30
Average revenue per passenger per mile	2.208 cents	2.215 cents	—.007 cents	.32
Average distance carried	44.32 miles	45.22 miles	—.90 miles	1.99

(a) Based on traffic over rail lines only, length of ferries used between rail stations excluded in distance over which traffic was moved. (b) Revenue freight train and all mixed train miles. (c) Revenue passenger train and all mixed train miles, including miles run by motor cars.

Compared with the previous year, the per cent. of operating expenses to the gross revenues was as follows:

RAIL LINES.	This Year.	Last Year.
For "Maintenance" (*Maintenance of Way and Structures and Maintenance of Equipment*)	25.56	25.59
For "Operation" (*Traffic Expenses, Transportation Expenses, and General Expenses*)	37.26	35.54
Total rail lines	62.82	61.13
Total rail lines and outside operations	65.76	64.10

The operating income and operating expenses for the year for all lines, distributed in accordance with the accounting regulations of the Interstate Commerce Commission, are shown in Table No. 29, and for each Company in Table No. 30. Details of passenger and freight traffic are shown in Tables Nos. 32 and 33.

The expenses of the rail lines for "Maintenance" decreased $148,990.30, or 1.34 per cent.; but expenses for "Operation" increased $1,549,436.78, or 3.58 per cent., a net increase of $1,130,446.48, or 1.52 per cent. The increase in expenses for "Operation" resulted from 1,539,233, or 5.61 per cent., more miles run by locomotives and motor cars in passenger service and of 680,459, or 3.54 per cent., more miles run by locomotives in freight service; from the additional expenses imposed by the requirements of the "Hours of Service" and "Full Train Crew" laws, and from higher wage schedules.

There were in service 34 gasoline and 65 electric motor cars. The mileage of these cars, 2,095,210 miles, or 8.28 per cent. of the total revenue passenger train mileage, is included in the mileage statistics.

In the following statements the details of operating expenses have been combined under titles of accounts to present the year's expenses in concise form.

At the timber-treating plants of the Companies, 2,375,830 cross ties and 17,695 switch ties were burnettized, and 667,765 cubic feet of piling and other timber were creosoted.

MAINTENANCE OF WAY AND STRUCTURES.

	This Year.	Last Year.	Increase or Decrease.	Per Cent.
Average miles of railway operated and maintained —first and additional main tracks	10,252.85	10,113.64	139.21	1.38
Ballast	$129,909.71	$224,782.13	—$94,872.42	42.21
Ties	1,908,202.60	2,004,200.00	—95,997.40	4.79
Rails	398,814.82	757,163.48	—358,348.66	47.33
Frogs, switches, and other track material	1,224,188.25	1,509,563.48	—285,425.23	18.91
Total material for roadway and track	$3,661,065.38	$4,495,709.09	—$834,643.71	18.57
Repairs of roadway and track	6,015,252.50	6,499,314.98	—454,062.48	4.99
Bridges, trestles and culverts	935,996.64	1,178,396.55	—242,399.91	20.57
Buildings, grounds, and appurtenances	2,284,330.29	2,210,535.30	73,794.99	3.34
Snow and sand fences and snow sheds	160,706.41	147,113.53	13,592.88	9.24
Electric power, telegraph, and telephone lines	142,398.65	113,589.79	28,808.86	25.36
Superintendence	948,592.10	873,995.05	74,602.05	8.54
Stationery and printing	37,380.40	39,230.62	—1,930.22	4.92
Other expenses	79,046.01	69,124.83	9,921.18	14.35
Property abandoned	169,511.43	262,120.09	—92,608.66	35.33
Total	$14,464,204.81	$15,889,129.83	—$1,424,925.02	8.97
Cost per mile—all main tracks	$1,410.75	$1,571.06	—$160.31	10.20

The expenses include $146,556.85, for extraordinary repairs to road-bed during high water in Louisiana and other protection work.

The following rails, ties, tie plates, and continuous rail joints were used in making renewals and the entire cost thereof charged to operating expenses, with the exception of $286,155.61 for increased weight of rail and improved frogs and switches charged to additions and betterments in accordance with the Classification of Expenditures for Additions and Betterments promulgated by the Interstate Commerce Commission:

	This Year.	Last Year.	Increase or Decrease.
Mileage of new steel rails (track miles)	256.82	483.11	—226.29
Per cent. of renewal of all rail in track, including sidings	1.84	3.56	—1.72
Number of new treated ties	2,161,865	2,711,334	—49,449
Number of other ties	1,446,551	1,378,821	67,730
Total number of ties	3,608,436	3,590,155	18,281
Equal to miles of continuous track	1,271.92	1,258.44	13.48
Per cent. of renewal of all ties in track, including sidings	9.14	9.27	—.13
Number of tie plates	4,069,475	5,365,865	—1,296,390
Equal to miles of continuous track	717.46	940.43	—222.97
Number of continuous rail joints	277,233	372,598	—94,875
Equal to miles of continuous track	433.94	582.19	—148.25

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The weight of rails per yard in main line and branches at the close of the year was as follows:

Miles of first and additional main tracks operated and maintained.	Total.	164 lb.	141 lb.	116 lb.	96 lb.	90 lb.	80 lb.	76 lb. and 75 lb.	70 lb.	65 lb.	61.5 lb. and 60 lb.	56 lb. and 54 lb.	52 lb. and less than 52 lb.
Main line	5,727.11	.....	1.15	.....	20.36	1,382.80	2,498.71	1,686.73	.....	.....	109.68	.98	26.70
Branches	4,669.97	.31	9.53	5.53	.02	263.52	209.70	926.98	9.44	264.43	1,431.07	404.07	1,145.37
Total	10,397.08	.31	10.68	5.53	20.38	1,646.32	2,708.41	2,613.71	9.44	264.43	1,540.75	405.05	1,172.07
Per cent. of total miles of track	100.00	.....	.10	.05	.20	15.84	26.05	25.14	.09	2.54	14.82	3.90	11.27
Per cent. last year	100.00	.....	.03	.....	.20	12.55	26.87	26.18	.09	2.61	15.92	4.08	11.47

Maintenance of Equipment.

	This Year.	Last Year.	Increase or Decrease.	Per Cent.
Locomotives	$7,320,342.48	$6,352,424.32	$967,918.16	15.24
Passenger train cars	1,801,686.66	1,840,836.49	—39,149.83	2.13
Freight train cars	4,719,238.48	5,307,918.95	—588,680.47	11.09
Work equipment	260,253.95	373,290.21	—113,036.26	30.65
Floating equipment	274,071.96	307,408.23	—33,336.27	10.84
Shop machinery and tools	355,089.96	361,183.79	—6,093.83	1.69
Superintendence	680,247.27	640,961.50	39,285.77	6.13
Other expenses	907,209.75	126,182.30	781,027.45	618.97
Total	$16,318,140.51	$15,312,205.79	$1,005,934.72	6.57

As in the past, the companies have charged to operating expenses the original cost (estimated if not known) or purchase price, less salvage, of all rolling stock condemned, destroyed, sold, or vacated from any cause during the year. The sums thus charged are reported under "Renewals" in Table No. 29, and amounted for the year to $794,083.76.

The average cost of repairs and renewals per locomotive (excluding motor cars) and per car per annum, and the average number of serviceable locomotives and cars owned during the year were:

	Average Cost per Annum. (Including original cost, less salvage of equipment vacated.) This Year.	Last Year.	Average Serviceable Number. This Year.	Last Year.
Locomotives, for repairs	$3,800.00	$3,361.12		
for renewals	93.10	155.17		
Total	$3,893.10	$3,516.29	1,872	1,803
Passenger train cars, for repairs	$794.56	$1,005.73		
for renewals	76.01	44.30		
Total	$870.57	$1,050.03	2,239	2,019
Freight train cars, for repairs	$90.16	$101.80		
for renewals	8.32	11.55		
Total	$98.48	$113.35	47,921	46,829

The rolling stock owned by the respective Companies is shown in Table No. 26, and the capacity, the service, and the average cost of maintenance, are shown in Tables Nos. 34, 35 and 36.

Traffic Expenses.

	This Year.	Last Year.	Increase or Decrease.	Per Cent.
Outside agencies	$1,090,985.55	$1,027,790.73	$63,194.82	6.15
Advertising	911,497.12	1,027,180.27	—115,683.15	11.26
Superintendence	932,737.04	638,244.61	294,492.43	46.14
Stationery and printing	228,690.27	217,047.51	11,642.76	5.36
Other expenses	37,456.65	36,800.46	656.19	1.78
	$3,201,366.63	$2,947,063.58	$254,303.05	8.63

The increase in "Superintendence" resulted principally from the transfer to this account of the salaries and expenses of the Freight Claim Department, which were last year dealt with as an item in "General Expenses."

Station and terminal service

	This Year.	Last Year.	Increase or Decrease.	Per Cent.
Station and terminal service	9,211,434.86	8,838,858.98	372,575.88	4.22
Ferry and river service	660,105.20	660,885.07	—779.87	.12
Injuries, loss, damage and other casualties	2,228,867.27	1,946,513.04	282,354.23	14.51
Superintendence	1,566,454.90	1,572,868.21	—6,413.31	.41
Stationery and printing	305,294.38	328,563.15	—23,268.77	7.08
Other expenses	119,937.82	105,534.20	14,403.62	13.65
	$38,270,811.05	$36,524,585.10	$1,746,225.95	4.78

The work done by the transportation department of the rail lines compared with that of last year is as follows:

	Increase.	Decrease.	Per Cent.
Total operating revenues	.....	$1,477,972.46	1.21
Transportation expenses	$1,746,225.95	.....	4.78
Tons of commercial freight carried one mile	78,777,829	.....	1.30
Tons of commercial and company freight carried one mile	.....	147,690,603	1.98
Mileage of cars in freight service, including caboose	.....	7,857,340	1.48
Locomotive mileage with freight and mixed trains, including helping	680,459	.....	3.54
Revenue passengers carried one mile	.....	20,493,578	1.13
Mileage of cars in passenger service (including motor cars and trailers)	4,027,604	.....	2.52
Mileage of motor cars (excluding trailers)	1,409,122	.....	205.39
Locomotive mileage with passenger and mixed trains, including helping	130,111	.....	.49
Total locomotive mileage in service for which the attendant expenses are charged to "Transportation Expenses"	648,969	.....	1.24

"Ton miles per revenue freight train and all mixed train miles."

The cost of fuel per locomotive mile run in revenue service and in non-revenue service for which the expenses are charged to "Transportation Expenses" was 17.33 cents against 17.93 cents last year.

General Expenses.

	This Year.	Last Year.	Increase or Decrease.	Per Cent.
Salaries and expenses of general officers	$320,634.44	$287,889.88	$32,744.56	11.37
Salaries and expenses of clerks and attendants	1,497,055.49	1,838,686.48	—341,330.99	18.58
Law expenses	427,668.27	306,785.83	—69,117.56	13.64
General office expenses	249,756.76	215,899.22	33,857.54	15.68
Stationery and printing	135,321.90	165,839.92	—30,518.02	18.40
Insurance	340,213.16	340,941.02	—727.86	.21
Pensions	219,374.19	182,482.41	36,891.78	20.22
Other expenses	197,559.11	310,150.78	—112,591.67	36.30
Total	$3,397,583.32	$3,848,675.54	—$451,092.22	11.72

The decrease in "Salaries and expenses of clerks and attendants" resulted principally from the transfer of the salaries and expenses of the Freight Claim Department, which were this year dealt with as an item in "Traffic expenses."

The average number of tons of freight per train, of loaded cars per train (excluding caboose), and of tons per loaded car for the year were:

Commercial and Company Freight. (Way-bill Tonnage.)	Tons per Train. Tons.	+Increase. —Decrease. Tons.	Per Cent.	Loaded Cars per Train. Cars.	+Increase. —Decrease. Cars.	Per Cent.	Per Cent. of Loaded Car Mileage to Total Car Mileage.	Tons per Loaded Car. Tons.	+Increase. —Decrease. Tons.	Per Cent.
Lines East of El Paso	354.84	—32.52	8.39	18.58	—.80	4.13	73.02+4.20	19.10	—.89	4.45
Lines West of El Paso	514.19	—13.68	2.59	25.12	—.42	1.64	71.70— .36	20.47	—.20	.97
Average all lines	455.73	—18.20	3.84	22.72	—.46	1.98	72.10+1.11	20.06	—.39	1.91

Transportation Expenses.

	This Year.	Last Year.	Increase or Decrease.	Per Cent.
Locomotives, fuel for	$9,176,120.72	$9,423,602.40	—$247,481.68	2.63
Locomotive service, other than fuel	8,229,137.42	7,520,221.55	708,915.87	9.43
Train service	6,773,458.48	6,127,538.50	645,919.98	10.54

GENERAL.

Under the requirements of the concessions granted for the construction of the railway of the Southern Pacific Railroad Company of Mexico, referred to in former reports, there were completed during the year 31.12 miles between Mazatlan and Tepic, which places the present end of track about 0.50 miles south of the station in the City of Tepic. Including the 39.50 miles of railway—Naco to Cananea, Sonora—purchased in 1902 from the Cananea Consolidated Copper Company, the completed mileage, June 30, 1912, is 982.42.

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The miles of railway projected under the concessions, the line completed, under construction, and remaining to be constructed are as follows:

	Projected. Miles.	Constructed to June 30, 1912. Miles.	Remaining to be Built. Under Construction. Miles.	To be Built. Miles.
Main Line — Empalme to Guadalajara	815.20	713.55	2.18	99.47
Branch Lines (Including Naco-Cananea Line)	691.56	268.87	—	422.69
Total	1,506.76	982.42	2.18	522.16

Under the concession as revised November 5, 1910, the time for the completion of the main line from Empalme to Guadalajara was extended to November 6, 1915, and for the branch lines to November 11, 1920.

The advances by the Southern Pacific Company for account of the construction of these lines amounted, on June 30, 1912, to $39,026,799.19. Interest charges accruing on these advances during the year have not been taken into either the assets or income of the Company.

The revolutionary depredation claims, amounting to 288,118.74 pesos, are still pending before the Mexican Government. Settlement has been retarded by the fact that the Mexican Government, since February, 1912, has been engaged in attempting to suppress an insurrection which first manifested itself in the States of Sinaloa and Chihuahua. On the main line from Empalme to Tepic, twenty-three wooden trestles, having a total length of 2,985 lineal feet, and on the Central-Tonichi Branch, four wooden trestles, having a total length of 240 lineal feet, were destroyed by the insurrectos between February 14 and June 30, 1912. Claims for compensation for the destruction of this property will be presented to the Mexican Government.

In addition to the completed lines of railway reported under "Properties and Mileage" and the railway of the Southern Pacific Railroad Company of Mexico, above referred to, construction either was completed or is progressing, on the lines of the following companies or of companies organized in the interest of the Southern Pacific Company:

	Length of Projected Line. Miles.	Track Completed. Miles.	Grading Completed. Miles.	Grading Progressing. Miles.
Central Pacific Railway:				
Fernley, Nev., to Walker Mill Junction, Cal.	135.00	—	5.59	129.41
Oregon, Nev., to Rose Creek, Nev. (second track)	47.81	17.60	30.21	
Colusa & Hamilton Railroad:				
Hamilton, Cal., to Harriogton Cal.	61.15	—	45.70	15.45
Pacific Railway & Navigation Company:				
Hillsboro, Ore., to Tillamook, Ore.	91.16	91.16		
Willamette Pacific Railroad:				
Eugene, Ore., to Marshfield, Ore.	130.00	—	8.40	121.60

A considerable part of the Company's records in its New York office in the building of the Equitable Life Assurance Society at No. 120 Broadway, were lost or impaired in the fire on January 9, 1912, which destroyed said building. Such of these records as were copies of statements received from the New Orleans, Houston, Tucson and San Francisco offices were readily replaced, and the remaining records were supplied from the full and complete details of the company's operations and transactions published annually in its reports, and the stated and special reports made to the Interstate Commerce Commission from time to time in respect of its affairs.

In the summer of 1911 the Machinists, Boilermakers, Blacksmiths, Car Repairers, and Sheet Metal Workers on the Southern Pacific and Union Pacific systems formed a federation and presented demands involving a 20 per cent increase in wages aggregating thirty-six per cent, and working rules and conditions which would have seriously abridged the Company's ability to perform its duties to the public as well as to its stockholders. The employes were so informed, but at the same time were assured that the Company was willing to continue working agreements as theretofore with individual crafts, recognizing hot without discriminating to favor of or against the different unions. A general strike was declared on September 30, 1911, and 5,189 employes of the Southern Pacific System and 3,042 of the Union Pacific System responded. Their places were soon filled, but, of course, many unskilled workmen were among those first employed and several months elapsed before all of these were replaced and the new force was brought up to the proper state of efficiency. Heavy expenses were incurred in hiring guards to protect the employes of the Company from violence and prevent damage to the Company's property, and much annoyance and inconvenience in the conduct of the Company's business ensued; but the expense, loss and inconvenience were very much less than anticipated when the strike occurred.

There has been a gratifying increase in the earnings beginning with the current fiscal year. The large crops throughout the country have given an impetus to business, and the prospects for a good business year are most encouraging. The operating income for the first six months of the enrrent fiscal year compares with that of the previous year as follows:

	1912.	1911.	Increase.
Gross revenue	$75,648,104 61	$69,069,365.41	$6,578,739.20
Operating expenses	$46,041,570.26	$43,200,884.30	$2,840,685.96
Taxes	2,916,870.21	2,633,665.40	283,204.81
Total expenses and taxes	$48,958,440.47	$45,834,549.70	$3,123,890.77
Revenue over operating expenses and taxes	$26,689,664.14	$23,234,815.71	$3,454,848.43

Under the pension system put into effect on January 1, 1903, there are carried on the pension rolls of the rail and water lines 575 employes. The payments to them for the year amounted to $229,666.79.

The accompanying report of the Vice-President and Controller shows fully and in detail the financial and other transactions of the Companies.

By order of the Board of Directors,

ROBERT S. LOVETT,
Chairman of the Executive Committee.

SOUTHERN PACIFIC COMPANY AND PROPRIETARY COMPANIES.

No. 2.—Combined Income Account for the Year Ended June 30, 1912.

(Revenues and Expenses of "Proprietary" and Non-Proprietary" Lines and Miscellaneous Income of the Southern Pacific Company and Proprietary Companies, combining details shown in Tables Nos. 10 and 16.)

Operating expenses (and taxes) of proprietary lines, interest on funded debt and all other expenses of Proprietary Companies as shown in detail in Table No. 16		$109,744,453.15
Operating expenses, taxes, and all other expenses incurred in connection with the operation of the following non-proprietary lines:		
New Mexico & Arizona R. R.	$116,819.24	
Sonora Railway	905,709.16	
		1,022,528.40
Disbursements of Southern Pacific Company (Table No. 10):		
Expenses of operating steamship lines		6,988,547.56
Interest on funded debt (Table No. 7)		3,418,562.99
Interest due to Proprietary Companies on advances and open accounts	$2,825,926.18	
Less interest due from Proprietary Companies	1,106,379.40	
		1,719,346.78
Rental to Central Pacific Ry. Co.		10,000.00
Rental to Nevada & California Ry. Co.		3,333.33
Rental to Oregon & California R. R. Co.		5,000.00
Rental to Southern Pacific R. R. Co.		10,000.00
Taxes		193,382.26
General and miscellaneous expenses		52,516.65
Annual payment for redemption of San Francisco Terminal bonds		5,000.00
Reserve for depreciation of rolling stock owned and leased to other companies		854,060.67
Cost of surveys written off		30,242.67
Cost of examinations for water power written off		65,449.09
Balance to profit and loss (Table No. 3)		21,693,152.98
Total		$147,725,576.63

Revenues of proprietary lines and miscellaneous income of Proprietary Companies as shown in detail in Table No. 16		$127,996,250.42
Revenues of the following non-proprietary lines:		
New Mexico & Arizona R. R.	$60,176.94	
Sonora Railway	743,957.80	
		804,134.74
Revenues of Southern Pacific Company (Table No. 10):		
Gross revenues from operation of steamship lines		7,382,431.96
Interest on bonds owned of Proprietary Companies (Table No. 4)		1,847,879.84
Interest on bonds owned of companies other than Proprietary Companies (Table No. 5)		2,670,043.49
Dividends on stocks owned (Table No. 6)		1,061,983.94
Rentals from lease of road		1,669,537.17
Hire of equipment		2,248,822.50
Rentals from lease of joint tracks, yards, and terminal facilities		12,511.96
Miscellaneous rentals		35,005.93
Proceeds from sale and lease of lands		43,357.09
Balance of interest on loans and on open accounts other than with Proprietary Companies		1,937,001.32
Miscellaneous income		14,616.27
Total		$147,725,576.63

SOUTHERN PACIFIC COMPANY AND PROPRIETARY COMPANIES.

No. 3.—Combined Profit and Loss—Year Ended June 30, 1912.
(Combining details as shown in Tables Nos. 11 and 17.)

Dividends on stocks of Proprietary Companies, viz.:		
Central Pacific Ry. Co. preferred		$692,000.00
Central Pacific Ry. Co. common		4,036,530.00
Houston, East & West Texas Ry. Co.		211,200.00
Hooston & Shreveport R. R. Co.		120,000.00
Iberia & Vermilion R. R. Co.		150,000.00
Louisiana Western R. R. Co.		336,000.00
Morgan's Louisiana & Texas R. R. & S. S. Co.		600,000.00
Southern Pacific R. R. Co.		9,600,000.00
Southern Pacific Terminal Co.		120,000.00
		$15,865,730.00
Less paid to:		
Southern Pacific Company	$15,714,887.00	
Morgan's Louisiana & Texas R. R. & S. S. Co.	150,000.00	
		15,864,887.00
		$843.00

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Dividends on common stock of Southern Pacific Co., viz.:	
One and one-half per cent. paid January 2, 1912	$4,090,086.08
One and one-half per cent. paid April 1, 1912	4,090,086.08
One and one-half per cent. payable July 1, 1912	4,090,086.08
One and one-half per cent. payable October 1, 1912	4,090,086.08
	16,360,344.32
Discount and commissions on securities sold	3,149,516.12
Difference between cost on books and amount received for property sold	109,455.37
Cost on books, less salvage, of property abandoned	208,407.34
Uncollectible accounts written off	34,385.50
Fund for refunding outstanding old bonds of Southern Pacific R. R. Co.	2,500,000.00
Advances to collateral enterprises, written off	150,278.72
Payment of old accounts	3,396.58
Losses San Francisco fire, April, 1906	44,757.51
Miscellaneous payments	24,001.13
Adjustment in accounts	410.91
Balance June 30, 1912, viz.:	
Southern Pacific Company	$66,839,197.53
Proprietary Companies	89,980,409.92
	156,819,607.47
	$179,405,433.97

Balance June 30, 1911, viz.:	
Southern Pacific Company	$64,137,198.01
Proprietary Companies, including expenditures for additions and betterments paid for out of income—Table No. 17	$87,022,899.43
Balance from income account (Table No. 2)	$151,160,097.44
Proceeds from sale of unpledged lands	21,603,152.98
Proceeds from sale of lands pledged for the redemption of bonds	126,740.11
Collection of old accounts	4,948,686.63
Annual payments to sinking funds and income from sinking fund investments	4,354.20
Profit on stocks and bonds sold	576,769.11
Difference between cost and face value of $690,500 Central Pacific Ry. Three and One-Half Per Cent., $26,000 Central Pacific Ry. First Refunding Four Per Cent., $12,000 Southern Pacific R. R. First Refunding Mortgage Four Per Cent. and $5,000 Southern Pacific Co. San Francisco Terminal First Mortgage Four Per Cent. Bonds purchased and retired	263,931.07
Contingent liabilities written off	62,125.38
Miscellaneous receipts	261,475.60
Old accounts written off	163,851.71
Nevada & California Ry. Co. liquidation	10,310.55
Interest accruing prior to July 1, 1911, on bonds owned	96,185.77
	177,757.32
	$179,405,433.97

NO. 12—SOUTHERN PACIFIC COMPANY—ASSETS—JUNE 30, 1912.

Assets.	June 30, 1912.	June 30, 1911.
Capital Assets.		
Stocks and bonds owned—Tables Nos. 13, 14 and 15	$379,704,317.62	$342,139,975.55
Bay Shore Line Terminals, and other real estate	37,998,537.00	36,647,704.94
Timber treating plants, saw mills, and other property	349,879.89	389,723.95
Steamships and other floating equipment—Table No. 25	13,757,104.89	13,767,289.43
Rolling stock—Table No. 24	20,217,267.00	18,847,153.50
Advances for Oakland—Berkeley electric lines	9,001,020.46	6,578,294.90
Advances for construction and acquisition of new lines	18,243,976.28	42,550,193.07
Advances to Southern Pacific Railroad Co. of Mexico	39,026,799.19	38,138,720.60
Advances to electric lines in California and Oregon	9,773,318.12	14,244,845.22
Advances to Kern Trading & Oil Co.	8,523,255.92	5,129,821.49
Advances to Pacific Fruit Express Co.	1,214,923.37	2,208,492.79
Lands and other investments	2,859,564.49	2,531,599.07
Advances to Southern Pacific Land Co.	3,560,000.00	.....
	$544,229,964.23	$523,173,014.51
Sinking funds	635.41	295.83
	$544,230,599.64	$523,173,310.34
Current Assets.		
Cash	$10,418,074.64	$11,139,809.25
Time loans and deposits	250,000.00	24,963,456.67
Loans and notes receivable	1,167,198.74	1,023,927.54
Agents and conductors	1,495,942.60	1,098,284.52
Income accrued to June 30, on securities owned	2,261,059.36	1,247,131.30
Individuals and companies	2,626,585.25	2,744,429.42
U. S. Government transportation	805,268.08	780,796.19
Material and supplies	11,651,972.14	13,895,338.50
Union Pacific Railroad Co. bond purchase notes	23,740,362.22	.....
	$54,416,463.03	$56,893,173.39
Deferred Assets.		
Individuals and companies	.....	$461,074.69

Proprietary Companies.		
Direct Navigation Co.	$59,418.81	$38,789.18
Galveston, Harrisburg & San Antonio Ry. Co.	10,989,463.33	10,575,823.87
Houston, East & West Texas Ry. Co.	29,379.11	.....
Louisiana Western R. R. Co.	58,090.00	83,462.87
Morgan's Louisiana & Texas R. R. & S. S. Co.	1,769,416.63	1,598,248.49
Nevada & California Ry. Co.	.....	199,723.84
Oregon & California R. R. Co.	3,178,670.46	3,771,116.87
Texas & New Orleans R. R. Co.	412,322.18	48,496.54
	$16,496,760.52	$16,315,661.66
Due from other Proprietary Companies	$667,598.01	$537,779.77
Contingent Assets.		
San Antonio & Aransas Pass Ry. Co.*	$1,843,607.15	$1,754,700.09
Individuals and companies	364,367.14	380,321.37
Unadjusted accounts—Proprietary Companies	15,153.05	109,885.69
Expended for account of Colorado River Crevasse	4,049,434.95	4,040,648.61
	$6,274,562.29	$6,285,555.96
Total assets	$622,085,893.49	$603,666,555.81

*Includes $1,898,000, face value, San Antonio & Aransas Pass Ry. Co. Income Four Per Cent. Bonds at 5 per cent. of their face value. Interest on these bonds is payable on January 1st of each year, if earned, out of net earnings and income.

NO. 12—SOUTHERN PACIFIC COMPANY—LIABILITIES—JUNE 30, 1912.

Liabilities.	June 30, 1912.	June 30, 1911.
Capital Liabilities.		
Common Stock	$272,672,405.64	$272,672,405.64
Preferred stock called for redemption but not presented	3,325.00	3,325.00
Total capital stocks	$272,675,730.64	$272,675,730.64
Four per cent. gold bonds (Central Pacific Stock Collateral), due August 1, 1949	$34,218,500.00	$28,769,500.00
Four per cent. twenty-year convertible bonds, due June 1, 1929	$1,148,000.00	$1,148,000.00
Four per cent. convertible bonds—subscription receipts and scrip	3,910.00	3,910.00
Four and one-half per cent. twenty-year gold bonds, due July 1, 1929	227,000.00	227,000.00
San Francisco Terminal first mortgage four per cent. bonds, due April 1, 1950	24,990,000.00	18,995,000.00
Total funded debt	$140,587,410.00	$129,143,410.00
	$413,263,140.64	$401,819,140.64
Current Liabilities.		
Coupons matured but not presented	$136,919.50	$92,609.50
Coupons due July 1	3,305,132.50	3,104,232.50
Interest accrued on bonds and loans to June 30, but not due	4,608,182.85	3,971,133.33
Dividends due—unpaid	29,718.16	139,956.96
Dividends due, July 1 and October 1	8,180,172.16	8,180,172.16
Traffic and car service	1,007,989.95	653,076.76
Due to Union Pacific Railroad Company	12,000,000.00	20,007,305.41
Vouchers and payrolls	7,531,340.57	7,646,407.53
	$36,799,455.69	$43,804,894.15
Deferred Liabilities.		
Pacific Mail Steamship Co.	$93,697.40	$79,567.35
Taxes assessed but not due	548,104.00	439,935.60
Wells Fargo & Co.'s Express contract	80,000.00	112,000.00
Sinking fund uninvested	635.41	295.83
Individuals and companies	458,208.34	.....
	$1,180,645.15	$631,798.78
Proprietary Companies.		
Central Pacific Ry. Co.	$29,416,986.98	$34,639,092.32
Houston, East and West Texas Ry. Co.	.....	264,723.30
Houston & Shreveport R. R. Co.	47,397.91	22,850.52
Houston & Texas Central R. R. Co.	1,161,502.80	1,196,952.80
Southern Pacific Railroad Co.	50,119,915.10	39,623,464.90
Southern Pacific Terminal Co.	12,521.21	4,133.10
	$80,758,328.33	$76,141,217.14
Due to other Proprietary Companies	$6,385,834.40	$2,313,064.67
Contingent Liabilities.		
Marine insurance fund	$3,163,535.48	$3,175,954.02
Steamship insurance fund	1,607,697.54	1,607,697.54
Floating equipment replacement fund	6,434,380.10	5,371,633.83
Reserve for replacement and depreciation of rolling stock	2,021,813.92	1,253,188.65
Insurance fund	507,193.52	353,199.16
Unadjusted accounts	3,054,573.37	2,743,926.39
Principal of deferred payments on land contracts	70,097.80	113,252.83
	$16,859,291.73	$14,819,242.42
Total liabilities	$555,246,695.94	$539,329,357.80
Balance to credit of profit and loss	66,839,197.55	64,137,198.01
Total liabilities	$622,085,893.49	$603,666,555.81

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY,
83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies, 15 cents each	

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.0C.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,250 copies were printed; that of these 8,250 copies, 6,900 were mailed to regular paid subscribers and 154 were provided for counter and news companies' sales; that the total copies printed this year to date were 86,250 copies—an average of 8,626 copies a week.

VOLUME 54. MARCH 7, 1913. NUMBER 10.

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*Illustrated.

THE policy of the Hungarian State Railways in establishing standards of performance for its motive power and rolling stock, as outlined by H. W. Jacobs in an article in this issue, is to be heartily commended. While the conditions in this country cannot be compared with those in Hungary, the necessity of keeping more intelligent records of the performance and repair of our cars and locomotives is just as important and probably more so than it is in that country. No organization or business can expect to succeed without well defined aims, and records which make it possible to see just how closely these aims are being attained. The repair and performance of equipment in charge of the mechanical department is so complicated and extensive that such records should be even more important than in an ordinary business. A superintendent of motive power said recently that with an additional expenditure of $6,000 for clerical assistance, which would be necessary to establish certain records, he would guarantee to save $200,000 a year for his company. Records are being compiled on some roads which are comparatively useless, because those in authority do not understand how to make proper use of them, or because the information is not complete, or is inaccurately compiled. Conditions should be carefully analyzed so that it will be possible to know just what any piece of equipment should cost to maintain and keep it in repair for a certain unit of performance. The records should then be arranged to show almost at a glance just what cars or locomotives are exceeding the standard allowances which have been set, so that those in charge may confine their energies to investigating the exceptional cases. In other words those at the head of the organization should have available for ready use complete and up-to-date data which will give them a clear idea of conditions throughout the system, so that they may direct their energies to bringing up the efficiency of such of the various branches of the department as may fall below the standards set.

WE publish elsewhere extracts from an address made by John B. Olmsted just before his recent retirement as a member of the New York Public Service Commission, Second district. Mr. Olmsted's frank statement of the change that his experience as a member of a regulating commission made in his attitude toward public utility corporations, and especially railways, will perhaps, surprise many persons. It will interest, but not surprise those who, whether as students or public officials, have themselves begun the investigation of public utility questions with the anti-corporation bias that Mr. Olmsted admits he had, and who have, like him, honestly tried, during a considerable period, to ascertain the exact facts about public utility businesses and to draw just conclusions from them. There are few cases of persons who have had this experience, whether as university professors, publicists, law-makers or public utility commissioners, who have not come to think and feel much as Mr. Olmsted does. It is a fact often commented on that it is the new members of commissions who, being new, know little about the businesses they regulate that are the most radical, and the older members who know the most about them who are the most conservative. The difference between an inexperienced and an experienced public utility commissioner is a good deal like the difference between an efficiency engineer and an experienced railway officer. The new commissioner, like the efficiency engineer, can point out many conditions and results that are unsatisfactory. But usually their discoveries afford little new information to the managers of the utilities. The managers know already the conditions and results that are unsatisfactory. What they want is somebody to tell them how to improve them. Only the experienced know how hard it is to devise and apply remedies, and why this is so. As Mr. Olmsted indicates, a commission armed with power thoroughly to investigate the manufacturing, or mercantile, or banking, or farming business could uncover as many things to find fault with as public utility commissions can find in any public utility business. But, as Mr. Olmsted says, such a commission would be met, as public utility commissions are now met, "with the objection that its suggestions require too much of an outlay to carry them out, and would be asked how it proposed to provide the funds for the improvements recommended." We commend his next sentence to regulating bodies and the public as the summation of all wisdom in public regulation of business: "Let us be reasonable as well as critical."

THERE are two points suggested by the passage of the bill providing for a valuation of railroads that deserve consideration separately from the question of what will be shown by such a valuation. The New York, New Haven & Hartford had an independent appraisal of its property made by John F. Stevens and a statement of the valuations of these properties

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was made as of June 30, 1908, this statement being compiled by Price, Waterhouse & Company. This was an attempt to get at an entirely independent and fair valuation of a railroad property. The work was left entirely in the hands of Mr. Stevens as independent engineer in charge, and the statistical and legal basis of the valuation was left to Price, Waterhouse & Company. The cost of the valuation of the steam road property alone was $139,456. The New Haven operates only about 4,674 miles of all tracks, including sidings, out of the total of 362,709 miles of all tracks of all railroads whose operations are under the jurisdiction of the Interstate Commerce Commission. It is safe to say that if a valuation is to be made by thoroughly competent engineers and statisticians it will be a very expensive undertaking. One thing is certain: If the valuation is to be made at all it should be made by the best men available, and the Interstate Commerce Commission now has the weighty responsibility of selecting these men. No better plan could be devised than that suggested by L. F. Loree in his statement before the Senate Committee before the passage of the bill. He proposed that the commission be directed to constitute and employ a railroad valuation board to consist of nine members, three to be selected by the commission, three to be nominated to the commission by the American Railway Association, and one each to be nominated to the commission by the chief engineer of the Army, by the chief of the Bureau of Steam Engineering of the Navy, and by president of the American Society of Civil Engineers. This suggestion was ignored by the committee, but the commission has plenary powers in the premises. It is now squarely up to the commission to select examiners—economists, accountants and engineers—who shall be competent to conduct such a complicated and nice investigation as is contemplated by Congress. If the New York, New Haven & Hartford, for its own purposes, found that it was advisable to engage an engineer of Mr. Stevens' reputation and experience, and a firm of accountants of the standing of Price, Waterhouse & Company, surely it is expedient for the Interstate Commerce Commissioners to call on the best authorities which they can avail themselves of, to help them in their selection of a board of examiners.

THE "Safety-First" meeting to be held at Pittsburgh next Monday is to be managed, as announced by the Pennsylvania Railroad, "by the employees, for the employees." In other words the officers, so far as practicable, will keep their hands off. Of course, it cannot be that they intend to keep their minds off. All hands, high or low, will, no doubt, give energetic support. Everything that can reasonably be done to keep superintendents, trainmasters, road foremen, enginemen, conductors, yardmasters and shop foremen well acquainted with each other is profitable for the service, and co-operation in the management of these lectures is one good means of accomplishing such a purpose. The action of the Pennsylvania, therefore, is to be commended. We cannot believe that any weight should be accorded to the ill-natured charge that railroad officers have had some sinister motive in urging employees to safeguard their own lives and limbs, and we have seen no such charge in any reputable publication; but frank co-operation is highly desirable regardless of any criticism. We do not say that these different classes should be brought into sympathy, for 95 per cent of them are in sympathy already; but there is need of acquaintance to make that sympathy fruitful for efficient railroading. The engineman or shop foreman who has the temperamental and other gifts qualifying him to see through the superintendent's eyes, and who can talk to his fellows convincingly, has an important function in the railroad world. This has been demonstrated on the New York division of the Pennsylvania already. At the meeting held at Trenton, N. J., this week (announced in our last issue, page 399) the lecturers gave not only the usual assortment of stereopticon views, but also displayed on the screen enlargements, from the rule-book, of a large number of "don'ts" enabling their hearers to refresh their memories more effectually in a half-hour than they could otherwise do in a period three times as long—more effectually, in fact, than would be done by any amount of simple reading from the book; for the oral emphasis and the presence of other learners constitute a valuable mental stimulus. This use of the printed word on the screen—now so familiar in the moving picture shows—suggests the desirability of allowing men in the audience to ask questions; of converting the lecture into a conversazione—if we may be allowed such a "literary" expression. The "Safety-First" propaganda is essentially a teaching process, and the best teaching always implies talking by the pupils as well as by the teacher. A dozen questions often do more good than ten times as much talk from the lecturer. It would be easy, of course, to spoil a meeting by allowing too many questions from the ignorant and from persons who are offensively talkative; but the present suggestion is intended for those who are willing to do hard and thorough preparatory work, with a view to making their safety lectures of the utmost benefit. Why should not every railroad secure for this purpose the aid and counsel of the most accomplished lecturers and teachers? It will be necessary to make safety lectures attractive in order to avoid the deadening effect of sameness and tiresome repetition. The railroad officer who has sat on rule-revising committees for days at a time, can endure the tedium of considering and reconsidering the same idea a dozen different times or in a dozen different ways; but if he wishes to get brakemen and shopmen to look at things in this way—which will be necessary if they are going to learn to be always careful—he will have to apply first-quality skill to the process.

RAILWAY HOTELS AND EATING HOUSES.

ON account of limitations of space the description of the Grand Trunk hotel at Ottawa, published in this issue, does not contain sufficient detail to convey to the reader an adequate idea of the completeness of its appointments and the beauty of its architectural lines and interior furnishings. This structure is worthy of the attention of railway executive officers, not so much because it is the finest hotel in Canada's capital city, as because it represents the policy of the Grand Trunk in common with other Canadian roads to build and operate such first class hotels. These railway hotels are familiar to everyone who has traveled in Canada, and are almost uniformly recognized as the best in their respective cities.

The Canadian Pacific was the first to enter this field, and its Chateau Frontenac in Quebec, Place Viger in Montreal and Royal Alexandra in Winnipeg are all well established houses. The Canadian Pacific also has fine hotels in Vancouver and Victoria and is building a new one in Calgary which will be ready for occupancy late next summer. A series of resort hotels in the Canadian rockies is also operated by this company, being located at Banff, Laggan, Fields and Glacier. The Canadian Northern operates the Prince Arthur at Port Arthur and the Prince Edward at Brandon. The Grank Trunk, in addition to the Chateau Laurier at Ottawa, is building the Fort Garry at Winnipeg, the MacDonald at Edmonton and others at western cities along the new extension to the Pacific coast.

There are two general advantages to be gained by operating a system of hotels which includes also good lunch rooms at stations. Such facilities may be used to increase passenger traffic; and in most cases they can be made to earn a net revenue. Travelers naturally choose the road which has the best facilities of this kind, other things being equal. In the keen competition for passenger traffic, the road that can offer the most convenient and efficient service of the various kinds required by travelers, has a real advantage over competing lines. Hotels built by a railway company are naturally located conveniently in relation to that company's stations—a circumstance which quite often influences the choice of route of a traveler leaving the city. While the reports of the Canadian roads do not show the net revenue from hotels and dining rooms, the ability to buy supplies in large quantities for a large number of such places, and the excellent patronage at good rates which is practically assured,

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should make their operation profitable. It is known that on some foreign lines, as, for example, the South African railways, this service is made to earn a very appreciable revenue.

The service furnished in lunch rooms and hotels run in connection with railway stations on roads in this country usually contrasts unfavorably with that in Canada. The general practice in the United States is to sell hotel and eating house concessions to outside persons or concerns at each point and allow them to furnish such service as they see fit. Travelers in the United States often have unpleasant experiences in commercial establishments located in station buildings or adjacent to stations, which are known as "railway hotels" and officially recognized by the railway company, and a large part of the traveling public has come to think of eating in railway lunch rooms as a thing to be done only when unavoidable. The dining rooms in large terminal stations in this country often are good; but many even of these are very poor. There are railway hotels and dining rooms, especially on some of the roads in the Southwest, conspicuous among them being the Santa Fe's, that afford excellent examples of the good service that such places can offer. Typical among the good hotels on the Santa Fe are those at Barstow, Calif.; Hutchinson, Kan., and Albuquerque, N. M., and one of the very good resort hotels used by it as an advertising feature is one at Grand Canyon, Ariz.

The public has no right to demand that railways furnish anything but transportation. But travelers will often criticise the companies for not seeing that the incidental comforts of travel are easily available and praise them for providing these comforts, and there is an obvious advantage in getting all the praise and escaping all the censure possible.

THE FEDERAL VALUATION LAW.

AFTER several years' discussion of the subject a law providing for a valuation of all railways by the Interstate Commerce Commission has been passed by Congress. The enactment of such legislation a few years ago would have caused much concern among railway managers. It now gives rise to little or no apprehension on their part. The legislation has a dual purpose. One is to ascertain whether, as is often charged, the railways are over-capitalized. The other is to furnish a basis for the regulation of rates. The word "valuation" is currently used in two different senses. (1) A thing is usually deemed worth what it will sell for, and what it will sell for depends on the profits it will earn. (2) The sense in which the word valuation is used in the discussion of railway and other public utility matters is the ascertainment of what a property ought to be worth as a basis for determining what it ought to be allowed to earn.

Many persons, including most railway managers, do not agree that railway rates should be based on a valuation. One of their objections is that the plan is impracticable. Different railways compete for business, and the valuation placed on two competing railways may be substantially the same, while the amount of business handled by them is widely different. The rates between competitive points on the two must be the same, but on the same rates the two roads will necessarily earn very different profits. The answer made to this is that the entire situation should be considered, and rates so adjusted as to do justice to all the competing carriers. It is hard to see how by regulating rates thus on the basis of valuation equity could be done between all competing lines. A second objection made to the use of valuation as a basis for regulating rates is that rates should be based chiefly on the value of the service rendered to the shipper and the traveler, and not on its cost to the carrier, and that if the rates themselves are reasonable the profit made by charging them must be reasonable. Economists and regulating authorities, including the Interstate Commerce Commission, recognize the fact that the value of the service principle must govern to a large extent in fixing the relations between rates on different commodities and on the same commodity when moving between different points. The purpose for which they have advocated valuation is to ascertain, not whether each individual rate is reasonable, but whether the rates as a whole are so. Regardless of whether valuation is or is not a fair measure of the reasonableness of the entire schedules of rates, it is evident that it is going to be used in the future as the main measure.

The popular impression is that the railways of the United States as a whole are largely over-capitalized, that they are paying a return on their watered stock and that they are charging excessive rates to do so. The railway managers deny that the roads as a whole are over-capitalized. The average net return on the total capitalization has never equaled six per cent. It follows, if the managers' contention is correct, that on the theory of those who have advocated valuation the rates charged are not excessive. Valuation having been adopted by law as one, if not the main, basis for the determination of the reasonableness of rates, it becomes important that any valuation made shall be fair. To be fair a valuation must include all of the factors that should be considered in determining what railway properties ought to be held to be worth.

It is gratifying that the bill passed by Congress seems to provide fully for a valuation that shall include all important factors The law instructs the commission to ascertain the original cost to date, the cost of reproduction new, and the cost of reproduction less depreciation, and to present in its report an analysis of the methods by which these several costs are obtained and the reason for the differences between them, if any. The commission is also to ascertain and report separately all other elements of value, if any. This would include allowances for franchises, and going value, if the commission decided any such allowances should be included. One of the most important questions pertaining to valuation is how the land used for right of way and terminals should be appraised. Some contend that the appraisal should be based on the original cost, others that it should be based on what it would cost to acquire the land now. The valuation law requires both the original cost and the probable present cost to be found. It also contains a provision which will permit a carrier, in case of an appeal from the commission to the courts, to attack the valuation made by the commission and to present evidence to the court to show that the commission has erred in not giving weight to elements of value which the carrier believes should be included. Should the court uphold the contention of the carrier it will refer the matter back to the commission with instructions to revise its valuation so as to include the omitted elements. In brief, the provisions are broad enough to require the commission to give weight to all elements of value, and if the commission fails to do so to permit the roads to get orders from the courts requiring it to do so.

The large estimates that repeatedly have been made regarding the amount of water in the capitalization of the railways will lead many to expect the total valuation to fall far short of the total capitalization. It seems very much more probable that a valuation made in accordance with the provisions of the new law will exceed the net capitalization. There doubtless will be many instances where the valuations of individual roads will be less than their capitalizations. Probably, however, there will be many more important cases where the valuations will exceed the capitalizations; and there is much more ground for expecting that the total valuations will exceed the total capitalization than for expecting the opposite. Valuations of railways have been made in several states, and they have exceeded the capitalizations in more cases than the capitalizations have exceeded them. Furthermore, no valuations have been made in the states where the largest values are concentrated in big terminals. There are large terminals at the Twin Cities and Duluth in Minnesota, and on Puget Sound in Washington, and in both of these states the valuations exceeded the capitalizations.

Several state commissions are now engaged in making valuations. The federal law provides that the investigation to be

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made by the Interstate Commerce Commission "shall show the value of the property of every common carrier as a whole and the value of its property in each of the several states and territories and the District of Columbia." In view of this provision it seems reasonable to expect that the state valuations now under way will be discontinued, or at least that no more will be undertaken. The cost to both the public and the carriers of making a single thorough appraisal will be large, and it would seem that no good can come from the expenditure that would be involved in duplicating the work.

THE PENNSYLVANIA AND THE NEW YORK CENTRAL.

BOTH the Pennsylvania and the New York Central & Hudson River earned in 1912 the largest revenue in their history. Both felt many of the same economic forces which are at work in shaping contemporary railroad development. While the effect of the same forces on these two eastern trunk lines is often widely different, and their ways of meeting new conditions can more often be contrasted than compared, it is, nevertheless, possible to get two independent points of view on the results of the working out of both the same federal and economic laws* by a study of the annual reports of both.

The Pennsylvania Railroad operates directly 4,025 miles of line. The Pennsylvania Railroad Company is the parent company for all of the Pennsylvania system. Through stock ownership directly or indirectly it controls or has affiliated with it all the lines which go to make up this Pennsylvania system, which comprises a mileage of 11,557, and which in 1912 had total revenues amounting to $374,096,000. The present comments and figures, however, apply to only the operations of the Pennsylvania Railroad, which had total operating revenues in 1912 of $174,608,000, which was $17,120,000, or 10.87 per cent., greater than the revenues in 1911, there being practically no change in mileage.

The New York Central & Hudson River operates 3,791 miles of road. The New York Central & Hudson River Railroad Company is the parent company for all the New York Central Lines, which include approximately 13,000 miles. The figures given in these comments, however, apply only to the lines *operated*, the revenue from which in 1912 amounted to $109,900,000, which was an increase of 5.7 per cent. over 1911, with practically no change in mileage. The Pennsylvania Railroad had operating revenues in 1912 of approximately $43,000 per mile of road operated, comparing with operating revenues on the New York Central of $29,000 per mile of road operated. The Pennsylvania gets an average ton mile rate on its freight of 5.83 mills, and a passenger mile rate of 1.962 cents. The New York Central gets a ton mile rate of 6.26 mills, and a passenger mile rate of 1.766 cents. The average ton mile rate on both the Pennsylvania and the New York Central was slightly less in 1912 than in 1911, due to changes in the character of traffic carried. There were no important changes in freight rates on either road. Of the total tonnage carried, 61 per cent. on the Pennsylvania is furnished by products of mines, and 47 per cent. on the New York Central.

The density of revenue freight tonnage per mile of all track, including sidings, is 2,245,000 on the Pennsylvania and 1,127,000 on the New York Central. The density of passenger mileage per mile of all tracks is 188,000 on the Pennsylvania and 203,000 on the New York Central. These figures, taken in connection with a careful study of the accompanying map, give a general, but fairly vivid impression, of the difference between these two great eastern trunk line properties. The tangle of lines in the coal region north of Altoona gives an impression of competition for coal business which is accurate only if corrected by the additional fact that while the New York Central carries about 12,500,000 tons of bituminous coal a year, the Eastern Pennsylvania division alone of the Pennsylvania carries 31,990,000 tons, and the entire Pennsylvania 46,420,000.

The relative importance from the point of view of total revenues of a general improvement in industrial conditions to a railroad like the Pennsylvania, depending so largely on its coal and on products originating in the Pittsburgh district, and of an extraordinarily large crop and prosperous general business conditions to a road like the New York Central, which handles a comparatively large tonnage of grain and serves commercial cities rather than manufacturing cities, is well shown by the respective increases of nearly 11 per cent. in the Pennsylvania revenue and of between 5 and 6 per cent. in the New York Central revenue.

With its increase of nearly 11 per cent. in revenue, the Pennsylvania was able to save net $42,154,000 available for dividends, which is greater by $4,020,000, or — per cent., than the net in 1911. The New York Central had $13,880,000 net available for dividends, which is less by $1,420,000 than was available at the end of 1911. This widely different result in net is not by any means all due to disproportionately increased expenses on the New York Central, as will be explained more fully later.

The Pennsylvania operated in 1912 on a 72.53 per cent. basis and the New York Central on a 73.99 per cent. basis. The Pennsylvania's operating ratio was greater by 0.63 per cent. in 1912 than in 1911 and the New York Central's by 1.17. Of its total operating revenues the Pennsylvania spent 33 per cent. for maintenance in 1912, or 2 per cent. more than in 1911, and the New York Central spent 32 per cent. in 1912, or 1.6 per cent. more than in 1911. Transportation expenses consumed 36 per cent. of total operating revenues on the P. R. R., or 1 per cent. *less* than in 1911, and 37.2 per cent. on the N. Y. C., or 0.2 per cent. *less* than in 1911. The policy in regard to expenses, which is dependent to a certain extent on the disposition of the management, was the same on both the P. R. R. and the N. Y. C., and the trend of expenses over which the management has control only to a certain extent was the same on both roads; but both in the case of maintenance and cost of transportation the P. R. R. results are rather more striking than those on the N. Y. C.

Total operating expenses amounted to $126,638,000 in 1912 on the P. R. R., an increase of $13,410,000, or 11.84 per cent; while total operating expenses on the N. Y. C. & H. R. amounted to $81,311,000, which is $5,611,000 more than in 1911.

After the payment of operating expenses and taxes the Pennsylvania had $39,693,000 net, an increase over the previous year of $3,755,000; while the New York Central had $23,010,000, a decrease of $118,000.

Despite the increases in traffic, which necessitated greater absolute expenditures for transportation proper, both roads were able to show lower ratios for these expenses to gross revenue. This is a very important fact. In 1907, when the railroads of the country were carrying the largest tonnage up to that period in their history, transportation expenses generally mounted up relatively more rapidly than gross revenue. Of course, weather conditions in the present winter up to the end of December were favorable; but it must be remembered that the calendar year includes January and February of last winter, months in which weather conditions were unusually severe over the whole country.

On both roads the increase in earnings was made the occasion for notably heavier expenditures for both maintenance of way and maintenance of equipment. The New York Central spent

*The New York Central & Hudson River and the Pennsylvania Railroad are not, of course, comparable. They are, however, instructive to use as contrasts one with the other. It should be borne in mind that no attempt is being made here to criticise one road by contrasting it with the other, or in fact draw comparisons at all in that sense. There are many figures that are used in these comments that differ widely between the Pennsylvania and the New York Central, which difference might be fully and instructively explained by an exhaustive description of conditions on each road. The same, however, could be said of two different grand divisions of the Pennsylvania Railroad itself. The fact is that the different lines going to make up the Pennsylvania Railroad are often as unlike each other in conditions as are certain divisions on the Pennsylvania Railroad and the New York Central, and the same is true as between different divisions of the New York Central and certain divisions on the New York Central and the Pennsylvania.

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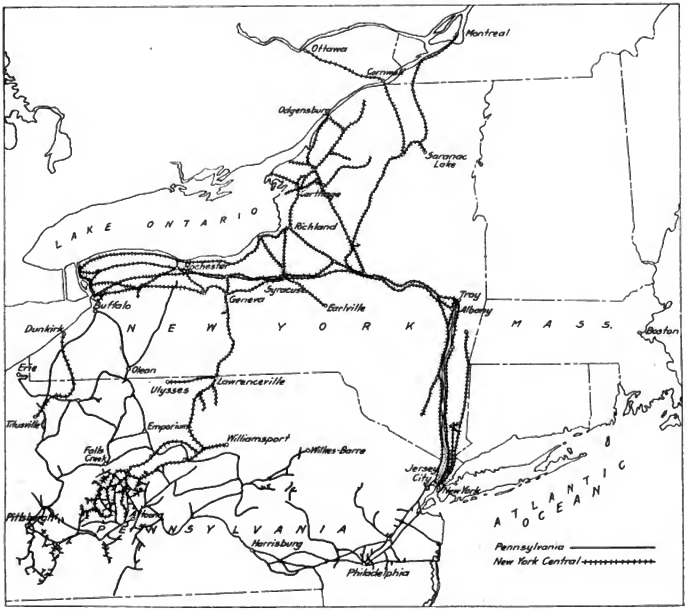
$20,440,000 for maintenance of equipment, an increase of $2,302,000 over 1911, and the Pennsylvania spent $36,088,000 in 1912, an increase of $5,508,000 over 1911. One is led to surmise that the New York Central *spent* more for repairs in 1912 than in 1911, partly because it felt that it could afford to be more liberal and partly because the increased traffic necessitated heavier expenditures, while on the other hand the Pennsylvania not only *spent* more for repairs because the increased traffic called for heavier expenditures, but a very appreciable part of the heavier appropriations for maintenance of equipment was due to heavier *charges* for depreciation.* Even in 1911 the P. R. R. was making very liberal expenditures for repairs.

In making a comparison as between different roads, of standards of upkeep, the tendency is generally to take average figures which contain so many variables that an accurate comparison is impossible. Conditions are so unlike on the P. R. R. and the New York Central that a comparison of the total cost of maintenance of way and structures per road mile or per track mile is not of much value. On the other hand, when we take expenditures per mile of first, second, third, etc., track, exclusive of side tracks, for specific accounts, such as rails and ties, we get a rather interesting idea of what the two roads are doing. The Pennsylvania Railroad in 1912 spent on an average $153 per track mile for rail renewals. This, of course, includes only the cost of delivery of the rails at the point of placing them in track, but not unloading them or placing them in track. The New York Central spent on the same account $199 per track mile. The Pennsylvania spent $459 per track mile for tie renewals, against the New York Central's $255. The Pennsylvania spent $1,178 for roadway and track, which includes largely track labor, placing track material in track, policing, etc. The New York Central spent $809 on this account.



The New York Central & Hudson River and the Pennsylvania Railroad.

The difference between the expenditures on the two roads for roadway and track is rather large, but is not so striking as the difference in expenditures for ties. An expenditure of $459 per mile of track is a very heavy expenditure.

Naturally, with the much larger proportion of low grade traffic on the Pennsylvania we would expect to find a heavier average train load. It might be mentioned, however, in this connection, that the New York Central has no such grades to

*The basis of this assumption is shown in the following table:

	New York Central.		Pennsylvania.	
	1912.	1911.	1912.	1911.
Repairs of locomotives.....	$6,776,432	$5,358,231	$12,124,823	$11,106,546
Renewals and depreciation of locomotives	1,799,015	1,405,870	2,547,474	1,114,267
Repairs of freight train cars	5,815,718	5,756,802	11,681,824	9,860,515
Renewals and depreciation of freight train cars.....	2,003,336	1,919,654	2,950,678	2,075,838

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contend with as has the Pennsylvania on its Western Pennsylvania division, since, however, the great bulk of the coal traffic moves east over the Eastern Pennsylvania division, with a ruling grade of .2 of 1 per cent., on the Pennsylvania, the average trainload figures would still be very much in its favor.

The revenue trainload on the Pennsylvania in 1912 was 685 tons, which is an increase over the average trainload in 1911 of 14.53 tons. The revenue trainload on the New York Central was 465 tons in 1912, an increase of about 35½ tons, or over 8 per cent. It is fair to point out that the greater part of the increase in train loading on the New York Central was due to an increase in the loaded car mileage, with an almost corresponding decrease in the empty car mileage. Car loading also was slightly better in 1912 than in 1911. There was an increase of 19,574,000 miles in loaded car movement and a decrease of 11,942,000 miles in empty car movement. Distinct gains in operation are indicated by a decrease of 686,000 miles in freight locomotive mileage, in the face of an increase in total ton mileage carried of 662,412,000 ton miles.

The Pennsylvania's increase in train loading is due to an increase in tons per loaded car, which averaged 27.45 in 1912, an increase of 0.86 tons. The average number of loaded cars in train was 24.97, a decrease of 0.26 from 1911, and the average number of empty cars was 13.39, a decrease of 0.48. The number of car miles per mile of all tracks, including sidings, gives a rough idea of the density of movement from an operating standpoint. In 1912 the Pennsylvania had a freight car density, if it may be so called, of 129,000; the New York Central, 95,000. On the other hand, the Pennsylvania had a passenger car density of 16,100, and the New York Central a passenger car density of 17,800. From any way of looking at it, the New York Central's passenger business bulks large as a factor of expenses and as an important difficulty in the problems of the operating department.

The New York Central is in the midst of a very extensive scheme of additions and betterments, part of which it has already at least temporarily financed, and therefore is at present bearing the interest burden. The Pennsylvania is on the threshhold of extensive betterments and presumably of extensive new financing as well. In 1912 the New York Central & Hudson River spent a total of $17,084,000 on additions and betterments, exclusive of what is being spent on the Grand Central Terminal. The more important details of this construction work is mentioned in our construction news columns. The net increase in the funded debt for the year was $46,158,000. The principal part of this financing was done through the issue of notes and equipment trust certificates. There were $20,000,000 3-year 4½ per cent. notes sold, and the N. Y. C. & H. R. share of the New York Central equipment certificates issued amounted to $7,157,000. The Grand Central Terminal is being built by the N. Y. C. and H. R. and New Haven jointly. The New York State Realty & Terminal Company is interested in part in the financing of the Grand Central Terminal, and to this company the New York Central has advanced up to the end of 1912 $23,370,000, the advances made during the year amounting to about $1,560,000. In addition to these advances to the Realty company, the New York Central carries as a permanent investment $29,961,000 on account of the Grand Central Terminal improvements. This is an increase of $7,120,000. It is impossible and quite misleading to try to make a comparison of the costs of the Grand Central Terminal and the Pennsylvania station in New York City, because included in the Pennsylvania's costs are the costs of building the very expensive tunnels under both the North river and the East river and the Sunnyside yards on Long Island. The Pennsylvania thus gets besides the advantages of its terminal in New York a connection between its New York division and the Long Island Railroad, paying for the combined advantages a very heavy interest charge. The New York Central completed in 1912 the major part of its Grand Central Terminal, but the entire development will not be completed for some years. If, however, the plans of the company are carried out successfully, and at present there seems every chance that they will be carried out even more successfully than the originators of the idea ever even imagined, the New York Central will get its entrance into New York almost interest free. The terminal itself was described in the *Railway Age Gazette* of February 14, and the plan for building offices over the track spaces and obtaining in rent sufficient income to pay interest charges on the terminal itself as well as its approaches was described in the *Railway Age Gazette* of March 15, 1912, p. 462.

The Pennsylvania, since the completion of its New York terminal, has had two or three years of intensive development during which time, however, no great new projects were undertaken. President Rea's remarks in regard to improvements on the property of affiliated companies include the statement that "the surplus property fronting on Seventh avenue between Thirty-second and Thirty-third streets, New York, owned by the Pennsylvania Tunnel & Terminal Railroad Company, a subsidiary of this company [the Pennsylvania], has been conveyed to the Pennsylvania Terminal Real Estate Company looking to its future development." This suggests the possibility of some such development as is being carried out by the New York Central. It will, however, probably be years before real estate in the neighborhood of the Pennsylvania terminal becomes valuable enough to hold out the same promise of success for paying interest charges through income from rentals as is the case at the Grand Central.

The great undertaking which the Pennsylvania is about to engage in is, as President Rea put it, in brief " . . . to provide increased terminal facilities and approaches [at Philadelphia] for approximately 20 years for lines which equal eight double track railroads." The Pennsylvania spent in 1912 a total of $16,322,000 for additions and betterments, of which $14,707,000 was on the main line system between New York and Pittsburgh. Of this $14,707,000, $5,494,000 was charged to income and $9,213,000 to capital account, but this does not include any of this new work at Philadelphia.

President Brown, in his letter of transmittal with the New York Central report, makes a rather striking statement of the increases in cost of material. After pointing out that notwithstanding the fact that the New York Central handled the largest volume of traffic, both passenger and freight, in its history, and that the year was singularly favorable for handling traffic at a moderate cost, and that there were no extraordinary circumstances which called for unusual expenditures, and leaving the fact that the New York Central's net available for dividends was less by over 10 per cent. last year than in 1911 to speak for itself, he gives certain figures in regard to costs of equipment. He says:

"In October and November, 1911, contract was made by the New York Central Lines for 1912 delivery of 14,500 standard steel underframe 40-ton capacity box cars at an average cost of $790 each. The best price obtainable for these cars for delivery in 1913 is $1,075, an increase of $285 per car, or 36 per cent., which would have made an increase in the cost of these cars of $4,132,500.

"Two thousand five hundred standard 50-ton steel self-clearing hopper cars were contracted for at the same time at $810 each. The price of the same cars contracted for in December, 1912, for delivery in 1913, was $1,113 each, an increase of $303 per car, or 37 per cent.

"Eight Pacific type freight locomotives contracted for in December, 1911, cost $22,456 each; the price of locomotives, identical in every way, in December, 1912, for delivery in 1913, was $26,030, an increase of $3,574 per engine. Twenty Pacific type passenger engines for 1912 delivery cost $24,780 each, the price for 1913 delivery is $26,315 per engine, an increase of $1,535 each.

"The aggregate increase in the cost of this equipment, if purchased in December, 1912, compared with the actual prices paid in the latter part of 1911, would amount to $5,206,000 or 33 per cent."

Both Mr. Brown and Mr. Rea mention the finding of the committee which arbitrated the demand of enginemen for increased rates of pay, and both agree that arbitration under the Erdman act is not satisfactory, although it is an enormous improvement

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over leaving disputes to be settled by means of a strike.

Both the New York Central and the Pennsylvania reports contain rather interesting sidelights on what is regarded as the probable future needs of railroads in the East. President Brown points out that the New York Central, notwithstanding the favorable business conditions, earned a surplus after the payment of 5 per cent. dividends of only about 1¼ per cent. on its stock, and suggests that this is by no means enough to meet future needs. The Pennsylvania paid out of its $42,154,000 net income only $27,199,000 in dividends. All of the rest it put back into the property, definitely appropriating for this purpose all but $1,661,000, which it credited to profit and loss.

The following tables show the principal figures for operation for the Pennsylvania and the New York Central in 1912 and 1911:

PENNSYLVANIA RAILROAD.

	1912.	1911.
Average mileage operated	4,205	4,018
Freight revenue	$127,578,202	$113,414,431
Passenger revenue	35,405,555	33,525,583
Total operating revenues	174,607,598	157,487,412
Maint. of way and structures	21,103,640	19,353,290
Maint. of equipment	36,068,367	30,579,967
Traffic expenses	2,312,400	2,143,147
Transportation expenses	62,895,553	58,046,751
General expenses	4,238,984	4,105,239
Total operating expenses	126,617,945	113,228,393
Taxes	7,128,535	6,826,070
Operating income	39,693,133	35,907,748
Gross corporate income	59,982,867	51,617,111
Net income	42,153,964	37,318,351
Dividends	27,198,918	25,950,837
Reserve for additions and betterments	6,000,000	4,000,000
Appropriated for sinking funds, extraordinary expenditures and principal of equipment trust obligations, etc.	6,293,942	5,662,497
Surplus	1,661,104	1,704,997

NEW YORK CENTRAL & HUDSON RIVER.

	1912.	1911.
Average mileage operated	3,791	3,790
Freight revenue	$65,101,310	$61,133,310
Passenger revenue	33,134,509	31,759,238
Total operating revenues	109,900,816	103,954,863
Maint. of way and structures	14,705,289	13,723,709
Maint. of equipment	20,440,446	18,138,771
Traffic expenses	2,314,427	2,180,206
Transportation expenses	41,052,202	38,935,031
General expenses	2,764,889	2,722,485
Total operating expenses	81,311,153	75,700,203
Taxes	5,902,521	5,447,759
Operating income	23,010,367	23,128,377
Gross corporate income	40,890,960	39,364,557
Net income	31,879,837	35,304,449
Dividends	11,136,465	11,136,465
Surplus	2,743,372	4,167,984*

*In 1911 $2,500,000 was appropriated from this surplus to cover replacement value of abandoned property, including buildings at the Grand Central Terminal.

NEW BOOKS.

Poor's Manual of Railroads, 1913. Poor's Railroad Manual Co., 535 Pearl street, New York. Price, $10.

There is little new to be said about this excellent annual compilation of railroad statistics. It is the standard compilation of such statistics and its chief defect in the past has been that it has taken so long to get the figures together that they have been nearly a year old when published. The present manual contains figures for the fiscal year ended June 30, 1912. This brings the figures up very much nearer to date—in fact, the Southern Pacific annual report for the fiscal year ended June 30, 1912, appeared only a week or two ago. Government figures covering the same period will not appear for a number of months. Even with the elaborate statistics that the government now compiles, Poor's railroad manual continues to be almost the only handy source which is available for bankers, investors, railroad men and the general public to turn to for the figures for earnings, expenses, capitalization, etc., of all railroads. It includes, of course, railroads doing an intrastate business as well as those doing an interstate business. In addition to the figures which are given in the form comparable to previous years and which make a complete set of Poor's railroad manuals so very highly valued, there is no other source, government or otherwise, which contains the same complete history of railroads as is contained in Poor's manual. It is needless to say that a statistical library, if it is to include any book at all on railroad statistics, will include Poor's.

Letters to the Editor.

WHEN "ACCIDENTS" ARE NOT ACCIDENTAL; PLAIN WORDS FROM A SUPERINTENDENT.

ST. LOUIS, MO., February 16, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In its report on the collision at Corning July 4, last, the Public Service Commission of the State of New York recommended, among other things, that the discipline be improved, and that greater care be exercised in selecting local transportation officers; and deprecated the shielding of undesirable men by the various organizations, which recommendations are most timely.

As cogently set forth in your editorial of July 26 last, "The Lesson of Three Collisions," the responsibility for laxity in discipline rests largely with the managers. The appointing to, and retaining in the positions of trainmaster, master mechanic, and superintendent, of weak and inexperienced men, and men of loose morals, is one of the underlying causes of poor discipline. Unfit officers will not only keep around them unfit men, but will actually cause a decrease in the efficiency of good men. The adage, "birds of a feather flock together," is more significant than some managements seem to think.

If a manager must find a place, or pension, for a friend or relative, by all means put him somewhere outside the operating department, or pension him absolutely. I know whereof I speak in this matter, having been in the ranks on a large system for a number of years. This road has changed managements frequently; and certain of the changes brought with the new managers numerous followers, a number of whom were made trainmasters, master mechanics and superintendents. So far as could be seen, these appointments were made simply on account of old acquaintance or to cancel obligations; certainly not on account of fitness. Among others whom I now recall were three men placed in the important position of superintendent who were depraved sensualists, with all that that term implies; a number of others who were inveterate gamblers and drinkers. One of these moral lepers held the position of superintendent on a heavy division until the citizens of the town where he made his headquarters actually petitioned the management for his removal; and this was not very long ago. What a farce to talk about discipline under such conditions!

Managers who sincerely desire the best of discipline can and do find men of high character and experience for the official positions. That accomplished, a long step has been taken toward the solution of the problem. Such men, properly supported, will gradually improve the discipline in the ranks, even under present conditions.

The indiscriminate overruling by the management of the superintendents in appealed cases of discipline, no matter how small and trivial the cases may be; and the reinstating of men discharged for cause, constitute one of the worst deadening influences. This, more than any other one thing, tends to weaken discipline. This practice has obtained on some roads to such an extent that the brotherhood committees appeal all except the most flagrant cases; and, in consequence, the local officers have been reduced to figure-heads in the eyes of the officers of the organizations; and also, necessarily, in the eyes of the employees. This has gone so far, that a discharge, as a rule, means, at the most, a suspension, and the manager very often justifies himself in his actions in thus overruling the superintendent by tacitly criticizing the officer for what was proper action in the premises. This, in turn, has the effect of making the superintendent over-cautious. The men are the first to perceive this, and those inclined to be careless go the limit in taking advantage of the situation.

Only the managers can correct this. By employing competent officers, and supporting them, they can quickly clear the air. As one effective means to that end, they should adopt a

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system of discipline similar to the "Brown system," which is essentially a checking account; a certain number of net demerit marks meaning dismissal. With this system a careless man automatically will check himself out eventually; and when he is out, he should stay out. No exceptions should be made to this rule unless it can be shown that an error was made in the premises; and, withal, no officer short of the highest operating officer should have authority to reinstate, for any reason, a discharged man. I have heard it suggested that a commission should be appointed to act upon appealed cases; it occurs to me that it might be feasible for such a commission to act, under certain conditions, for more than one road. In railway work the most rigid discipline is necessary, and it should be uniform; and it should be made known that a man's general habits will be carefully observed, even though it be necessary to resort to surveillance to the extent of espionage.

Up to the present time about the only moral obligation required of employees by most roads is that they shall not drink on duty, or frequent places where intoxicants are sold. In many instances this rule is not rigidly enforced, for the reason that the local officer is not clean himself. A more dangerous man, by far, than the occasional drinker (and the drinker is a dangerous man) is the sensualist, who is on the street all day when he should be taking his rest, or, improving his time, or taking wholesome recreation. This man, whose home life is, usually, unpleasant, by his very mode of living weakens himself mentally so that he cannot concentrate his mind on a given thought. He gets along in a sort of automatic way, but, sooner or later, gets into trouble. We are all familiar with these characters. All students of even the elementary principles of psychology and character-analysis can put their finger on men of this kind on short acquaintance. The same observation applies to gamblers. The two vices usually go together. These men, the drinkers, gamblers and sensualists, are the careless men. It is they who are responsible for upward of ninety per cent. of the serious accidents; and the sad part of it is that, under present conditions, the local officer often has to wait for the accident to occur before he can get rid of the dangerous man. Even then, on account of the practice of managers reinstating men on leniency pleas, and over the protest of local officers, he is, in many instances, rid of the man for only a few months.

If the real truth were revealed, if the fundamental causes of serious wrecks were made public, it would be so appalling as to cause not only the managements, but the legislatures, labor organizations, and the public to recognize the great necessity of placing on engines and trains sober and temperate men—using those terms in their most comprehensive sense.

I have been in the ranks for upward of twenty-five years; I know intimately engineers, conductors and train despatchers who have been in continuous service on heavy single-track road for from fifteen to forty years, and who are essentially safe men; and they will continue to be such, for their mental and physical habits are correct. What these men have accomplished, even in spite frequently of lack of encouragement, others can accomplish, if they can have the proper environment. After all, there is no accident about these accidents; we have simply the effects of well-known causes. We have been too eager to find excuses; which is like giving a sick patient a palliative to deaden his pain, rather than a medicine that will remove the cause of his malady.

Start in by placing a premium on character and merit; place the right kind of men in the local positions. Such men can be found in the ranks on all roads. There is no great secret in the business, as the old switchman, or conductor or train despatcher would have us believe when they say that men for such positions "are born, and not made." The essential quality is just good common sense.

Reducing the proposition a little further, an ounce of rational precept, reasonably enforced, is worth a ton of insincere type written instructions. I have never been a general manager, and am not qualified to pass on many of the requirements for that position; but this much I feel convinced of; that, regardless of his brains, or his station, the manager should serve in the ranks a number of years in order to get the necessary seasoning. As has been said:

"All that you positively know is contained in your experience; all that you shall ever know, must pass through the gateway of experience, and thus become part of yourself."

SUPERINTENDENT.

THE CAPTAIN OF A FREIGHT-TRAIN CREW.

ROCHESTER, N. Y., February 24, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have read the article entitled "The Lesson of Irvington," published in the *Railway Age Gazette*, February 21, and the editorial on the same subject, January 24. The latter closes with the following: "As we have said above, this is an illustrative case of a striking character. Railroad officers will need no assistance in drawing the moral." The former, among other things, says: "Every now and then some accident shows a general laxity throughout the service."

Who is responsible for this state of affairs, the officers or the employees? What has become of the commanding officer, with the title of conductor? Why was the custom of putting such an officer in command adopted in the first place? What were his duties up to a few years ago, and why is he not still the commanding officer in fact? What would be the fate of a captain were he to permit his regiment to meet the enemy while he remained in his tent? Are conductors of today responsible for having lost their identity, or is it due to a lack of organization, for which the officers are more responsible than the employees? What would be the result if the general of an army were to issue orders direct to the privates in the field, as is the custom on many railroads today? The result would be that the captain (conductor) would permit the privates under him to perform their duties without supervision.

On roads where the officers deal directly with the members of train and engine crews, instead of through the commanding officer—the conductor—trains are being handled today as they were in the beginning when the command of a train was undefined and doubtful. Experience developed that a commanding officer must be placed in charge, with the title of conductor, to see that the train was moved over the road safely, and that each man on the train under him performed his duties in accordance with the rules. The regiments of an army are under the eye of their superiors at all times, while the regiments on a railroad are scattered over hundreds of miles out of sight of their superior officers. For this reason, if for no other, the organization of a railroad should be more perfect than the organization of an army.

The commanding officer in charge, whether he be captain or conductor, should be in the lead when meeting the enemy, not in the rear. In other words, it is the duty of the conductor to see that main track switches are closed. This is especially true when the privates in the front rank, as in the case at Irvington, are inexperienced.

When that train pulled up to back on the siding, the conductor should have remained at the switch, permitting the two brakemen to remain with the train, which was equipped with air brakes. If necessary to protect by flag, the fireman should have been sent. If on too close time against the passenger train, it would have been better to stop on the main track until the passenger train could be stopped. I am a railroad pessimist, and believe in applying a preventive just before, instead of a remedy just after.

J. S. M.

FRANKFORT-BRUSSELS LINE PROPOSED.—A new railway is proposed which would shorten the route between Frankfort on the Main, Germany, and Brussels, Belgium. At present the distance between Frankfort and Brussels through Cologne and Aix la Chapelle along the left bank of the Rhine is 213 miles.

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IMPRESSIONS OF HUNGARIAN RAILWAY PRACTICE.

Second Article—Considers the Building and Repairing of Cars and Locomotives and the Organization for So Doing.

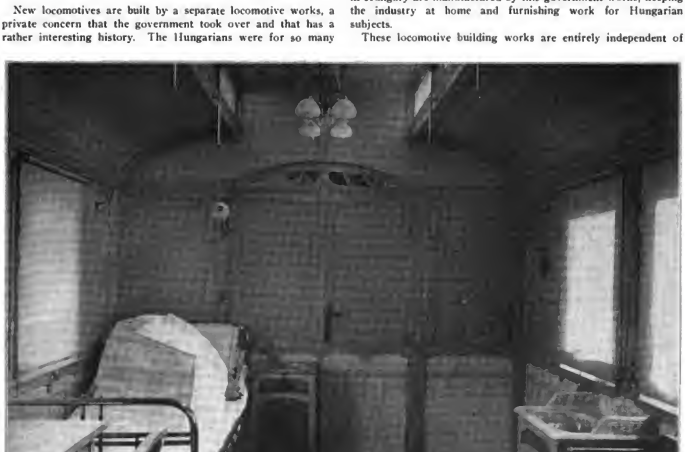
By Henry W. Jacobs.

The motive power and rolling stock of the Hungarian State Lines is cared for in two large central manufacturing and repair shops located at Budapest and at fifteen independent division shops. Manufacturing of standard locomotive and car parts and tools is carried on on a large scale at Budapest.

NEW EQUIPMENT.

New locomotives are built by a separate locomotive works, a private concern that the government took over and that has a rather interesting history. The Hungarians were for so many centuries a buffer people between the invading Moslem hordes and Christian Europe that through the tribulations of relentless conflict they have developed the strongest kind of self-reliant patriotism. In more modern times with the development of peaceful pursuits this same spirit of martial self-reliance has shown itself in workaday life. Instead of depending on the alien for manufactured products, such as railroad and agricultural machinery, the people established works of their own, and one of these large manufacturing works devoted itself to the building of locomotives, orders being placed by the State Railway Lines as well as by the private railroad companies in Hungary and also to the construction of agricultural machinery. When, in the course of time, this concern got into financial difficulties the government, rather than see this business get into the hands of foreigners, took over the works, so that today practically all the locomotives and agricultural machinery used in Hungary are manufactured by this government works, keeping the industry at home and furnishing work for Hungarian subjects.

These locomotive building works are entirely independent of the Railway Administration, the latter concerning itself merely with the repair of its equipment. Cars are built by another large independent works, appertaining to Ganz & Co.



Patient's Room in Private Invalid Car on Hungarian State Railways; Available for a Moderate Rental.

EQUIPMENT REPAIRS.

At the central repair and manufacturing shops of the State Railway at Budapest, which come directly under the jurisdiction of the director of motive power and rolling stock, only the heaviest class of repairs are made. The division shops come under the division operating officers, and at some of the larger

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of these also such heavy work as firebox replacement is done, although practically no manufacturing of new parts is done at any of these outlying shops.

In those fifteen division shops are the following aggregate facilities for the repair of equipment:

Locomotive pits	537
Boiler shop pits	69
Passenger car pits	1,413
Passenger painting shop pits	207

These facilities take care of the following equipment:

Locomotives	3,430
Passenger cars	7,448
Baggage cars, etc.	2,500
Freight cars	82,086

The force which handles this work is as follows:

Engineer inspectors	120
Foremen	234
Assistants	255
Workmen	10,183

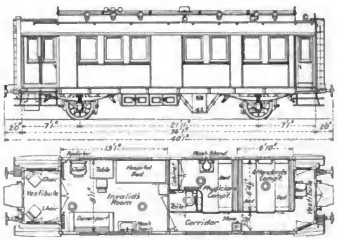
ENGINEER INSPECTORS.

A word of explanation is required as to the status of the engineer inspectors. These are men of the best technical

Surgical Supply Cabinet in Physician's Compartment on Invalid Car.

training who have served four years in practical shop work. They report to the highest officers of the division to which they are assigned, being, therefore, independent of the local shop administration. The function of these men is to exercise the closest supervision and control over the quality and costs of doing the work and to be instrumental in correcting methods where either the cost or the quality of the work is not up to standard.

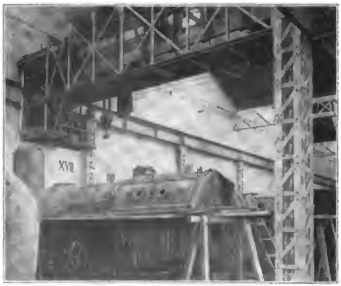
For instance, when a locomotive enters a shop the engineer inspector prescribes precisely what work should be done, there being already in effect standard schedules for the cost, the routing and the doing of each item of work. Departures are not made from the prescription of this engineer inspector without his authority. This supervision at the initial stage of the locomotive repair extends not only to the cost of doing the work, but is also concerned with the costs of the materials, the engineer preparing a detailed bill of material, whether the parts are to be repaired or new, to accompany his schedule of the work to be done. In this way the material costs are held down to the lowest figure which necessity demands. After getting the repairs on the locomotive well under way the engineer inspector follows up the work actually done in the shop, inspects its condition, sees that one gang does not hold another one back, sees



Arrangement of Private Invalid Car Used on the Hungarian State Railways.

that work is done within the standard cost, but is not slighted, and sees that the engine is returned to service as per the schedule before it was taken out of service.

A similar system upon a smaller scale obtains in roundhouse management, and due to the care that is exercised, both in general and in running repairs, engine failures are almost unknown. I must say that I find this condition of absolute reliability in the operation of the locomotives surprising in the



Boiler Shop with Traveling Crane; Hungarian State Railways at Budapest.

extreme. There is, however, a source of satisfaction in knowing that it is possible, with proper organization of working forces, to obtain such perfection in locomotive running and upkeep. Some of these one hundred and twenty engineer inspectors are, of course, allotted to supervision of car work, on the average of about one hundred workmen coming under the purview of one engineer.

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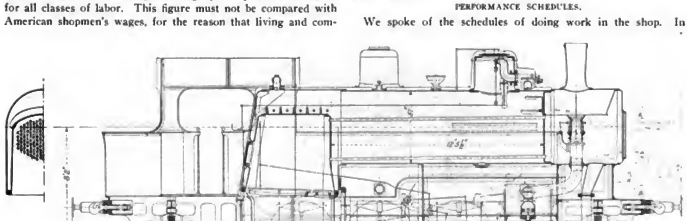
WORKING CONDITIONS.

The average ten hour days worked per month by the shop forces is 24.5. The average earnings per day are about $1.40 for all classes of labor. This figure must not be compared with American shopmen's wages, for the reason that living and comparative wage conditions in Europe are so different from those obtaining in the United States. Also, it must be emphasized that the conditions are better for the men in the way of providing dwelling quarters at very low rents, and in the way of the provident and welfare institutions which care for the needs of the men and their families, both in active service and in old age. It is worth something to a man to be secure in reasonable earnings in the present and for his declining years when he gives up active service.

PERFORMANCE SCHEDULES.

We spoke of the schedules of doing work in the shop. In conjunction with these shop schedules are similar standard schedules of the performance of the equipment in service. A locomotive or a car is not due to receive general repairs until it



Application of Polonco Sectional Crown Firebox on a Hungarian State Railways Locomotive.

Locomotive Tire Heater in Roundhouse of Hungarian State Railways.

Polonco Sectional Crown Firebox.*

*Three hundred of these, made of copper, are in use on the Hungarian State Railways. No crown stays or bolts are required. The first was built 20 years ago by the late Herr Polonco, an Austrian engineer. They are used in a bad water district where the staybolt, crown boiler requires washing out after 400 miles' service, while those of the Polonco type are washed out after 7,500 miles' service. The sections of the crown being unsupported by any connection to the wrapper are shaped like rectangular channels, instead of with a pressure resisting curve, and must be made of a heavy material. Notwithstanding this and the fact that the ordinary staybolt side sheets are joined to these sections by a seam near the crown, the maintenance cost is said to be so low as to outweigh these disadvantages.

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Residential Apartment Community for Shop Employees of the Hungarian State Railways.

has performed this service. Below are listed these standards of performance:

	Between shoppings.
Passenger locomotives	56,000 miles
Freight locomotives	37,000 miles
Old locomotives of the second class	28,000 miles
Old locomotives of the third class	19,000 miles

It should be explained that locomotives are classified according to age, and that the same treatment as to policy of repairs is not accorded to the older locomotives as is accorded to the newer ones. This division into grades according to age could very well be adopted as an American practice.

Steel Ash Hoist and Conveyor; Hungarian State Railways.

Engine House Water Tank 140 Feet High and Having 300,000 Gals. Capacity; Hungarian State Railways.

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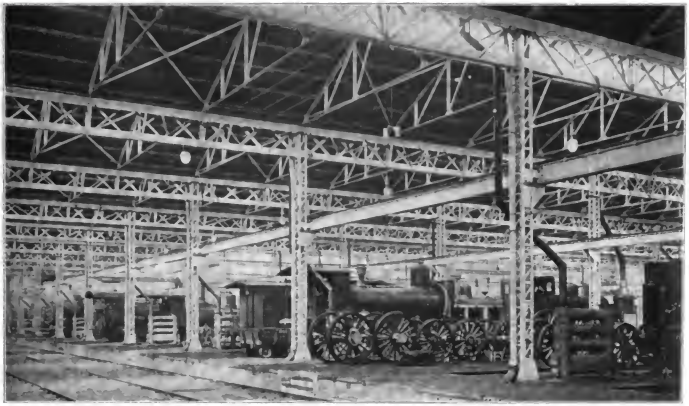
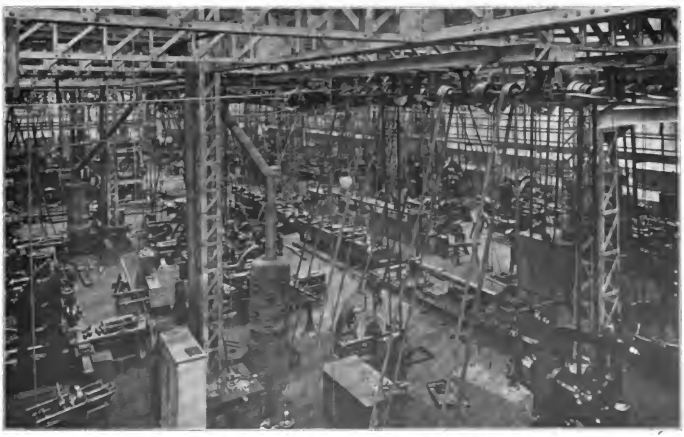


Locomotive Erecting Shop with Transfer Table Under the Same Roof; Hungarian State Railway Shops at Budapest.



Main Machine Shop of the Hungarian State Railways at Budapest.

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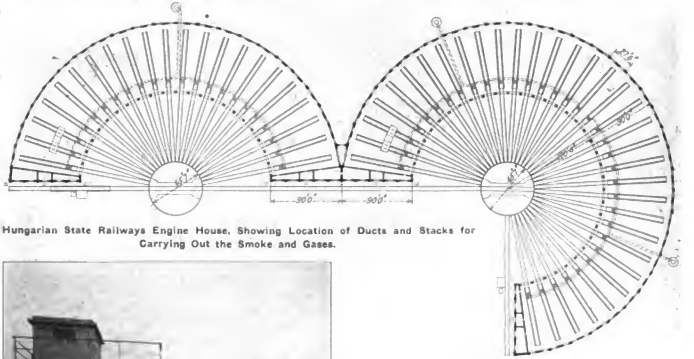
CAR REPAIRS.

Car repairs are made, not after so many miles of service, but at periodic intervals, as follows:

Passenger cars in fast service, without painting...every 4 mos.
Passenger cars on through lines, without painting.every 8 mos.
Passenger cars on branch lines, without painting..every 12 mos.
Passenger cars repainted.....every 5 yrs.
Passenger cars wholly scraped, repainted and varnished, within and without .....every 10 yrs.
Freight cars, general repair, without painting....every 3 yrs.
Freight cars, general repair, with painting.....every 6 yrs.



Hungarian State Railways Engine House, Showing Location of Ducts and Stacks for Carrying Out the Smoke and Gases.

Coal is shoveled from cars to the ground; and is re-shoveled into small iron cars which are hoisted by elevator to the coaling platform, from which they are dumped into the locomotive tenders.

Typical Modern European Concrete-Steel Coaling Station.

REPAIR COST SCHEDULES.

In conjunction with these standards of performance of the equipment are standards of repair cost upon a mileage basis, an allowance or allotment being appropriated for repairs. This allowance is divided between the car yards, shops and roundhouses maintaining the equipment in a running condition, and the main general repair shops. This plan of allowance, or allotment, is so thoroughly worked out that, generally speaking the predetermined cost and performance are actually attained in practice. In those cases, however, where the performance is materially below the standard set, or where the costs are very markedly above or below the standard, an investigation is made as to the causes. It is not considered a favorable sign when costs are greatly below the pre-determined standard, as it is felt this work may have been done superficially, and the rigid inspection system is continually on guard against any such

Locomotives face toward the center, and the smoke jacks carry the smoke and gases through the ducts to two high stacks outside, as shown on the drawing.

Interior of Engine House on Hungarian State Railways.

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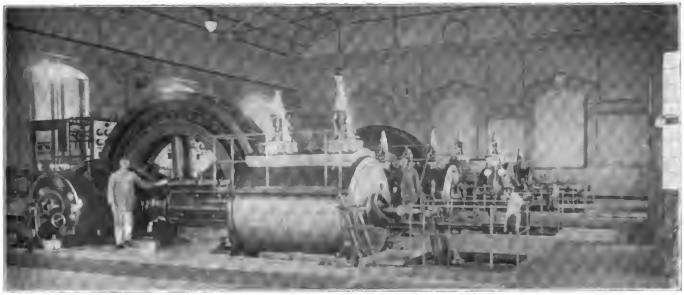
tendency. On the other hand, there is the reverse of a disregard for excessive labor costs. So closely do the standards and the actual costs compare that the amount of money spent upon the different classes of equipment, divided by the mileage performance of these classes, is a financial measure as to the existing condition of the equipment. The following table shows the actual repair costs of equipment of the Hungarian State Lines per one hundred miles of line of railway:

Locomotives	$3.44
Passenger cars	.33
Baggage cars	.32
Freight cars	.32

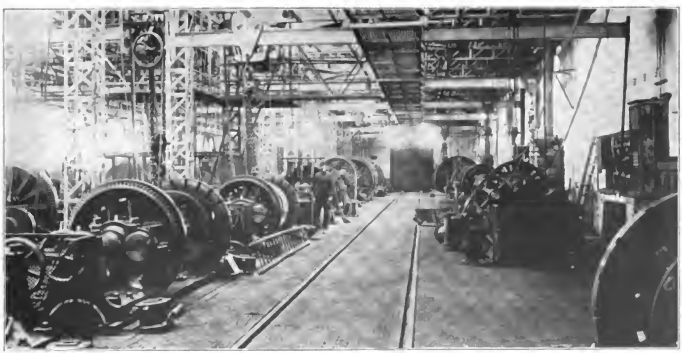
It must be explained that the figures above quoted as to car performance are not on the car mile, but upon the axle mile, most of the cars being four wheeled (or two axle), with a few equipped with two four-wheeled bogie trucks, as in American practice. Most of the passenger cars are also four wheeled, with a large proportion of six wheeled or three-axle cars, one of the axles being under the middle of the car. The modern through passenger equipment is to a large extent composed of four axle cars, the trucks being somewhat after the American arrangement.

These figures are quoted merely as a matter of information, the wage conditions, conditions of service and characteristics of design being so different in Hungary as not to furnish intelligible bases of comparison with American practice.



Dynamos Driven by Gas Engines; Hungarian State Railway Shops at Budapest.

SPANISH RAILWAY CONSTRUCTION.—The Minister of Fomento, Madrid, Spain, invites plans for constructing a 62-mile railway from Medina del Campo, in the province of Valladolid, to Benavente, province of Zamora. Plans must be received within four months. He also invites plans, to be received within six months, for constructing a 99-mile railroad from Segovia, province of Segovia, to Burgos, province of Burgos, by way of Aranda de Duero.—*Consular Report.*



A steel tired car wheel is turned for a labor cost of 20 cents, and a main driving wheel for 60 cents.

Wheel Shop at Budapest; Hungarian State Railways.

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THE RAILWAY VALUATION LAW.

The law empowering the Interstate Commerce Commission to make a detailed inventory of all the property of all railways subject to the Interstate Commerce law which was passed by Congress last week was signed by President Taft on March 4, and an appropriation of $500,000 is made for the purposes of valuation in the next fiscal year. The text of this law was printed in our last issue, page 397, subject to a few corrections. These corrections, which are in the matter beginning near the top of page 398, first column, are embodied in the following reprint of that part of the law:

"Except as herein otherwise provided, the commission shall have power to prescribe the method of procedure to be followed in the conduct of the investigation, the form in which the results of the valuation shall be submitted, and the classification of the elements that constitute the ascertained value, and such investigation shall show the value of the property of every common carrier as a whole and separately the value of its property in each of the several States and Territories and the District of Columbia classified and in detail as herein required.

"Such investigation shall be commenced within sixty days after the approval of this Act and shall be prosecuted with diligence and thoroughness, and the result thereof reported to Congress at the beginning of each regular session thereafter until completed.

"Every common carrier subject to the provisions of this Act shall furnish to the commission or its agents from time to time and as the commission may require maps, profiles, contracts, reports of engineers, and any other documents, records, and papers, or copies of any or all of the same, in aid of such investigation and determination of the value of the property of said common carrier, and shall grant to all agents of the commission free access to its right of way, its property, and its accounts, records, and memoranda whenever and wherever requested by any such duly authorized agent, and every common carrier is hereby directed and required to co-operate with and aid the commission in the work of the valuation of its property in such further particulars and to such extent as the commission may require and direct, and all rules and regulations made by the commission for the purpose of administering the provisions of this section and section twenty of this Act shall have the full force and effect of law, unless otherwise ordered by the commission, with the reasons therefor, the records and data of the commission shall be open to the inspection and examination of the public.

"Upon the completion of the valuation herein provided for the commission shall thereafter in like manner keep itself informed of all extensions and improvements or other changes in the condition and value of the property of all common carriers, and shall ascertain the value thereof, and shall from time to time revise and correct its valuations, showing such revision and correction classified and as a whole and separately in each of the several States and Territories and the District of Columbia, which valuations, both original and corrected, shall be tentative valuations and shall be reported to Congress at the beginning of each regular session.

"To enable the commission to make such changes and corrections in its valuations of each class of property, every common carrier subject to the provisions of this Act shall make such reports and furnish such information as the commission may require.

"Whenever the commission shall have completed the tentative valuation of the property of any common carrier as herein directed, and before such valuation shall become final, the commission shall give notice by registered letter to the said carrier, the attorney general of the United States, the governor of any State in which the property so valued is located, and to such additional parties as the commission may prescribe, stating the valuation placed upon the several classes of property of said carrier, and shall allow thirty days in which to file a protest of the same with the commission. If no protest is filed within thirty days, said valuation shall become final as of the date thereof.

"If notice of protest is filed the commission shall fix a time for hearing the same, and shall proceed as promptly as may be to hear and consider any matter relative and material thereto which may be presented in support of such protest so filed as aforesaid. If after hearing any protest of such tentative valuation under the provisions of this Act the commission shall be of the opinion that its valuation should not become final it shall make such changes as may be necessary, and shall issue an order making such corrected tentative valuation final as of the date thereof. All final valuations by the commission and the classification thereof shall be published and shall be prima facie evidence of the value of the property in all proceedings under the act to regulate commerce as of the date of the fixing thereof, and in all judicial proceedings for the enforcement of the act approved February 4, 1887, commonly known as 'the act to regulate commerce,' and the various acts amendatory thereof, and in all judicial proceedings brought to enjoin, set aside, annul, or suspend, in whole or in part, any order of the Interstate Commerce Commission.

"If upon the trial of any action involving a final value fixed by the commission evidence shall be introduced regarding such value which is found by the court to be different from that offered upon the hearing before the commission, or additional thereto, the court, before proceeding to render judgment, shall transmit a copy of such evidence to the commission, and shall stay further proceedings in said action for such time as the court shall determine from the date of such transmission. Upon the receipt of such evidence the commission shall consider the same and may fix a final value different from the one fixed in the first instance, and may alter, modify, amend, or rescind any order which it has made involving said final value, and shall report its action thereon to said court within the time fixed by the court. If the commission shall alter, modify, or amend its order, such altered, modified, or amended order shall take the place of the original order complained of and judgment shall be rendered thereon, as though made by the commission in the first instance. If the original order shall not be rescinded or changed by the commission, judgment shall be rendered upon such original order.

"The provisions of this section shall apply to receivers of carriers and operating trustees. In case of failure or refusal on the part of any carrier, receiver, or trustee to comply with all the requirements of this section and in the manner prescribed by the commission such carrier, receiver, or trustee shall forfeit to the United States the sum of five hundred dollars for each such offense and for each and every day of the continuance of such offense, such forfeitures to be recoverable in the same manner as other forfeitures provided for in section 16 of the Act to Regulate Commerce."

Remaining paragraphs unchanged.

BRAZILIAN CONCESSION ALTERED.—The president of the state of Sao Paulo, Brazil, has signed a decree granting the petition of the Empreza de Colonizacao Sul Paulista, concessionaires for building the Sao Paulo-Prainha Railway, asking for an extension of three months to complete the definite surveys for the modification of the first, second and third sections of this railway, and also an extension of three months from the date of approval of the surveys of the first section for the initiation of construction work; and also for an extension to three years of the time allowed for the completion of the railway.

FUNDED DEBT OF MANILA RAILROAD, PHILIPPINE ISLANDS.—On July 1, 1911, $2,966,000 bonds of the Manila Railroad were authorized. On October 18, 1911, $940,000 certificates were authorized, and on January 22, 1912, $1,000,000 certificates were authorized, making the total funded debt of this company $4,936,000. These bonds are secured by a mortgage on about 142 miles of line and represent a cost per mile of about $34,760.

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GRAND TRUNK TERMINAL AT OTTAWA, ONT.

The New Union Passenger Station and Chateau Laurier, Which are Among the Finest Structures of Their Kind in Canada.

The terminal of the Grand Trunk in the city of Ottawa, which is used by all Grand Trunk trains and by through trains of the Canadian Pacific, is closely adjacent to the group of Parliament buildings which occupy a high point of ground in the center of the city overlooking the Ottawa river and the Rideau canal. In the design of the new station building and the hotel, which have recently been opened for service, particular care was taken to harmonize both the buildings and their approaches with these surroundings. Sparks street, the principal business street of the city, and Wellington street, upon which the Parliament buildings front, intersect about over the north bank of the Rideau canal. The station building and the Chateau Laurier, the new hotel, are located north of and adjacent to the canal, just across from the Parliament

Grand Trunk Terminal in Ottawa.

buildings, the station being east of the street and the hotel facing it west of the street. The triangular area between Wellington and Sparks streets over the canal has been laid out in a plaza to be known as the Plaza Laurier. This plaza and the adjacent streets are carried on a new concrete arch structure, under which passes the canal, two through railway tracks from the station and a park walk extending from the Parliament grounds. The railway tracks after passing under this bridge, are carried through an enclosed street railway terminal, the roof of which forms the broad terrace of the hotel. This covered electric railway terminal is reached by broad stairways from the street above. The back of the hotel overlooks the historic Major's Hill park which commands a view of the locks, river and Parliament grounds.

The station is 281 ft. 6 in. x 140 ft. 8 in. exclusive of the train shed covering the platforms, the main portion in front being six stories high with a basement. The ground floor and the street level floor are used for station purposes, and the upper four floors for the offices of the Dominion Railroad Commission. Back of this portion of the building is the vaulted main waiting room extending the full width of the building and having its end walls carried up to the same height as the six-story section. Adjoining the waiting room on the rear is a three-story section containing station facilities, and back of this is a full width concourse which is as high as the three-story section and which opens directly to the train shed in the rear. As Sparks street is elevated in front of the station to carry it over the canal, the main entrance from this street opens into the second floor of the building. The carriage entrance and the approach for baggage, mail and express is at the northeast corner of the building opposite the concourse, where the street level is practically at the same elevation as the tracks and the lower floor of the main building.

THE STATION.

The station is of fireproof construction, the foundation and walls being of concrete, granite and sandstone. The principal architectural feature of the six-story section is a colonnade of columns in the west and south elevations. The entablature and cornice supported by these columns are massive and simple, an impression which is carried out by the entire exterior. The main entrance is between two large piers and is covered by a marquise, above which is set a large clock. The three double doors open into a large entrance hall with marble tile floor, beamed ceiling and paneled walls, finished in imitation Travertine stone. On the right just inside the entrance is a branch of the Bank of Toronto and the division freight agent's office. Back of these offices is the suite of royal waiting rooms intended

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for the exclusive use of royalty and the governors-general of the Dominion. This suite includes a lobby, a large waiting room and retiring rooms for ladies and gentlemen. The waiting room is elegantly finished in funied oak and contains a large marble mantel and overmantel with an open fire-place, a massive table and numerous upholstered chairs. Clocks, telephones and complete toilet facilities are provided. These rooms have windows overlooking the canal and also have windows with massive metal grills opening into the main waiting room. On the left of the entrance hall is a large room in which commercial travelers can exhibit their samples, a feature which is thought to be entirely new in station design. The elevator hall and stairway leading to the office floors above

Rear View of Station and Train Shed.

are reached directly from the entrance hall on the left from the entrance. Two electric elevators serve this part of the building. On the upper floors in addition to the offices of the Board of Railway Commissioners, a well appointed court room is provided for public hearings.

From the entrance hall a flight of marble stairs the full

Entrance Corridor and Subway to Hotel from the Ticket Lobby.

width of the hall descends to a broad landing, from which a marble stairway at each side leads down to the main waiting room level. Between these two lower stairways is a marble balcony overlooking the waiting room, from which the voice of the train announcer is distinctly carried to all parts of the room. Between the piers supporting this balcony is the entrance to the corridor and subway which leads from the waiting room level under the plaza to the lower floor of the new hotel, affording a very convenient means of reaching the hotel from the station.

The waiting room is 56 ft. 8 in. x 130 ft. 9 in., with a vaulted

One End of the Main Waiting Room.

ceiling 75 ft. high, which gives the room an appearance of much greater size. The floor is of marble and the walls are of imitation Travertine stone with four Corinthian columns of natural imported Travertine stone along each wall supporting the arched ceiling, which is of plaster, richly coffered. The room is well lighted, having three large arched windows in each side and one in each end. The artificial lighting is furnished by

Part Interior of Train Shed and Concourse.

four 13-light electric clusters on bronze columns, 18 10-light wall clusters, and 12 8-light tungsten clusters under art domes mounted on the back of each double bench. The bronze columns are set on large pedestals of light green marble containing ventilating ducts. The benches are mahogany, with marble risers, the contour of the seat being carefully designed to make the benches comfortable. The mounting of the bench lights and the shades provided make reading in these seats very enjoyable. At one end of the waiting room is the news stand, and at the other the telephone and telegraph booths, all of which are finished in quartered oak.

Adjoining the main waiting room on the ground floor and

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located under the royal waiting room in the six-story portion of the building is the ladies' waiting room 46 ft. 8 in. x 58 ft., with a rest room and well appointed toilets. The waiting room and rest room have terrazzo floors with marble base and border, plaster walls and ceiling, and are furnished with mahogany seats and easy chairs. The waiting room can be entered from the subway to the hotel, as well as from the main waiting room. Adjoining the main waiting room on the other side of the corridor are the smoking room, men's toilet, barber shop and check room. The finish in the smoking room and barber shop is the same as in the ladies' waiting room. Ample ventilating ducts are provided to keep the air circulating in the smoking room. The toilet rooms are finished with tile floors, marble wainscoting and plaster walls and ceiling. The barber shop has four chairs and is equipped with the most modern appliances, including a small sterilizing plant for towel service. The subway between the station and the hotel is 10 ft. wide and 9 ft. high. It has tile walls and floor, and is lighted by electric clusters from the ceiling.

On the east side of the main waiting room directly opposite and in line with the main entrance is a lobby leading to the concourse. On the north side of this lobby are four large ticket windows and two more are provided just around the corner opening in the main waiting room. The ticket office is large and provides ample room for all ticket cases and vaults, and the equipment for rapid handling of this business, as well as quarters for conductors and trainmen who use a door entering from the concourse. On the opposite side of the ticket lobby is the lunch room, having a seating capacity of 33 at the counter and 30 at the tables. The room is finished with a tile floor and plastered walls, the woodwork in common with that in all the other public rooms being of oak. The ticket office and lunch room occupy the first floor of the three-story section of the building mentioned above. Over the ticket office is located the office of the station master, and on the third floor are the divisional offices, all of which are served by an electric elevator entered from the main waiting room. Over the lunch room is the kitchen, which is modern in all its appointments, having 27 electric lighted refrigerators, an electrically driven ice crusher, dish washer, mincer and coffee grinder, ample gas ranges with numerous ovens, a complete ventilating and vacuum cleaning system, and a garbage refrigerator in which all refuse is frozen to eliminate odors and bacteria.

The concourse, which is entered through four double doors from the lobby, extends the full width of the building and is the same height as the three-story section adjoining it. It is amply lighted by large arched windows at each end and a large skylight in the roof. The walls are of imitation Travertine stone and the ceiling is coffered in the same style as that of the main waiting room. Five double doors at the north end of the concourse provide a convenient exit to the street, and a generous space has been allowed outside the entrance for a cab stand, with a large marquise over the entrance, allowing passengers to enter cabs without being exposed to the weather. A large clock is prominently displayed over the gates leading from the concourse to the train shed and platforms which, in common with the clocks in all public rooms and the big clock over the main entrance, is controlled electrically by a master clock.

Bush Train Shed; Grand Trunk Terminal.

The train shed covers seven tracks, six of which are stub end. The south side of the shed is offset from the main building to allow the south track to pass through the train shed and along the south side of the building under the plaza, as described above. The shed and the four platforms are 533 ft. 6 in. long. The shed is of the Bush type, supported by fluted cast iron columns on concrete pedestals, spaced 27 ft. center to center in each row. The tracks are 13 ft. center to center in each bay, and the platforms are 19 ft. wide, making the transverse distance between rows of columns 42 ft. 9 in. The lighting is by one tungsten light at each panel point of the shed structure. The shed is closed on the south side along the canal by a concrete wall with large elliptical windows, and on the

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north side it connects to the baggage and express annex and the power house. One of the accompanying photographs shows the shed construction clearly. The baggage room is nearest the concourse and can be approached from the street side by trucks. Division offices are located on the second floor over the baggage and express rooms.

POWER PLANT.

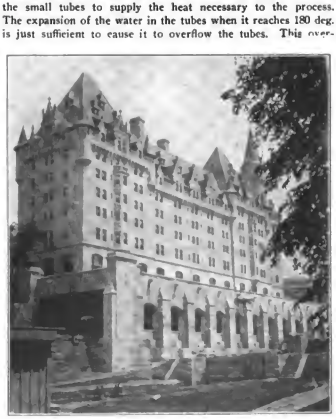
The power house is very complete and modern, being well housed above ground in a light roomy building which is quite in contrast to the sub-basement so frequently used for power generation purposes. The boiler room at the east end of the building contains four 300 h. p. vertical water tube boilers, fit-

General View of Engine Room in Station Power Plant.

ted with Green chain grate stokers having a unit grate area of 56 sq. ft. There are two 5 in. x 5 in. vertical steam engines, either of which can operate the stokers. Coal is delivered in hopper cars on a track just north of the boiler room, being dumped into a sheet steel hopper from which it is conveyed to the double roll crusher by a short beaded flight conveyor. The conveyor and crusher are operated by 25 h. p., 220 volt motors. From the crusher an elevator takes the coal to a scraper conveyor, which distributes it to the bunkers. A spiral ash conveyor delivers ashes to the same elevator that handles the coal, a by-pass valve in the elevator head permitting the handling of both coal and ashes in the same elevator. The elevator delivers ashes to a bunker having a capacity of four carloads. The power plant chimney is of the Weber concrete type 150 ft. high.

In the engine room are four tandem compound high speed engines, with 14 in. and 24 in. x 16 in. cylinders, direct connected to 175 kw. 250-125 volt d. c. generators. Two of these units can carry the day load and three of them can easily handle the peak load in the evening. The three-wire distribution system is used, furnishing 250 volts for power and 125 volts for lighting. This distribution system covers all parts of the station building and the hotel. The oil separators and traps discharge into a sump below the engine room floor, which is provided with a centrifugal pump to care for the accumulation of water. Two Worthington boiler feed pumps, either of which is capable of handling the maximum requirements, take the feed water from a Cochrane open heater at a temperature of 212 to 220 deg., and supply the boilers through 4 in. extra heavy brass mains. A fire pump takes water from the city main at 45 to 50 lbs., and maintains 130 lbs. pressure on fire hose lines throughout the Chateau and the station building. Two duplex pumps supply water to the station and the Chateau at 85 lbs. pressure. An air compressor with a capacity of 250 cu. ft. of free air per minute furnishes the air for pneumatic tools in the power house and for air brake testing and car cleaning in the train shed.

An ice-making plant, with a capacity of 5 tons a day is provided in which is made all ice used in the hotel and station and for icing drinking tanks on cars. Two duplex brine pumps circulate brine which is used in cooling refrigerators in the hotel and station. The supply and return pipes for this water are 4 in. in diameter, protected by a 3 in. cork covering. All the water used is taken from the Ottawa river, filtered through gravel beds and sterilized by a heat process installed by the J. F. Forbes Company, Philadelphia. There are three sterilizing units, each with a capacity of 1,000 gallons per hour, which is one of the largest installations of this kind in the country. The process consists of heating the water to about 180 deg. by the application of steam, all pathogenic organisms being killed at this temperature. Each unit consists of a cylindrical brass standpipe about 30 ft. high containing over 200 small tubes standing vertically, supported by a tube sheet at the lower end. A supply of raw water is maintained in these tubes at an elevation a little below the top of the tubes by feeding into a riser tube connected with the standpipe below the tube sheet. Steam pipes are inserted about 30 in. into the upper ends of the small tubes to supply the heat necessary to the process. The expansion of the water in the tubes when it reaches 180 deg. is just sufficient to cause it to overflow the tubes. This over-



Chateau Laurier, the Grand Trunk Hotel in Ottawa with the Station in the Background.

flow runs down the outside of the tubes, which are filled with cold water rising, and by convection through the walls of the tubes the hot water descending gives up a part of its heat to the water inside, thus decreasing the amount of heat that must be applied to raise the raw water to the proper temperature, and also decreasing the amount that the treated water must be cooled before being used. The treated water collects above the tube sheet at the bottom of the standpipe and stands in a riser tube connected to the standpipe above the tube sheet, from which it is pumped to tanks on the roofs of the hotel and station. This sterilized water is used for all purposes in both the hotel and the station.

A tunnel 6 ft. x 7 ft. in cross section carries all pipes and wiring from the power house to the station and hotel. In the

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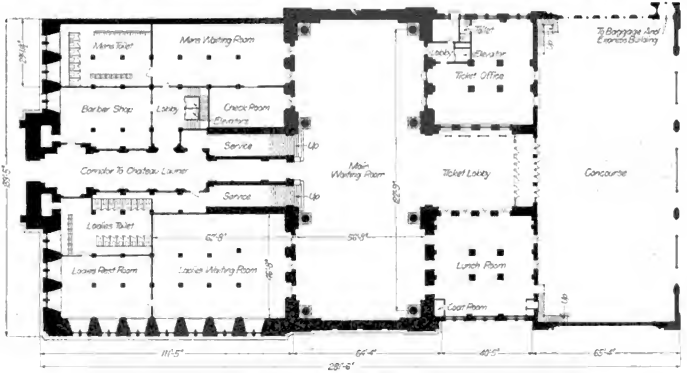
basement of the new station are located the heating and ventilating fans, air-washing plant, water heaters for the toilet rooms and barber shop, storage tanks for drinking water and a vacuum cleaning plant with connections all over the building and power enough to allow four cleaners to be operated at once.

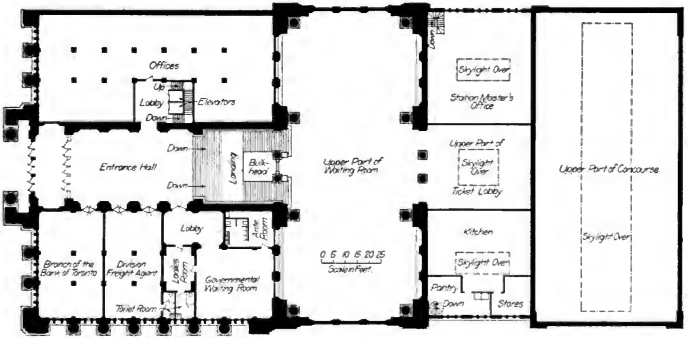


Floor Plan of the Track Level.

THE CHATEAU LAURIER.

The Chateau Laurier is an eight-story L-shaped building facing the street and the canal, the main entrance being opposite the station and the longer dimension of the building being perpendicular to the street. The Chateau type of French architecture is used, the materials of construction being the same as in the station building. The hotel building is fireproof throughout, the corridors being divided into sections by fire doors to separate them in an emergency. No wood is used in the construction of the building except the door frames and baseboards. The main corridors lead directly to fire escapes.

There is a basement and sub-basement below the street level floor, the sub-basement containing the power equipment and storage rooms and the basement containing the grill, bar, kitchen, barber shop, manicuring parlors and toilet rooms. This basement connects directly with the subway from the station build-



Floor Plan of the Street Level.

The walls are of caen stone, and the floors are laid in Napoleon grey and

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Belgian black marble. The room contains a finely carved caen stone fire-place, and as a central figure a bust of Sir Wilfred Laurier, ex-premier of the Dominion, for whom the hotel is named. On one side of this rotunda is the lounge, or gentlemen's writing room, which is finished in simple Flemish style, with wainscoting of oak and richly modeled plaster frieze and cornices. A marble staircase leads from the center of this room down to the grill and bar room. Back of the rotunda is a palm room which is also used as a tea room. This room has a barrel vaulted ceiling and caen stone walls and floor of Gruby tiles, the scheme of decoration being Renaissance in character. Especially designed tables, chairs and settees in verde antique were chosen for this room in which tea is served every afternoon between the hours of four and six. Adjoining the rotunda opposite the lounge is the main office of the hotel with telephone exchange, telegraph office, elevators and main staircase. From the office a long corridor leads back along the side of the building to the main dining room, which occupies the corner of the main floor overlooking the park and the Rideau canal. This room is 83 ft. long, 50 ft. wide and 29 ft. high. It is decorated in the style of the Elizabethan period with oak wainscoting. This room also has a large fire-place above which is a mural painting of local historic interest. The corridor leading back to the dining room opens out on a broad terrace overlooking the locks on the canal. During the summer months awnings are provided on this terrace and it is furnished with tables and chairs, making it a very picturesque and enjoyable lounging spot. A view of the canal and the Ottawa river is best obtained from this veranda. On the mezzanine floor are located the ball room, banquet room, private dining rooms, ladies' writing rooms, ladies' parlor, balcony overlooking the rotunda, musicians' gallery overlooking the main dining room and cafe, manager's office, accountant and auditor's office and public stenographer's office. The decoration of the ladies' writing room is in the style of the Louis XVI period with paneled ceiling and French grey enameled woodwork. The banquet room has a seating capacity of 250, and is connected with the foyer, a large room facing the Plaza Laurier, which is used for assembling guests before banquets and during the intermission of dances. The ball room is 70 ft. long x 40 ft. wide and 20 ft. high. It is divided into bays with fluted columns which support massive beams spanning the room. There are wall decorations of large painted panels portraying classical subjects which harmonize with the brown and gold tone of the room. The ball room, banquet room and foyer are all decorated in the Louis XVI style, with furniture of Italian walnut.

The second, third, fourth, fifth and sixth floors have 53 bedrooms each, the furnishings of which are of the most modern type and include every known convenience in hotel management. On the second floor there is provided a royal suite which is elegantly furnished for the exclusive use of royal guests. On each floor particularly well located rooms are furnished in an attractive manner for parlor bedroom suites.

The construction of this complete terminal was begun under the direction of Howard G. Kelly, vice-president, formerly chief engineer, and completed by H. R. Safford, chief engineer, to whom we are indebted for the foregoing information. The architects were Ross and Macfarlane of Montreal.

ARICA-LA PAZ RAILWAY, BOLIVIA.—It is said that important petroleum deposits have been found, and proved of great value, at a place called Calacoto, which is one of the stations situated on the newly-built Arica-La Paz Railway. The same line has already considerably benefited by the act of the government in helping to establish a new town in the department of La Paz, called Caracaro, and contributing the sum of $25,000 towards the acquisition of the necessary land. This is in a great wine-producing district, and in a few years' time its cultivated fields should serve to yield a rich and increasing traffic to the railway company.

WHAT REGULATION TAUGHT ONE REGULATOR.*

By JOHN B. OLMSTED,

Former Member, New York Public Service Commission, Second District.

I came into office with decided leanings towards the anti-corporation view of public utility questions. Some of my good friends among the corporation lawyers in Buffalo were kind enough to say that I was too much of an anarchist to be of much use as a commissioner. Want of knowledge as to the precise point involved I have found in many cases to be the principal cause of the prejudices I then entertained. Experience has taught me that there is another side to these questions, and one not lightly to be dismissed.

For instance, I held the view, as I imagine many another person holds the view, that the New York Central Railroad is grossly over-capitalized, and is paying dividends on a large amount of what is popularly known as water. When it came to my knowledge as a part of the evidence of a long investigation in the Buffalo, Rochester & Eastern case that the estimated cost of that company's 300 miles of railroad from Troy to Buffalo, planned without adequate allowances for terminal yards and facilities at either end, and touching but one or two large centers of population, was approximately one hundred millions of dollars, I came to the view that the New York Central, with its four tracks running through the heart of so many great cities of the State, with all the attendant advantages to freight and passenger business, and with approximately 500 miles more trackage, including the vast and valuable terminal facilities of New York City, might possibly on a valuation measure up to a capitalization of five times that of the B., R. & E.

MANAGERS CONCILIATORY.

I have changed my mind also as to the attitude of most corporation managers towards the public. I had expected to find it recalcitrant and objurgatory, which is a Latinized and "more tenderer" way of saying that it was made up of kicks and damns. I have found it almost uniformly, when expressed in the presence of the Commission, conciliating and willing to abide by the results of a fair hearing. The difficulty with me has been not so much in getting the corporations to do what I thought was right as to determine in my own mind what under all the circumstances of certain cases was right.

I am fully aware that this is not the popular view of public service corporations, nor do I wish to be understood as having discovered wings on the shoulders of the managers thereof. I say that a better knowledge of the conditions under which their business is carried on brings one to a more just appreciation of some of the difficulties under which they labor. I know well that there are many—very many—particulars in which the service which they are rendering may be improved, as I know well that there are very many particulars in which the business of every man in this room might be improved if an inquiry into it were started by a commission armed with power. Such a commission would be at once met with the objection that its suggestions required too much of an outlay to carry them out, and would be asked how it proposed to provide the funds for the improvements recommended. Let us be reasonable as well as critical. Let us realize that the management of one thousand men on a street car line is no less difficult than the management of an equal number in a factory, and that there are times when you have to do the best you can with the material with which you have to work.

"STRAIGHT" STREET MORE POPULAR.

I believe that in the past ten years a great change has come over the minds of men who are in the management of public utilities. There are still some left who cling to the old "public-be-damned" idea, but they are fast being supplanted, and the

*Extracts from an address made at Amsterdam, N. Y., just before Mr. Olmsted's retirement as a public service commissioner.

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up-to-date railway or electric light official stands ready to listen to any reasonable complaint that may be brought to his attention, and, what is more to the point, to turn a deaf ear to proposals which call for abhorrent and forbidden methods in their accomplishment. I am not innocent enough to believe that all the dark, devious and easy ways of "getting there" have been wholly abandoned; but I do hold the view that the street called "Straight" is a much more popular thoroughfare than it used to be, and that the directors and agents of the corporations over which we have control are walking it with much cleaner consciences and with great gain to their self-respect.

RISKS OF INVESTMENT.

I have intimated that one great difficulty with certain corporations is the lack of means to carry out the improvements to service which their operating men admit would be advisable and desirable. On this point some figures from our last annual report may be illuminating. Out of 78 steam railroads reporting to the commission in this State, only 27 paid any dividends for the current year. Out of 364 electric railroads, light, heat and power, and gas corporations, 237 paid no dividends. In 1909 it was 237 out of 310, so that conditions are improving some; but the figures are significant. They are contradictory to the general impression that dividends are the foundation upon which all public service corporations are erected, and they have a sobering effect upon an official who starts in with the idea of building Rome—or even Schenectady—in a day.

The consideration of them has not swayed the mind of the Commission where conditions have become intolerable or even irritating; but they have at times prevented the attainment of ends which otherwise might have been ordered.

I know that these views are not wholly popular, and I know that in certain quarters the idea prevails that a public service commissioner should be pictured with a knot of thongs to lash the sides of all the hated corporations, irrespective of their merits or deserts. In my view that savors too much of "Donnybrook Fair." I like the expression of President Taft, who quietly reminded his hearers on one occasion, as I recollect it, that the phrase "all the people" means just what it says, and that "all the people" included also the corporations, which are made up of people just as much as a municipality is.

EVEN-HANDED JUSTICE.

The Public Service Commission is organized to hand out justice as near as it can determine it, both to shippers and to carriers, to consumers and to producers, and if it has attained some success in its work of the last five years, it has done so by a strict adherence to that view, and not by spectacular brandishings of the "big stick." It has accomplished more good by getting both parties before it, pointing out the strength or weakness of opposing views, and then appealing to that sense of fair play which is inherent in every man, than it ever has by a display of the tremendous powers which the law undoubtedly confers upon it.

AN AMERICAN FREIGHT CAR FOR USE IN GERMANY.

The Pressed Steel Car Company has shipped an all-steel general service gondola car to Heidelberg, Germany, which is believed to be the first case on record of a steel freight car of standard American design and construction being exported for use on the railroads of Germany.

Last autumn Frederick Schott, president of one of the largest German cement manufacturing companies, came to this country on a tour and while here made a careful study of freight cars in use in this country, with a view of ascertaining what advantages, in certain phases of transportation, the American types might possess over those in general use in Europe. For his particular purpose a car that could handle crushed stone, coal or other material that required dumping, as well as cement in bags or barrels, best loaded on a flat car, possessed many advantages.

Interior of General Service Gondola Car.

Mr. Schott therefore decided on a general service type of car and placed an order with the Pressed Steel Car Company for one of the standard cars of this kind manufactured by them.

The car, as will be seen from the illustration, is equipped with 16 drop doors, which are operated by a creeping shaft device, so that when closed they rest on a steel shaft and make a flat and rigid floor. The car weighs about 41,500 lbs., is 41 ft. 6 in. in length and is of 100,000 lbs. capacity. Air brakes, couplers, truck frames, bolsters and all other specialties are of American standard practice.

American General Service Gondola Car Built for Use in Germany.

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THE EFFECT OF BLOCK SIGNALS AND AUTOMATIC STOPS ON ACCIDENTS.*

By A. G. Shaver,
Signal Engineer, Rock Island Lines.

It is to be regretted that the statistics of the Interstate Commerce Commission do not show exactly what accidents block signals would probably have prevented. Of the causes for train accidents, rear and butting collisions and broken rails may be considered as almost wholly preventable by block signals. Since there is some doubt as to just what is included under miscellaneous collisions, irregular track, derailments due to miscellaneous defects in roadway and derailments due to miscellaneous causes, the accidents so classed will also be considered as not having happened if the trains had been operated under block signals, although it is probable only a small percentage could have been so prevented. Of all these: rear collisions killed 117 and injured 2,019; butting collisions killed 157 and injured 3,136; miscellaneous collisions killed 100 and injured 2,656; broken rail derailments killed 52 and injured 1,065; irregular track killed 15 and injured 743; miscellaneous derailments due to defects in roadway killed 14 and injured 317; and derailments due to miscellaneous causes killed 129 and injured 1,663. The total of these is 584 killed and 11,599 injured, or 5.5 per cent. and 6.8 per cent., respectively, of the total killed and injured from all causes.

In the Interstate Commerce Commission report of block signals in service, as of January 1, 1912, 169 railroads report 176,847.7 miles of passenger lines (railways where more than one train is in operation at a time), of which 20,027.9 miles of two or more tracks and 56,381.8 miles of single track railway are equipped with block signals. Of the 43.2 per cent. of total passenger lines equipped with block signals, 11.49 per cent. are equipped with the automatic and 31.71 per cent. with the non-automatic system. This involves an approximate installation cost for the block signals in service of $48,300,000, and for those yet to be installed to completely equip all passenger lines, assuming the installation of automatics and non-automatics to continue in the same ratio, of $54,800,000, or a total of $103,100,000. There is also involved not less than an annual upkeep and operating expense for those block signals now in service of $10,000,000 and for those yet to be placed in service of $12,000,000, or a total of $22,000,000.

The block signal system as a means of preventing certain classes of train accidents is now generally recognized, and many railways are installing it along with other improvements as fast as their finances will permit. Several bills requiring the block system to be used are now pending in Congress. The best and fairest of these is the Esch bill. With a few changes and some modifications the railways could very well accept it. It is doubtful if there is any particular objection on the part of the railways to reasonable block signal legislation. Indeed, some railway managers have expressed themselves as in favor of it, for it would help them in obtaining the necessary money for installation and would compel those roads which have as yet done nothing to get busy.

During the last several years, there has been considerable agitation which would require the railways to install and use a system whereby the control and stopping of a train will be taken out of the hands of the engineman in case he fails to act when the necessity for controlling or stopping his train exists. This has continued, too, despite the fact that many of the accidents occurring would probably never have happened if an adequate block system had been in use.

An ideal train control system is one that will give the same results in service as a careful engineman. Thus far no such system seems to have been developed for general use, though hundreds of inventors have been at work on the problem and thousands of schemes have been patented. Most inventors seem to work with the idea of stopping trains, rather than of keeping them going safely, which is what the public really demands. Enough has been learned as to the probability and practicability of such devices to lead some signal engineers to conclude that the total cost for installation, maintenance and operation would be at least equal to that for block signals.

There is no difference between the automatic train control and the block system as to the results to be accomplished. Automatic train control is merely an agent to do what the engineman should do. The "surprise checking" on those roads where the block system is in use develops the fact that enginemen and trainmen are at least 90 per cent. efficient in observing and obeying the signal indications and the rules and instructions for the protection of trains. Hence, we can conclude that the automatic train control system would tend to prevent not more than 10 per cent. of the train accidents which are given above as preventable by the block system; i. e., it would save 58 persons or 55/100 of 1 per cent. of the total killed and 1,159 or 68/100 of 1 per cent. of the total injured for all causes.

No man is any better than any other in the eyes of his Creator. Because of this equality, is it not more humane and more reasonable that our energies and our resources should first be expended to eliminate those causes of railroad accidents that kill and injure the greatest number of persons? If this is so, then the trespasser should receive first attention. By a system of education, compulsion and punishment he must be made to keep at a safe distance from railway trains. This cannot be done by the expenditure of money alone. There must also be co-operation between the individual, the state and the railway.

*From an address on "Railroad Accidents" delivered at Purdue University.

WEIGHING HEARING AT CHICAGO.

The final hearing, as far as the west is concerned, in the weighing investigation by the Interstate Commerce Commission, which has been in progress during the past year, was held at Chicago on February 26 and 27, before Commissioner Prouty; John T. Marchand representing the commission as attorney. The hearing was devoted almost entirely to the subject of weighing coal, and in addition various witnesses were given an opportunity to present their views as to some of the principal questions that have arisen in previous hearings.

M. N. Billings, assistant traffic manager of the Illinois Steel Company, testified as to methods of weighing shipments of iron and steel. He was followed by W. M. Hopkins, manager of the transportation department of the Chicago Board of Trade, who complained of the inaccuracy of grain weights obtained on the wagon scales of the railways in Chicago, on account of the lack of supervision, and asked to have this weighing done under the supervision of the Board of Trade. He also called to the stand Albert L. Somers, a grain commission merchant, who testified that grain cannot be sold from team tracks, except at a premium of from one-half to two cents above the market price, because of the risks to be expected in checking weights from wagon scales.

Mr. Cruikshank, representing the Streeter-Amet Weighing & Recording Seale Co., briefly described the automatic recording device manufactured by his company, which he said had been in use about 20 years.

W. F. Sheridan, inspector of transportation of the Louisville & Nashville, testified that on his line coal is weighed at or very near the mine, either on scales owned by the operators, or on the railroad track scales, using the tare weight as stenciled on the cars, and that the weights so obtained are used both for the assessment of freight charges and for making out the invoice. Where mine scales are used they are inspected in the same way that the railroad's own scales are inspected. There are no re-weighings, except for obvious discrepancies. He believed that weighing should be done at the point of origin, and that the roads should not be responsible for shrinkage in transit, due to evaporation of moisture. It is important to use point

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of origin weights, not only for the purpose of assessing freight charges properly, but in order that trains may be made up according to the rated capacity of the engine. Grain is weighed in the same manner as coal, and no change is made after check weighing, except in the case of a discrepancy of 1,000 lbs. or over.

Charles Ware, general manager of the Union Pacific, was called to testify as to practices in the weighing of coal in Wyoming. He stated that most of the mines are equipped with their own track scales, and that coal weighed on these scales is not re-weighed by the railway. He also favored weighing at as near as possible to the point of origin, in order to secure the proper tonnage for locomotives. T. E. Brentnall, general scale inspector of the Union Pacific, supplemented Mr. Ware's testimony with technical details regarding the inspection of scales. He stated that on the Union Pacific all scales are examined once a month to see that the parts work freely, and that once in three months they are tested by a test car. Weights are taken while the cars are uncoupled and standing.

W. E. Wells, chief scale inspector of the Chicago, Burlington & Quincy, testified as to methods in the weighing of coal in Illinois, Iowa and Missouri. He said that most of the mines have track scales of their own, and that their weights are checked occasionally by the railway, which also inspects the scales once a month. John G. Crawford, fuel engineer of the Burlington, testified regarding the percentages of moisture in coal of various kinds and from various districts, and described a series of tests to show changes in weight of loaded cars due to evaporation or to rain while the coal was in transit.

F. C. Maegly, assistant general freight agent of the Atchison, Topeka & Santa Fe, agreed with the preceding witnesses as to the necessity for taking weights at the point of origin. He said that in the southwest some railways have provided for making an allowance for the loss of weight in washed coal due to evaporation. Some companies provide for weighing the coal eight or ten hours after it is loaded to allow time for water to run off. In the southwest coal weights obtained on mine scales are accepted by the carriers where the mines have weight agreements with the Western Railway Weighing Association & Inspection Bureau, which must have full control of the inspection of the scales. If a mine has no scale the coal is weighed at the nearest track scale of the railway, otherwise the railroads depend on the bureau to approve or condemn the scales and methods at the various mines. Coal is almost uniformly sold on the basis of the primary weight and the trade has been adjusted to it. It would entirely disarrange many features of the industry if this method were changed.

A. S. Dodge, superintendent of the Western Railway Weighing Association & Inspection Bureau, submitted a statement in addition to those he had submitted at previous hearings summarizing data for 10,501 cars weighed at 67 different points in the ordinary course of business, but which had been weighed for the purpose of the test, first uncoupled at only one end, and again uncoupled at both ends. The difference in weight was 13,960 lbs. less when cars were uncoupled at both ends, but in 8,996 cars there was no variation. The ordinary difference on the others was from 100 to 200 lbs. per car, although there was one case in which the difference was 1,980 lbs., which was being investigated. He thought the test showed conclusively the reliability of weighing cars coupled at one end. Commissioner Prouty insisted, however, that the test showed that, while there might be no variation in case the operation was properly performed, the fact that a car is coupled at one end introduces a chance for a mistake which may be small, or which may amount to a considerable difference, as in the case of the maximum difference found in the test. Mr. Dodge stated that 80 per cent. more time is required to weigh cars uncoupled at both ends.

W. J. Towne, general superintendent of the Chicago & North Western, testified regarding the scales and weighing practices of the North Western, saying that cars are usually weighed standing and uncoupled at one end, although sometimes they were weighed in motion. An effort was made to obtain the light weight of all cars once a year, but he thought it had never been completely successful. Scales at the mine are owned by the railway and invoices are made from the scale weights.

Oscar F. Bell, traffic manager of the Crane Company, and chairman of the weighing committee of the National Industrial Traffic League, discussed a large number of the causes for inaccurate weights. He agreed that weighing at or near the point of origin was necessary, but thought there should be some better method than exists at present of deciding which of two varying weights should be taken as the correct one. The stenciled tare weight of a car, he said, is almost always wrong, and in case of a difference between stenciled tare and track weights the scale weight should govern. He also believed that preference should be given to weights obtained on small scales, such as platform scales, over weights taken of an entire car and its load on a track scale. He thought notice ought to be given the shipper promptly in case of any change in the weight found by the carrier.

L. D. Davis, supervisor of scales and weighing of the Baltimore & Ohio, and A. B. Starr, general superintendent of freight transportation of the Pennsylvania lines, were prepared with a large amount of data to be used as arguments against destination weighing, but this line of testimony was made unnecessary by a statement from the commissioner that there had been no demand for destination weighing, and that the commission recognized the necessity for weighing at point of origin. Mr. Davis testified that discrepancies in the tare weight of cars are almost unavoidable, and that they frequently arise from rubbish left in the car. He disagreed with Mr. Bell that small scales would give more accurate weights than track scales, for the reason that the opportunity for error is multiplied when packages are weighed separately.

Eugene McAuliffe, general coal agent of the Frisco lines, gave a large amount of technical testimony in regard to the weighing of coal and the percentages of moisture found in different coals. He believed that, on account of the larger number of opportunities for error with small scales, weights taken on large scales would give better results, even though the smaller scale might be a more accurate machine.

At the Thursday morning session Mr. Maegly and Arthur Hale, general agent of the American Railway Association, announced that for several months a sub-committee of the committee on relations between railroads has been at work on a plan of uniform rules and specifications for weighing, which, it is hoped, may be in shape for adoption at the May meeting of the American Railway Association. The work has been subdivided so that the matter of technical construction and operation of scales will be reported upon by a committee consisting of A. F. Epright, of the Pennsylvania, and Mr. Davis, of the Baltimore & Ohio, while complete rules governing the entire matter of weighing, including the tariff rules, will be formulated by a committee consisting of Mr. Maegly and the managers of the various weighing and inspection bureaus. The committee had made a partial report to the November meeting of the American Railway Association, and new and improved rules for the light weighing of cars had been adopted, effective January 1. The technical committee expects to suggest complete specifications for standard scales, and for the best methods of installing, testing and using scales. The committee on rules may not be able to complete its work before the November meeting. The weighing committee of the National Industrial Traffic League has been asked to co-operate with the railway committees.

Mr. Hale submitted a list of points which he thought should be covered in the briefs and arguments to be filed with the commission, and made a statement in which he urged the commission not to adopt rules which would be so rigid as to deprive some roads of the incentive to strive for a higher standard. He thought that one of the dangers of government regulation was

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the inclination to enforce average or compromise standards, and he thought that proper stimulation and encouragement of higher standards would bring better results. Commissioner Prouty made a statement in which he said that one of the principal questions to be considered was as to the extent to which federal control of weighing practices should be substituted for individual control. The important thing is to see that weights are made as nearly accurate as possible, and to provide methods by which controversies may be settled before the consignee has taken possession of the property. He thought the weighing should be done as early as possible after the shipment is turned over to the carrier. Many of the questions involved were such that the commission had no jurisdiction to make a formal order, for instance, it had no authority as to the matter of weighing in motion, but might make some strong recommendations on that point.

Further hearings will be held on March 10, at Philadelphia, and on March 17, at New York, for the purpose of receiving additional testimony regarding the weighing of anthracite coal. Those desiring to prepare briefs or submit arguments are to notify the commission prior to April 15, and Commissioner Prouty stated that final arguments will probably be heard about the first week in May.

FLASH LIGHTS FOR AUTOMATIC SIGNALS.

The Chicago Great Western has installed a Commercial Acetylene flashlight in one of its automatic block signals. This signal is No. 11-3, and is located about 200 yards east of the station at Maywood, Ill. It is a single-arm, upper-quadrant, three-position signal governing westbound movements. The

Acetylene Tank and Regulator for Flash-Light Signal.

light is of the standard type as manufactured by the Commercial Acetylene Railway Light & Signal Company, 80 Broadway, New York, for railway signaling purposes. It flashes once each second, or 60 times a minute, and is lighted one-tenth of each second and dark nine-tenths. The flashing is continuous through all three indications of the signal. The light will burn 24 hours a day for nine months without attention. To disconnect the empty tank and connect up a full one takes 15 minutes. No relighting is necessary, as there is enough gas in the pipes to keep the flame going. The feed pipe from the tank is carried up to the lamp outside the signal post.

INCREASE IN MAIL PAY.

The post office appropriation bill as passed by Congress this week allows the postmaster general to increase, not exceeding 5 per cent., the contract compensation to be paid the railways for carrying the mails from July 1 next to the end of the present contract period, except on routes where the mail has been weighed since the beginning of the present year. This change in the law is made because of the increase in the weight of mail carried on account of the introduction of the parcel post, January 1, last; but it is only a small part of what the railroads have asked for. Ralph Peters, vice chairman of the committee on railway mail pay, has presented strong arguments to both congressional committees for a reasonable readjustment of the rates of pay, accompanying his statement with data concerning the increased weight of mails thrown upon the railroads since the establishment of the parcel post, which increase in many cases has amounted to 25 per cent. or more. With a 25 per cent. increase in weight and a 5 per cent. increase in compensation the railroads will be getting for the new business one-fifth the compensation that they should.

The annual appropriation for compensation of the railroads for the mails is about fifty millions and this, to anti-railroad congressmen, seems a huge sum; but Mr. Peters calls attention to the fact that the rural mail carriers receive 45 millions of dollars; the railway mail clerks 35 millions, and the letter carriers 37½ millions. The mail-pay committee will continue its campaign with the congressmen to secure a modification of the law so as to require the postmaster general to reweigh the mails at least once every year.

NEW YORK CITY SUBWAYS.

The New York State Public Service Commission, first district, on March 4 approved the operating contracts, which have been the subject of tedious delays and litigation since they were first proposed, many months ago, under which the Interborough Rapid Transit Company and the Brooklyn Rapid Transit Company are to operate new subways to be built in Manhattan, the Bronx and Brooklyn. The contracts, as now agreed upon, do not include the construction or operation of the proposed additional main tracks on the elevated lines on Third avenue and other avenues, this feature of the new system having been delayed by objections interposed at the last minute by owners of the Manhattan Elevated. Officers of the Interborough Rapid Transit Company, lessee of the Manhattan Company's lines, had agreed to all of the proposals of the city and state authorities, but they were surprised on the day on which the contracts were to be signed by the refusal of George J. Gould and other prominent owners of the elevated lines to agree to the proposed changes. Hearings will be given by the Public Service Commission March 15 on a proposal to authorize the Interborough Company to put up the proposed new elevated lines.

ARGENTINE RAILWAY CONCESSIONS.—The Argentine Director General of Railways is drafting a bill dealing with the conditions to be fulfilled by applicants for railway concessions. The object is to put a stop to acquiring concessions which will never be carried out and are obtained for speculative purposes, either by endeavoring to sell to an existing railway company whose zone has been invaded or for land speculation.

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General News.

The annual meeting of the Burlington Association of Operating Officers was held at the general offices in Chicago on March 3, 4 and 5.

Suit was filed by the government on March 1, in the United States district court, at Chicago, charging the Chicago & Eastern Illinois with 104 separate violations of the hours of service law.

Officers of the Grand Trunk say that the increase in wages paid for organized labor for 1912 over 1911 amounts to $750,000, and that the increases for other classes of employees will amount to very nearly an equal amount; bringing the total wage increases for the year up to nearly $1,500,000.

The Cincinnati, New Orleans & Texas Pacific, which is now using the telephone for train despatching on 137 miles of its line, is to adopt the same plan on 117 miles additional. With this extension there will be left only 87 miles on which the telegraph is still in use for despatching.

Representative Curley of Massachusetts has introduced in Congress a bill looking to the amendment of the Constitution so as to give Congress the right to regulate hours of labor throughout the United States. Cotton and woolen manufacturers and other employers in Massachusetts suffer because of the lax labor laws in other states.

On recommendation of the Texas railroad commission it is said that the attorney general of Texas will institute proceedings for suits against the Timpson & Northwestern and the Jefferson & Northwestern railways to recover penalties aggregating $427,000 and $179,000, respectively, for alleged violations of the law requiring monthly reports to the commission.

On Tuesday, February 25, a French aviator, Marcel G. Brindejonc des Moulinais, flying in a monoplane, traversed the distance from Paris to London, 287 miles, at the rate of about 90 miles an hour. There was a dense fog when he crossed the channel. The aviator started at 9:15 a. m., landed at Calais at 10:50, resumed his flight at noon, and descended in London at 1:30.

Following a series of conferences between officers of the Illinois Central and of the Order of Railway Telegraphers a new contract has been made by which more than 1,000 of the company's operators will receive an increase in pay. The schedule is so arranged that the increases will apply in accordance with the responsibilities at different stations.

In the Federal Court at Buffalo, N. Y., March 4, fines aggregating $30,000 were imposed on the New York Central for discrimination in the assessment of demurrage charges on freight cars at East Buffalo. At the same time the Lake Shore & Michigan Southern paid fines aggregating $20,000, and the New York, Chicago & St. Louis $5,000, for violation of the 28-hour law regulating transportation of animals.

The Colorado House has passed a bill reducing passenger fares in the state. The rates in the plains district are to be two cents a mile where the annual gross passenger earnings exceed $1,000 per mile, and three cents a mile where the earnings are less than that amount. In the mountainous district the rate is to be three cents a mile where the earnings exceed $1,200 a mile, three and a half cents where they are less than $1,200 a mile, and 5 cents a mile for hauls of 10 miles or less.

The safety department of the Chicago, Burlington & Quincy, of which E. M. Switzer is the superintendent, has had a car fitted up especially for use in the "safety first" campaign. It is arranged similar to a small theater, having seats for 70 persons, and a platform with a large screen on which moving picture views will be shown during lectures to be given by Mr. Switzer. Lectures will be given from this car at prominent points on all parts of the Burlington system, the purpose being to have the car go to the men, instead of requiring the men to go to a hall to attend the lectures.

A "safety first" rally was held at Williamsport, Pa., on Monday evening last, participated in by officers and employees of the Pennsylvania, the Philadelphia & Reading, the New York Central and the Susquehanna & New York railroads. H. M. Carson, general superintendent of the Pennsylvania Railroad, presided. The principal address, which was accompanied by stereopticon views, was given by George Bradshaw, general safety agent of the New York Central. Mr. Bradshaw's lecture was preceded by a half dozen five-minute addresses by employees of the different roads, an engineman, a train master, an agent, a freight brakeman, a machinist and a passenger conductor.

To comply with the order of the Public Utilities Commission of Connecticut, and the recommendation of the Interstate Commerce Commission, the New York, New Haven & Hartford is rebuilding 78 crossovers between Boston and Woodlawn (New York) 220 miles; and at the same time will reconstruct 12 switch leads which are not in crossovers. In connection with this work 36 interlocking plants will have to be rebuilt, or extensively altered; and the estimated cost of the whole of the changes is $750,000. Forty-three of the crossovers are number 15, these having been installed in former years with the expectation of providing for all necessary movements of all classes of trains.

The Illinois Central was fined $2,000 in the federal court at Chicago on February 28, for violation of the safety appliance law, hours of service law, the law providing for the filing of reports with the Interstate Commerce Commission, and the law regulating the transportation of cattle. The Lake Erie & Western, the Lake Shore & Michigan Southern, and the Indiana Harbor Belt railways were fined in the United States court at Indianapolis on February 24, for violation of the hours of service law and the safety appliance law. Suit was filed in the United States district court at Chicago last week against the Chicago & Alton for 12 alleged violations of the hours of service law.

The Chicago plan commission has appointed a committee, consisting of Charles H. Wacker, W. D. Kerfoot, Clyde M. Carr, Michael Ziimmer and James Simpson, to confer with officers of the Pennsylvania Lines; Chicago, Burlington & Quincy; Chicago, Milwaukee & St. Paul, and Chicago & Alton, with reference to the possible adaptation of their plan for the erection of the proposed union station to the "plan of Chicago," formulated by the commission. The committee will collect data and information to be presented to the railways in the effort to prove that a union terminal at Twelfth street is preferable to the site proposed by the railways between Jackson, Adams, Canal and Clinton streets.

President Percy R. Todd, of the Bangor & Aroostook, says that the action of his company in bringing suit against the Maine Central for damages is based on the refusal of the M. C. to continue an allowance to the B. & A. which was agreed upon in 1906 when the point of interchange for freight between the two roads was changed from Oldtown, Me., to Northern Maine Junction. In view of the disadvantage to the B. & A. resulting from this change the Maine Central was to pay it certain sums monthly, based on the amount of freight interchanged. These payments were made until May 1, 1911, when the M. C. refused to continue the allowance, thus depriving the B. & A. of upward of $75,000 a year.

"Safety first" reaches its highest development the farther ahead a dangerous condition can be seen; and according to "The Frisco-man," this was exemplified recently in a striking manner on a road in a southern state—not the Frisco road—when a locomotive engineman, running a fast train, on a very dark and rainy night, and approaching a street crossing, noticed sparks of light fluttering in the air. Recognizing this phenomenon as one commonly seen when a trolley slips off its wire, the engineman, surmising that possibly a street car was in trouble, shut off steam and slackened his speed. On reaching the crossing he found across his track a car, loaded with passengers, while the conductor was vainly trying to place the trolley in its position against the wire. The motorman was standing at his place on the car waiting for the connection to be made. No one had taken the precaution to watch for the express train.

Firemen's Wages.

William L. Chambers of Washington, D. C., formerly chief justice of the International Court at Samoa and member of the Spanish Treaty Claims Commission, has been chosen by Messrs. Knapp and Hangar to be the third member of the arbitration board which is to consider the Eastern firemen's demand for increased pay. Mr. Chambers was a member of the board

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which, in May, 1910, arbitrated the wages of the firemen of 49 roads west of Chicago. The arbitrators, Messrs. Atterbury, Phillips and Chambers, will hold their first public session at Washington, D. C., March 10.

Pullman Cars on the New Haven.

That the Pullman Company now furnishes and operates the parlor and sleeping cars on the New York, New Haven & Hartford is a fact which, we trust, is by this time known to the readers of the *Railway Age Gazette*. We hope, therefore, that our devil-proof-reader will be forgiven for stating last week that the new parlor cars recently put on the Merchants' Limited were made by "Borman."

Proposed Legislation.

The lower house of the Indiana legislature has passed a bill limiting the length of freight trains to 85 cars.

A bill has been introduced in the Iowa senate requiring railways to pay claims within 90 days, subject to a penalty of $100.

A bill has been introduced in the senate of the Michigan legislature requiring railways to furnish cars to shippers within 72 hours, and refrigerator cars for perishable shipments within 18 hours.

A bill has been introduced in the Nebraska legislature which would require all railways in the state to employ train auditors to look after collections of tickets, leaving the conductor to run the train.

A bill has been introduced in the Michigan legislature requiring railways to furnish freight cars to shippers within 72 hours after the request is made, except in the case of refrigerator cars for perishable shipments, which shall be furnished within 18 hours.

A bill has been introduced in the Indiana legislature by Mr. McCabe to regulate demurrage on freight cars. Mr. McCabe would allow 72 hours' free time on a carload weighing from 30 to 40 tons; and 96 hours on shipments weighing more than 40 tons.

The railroad committee of the Kansas senate has amended the proposed full-crew law which it has had under consideration for several days, so as to require an additional brakeman only on trains of 50 or more cars, instead of 25 or more cars, as originally drafted.

The railway committees of the Michigan legislature have held hearings on a bill to authorize an additional charge when cash fares are paid on the trains. Conductors testified that without a penalty against the payment of cash fares too much of their time is taken up in making collections.

At a recent meeting of the Commerce Club of Pueblo, Colo., resolutions were passed expressing disapproval of bills pending in the legislature to compel railways to equip their locomotives with headlights of 1,200 c. p.; to compel railways to have a third man on all locomotives; and to prohibit running locomotives backward.

The Indiana legislature has before it a bill to amend the full crew law of the state so as to forbid the employment on trains of any person except men regularly employed as enginemen, firemen, conductors and brakemen. F. A. Feick claimed that the railroads were flagrantly violating the present law by classing colored porters as brakemen.

A bill has been reported in the Missouri senate providing that when rates fixed by statute are made inoperative on account of litigation, railways or public utilities are required to give rebate tickets providing for a refund in the event the statutory rate is upheld. The corporations are required to file an itemized statement of the overcharges with the state twice a year, so that the state may bring suit against the corporations for a return of the excess collections, to be distributed among the holders of the rebate tickets. Another bill provides that, as an inducement to railways and other public utilities to pay claims without litigation, judgments in courts of original jurisdiction will be reduced one-half in case the corporation chooses to pay without appeal.

Suits have been filed in the federal court at Danville, Ill., charging the Mobile & Ohio with transporting sheep from the quarantine district of Jordan, Ky.; the Chicago & Alton with three violations of the federal hours of service law; the Illinois Central with one violation of the law regulating the transportation of live stock; the Merchants' Bridge Company of St. Louis with 29 violations of the hours of service law; the Terminal Railroad Association of St. Louis with 68 violations of the hours of service law, and the Chicago, Burlington & Quincy with three violations of the hours of service law. Four railways were fined in the United States district court at Chicago on February 21, for violations of the law regulating the transportation of live stock. The Chicago, Milwaukee & St. Paul was fined $1,200, the Michigan Central $200, the Minneapolis, St. Paul & Sault Ste. Marie $400, and the Cleveland, Cincinnati, Chicago & St. Louis $200.

The Nebraska railway commission has issued a statement saying that the passage of the Keckley bill to reduce freight rates in the state 20 per cent., now pending in the legislature, would seriously hamper it in securing reasonable rates, because it has already, after an exhaustive investigation, issued a general order setting forth a tentative distance schedule of reduced class rates which it has held up awaiting the decision of the Supreme Court in the Minnesota rate case. If this decision when rendered shall leave it within the power of the several states to regulate their intrastate rates the commission will proceed with its investigation, following such principles as may be laid down in that decision, and will make such reductions as it is reasonably satisfied it can sustain in the courts. Representatives of the railways presented arguments against the bill at a hearing before the house committee on railroads on February 19, and showed that Mr. Keckley's comparisons of earnings in the states of Nebraska and of Iowa were based on a division of earnings and expenses published in a report of the Iowa railway commission which has since been repudiated by the commission as unreliable; and that in his comparison with Iowa and Nebraska local rates, he had used the exceptional joint rates which are 80 per cent. of the standard local rates.

President Wilson's Cabinet.

In the cabinet of the new president, as announced from Washington, this week, William G. McAdoo, of New York City, president of the Hudson & Manhattan Railroad, is Secretary of the Treasury, and Franklin K. Lane, hitherto chairman of the Interstate Commerce Commission, is Secretary of the Interior.

Beats the New York Subway.

"The Panama Canal Railroad can boast of the biggest labor train in the world," says a recent traveler. "The train is run for the accommodation of the workmen living between Panama City and Pedro Miguel, and those working at the locks at Culebra cut. There are 22 cars in the train and the average number of passengers is estimated to exceed 2,000. Three are for 'gold employees,' a term used to designate those paid in United States currency; five cars are for 'silver employees,' or those paid in Panama currency, and the remaining cars are for negroes.

"Each of the cars for gold employees will carry fifty to seventy passengers without crowding, while those for silver or European employees are packed tightly; and those for negroes are filled like sardine tins. In fact, according to the conductor of the train, the average number of negroes in a car was 165."—*New Orleans Picayune.*

The Grand Trunk Line to Providence.

President E. J. Chamberlin of the Grand Trunk appeared before the legislature of Rhode Island last week and told Governor Pothier and the legislators that if the state would guarantee the bonds of the Southern New England to the amount of $6,000,000 the company would resume work on the line in the spring. By a law passed in Canada while the late president Hays was in Europe the Grand Trunk can secure new capital for improvements only in case these are to be made in Canada. Mr. Chamberlin said that the Central Vermont would guarantee the bonds of the Southern New England and that all that was asked of Rhode

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Island was to put the guarantee of the state after that of the C. V. It is expected that the legislature will submit the question to a vote of the citizens. Mr. Chamberlin is reported as saying that officers of the Grand Trunk had estimated that the Southern New England line from Palmer to Providence would be self-supporting. Vice-President M. M. Reynolds of the Grand Trunk, asked about the original plans for the financing of the Southern New England, said that these were known only to Mr. Hays; whatever plans he had in his mind perished with him when the *Titanic* sank.

On Monday of this week during the absence of Governor Pothier in Washington, a committee of 19 state officers and prominent citizens which had been appointed by the governor and asked to consider the proposed plan, voted that under no circumstances should the state of Rhode Island guarantee the bonds of the Southern New England Railway.

The Bureau of Explosives.

Colonel B. W. Dunn, chief inspector of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles, has issued a circular calling attention to the advantages of associate membership in the bureau. The constitution of the bureau is now so amended that manufacturers and others interested can become associate members at a cost of $25 a year. Shippers and makers of chemicals and other dangerous articles not classed as explosives, are now joining the bureau. This organization is now more than seven years old, and, with the co-operation of the federal government, is a most useful and important instrumentality for safe railway operation and railway travel. Railway officers desiring to interest shippers in the bureau can secure circulars and blank applications for membership by sending to Colonel Dunn, 30 Vesey street, New York City.

A Signal Instructor on the North Western.

The Chicago & North Western, on March 1, created the position of signal instructor. The duties of the incumbent of this position are to instruct and educate enginemen, trainmen and other employees on signals and signal indications and the observance of them. Lectures will be given periodically at all the division points and at other places where automatic signals are in service or at which there are a number of interlocking plants.

A passenger car has been remodeled and fitted up for the use of the instructor, and its equipment includes a stereopticon; and also a "radiopticon," an instrument for projecting photographs and drawings without the necessity of having slides made for them. Pictures are to be taken of every indication and aspect which can be given or shown by the various types of signals at present in use on the road, and also by any signals the appearance or placing of which is out of the ordinary on account of local conditions or surroundings. The observance of switch signals and indicators, and train operation at interlocking plants will be carefully explained and illustrated in the lectures. The rules governing all signaling facilities will also be the subjects of frequent talks. C. G. Stecher, who has been supervisor on the terminal at Chicago, has been appointed signal instructor. (See Railway Officers department.)

Proposed New Bridge at New London.

Engineers of the New York, New Haven & Hartford are completing plans for a new steel bridge over the Thames river at New London, Conn. This bridge is to take the place of the present one, which was opened in October, 1889, and which cost over $1,000,000. The details of the new structure are not yet fully determined. The plans call for a four-track bridge, consisting of two double-track parallel spans. The height of the bridge above the bottom of the channel will be 140 ft. There are to be five fixed spans, four of which will be of 195 ft. each and one of 245 ft., and also one draw span having a clear channel of 150 ft.

The cost of building the new bridge, including certain sections of the approaches, is estimated at about $4,000,000. The present structure has been offered to the state of Connecticut as a feature of its highway program and a bill has been introduced in the legislature providing for the acceptance of this offer. The railroad company reserves the right to run trolley cars over the bridge. Announcement of the complete plans will probably be made soon, but the beginning of work on the bridge depends on what is to be done with the old structure.

Railway Signal Association.

At the regular meeting of this association in Chicago, March 17, seven committee reports will be brought up for discussion. Committee No. 3, Power Interlocking, will present specifications for annunciator bells; for push buttons; floor pushes; for fuses; for steel pipe conduit; and for wrought iron pipe conduit. Committee No. 5 will present a code of rules for the operation and maintenance of interlocking plants. Committee No. 6 will present standard drawings for anchor post; location for detector bar and clip bolt; stuffing box for 1 in. pipe; stuffing box for wire; connections for double switches; and details for lock rod and operating connections. Committee No. 8 will present additions to specifications and requisites for alternating current automatic block signal systems on steam railways. Committee No. 9 will present revised specifications for galvanized steel wire for mechanical connections. Committee No. 10 will submit information concerning Edison storage batteries and specifications for lead type stationary storage batteries; also a drawing of a motor panel. The special committee, W. L. Manual, chairman, will present a progress report on blanks and rules for recording signal performance.

Program of the American Railway Engineering Association.

The following is the program for the convention of the American Railway Engineering Association, which will be held at the Congress hotel, Chicago, on March 18-21, inclusive:

Morning Sessions—9:00 a. m. to 12:30 p. m.
Afternoon Sessions—2:00 p. m. to 5:30 p. m.

TUESDAY, MARCH 18.

President's Address.
Reports of Secretary and Treasurer.
Reports of Standing and Special Committees.
XII. Rules and Organization.
X. Signals and Interlocking.
XV. Iron and Steel Structures.
V. Track.
IV. Rail.
Reception at 8:00 p. m.

WEDNESDAY, MARCH 19.

XVI. Economics of Railway Location.
VII. Wooden Bridges and Trestles.
(Special) Uniform General Contract Forms.
XVII. Wood Preservation.
III. Ties.
IX. Signs, Fences and Crossings.
VIII. Masonry.
Annual Dinner at 7:00 p. m.

THURSDAY, MARCH 20.

XIX. Conservation of Natural Resources.
II. Ballast.
VI. Buildings.
VIII. Water Service.
XIV. Yards and Terminals.
(Special) Grading of Lumber.
I. Roadway.
XVIII. Electricity.
XI. Records and Accounts.
New Business.
Election and Installation of Officers.
Adjournment.

FRIDAY, MARCH 21.

Visit to National Railway Appliances Exhibition in the Coliseum and Armory.

The Board of Direction will give a reception on Tuesday evening to the members and guests. A musical program will be presented, and Past President William McNab will give an illustrated talk on the Panama Canal.

The annual dinner will be held in the Gold room of the Congress hotel on Wednesday evening. B. A. Worthington, president of the Chicago & Alton, will give an address entitled Look-

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ing Into the Future; George A. Post of New York, president of the Railway Business Association, will speak; Rev. R. W. Dickie of Montreal, Can., will speak on Internationalism and P. G. Rennick, of Peoria, Ill., on the Twentieth Century Pattern.

American Society of Mechanical Engineers.

The railway committee of the American Society of Mechanical Engineers has arranged for the discussion of the subject of Steel Passenger Car Design in its various phases at a meeting to be held April 8. The following have accepted an invitation to discuss various phases of the subject: Problem of Steel Car Design, W. F. Kiesel, Jr. (Penna. R. R.); Suspension of Steel Cars, E. W. Summers, president, Summers Steel Car Company; Trucks for Steel Passenger Cars, J. A. Pilcher (N. & W.); Provision for Electric Lighting in Steel Cars, H. A. Currie (N. Y. C. & H. R.); Provision for Electrical Equipment on Steel Motor Cars, F. W. Butt (N. Y. C. & H. R.); Special Ends for Steel Passenger Cars, H. M. Estabrook, president, Barney & Smith Car Company; Draft Gears for Steel Passenger Cars, S. P. Bush, Buckeye Steel Castings Company; Cast Steel Double Body Bolster and End Frames for Steel Cars, C. T. Westlake, Commonwealth Steel Company.

Other subjects which will be discussed are as follows: Introduction to General Discussion of Steel Passenger Cars; Superstructure of Steel Cars; Roof Structure for Steel Cars; Interior Steel Finish for Steel Passenger Cars; Corrosion and Protection of Steel Passenger Cars; Air Brakes for Heavy Steel Passenger Cars; and Special Pressed Steel Shapes for Steel Cars.

The chairman of the Railway Committee is E. B. Katte, chief engineer, Electric Traction, New York Central & Hudson River, New York.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DAIRYMAID OFFICERS.—A. G. Thomson, Boston, Mass. Convention, May 20, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesday, except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 3d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andrucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick Building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 19, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. Coleman Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION OF THE U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, 3d, 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in January, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—S. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Richardson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Elec. Engrs.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—I. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 1868 Park Row, New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—M. Reid, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Associations.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—L. Wells, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—W. H. Wells, Buffalo, N. Y. Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevere, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. M. Wilcox, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

W. E. Price has been appointed agent of the land and industrial department of the Southern Railway at Harrisburg, Pa.

During the month of January 121 cars of emigrants from 14 states were moved over the St. Louis, Brownsville & Mexico.

Dr. William T. McElveen, pastor of the First Congregational Church of Evanston, addressed the Traffic Club of Chicago at a luncheon, February 27.

The railways in the Western Passenger Association have decided to discontinue all party fares in the territory between Chicago and the Missouri river from and after March 15. They have also decided to abolish special rates for the transportation of railroad laborers, except over the lines on which they are to be employed.

On the opening of a new station at Union Hill, Jamaica, N. Y., the Long Island Railroad Company will adopt a new tariff of passenger rates in which there will be some increases in fares as well as some reductions. The changes are mostly for short distances, on single trip and round trip tickets; usually one, two or three cents.

The secretary of agriculture has released from quarantine 19,490 square miles in the southern states, in which hitherto shipments of cattle have been restricted or forbidden because of the prevalence of cattle ticks. Since the work of eradicating the ticks was begun in 1906 more than 187,000 square miles have been cleared. A map showing the quarantined territory and the areas that have been released can be had upon application to the secretary at Washington.

The New York Central and the New York, New Haven & Hartford have secured from the Appellate division of the Supreme Court of New York a writ of certiorari which will suspend the order of the Public Service Commission reducing fares on these roads in the suburban district adjacent to New York City. According to the order of the court the roads will continue charging the fares now in effect, but will give to each purchaser a certificate to the effect that, in case the order of the commission reducing the rates shall finally be sustained by the Court, the difference between the high and the low rate will be refunded.

Inefficiency of Our Paternal Government.

According to a recent press despatch from Brownsville, Tex., an express car shortage has been causing great anxiety in that region. In Brownsville, alone, there were 50 carloads of lettuce awaiting shipment. The express companies could not furnish refrigerator cars for ten days. One firm telegraphed the Interstate Commerce Commission and also the State Railroad Commission asking aid.

Summary of Revenues and Expenses of Steam Roads in December.

The Bureau of Railway Economics' summary of revenues and expenses and comments for December, 1912, are as follows: The railways whose returns are included in this bulletin operate 221,077 miles of line, or about 90 per cent. of the steam railway mileage of the United States. Total operating revenues for the month of December, 1912, amounted to $257,685,590. Compared with December, 1911, the total operating revenues of these railways show an increase of $29,154,221. These total operating revenues per mile of line amounted to $1,166 in December, 1912, and $1,050 in December, 1911, an increase of $115, or 11.0 per cent. Freight revenue per mile increased 13.2 per cent., and passenger revenue per mile 5.6 per cent.

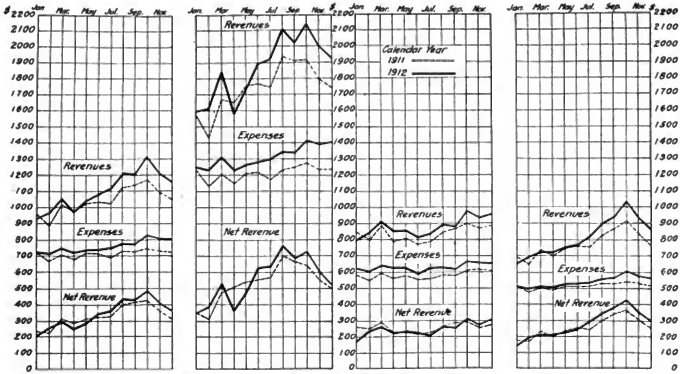
Operating expenses amounted in December to $177,690,984. This was $20,467,731 more than for December, 1911. These operating expenses per mile of line amounted to $804 in December, 1912, and $723 in December, 1911, an increase of $81 per mile or 11.2 per cent. All the five primary operating expense accounts showed increases per mile over 1911.

Net operating revenue amounted in December to $79,994,606. This was $8,686,490 more than for December, 1911. Net operating revenue per mile of line amounted to $362 in December, 1912, and $328 in December, 1911, an increase of $34 per mile, or 10.4 per cent.

Taxes for the month of December amounted to $10,501,960, or $48 per mile, an increase of 3.0 per cent. over December, 1911.

Operating income amounted in December to $315 per mile of line, and in December, 1911, to $282. This was an increase of $33, or 11.8 per cent. Operating income for each mile of line for each day in December averaged $10, and for December, 1911, $9. This is the amount available to the railways for rentals, interest on bonds, appropriations for betterments, improvements, new construction and for dividends.

The operating ratio for December was 69.0 per cent., which is



Monthly Revenues and Expenses Per Mile of Line in 1911 and 1912.

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comparable with 66.4 per cent. in November, 1912, and 68.8 per cent. in December, 1911.

The eastern group of railways shows an increase in total operating revenues per mile of line as compared with December, 1911, of 10.7 per cent., the southern group an increase of 8.9 per cent., and the western group an increase of 12.9 per cent. Operating expenses per mile increased 13.6 per cent. on the eastern railways, 7.7 per cent. on the southern railways, and 10.4 per cent. on the western railways. For the eastern group of railways net operating revenue per mile increased 3.5 per cent., for the southern group it increased 8.6 per cent., and for the western group it increased 17.9 per cent. The increase in taxes per mile was 3.3 per cent. in the eastern group, 5.5 per cent. in the southern group, and 2.2 per cent. in the western group. Operating income per mile increased 3.6 per cent. in the eastern group, 8.9 per cent. in the southern group, and 21.1 per cent. in the western group.

Comparison of the returns for the six months of the fiscal year with those of the corresponding months of the previous fiscal year reveals an increase in total operating revenues per mile of 9.6 per cent., an increase in operating expenses per mile of 9.0 per cent., and an increase in net operating revenue per mile of 10.8 per cent. This net operating revenue per mile of the eastern group of railways increased 8.5 per cent., as compared with the corresponding period of the previous year, that of the southern group increased 1.5 per cent., and that of the western group increased 16.1 per cent.

Compilation of December returns makes possible a summary of the earnings and expenses of the railways having total operating revenues of $1,000,000 and over for the calendar year 1912. These lines include 90 per cent. of the steam railway mileage of the United States.

Total operating revenues for 1912 amounted to $2,923,936,957. This is equivalent to an increase over the previous year of $787, or 6.3 per cent. per mile of line. Freight revenue per mile increased 8.1 per cent., and passenger revenue per mile 1.0 per cent. Operating expenses increased $585 per mile, or 6.8 per cent., and net operating revenue per mile increased $201, or 5.1 per cent. There was an increase in taxes per mile of 7.7 per cent. Operating income per mile of line increased $163, or 4.7 per cent.

The results by groups are as follows: Net operating revenue per mile increased 4.9 per cent. on the eastern group, 8.4 per cent. on the southern group, but decreased 3.1 per cent. on the southern group. All three groups show increases in total operating revenues per mile and in operating expenses per mile, but it is in the southern group alone that these increased operating expenses overbalance the increase in revenues. Taxes per mile increased 8.0 per cent on eastern railways, 2.8 per cent. on the southern railways, and 9.3 per cent. on the western railways. Operating income per mile increased 4.3 per cent. on the eastern group of railways; increased 8.4 per cent. on the western group; it decreased 4.0 per cent. on the southern group.

The diagram shows the variations in total operating revenues, operating expenses and net operating revenue per mile for separate months of the calendar years 1911 and 1912. The following table shows the per cent. of operating revenues consumed by each class of expenses:

PER CENT. OF TOTAL OPERATING REVENUES.

	December		Fiscal year ending		Calendar year ending	
	1912.	1911.	1912.	1911.	1912.	1911.
Maint. of way and structures	11.8	11.1	12.7	12.9	12.8	12.7
Maint. of equipment	16.2	15.9	15.8	15.5	16.0	15.7
Traffic expenses	2.0	2.1	2.2	2.2	2.0	2.1
Transportation expenses	36.5	37.0	35.9	35.5	35.5	35.4
General expenses	2.5	2.7	2.5	2.5	2.4	2.5
Total operating expenses	69.0	68.8	69.1	68.6	68.7	68.4

Car Location.

The accompanying tables, which are taken from the car location bulletins Nos. 2-A and 3 of the American Railway Association, give summaries of the location of freight cars by groups on January 15 and February 1, 1913, together with surpluses and shortages on the same dates.

CAR LOCATION ON JANUARY 15, 1913.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Ida., Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	39,124	675,791	284,380	190,980	170,644	456,977	16,506	150,154	29,362	127,057	114,725	2,306,700
Home Cars on Home Roads	39,351	340,368	83,510	96,307	68,376	276,645	3,442	64,277	11,804	61,518	75,128	1,120,646
Home Cars on Foreign Roads	46,873	335,423	200,870	100,673	102,268	180,332	13,064	85,877	17,558	65,539	39,597	1,188,004
Foreign Cars on Home Roads	61,354	313,420	290,045	86,625	85,241	167,576	11,857	85,129	31,364	69,771	57,303	1,201,685
Total Cars on Line	100,605	653,788	283,555	182,932	153,617	474,221	15,299	149,406	43,168	131,309	132,431	2,322,331
Excess or Deficiency	14,481	*20,093	*825	*14,048	*17,027	17,244	*1,207	*748	13,806	4,252	17,706	13,631
Surplus	992	9,848	3,112	1,818	1,577	27,507	780	1,410	4,972	17,691	2,653	54,660
Shortage	714	2,088	1,497	1,801	5,058	7,039	559	793	80	1,115	4,162	24,888
Shop Cars—												
Home Cars in Home Shops	5,178	30,571	11,937	8,575	9,310	18,996	439	7,696	1,413	3,915	3,751	101,781
Foreign Cars in Home Shops	1,699	8,905	8,824	1,930	2,578	5,909	740	2,492	1,261	2,370	582	37,290
Total Cars in Shop	6,877	39,476	20,761	10,505	11,888	24,905	1,179	10,188	2,674	6,285	4,333	139,071
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	45.57	50.37	29.37	48.89	40.07	60.54	20.85	42.81	40.20	48.43	65.49	48.54
Total Cars on Line	114.32	97.04	99.63	92.87	90.02	103.77	92.69	97.34	147.02	103.35	115.43	100.59
Home Cars in Home Shops	6.01	4.52	4.35	4.35	5.46	4.39	2.66	5.13	4.81	3.08	3.27	4.50
Foreign Cars in Home Shops	1.46	1.32	3.37	.98	1.51	1.37	4.48	1.56	4.30	1.87	.51	1.65
Total Cars in Shops	7.47	5.84	7.92	5.33	6.97	5.76	7.14	6.69	9.11	4.95	3.78	6.15

CAR LOCATION ON FEBRUARY 1.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	86,878	679,881	256,921	199,593	172,587	467,865	16,857	150,750	29,025	127,172	128,522	2,345,971
Home Cars on Home Roads	40,996	353,066	88,821	99,634	71,846	279,573	3,314	65,923	11,154	63,339	82,458	1,160,164
Home Cars on Foreign Roads	45,882	326,795	198,100	99,939	100,641	185,292	13,543	84,827	17,871	63,833	46,064	1,185,807
Foreign Cars on Home Roads	58,081	314,645	209,178	96,383	92,663	203,495	12,288	86,228	27,124	69,796	64,327	1,234,178
Total Cars on Line	99,027	667,231	297,999	196,017	164,509	483,068	15,572	152,151	38,278	133,135	146,785	2,394,342
Excess or Deficiency	12,199	*12,150	11,078	*3,556	*7,998	15,203	*1,285	1,401	9,253	5,963	18,263	48,371
Surplus	11,851	5,216	7,952	10,476	11,189	47,747	763	4,801	4,376	17,213	2,073	62,240
Shortage	484	2,141	1,088	4,232	3,714	6,572	729	923	60	1,167	3,771	24,881
Shop Cars—												
Home Cars in Home Shops	5,322	28,241	13,158	8,487	9,174	18,139	426	7,289	1,225	3,872	4,312	99,645
Foreign Cars in Home Shops	1,417	7,838	7,286	2,046	2,616	5,526	616	2,427	950	2,457	772	33,951
Total Cars in Shop	6,739	36,079	20,444	10,533	11,790	23,665	1,042	9,716	2,175	6,329	5,084	133,596
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	47.19	51.93	30.96	49.93	41.65	59.76	19.66	43.73	38.43	49.81	64.16	49.45
Total Cars on Line	111.65	98.21	103.86	98.22	95.36	103.25	92.38	98.60	131.88	104.69	114.21	102.06
Home Cars in Home Shops	6.12	4.16	4.59	4.25	5.32	4.13	2.53	4.89	4.22	3.05	3.36	4.30
Foreign Cars in Home Shops	1.12	1.15	2.54	1.03	1.51	1.26	3.65	1.52	3.27	1.93	.60	1.47
Total Cars in Shops	7.24	5.31	7.13	5.28	6.83	5.39	6.18	6.41	7.49	4.98	3.96	5.77

*Denotes deficiency.

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INTERSTATE COMMERCE COMMISSION.

The commission has suspended until June 28 the operation of certain tariffs which provide for the discontinuance of free store-door delivery and pick-up service now maintained by the Baltimore & Ohio and the Pennsylvania Railroad in Washington, D. C. This service is extended to shippers and consignees on less than carload shipments originating at or destined to points north of Wilmington, Del., including New York and Boston.

President Wilson on Wednesday last nominated John H. Marble, Secretary of the Interstate Commission, to be a member of the commission in place of Mr. Lane, who becomes Secretary of the Interior. He also nominated for another term Edgar E. Clark, member of the commission, whose name was sent to the Senate three months ago by President Taft. His nomination has now been confirmed by that body. John H. Marble, for the past 12 months secretary of the Interstate Commerce Commission, was an attorney for that body for several years before he was appointed to the secretaryship. He came to the commission from California, in 1906, as a confidential clerk. He was born at Ashland, Neb., in 1869, and was educated at the University of Nebraska. He was in the newspaper business in South Dakota, Wyoming and in California (San Francisco) and was admitted to the bar in California in 1902.

J. H. Marble.

Coal Rates from Iowa to tha Dakotas.

In re investigation and suspension of advances in rates by carriers for the transportation of coal in carloads from mines in Iowa to stations in South Dakota, North Dakota and Montana. Opinion by the commission:

The commission found that the defendants had not justified the advances in the rates in question and ordered them to withdraw the suspended tariffs. (26 I. C. C., 144.)

Cottonseed Rates Not Advanced.

In re advances in rates on cottonseed from points in Oklahoma to Little Rock, Ark. Opinion by Commissioner Prouty:

The commission found that the tariffs canceling present joint rates and through rates on cottonseed from points in Oklahoma to Little Rock, Ark., must be withdrawn. (26 I. C. C., 211.)

Rates on Yellow-Pine Lumbar Raduced.

Davis Brothers' Lumber Company, Limited, v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Meyer:

The commission found that the rates on yellow-pine lumber in carloads from Ansley, Bernice, Dubach, and Wyatt, La., to Louisville, Ky., of 25 cents, and to Cincinnati, Ohio, of 27 cents are unreasonable to the extent that they exceed 21 cents to Louisville and 23 cents to Cincinnati, and that for the future the defendants should establish joint rates from and to said points which are not in excess of the rates last named. (26 I. C. C., 257.)

Rates on Nuts Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of edible nuts from New Orleans and Port Chalmette, La., to St. Louis, Mo., and other points. Opinion by Commissioner McChord:

The proposed increased rates on edible nuts from New Orleans and Port Chalmette, La., to St. Louis, Mo., and other points were found not to be unreasonable. The order of suspension was vacated. (26 I. C. C., 213.)

Minimum Weights on Corn.

In re investigation and suspension of advance in minimum weight on ear corn, snapped corn, and corn in the shuck in carloads by carriers operating in Southwestern Lines territory:

The proposed advance in the minimum weight on ear corn, snapped corn, and corn in the shuck in carloads throughout southwestern lines territory, to 40,000 lbs. was not found to be justified. A flat minimum weight of 40,000 lbs. was found to be reasonable, however, when standard 36-ft. cars or larger are furnished. An order was entered requiring the carriers to cancel the suspended schedules and to maintain the present minimum-weight rule on cars smaller than the standard 36-ft. cars and to establish a 40,000-lb. minimum weight applicable to larger cars. (26 I. C. C., 197.)

Ratas on Fual Wood Not Advanced.

In re investigation and suspension of advances in rates by carriers for the transportation of fuel wood, sawdust, and shavings from stations in Wisconsin and Michigan to Evanston, Ill., and other points. Opinion by Commissioner McChord:

The proposed advanced rates on fuel wood, sawdust, and shavings from stations in Wisconsin and Michigan to Evanston, Ill., and other points were found to be unreasonable. The defendants were ordered to withdraw the suspended tariffs. (26 I. C. C., 254.)

Rates on Fraah Maats Not Advanced.

In re investigation and suspension of advances in rates by carriers for the transportation of fresh meats and packing-house products from Oklahoma City, Okla., and other points to points in the state of New Mexico. Opinion by the commission:

The proposed advances in rates on fresh meats and packing-house products from Oklahoma City, Okla., Fort Worth, Tex., and Wichita, Kan., to all points on the line of the Atchison, Topeka & Santa Fe in New Mexico, excepting coast line points west of Albuquerque, N. Mex., were not shown to be reasonable. The commission ordered the defendant to withdraw the suspended tariff. (26 I. C. C., 154.)

Ratea on Sash, Doors and Blinds Not Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of sash, doors and blinds from stations in Louisiana to stations in Texas and between other points. Opinion by Commissioner McChord:

The present rate on sash, doors and blinds between the points in question is the same as the lumber rate. The defendants contend that these products should take a higher rate than the lumber rate, which they said was low and highly competitive in the territory involved. As the reasonableness of the lumber rate was not shown, the commission had to consider the reasonableness of the rate in question without relation to the lumber rate. After looking into the matter of per ton mile revenue, the commission decided that the proposed rate had not been shown to be reasonable and ordered the defendants to withdraw the suspended tariff. (26 I. C. C., 116.)

Fertilizer Rate Reduced.

Meridian Fertilizer Company v. Vicksburg, Shreveport & Pacific et al. Opinion by Commissioner McChord:

Rate of 12 cents per 100 lbs. for the transportation of fertilizer in carloads from Shreveport, La., to Junction City and El Dorado, Ark., was found to be unreasonable to the extent that it exceeds 11 cents, which rate is prescribed for the future. (26 I. C. C., 224.)

Complaint Dismissed.

Mansfield Hardwood Lumber Company v. Tremont & Gulf et al. Opinion by Commissioner Prouty:

The complainant contends that the rate of 31 cents per 100 lbs. for the transportation of cross ties in carloads from Eros, La., to Laredo, Tex., via Winnfield, La., was unreasonable and seeks reparation. The commission found that the joint rate on cross ties from Eros to Laredo via Tremont, Tex., was 25 cents

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per 100 lbs. The commission decided that under the circumstances it should not establish a joint rate between the two points in question via Winnfield, a longer and more unnatural route, and also that the rate charged was not unreasonable. (26 I. C. C., 138.)

Ozark Cooperage & Lumber Company v. St. Louis & San Francisco et al. Opinion by the commission:

In this case the complainant contends that the rates for the transportation of cooperage stock from Black Rock, Trumann and Grassy Lake, Ark., to Brownsville, Tex., are unreasonable. The rate from Trumann and Grassy Lake was 42 cents per 100 lbs., and the rate from Black Rock was 47 cents per 100 lbs. The commission decided that these rates were not found to have been unjust or unreasonable. Since the complaint was filed the rates from all the points of origin in question to Brownsville have been reduced to 29 cents per 100 lbs., which is lower than the rate to Arkansas by the complainant. (26 I. C. C., 132.)

Union Tanning Company et al. v. Southern Railway et al. Opinion by Commissioner Clements:

The present adjustment of rates on leather from tanning points in western North Carolina on the lines of the Southern Railway was not found to be unjustly discriminatory or unreasonable. Where the other facts and conditions are substantially uniform or similar, distance may become the dominating factor in the relative adjustment of rates, but by reason of the existence of controlling facts and conditions it may be a minor factor. The weight to be given a comparison of distances varies in different cases and the reasonableness of rates should be determined by considering all of the facts standing together in each case. (26 I. C. C., 159.)

Coal Rates Not Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of soft coal in carloads from Illinois mines to Clinton, Iowa, and other points on the Chicago, Burlington & Quincy. Opinion by Chairman Lane:

The commission found that the proposed advances in the rates on soft coal in carloads from certain mines in Illinois to Clinton and Lyons, Iowa, were not shown to be reasonable, and ordered the defendants to withdraw the suspended tariffs. (26 I. C. C., 179.)

Lumber Rates Not Advanced.

In re investigation and suspension of advances in rates for the transportation of cypress lumber, laths and shingles from points located on the New Orleans, Texas & Mexico to Albany, N. Y., and other points. Opinion by Chairman Lane:

The proposed advances in rail-water-rail rates on cypress lumber from points on the New Orleans, Texas & Mexico, between Baton Rouge and New Orleans, to interior points in the north Atlantic states were not justified. An order will be issued requiring the carriers to cancel the item proposing these advances. (26 I. C. C., 186.)

Rates on Coal Not Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of coal in carloads from Hillsboro and other points in Illinois to Davenport, Iowa, and other destinations in Illinois and Iowa. Opinion by Chairman Lane:

The commission found that the proposed increases in the rates in question had been filed with the idea of securing for the mines on the lines of one of the defendants a differential in the rate which would give to such mines an advantage over other mines which had hitherto been given the same rate basis. The commission ordered the defendants to withdraw the suspended tariffs. (26 I. C. C., 140.)

Soft Coal Rates Not Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of soft coal and soft coal briquettes from southern Illinois mines to stations located on the Gauld Southwestern in Arkansas. Opinion by Commissioner McChord:

The existing rates in question range from $2.25 per ton to $2.45 per ton, and the proposed advances range from 10 cents to 50 cents per ton. The defendants contend that these rates were established in anticipation of shipments of domestic coal, but that the only shipments that had been made were to the Gould Southwestern for their engine purposes. The commission found that the proposed advances were not shown to have been unreasonable and dismissed the complaint. (26 I. C. C., 135.)

Sugar Rates Reduced.

W. H. Edgar & Son v. Louisville & Nashville et al. Opinion by Commissioner Harlan:

In this case the complainants contend that the rates for the transportation of beet sugar in carloads from Cincinnati, Ohio, to Knoxville and Chattanooga, Tenn., are unreasonable. No testimony was offered upon which the commission might base any conclusion as to the reasonableness of these rates except by measuring them in their relation to rates in effect elsewhere on the same or related commodities. The commission found that, as compared with the hauls from Baltimore and New Orleans, the through charges exacted of the complainants on shipments to Knoxville and Chattanooga were discriminatory and should be corrected. The part of the through charges which accrues to the defendants' lines south of the Ohio river is the seat of the trouble, and those carriers will be required at once to readjust the rate situation. (26 I. C. C., 181.)

Powerless to Compel Switching Service.

Morris Iron Company et al. v. Baltimore & Ohio et al. Opinion by Chairman Prouty:

In this case the complainant asks the commission to compel the Baltimore & Ohio and the Northern Central to establish switching arrangements with the Frederick Railroad at Frederick, Md. A connection would have to be built between the tracks of the Baltimore & Ohio and those of the Frederick Railroad. The Northern Central now has a connection with the Frederick Railroad, but declines to interchange any cars with that road. The defendants contend that the Frederick Railroad is a part of the Western Maryland and that if they established the switching arrangements in question they would be opening up their terminals to a competitor. The commission found that the terminals of the Frederick Railroad at Frederick were larger than those of either the Baltimore & Ohio or the Northern Central. Under the present arrangement the rates from Frederick to points in the Southeast via the Frederick Railroad are greatly in excess of those via the lines of the defendants. As the Frederick Railroad was not a lateral branch line, the commission could not order a connection between it and the Baltimore & Ohio. The third section of the act to regulate commerce provides that no railroad may be required to give the use of its track or terminal facilities to carriers engaged in like business. Even though the Frederick Railroad would lose by the exchange of terminal facilities with the defendants, the commission was without authority to grant the request of the complainant. The commission found that more industries at Frederick were located on the lines of the Frederick Railroad than on the lines of either of the two defendants and also that if the switching arrangements sought by the complainant were established none of the roads would sustain a serious loss, but the shippers would benefit materially. The commission recommended that a switching connection be made between the Baltimore & Ohio and that the three roads in question enter into reciprocal switching arrangements upon the basis of charges, which, whether stated by the car or by the 100 pounds, should not exceed $5 per car. As the commission did not have the authority to require this, the complaint was dismissed. (26 I. C. C., 240.)

Responsibility for Furnishing Cars.

In re investigation and suspension of advances in rates by carriers for the transportation of coal from points on the Stony Fork branch of the Louisville & Nashville to various destinations. Opinion by Commissioner Meyer:

The tariffs under suspension propose to cancel the joint rates on coal from points on the Stony Fork branch of the Louisville & Nashville to southeastern territory. The purpose of this proposed change is to relieve the Louisville & Nashville of the

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responsibility of the initial carrier and of furnishing cars. The shipments from points on the Stony Fork branch to southeastern territory move to Middlesboro, Ky., over the line of the Louisville & Nashville and thence to destination via the Southern Railway. The Louisville & Nashville contends that the service it performs in this traffic is merely a switching service and it is, therefore, not required to furnish cars for coal destined to move from Middlesboro via the Southern Railway. The Southern Railway contends that it is not the initial line and, therefore, it is under no obligation to furnish cars for loading at mines on the Stony Fork branch. During the latter part of the summer of 1911 both defendants refused to furnish cars, but the Commerce Court placed upon both the obligation to furnish cars for this traffic. The commission finds that, as the service performed by the Louisville & Nashville has already been treated as a line haul in tariffs published by it, it cannot now treat it as a mere switching movement. The carrier, upon whose line shippers are located, must assume the responsibility of furnishing transportation facilities. The Louisville & Nashville is not justified in attempting to avoid the responsibility which rests upon it as the initial carrier in regard to this traffic. Were the proposed tariffs to become effective, the mines of the Stony Fork branch would be discriminated against in favor of their competitors situated on the Cumberland Valley division of the Louisville & Nashville. The Louisville & Nashville will not be compelled to furnish exclusively its own equipment for the traffic moving from the Stony Fork branch to the Southeast under the present tariffs, for the Commerce Court has placed this responsibility upon both. Should the defendants be unable to agree among themselves upon the manner of car distribution, the commission will give that question further consideration. The commission ordered the defendants to withdraw the suspended tariffs. (26 I. C. C., 168.)

Preparation of Cars.

Southwestern Missouri Millers' Club v. St. Louis & San Francisco et al. Opinion by Commissioner Meyer:

During 1908 and 1909 the defendants' tariffs contained the following rule: "When cars furnished by this company for grain or other loading require repairing in order to insure against leakage in transit, and material necessary for repairing is furnished by the shipper, this company will pay the actual cost of same, but not to exceed 80 cents per car." This rule was canceled in 1911 and the complainants seek to have it restored. The Missouri Pacific now has in effect a similar rule restricted to business originating within the switching district in St. Louis. Though cars are now inspected by employees of the carrier before being placed for flour or grain loading, the millers find it necessary to further prepare those cars. The carriers do not deny that shippers frequently have to repair leaks and remove nails which should have been attended to by carriers. Complainants, however, do not confine their prayer for compensation to the cost incurred for repairing leaks and removing nails, but include the cost of lining the sides of the car with paper and padding, the floor with burlap, or a cushion of chaff, hay or straw, irrespective of the condition of the car as to leaks or nails. They even state that they have to line new cars that have never been used before. The reason for this padding is to protect the sacks from being soiled in transportation. The complainants sought reparation but the commission found that the rule in question was not intended to cover the expenditures in preparing cars for flour loading which the complainants seek to have included. The word "leakage" contained in the tariff refers to leakage of grain or other commodities from the car, but not to the leakage from a package to the floor of the car. The commission found that the complainant could recover for any material furnished or work done to the car itself in order to prevent leakage, but they could not recover for inserting the lining in the car. The commission is warranted in taking cognizance of the adequacy or inadequacy of the facilities of transportation of the defendant carriers. It is the duty of carriers to furnish cars suitable for transportation, but a shipper should so pack his commodity as to insure against damage by leakage from the package due to the ordinary incidents of transportation. The commission found that the protection of the sacks from becoming soiled was in the nature of private packing rather than public equipment. Where special preparation is required to fix a car for the shipment of a particular commodity the task of special preparation ordinarily devolves upon the shipper. The commission found that the provisions for the payment of allowances to the shippers should not be approved, as they would be subject to abuses in the shape of rebates and discriminations because the repairs could not be properly policed. Especially in view of the complainant's contention that every car must be lined for the shipment of flour in sacks, it would be a sounder principle to let the rate take care of such expenditures. The commission decided that the practice of the Missouri Pacific of still granting allowances to millers situated within the switching district of St. Louis was discriminatory and ordered that carrier to discontinue this discrimination. Decision with regard to reparation was withheld until the complainants shall have filed amended specifications setting forth in detail the damages which they intend to recover under this holding. The complainant's prayer for an order requiring carriers to prepare cars for loading grain and flour in a manner indicated by the complainant was denied. (26 I. C. C., 246.)

Consumers Must Be Considered.

In re investigation and suspension of advances in rates by carriers for the transportation of soft coal in carloads from mines in Colorado to stations in Oklahoma and Texas located on the Wichita Falls & Northwestern, the Wichita Falls & Northwestern of Texas and the Wichita Falls & Southern. Opinion by Commissioner Meyer:

The tariffs which have been suspended would abolish all joint rates on coal from mines in Colorado and New Mexico to points in Oklahoma and Texas on the lines of the Wichita Falls & Northwestern system, and would make effective certain combination rates which would result in increases ranging from 60 cents to $1.20 per ton. The Wichita Falls & Northwestern system, though operated separately, is owned by the Missouri, Kansas & Texas. The defendants did not contend that the present rates were unreasonably low, but considered that the mines in Oklahoma and Arkansas produce sufficient coal for the requirements of the points on their line and felt that that was sufficient justification for the cancellation of rates from other territory. The defendants admitted that if the Wichita Falls & Northwestern was still independent it was entirely likely that no effort would have been made to cancel the present rates. The coal from New Mexico and Colorado mines is more popular at the points in question than is the coal from Texas and Oklahoma mines. Transportation charges are higher on the western coal, but the cost of production is lower, so it is able to compete with the Oklahoma and Texas coal. The commission found that the defendants, in their desire to serve the Oklahoma coal industry, should not brush aside the rights of the western producers to compete with Oklahoma producers and other consumers to receive the benefit of this competition. The commission decided further that the defendants could not operate their lines solely with a view to increasing their revenue and for the industries reached by them without regard to the interests of their patrons, except where such interests further their purpose. The commission declared that the present rates are reasonable and that the proposed advances would result in undue discrimination and ordered the defendants to withdraw the suspended tariffs. (26 I. C. C., 216.)

STATE COMMISSIONS.

The Texas railroad commission has called a hearing for March 11 on a schedule of proposed changes in the rules and regulations for the handling of baggage.

The Public Utilities Commission of New Jersey has ordered the Delaware, Lackawanna & Western to continue to honor season passes issued by it to 260 officers of the state. The road recently directed its conductors not to recognize these passes, and a member of the State Water Supply Commission appealed to the Public Utilities Commission.

The Indiana State Railroad Commission has sued the Cincinnati, Hamilton & Dayton in the Circuit Court of Indianapolis

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for disobedience of the order of the commission requiring automatic block signals to be installed on the company's line eastward from Glenwood to the Ohio State line. The commission's bill says that since January 1, 1913, the company has been running trains unlawfully between these points.

The Texas Railroad Commission has amended its stopping in transit rules so that Rules 7 and 12 will read substantially as follows: "When shipments of grain, etc., are placed in a mill or other place of storage at stopping point, not reached by the tracks of the line bringing the same into that point, the cost of switching from and returning to such initial line, shall be borne by the carrier."

The Texas railway commission has issued an order providing for a periodical investigation of the operation of passenger trains for the purpose of detecting violations of the law against running trains more than 30 minutes late. The commission will issue calls at least every six months requiring the roads to submit statements of the operation of their passenger trains for a 30-day period. Where the 30-minute law has been violated the cases will at once be reported to the attorney general for prosecution, unless legal excuse can be made. It is stated that heretofore the enforcement of this law has been of a haphazard character.

The decision of the California Railroad Commission in the application of the Union Pacific, Southern Pacific and Central Pacific for approval of the plan for changes in ownership of these properties was briefly noticed in our last issue, page 405. From the full text of the decision it appears that the commission asserts the right to name the terms on which the Central Pacific shall be sold by the Southern to the Union, and the terms of all leases and joint trackage rights. Says the commission: "There is reason for grave fear that if the agreement is carried out, this state will, instead of securing two strong competing lines, secure one dominant line and one much impaired line." Continuing, the decision says: "The price at which the properties covered by the agreement between the applicants hereto shall be sold or the valuation on which its rentals shall be based, as the case may be, shall lie only such price and valuation as shall first have been formally approved by the Railroad Commission." All terminals used jointly by the Central and the Southern in California must be opened to any other road desiring the use of them, provided equitable compensation is tendered. The commission will decide what is equitable. Within sixty days from the effective date of said agreement the parties must file with the commission joint rates and fares for the transportation of freight and passengers between all points in the state of California.

COURT NEWS.

A temporary injunction has been issued by the federal court at Carson City, Nev., restraining the state authorities from putting into effect the three-cent passenger fare ordered by the state railroad commission.

Arguments relating to the form of the decree to be entered in compliance with the decision of the Supreme Court in the "anti-trust" case against the Terminal Railroad Association of St. Louis, were presented before Judges Sanborn, Hook and Smith, at St. Louis, on February 25. Attorney General Wickersham and E. C. Crow, representing the government, objected to the continuation of an arbitrary element in the rates on traffic originating within the one-hundred-mile zone.

In the United States District Court at St. Louis, March 4, the government filed a suit against the St. Louis Coal Traffic Bureau to enjoin the bureau and the roads connected with it from regulating and agreeing on the rates on coal from Illinois mines to St. Louis. The court also is asked to dissolve the bureau as a combination in restraint of trade. It is said that the immediate occasion of this suit is a tariff, which was to go into effect April 1, increasing the rates on coal 5 cents a ton. All of the 24 roads interested in the Terminal Railroad Association and the Merchants' Bridge Terminal Company are made defendants.

Railway Officers.

Executive, Financial and Legal Officers.

A. H. Smith, vice-president of the New York Central & Hudson River, has been elected senior vice-president of the New York Central Lines.

Samuel C. Stickney, who has been doing special work under the direction of the vice-president in charge of operation on the Erie, has been appointed assistant to the president, with office at New York.

R. Kemp Slaughter has been appointed auditor of the Atlanta, Birmingham & Atlantic, succeeding J. L. Hamar, resigned, and F. K. Mays has been elected treasurer, succeeding H. M. Milam, resigned, both with offices at Atlanta, Ga.

W. T. Irwin, formerly president of the Peoria Railway Terminal Company, has been appointed general counsel, with headquarters at Peoria, Ill., succeeding William Jack. B. A. Worthington succeeds Mr. Irwin as president. George H. Crosby has been appointed secretary and treasurer, with office at Chicago, to succeed T. A. Greer, secretary, and T. F. Scanlon, treasurer. W. H. Burns has been appointed auditor, with headquarters at Chicago, in place of R. H. Hardin.

Operating Officers.

W. P. Moran has been appointed trainmaster of the Chicago, Milwaukee & St. Paul, with office at Savanna, Ill., in place of N. P. Thurber, promoted.

L. H. Cecil has been appointed assistant superintendent of the Louisiana lines of the Southern Pacific Company, with headquarters at Lafayette, La.

Caleb Corser has been appointed superintendent of the Copper River & Northwestern, with office at Cordova, Alaska, to succeed George Geiger, resigned.

John H. Harris has been appointed general manager of the Peoria Railway Terminal Company, with headquarters at Peoria, Ill., in place of J. H. Franke.

The office of A. J. Donegan, assistant superintendent of the Algoma Central & Hudson Bay, has been transferred from Michipicoten Harbor, Ont., to Hawk Junction.

James E. Farrell has been appointed assistant to the general manager of the United Fruit Company and the Northern Railway (Costa Rica), with office at San José, Costa Rica.

The position of C. G. Smith, trainmaster of the Erie, at Cleveland, Ohio, has been abolished, and the authority of P. Minehan, trainmaster at Youngstown, has been extended over the entire division.

E. N. Brown, formerly assistant general superintendent of the Southern Pacific of Mexico, at Empalme, Mex., has been appointed division superintendent of the Chicago & Eastern Illinois, with office at Danville, Ill., succeeding John C. Muir, resigned.

E. A. Patterson, assistant superintendent of telegraph of the Chicago, Milwaukee & St. Paul, has been appointed superintendent of telegraph, with office at Milwaukee, Wis., to succeed U. J. Fry, deceased. A. C. Adams succeeds Mr. Patterson, with headquarters at Chicago.

F. Cone, assistant division superintendent of the Chicago, Burlington & Quincy at St. Louis, Mo., has been appointed assistant superintendent of the LaCrosse division, with headquarters at LaCrosse, Wis. A. J. Carter has been appointed trainmaster at Aurora, Ill., in place of G. A. Law, promoted.

George Ross, assistant superintendent of the Oregon Short Line at Salt Lake City, Utah, has been appointed an assistant superintendent of the Oregon-Washington Railroad & Navigation Company, with headquarters at La Grande, Ore., succeeding J. W. Anderson, resigned to accept service with another company.

Guy L. Anderson, clerk and assistant to R. B. Miller, traffic manager of the Oregon-Washington Railroad & Navigation Company, has been appointed general manager of the Sumpter Valley, with headquarters at Baker City, Ore. He was born

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at Portland 28 years ago, and began railway work at the age of 18 as a messenger boy.

Fred J. Byington, who recently was appointed superintendent of the West Iowa division of the Chicago & North Western, with headquarters at Boone, Ia., was born September 3, 1876, at Rochelle, Ill. He received a common school education, and began railway work June 1, 1890, with the Chicago & North Western as a telegraph operator on the Galesburg division. With the exception of one year with the Union Pacific as train despatcher, his entire service has been with the North Western as a telegrapher, train despatcher, chief train despatcher and assistant superintendent on various divisions until his recent promotion as division superintendent, as above noted.

George Edwin Simpson, who recently became general supervisor of transportation of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, was born on May 25, 1847, at Concord, N. H. He began railway work October 1, 1864, as a telegraph operator with the Chicago, Burlington & Quincy. He was later agent and operator at Buda, Ill., and then to 1882 was train despatcher and chief train despatcher at Galesburg and Aurora, Ill., and Ottumwa, Ia. In the latter year he left the Burlington to take the position of superintendent of telegraph of the Chicago, Milwaukee & St. Paul, and in 1888 he was made superintendent of transportation of that road, which position he held until his recent promotion to general supervisor of transportation, as above noted.

George C. Randall, who, on February 1, became superintendent of transportation of the Colorado & Southern, with headquarters at Denver, Col., as already announced in these columns, was born March 31, 1883, at Northfield, Vt. He was graduated from Norwich University in 1904. Prior to attending college he was a telegraph operator for the Boston, Concord & Montreal, now a part of the Boston & Maine, and on July 10, 1904, immediately after completing his college course, he went to the Colorado & Southern as a clerk in the superintendent's office at Cheyenne, Wyo. From October, 1904, to September, 1906, he was chief train despatcher at Cheyenne, and was then made chief clerk in the car service office at Denver, which position he held until his recent appointment as superintendent of transportation, as above noted.

J. A. Somerville, whose appointment as superintendent of transportation of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with headquarters at St. Louis, Mo., has been announced, was born in 1867 at Carthage, Ill. He began railway work in 1887 with the Chicago, Burlington & Quincy as a messenger at Keokuk, Ia. He remained with the Burlington until about four years ago, and filled the various positions of local agent at Keokuk, chief clerk in the general freight office at St. Louis, contracting freight agent at St. Joseph, Mo., general agent of all departments at Hannibal, Mo., local agent at St. Louis, and general agent at Keokuk, and superintendent of terminals at St. Louis. He resigned the latter position to go with the Missouri Pacific as superintendent of terminals at Kansas City, Mo., which position he held until his recent apopintment as general superintendent of transportation, as noted above.

Fred M. Melin, who recently was appointed superintendent of the Hastings & Dakota division of the Chicago, Milwaukee & St. Paul, with office at Aberdeen, S. D., was born September 6, 1868, at Port Washington, Wis. He was educated in the common schools and began railway work in September, 1884, as night operator for the Milwaukee & Northern at Plymouth, Wis. From March, 1887, to January, 1891, he was train despatcher of that road, and then to June, 1893, chief train despatcher of the Calumet Terminal Railway at East Chicago, Ind. On the latter date he went to the Iowa Central as train despatcher and ten years later became train despatcher on the Hastings & Dakota division of the Chicago, Milwaukee & St. Paul at Minneapolis, Minn. Six months afterwards he was made chief despatcher, and from June, 1903, to March, 1908, he was trainmaster on that division, when he was transferred to the Puget Sound in a similar capacity. He was promoted to superintendent of the Musselshell division in August of that year, and in July, 1909, he was made superintendent of the Rocky Mountain division. In October of the following year he was transferred to the superintendency of the LaCrosse and Northern divisions at Milwaukee, Wis., where he remained until his recent appointment as superintendent of the Hastings & Dakota division, as above noted.

C. G. Stecher, who has been appointed to the newly created position of signal instructor for the Chicago & North Western, as noted elsewhere in this issue, was born in Germany in 1873, and came to this country in 1899. He began railway work as a lampman and batteryman on the Chicago & North Western at South Milwaukee, Wis. In September, 1902, he was promoted to the position of maintainer at Racine, Wis., and the following April to that of repairman in Chicago. He later served as lamp and signal inspector and then as electrician and foreman on the old Chicago Terminal. In September, 1907, he was promoted to supervisor of signals in Iowa, with headquarters at Boone. He was transferred to Chicago in September, 1910, and served as chief inspector on the final signal construction work in connection with the new passenger terminal. On the completion of this work, June 1, 1901, he was appointed supervisor of signals of the Chicago terminal, and held this position until his recent appointment as signal instructor.

C. G. Stecher.

Herbert S. Balliet, engineer of maintenance of way of the Grand Central Terminal and signal engineer of the Electric division of the New York Central & Hudson River, with headquarters at New York, has been appointed assistant manager of the Grand Central Terminal. He continues to perform the duties of signal engineer of the Electric division, and engineer of maintenance of way of the terminal. Mr. Balliet was born in Neffsville, Pa., in 1868, and was for several years a telegraph operator, working both for the Western Union Company and for the United Press Association. He was at one time station agent and operator on the Philadelphia & Reading. He began on the Lehigh Valley as operator, but he soon went into the signal department and was engaged in that department eleven years—from 1894 to 1905. He was appointed assistant signal engineer in 1901. He left the Lehigh Valley to go to the New York Central in April, 1905. For two years, 1905-1906, he was secretary of the Railway Signal Association. He has been one of the most prominent members of that association from its earliest years, and in 1910 he was its president. In his position at the Grand Central during the past five years he has had charge of the construction of the extensive new tracks and signaling connected with the establishment of the new two-level station.

H. S. Balliet.

Traffic Officers.

Robert John has been appointed soliciting freight agent of the Gulf, Colorado & Santa Fe at Houston, Tex.

E. W. Eichenberger has been appointed traveling freight agent of the Lehigh Valley, with office at Pittsburgh, Pa.

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C. A. Laud has been appointed general agent of the Atlanta, Birmingham & Atlantic, with office at Talladega, Ala., succeeding W. W. Breedlove.

F. E. Clarke has been appointed traveling passenger agent of the Chicago & Alton, with office at St. Louis, Mo., in place of J. M. Mauden, resigned.

Lucian T. Rice has been appointed commercial agent of the Louisville, Henderson & St. Louis, with office at Louisville, Ky., succeeding E. G. Jones, resigned.

R. C. Perkins has been appointed soliciting freight agent of the Missouri & North Arkansas, with office at New Orleans, La., succeeding C. E. Trust, resigned.

George B. Haynes, assistant general passerger agent of the Chicago, Milwaukee & St. Paul, has been appointed general passenger agent, with headquarters at Chicago, effective March 1.

J. S. Bloodworth, city passenger and ticket agent of the Southern at Savannah, Ga., has been promoted to traveling passenger agent, with office at Macon, Ga., succeeding C. A. Carson, Jr., deceased and George G. Walker succeeds Mr. Bloodworth.

John H. Bunch has been appointed general freight and passenger agent of the Copper River & Northwestern, and the Alaska Steamship Company, with office at Seattle, Wash., to succeed C. J. Jones, traffic manager, resigned to accept service elsewhere.

George A. Bergen, assistant general freight agent, in charge of coal and coke traffic of the Erie and subsidiary companies, with office at New York, has been appointed coal traffic manager, with office at New York, and his former position has been abolished.

J. J. Rose has been appointed Canadian passenger agent of the Union Pacific System at Toronto, Ont., in place of George W. Vaux, transferred. W. H. Benham has been appointed general agent at Cleveland, Ohio. S. A. Myers has been appointed district passenger agent, and J. J. Kientz, city passenger agent, both with headquarters at Pittsburgh, Pa. C. C. Phillips and Herbert J. Farber have been appointed traveling freight agent, both with headquarters at Pittsburgh.

R. C. Wallis, district passenger agent of the Louisville & Nashville, at Nashville, Tenn., has been appointed division passenger agent, with headquarters at St. Louis, Mo., succeeding J. E. Davenport, resigned; Geo. E. Herring, traveling passenger agent at Cleveland, Ohio, succeeds Mr. Wallis; J. 1. Zempke succeeds Mr. Herring; J. H. Settle is now district passenger agent, with headquarters at Birmingham, Ala., and E. G. Jones has been appointed city passenger agent at Louisville, Ky., succeeding Mr. Settle.

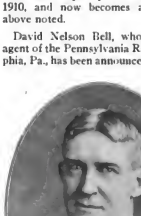
W. A. Cox, general freight agent of the Western Maryland at Pittsburgh, Pa., has resigned, and his former position has been abolished. Dudley G. Gray, formerly general freight agent of the Baltimore & Ohio, at Pittsburgh, has been appointed general western freight agent of the Western Maryland, with office at Pittsburgh, and he will have charge of all matters heretofore handled by the general freight agent. The titles of J. S. Talbot, general western agent at Chicago, and of Orno M. Brown, general eastern agent at New York, have been changed to general agent.

Fred H. Law, whose appointment as assistant general freight agent of the Illinois Central, with headquarters at St. Louis, Mo., has already been announced, was born November 10, 1876, at Sheridan, Ill. He received a high school education and began railway work with the Illinois Central in August, 1897. He filled various positions in the office of the assistant general freight agent at St. Louis until June 1, 1907, when he was advanced to commercial agent at that point. In October, 1909, he was transferred to Pittsburgh, Pa., in a similar capacity, where he remained until February, 1911, when he was made assistant general freight agent of the Illinois Central and the Yazoo & Mississippi Valley, with headquarters at Memphis, Tenn. He held the latter position at the time of his recent promotion as assistant general freight agent, as above noted.

W. G. Carmichael has been appointed traveling passenger agent of the Union Pacific system, with headquarters at Pittsburgh, Pa. C. J. Collins has been appointed traveling passenger agent at Cincinnati, O., in place of Earl Z. Giblon, resigned, to take service with another road. John J. Klenke has been appointed traveling freight agent, with office at Cincinnati, succeeding Lyon Liston, resigned, to go with another company. F. B. Swope has been appointed traveling freight agent, with office at Cincinnati, in place of S. C. Sigler, resigned, to accept service with another road.

Richard Joseph DeLong, whose appointment as assistant general passenger agent of the Pennsylvania Railroad, with headquarters at Philadelphia, Pa., has been announced in these columns, was born on July 10, 1854, in Lehigh county, Pa., and after leaving the public schools, attended the Pennsylvania State Normal School, at Millersville, Pa., from which institution he was graduated in the class of 1875. He entered the service of the Pennsylvania Railroad, on December 1, 1883, and was stenographer and special clerk in the passenger department until October 1, 1892, when he was promoted to chief clerk of the advertising department. Four years later he was placed in charge of the company's "personally conducted" tourist bureau. On January 1, 1900, he was promoted to chief clerk to the assistant general passenger agent, and in July, 1903, he was made division ticket agent of the West Jersey & Seashore. He was transferred to the New Jersey division, in a similar capacity, on June 1, 1910, and now becomes assistant general passenger agent as above noted.

David Nelson Bell, whose appointment as general passenger agent of the Pennsylvania Railroad, with headquarters at Philadelphia, Pa., has been announced in these columns, was born in Philadelphia, on November 18, 1868. After graduating from the public schools of his native town, he entered the general office of the passenger department of the Pennsylvania Railroad on July 5, 1885. He was appointed assistant advertising agent in April, 1891, and in November, 1896, was made tourist agent of the same road. On June 1, 1903, he was appointed special assistant to the general passenger agent, and was promoted in August, 1906, to division ticket agent of the United Railroads of New Jersey division. He remained in this position until June 1, 1910, when he was appointed assistant general passenger agent, in charge of through traffic of the same road, with headquarters at Philadelphia, which position he held at the time of his recent appointment as general passenger agent, with headquarters at Philadelphia, as above noted.



D. N. Bell.

Joseph Laurens Sheppard, who recently was appointed assistant general freight agent of the Illinois Central and the Yazoo & Mississippi Valley, with headquarters at Memphis, Tenn., was born June 11, 1881, near Greenville, S. C. He was educated in the public schools of Memphis, and began railway work July 1, 1896, as a messenger in the office of the assistant general freight agent of the Chesapeake, Ohio & Southwestern at Memphis, Tenn. When that road was absorbed by the Illinois Central in July, 1896, he became messenger in the local freight office of the latter road at Memphis. He filled various minor positions in the local freight office of the Illinois Central and the Yazoo & Mississippi Valley until July 1, 1903, and in September of that year was made export bill of lading clerk in office of the commercial agent at Memphis. One year later he was advanced to chief clerk in that office, and in July, 1905, he was transferred to the general freight agent's office at Memphis as rate quotation clerk, and filled various clerical positions in that office, including that of chief clerk, from which he was promoted to assistant general freight agent, as above noted.

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Colin Studds, who has been appointed assistant general passenger agent of the Pennsylvania Railroad, with headquarters at Philadelphia, Pa., as has been announced in these columns, was born in Fairfax county, Virginia, on November 23, 1861. After attending private and public schools, he entered the service of the Baltimore & Potomac, now a part of the Philadelphia, Baltimore & Washington, at Washington, D. C., in the telegraph department. For several years he served in various offices as telegraph operator, and, in 1882, entered the passenger department of the Southeastern district, as a stenographer. He was then promoted to chief clerk and city passenger agent, at Washington, and in June, 1889, was transferred to the tourist department, at Philadelphia. In August, 1892, he was appointed passenger agent of the Atlantic City district, and ten years later was transferred in the same capacity, to the Southeastern district, at Washington. On January 1, 1903, he went to New York, in charge of the Eastern district, and was then appointed passenger agent in charge of the New York district, which position he held at the time of his recent appointment as assistant general passenger agent as above noted. His entire service has been with the Pennsylvania Railroad System.

James Paul Anderson, who has been appointed general passenger agent of the Pennsylvania Railroad, with headquarters at Philadelphia, Pa., as has been announced in these columns, was born at Beaver, Pa., on August 29, 1862, and received his education in the public schools at Beaver and at Allegheny. He entered the service of the Allegheny Valley on July 15, 1880, as a clerk in the passenger department. After serving as chief clerk and traveling passenger agent, he was appointed general passenger agent of the same road in June, 1889, and when the Pennsylvania Railroad absorbed the Allegheny Valley in August, 1900, he was appointed division ticket agent of the Buffalo & Allegheny Valley division, now the northern division of the Pennsylvania Railroad. On April 1, 1910, he was made district passenger agent of the Pittsburgh district, and in August, 1912, was promoted to assistant general passenger agent of the Pennsylvania Railroad Lines east of Pittsburgh and Erie, with headquarters at Philadelphia, which position he held at the time of his recent appointment as general passenger agent of the same road, as above noted.

J. P. Anderson.

Engineering and Rolling Stock Officers.

V. K. Hendricks, principal assistant engineer of the St. Louis & San Francisco, has been appointed assistant chief engineer, with headquarters at Springfield, Mo.

The jurisdiction of C. R. Diemar, assistant engineer of the Baltimore & Ohio Southwestern at Cincinnati, O., extends also over the Cincinnati, Hamilton & Dayton.

J. E. Gardner has been appointed electrical engineer of the Chicago, Burlington & Quincy, with headquarters at Chicago, to succeed H. A. Gardiner, resigned; effective March 1.

W. W. Hubley has been appointed assistant supervisor of division No. 9, Middle division of the Pennsylvania Railroad, with office at Altoona, Pa., succeeding H. A. Gass, promoted.

M. B. McPartland has been appointed general foreman, locomotive department, of the Rock Island Lines, with office at Cedar Rapids, Iowa, succeeding L. C. Neyer, assigned to other duties.

F. L. Wells, signal supervisor on the Western Iowa division of the Chicago & North Western, has been transferred to the Chicago Terminal as signal supervisor to succeed C. G. Stecher, appointed signal instructor, and K. E. Kellenberger, signal inspector in the office of J. A. Peabody, signal engineer, has been appointed signal supervisor on the Western Iowa division of that road to succeed him.

R. F. Morkhill has been appointed signalling engineer of the Grand Trunk, with offices at Montreal, Que., succeeding C. A. Dunham, resigned, to resume his old duties as signal engineer of the Great Northern, with headquarters at St. Paul, Minn. Mr. Morkhill was born at Sherbrooke, Que., and about six years ago was in charge of the signalling on the Central South African Railways. He was then in the sales department at New York of the Union Switch & Signal Company, and was later one of the assistant engineers for that company engaged in the construction of the New York terminal of the Pennsylvania Railroad. Later he went to the Railway Signal Company of Canada.

Joseph Chidley, whose appointment as assistant superintendent of motive power of the Lake Shore & Michigan Southern, the Chicago & Indiana Southern and the Indiana Harbor Belt, with headquarters at Cleveland, Ohio, has been announced in these columns, entered the service of the Lake Shore & Michigan Southern on March 28, 1890, as a machinist at the Elkhart, Ind., shop, and was transferred in February, 1892, as machinist to Chicago. He was promoted to foreman machinist at Englewood, Ill., in February, 1900, and later was acting foreman at the same place until December, 1900, and was then night foreman at Elkhart, Ind., until January, 1901. The following May he was promoted to foreman at Air Line Junction, Ohio, and was made assistant master mechanic at Elkhart in November, 1904, remaining in that position until July, 1906, when he was made master mechanic at Collinwood, Ohio, and now becomes assistant superintendent of motive power of the same road, as above noted.

Nicholas Luke Smitham, whose appointment as assistant superintendent of motive power of the Missouri, Kansas & Texas Railway of Texas, with headquarters at Denison, Tex., has already been announced in these columns, was born in December, 1862, at Cornwall, England. He was educated in the public schools of Hazleton, Pa., and began railway work in 1877 as boilermaker apprentice with the Lehigh Valley. In the latter part of 1881 he went with the Colorado Iron Works at Denver, Colo., as boilermaker, remaining there a year, and then until the latter part of 1883 was with the Denver & South Park Railway as boilermaker. From that time until December, 1884, he was employed by the Denver & Rio Grande in a similar capacity, leaving to go to the Houston & Texas Central at Houston, Tex. In March, 1885, he was transferred to Walnut Springs, Tex., as general foreman in charge of boiler work. He was made general foreman of the Texas Midland at Terrell, Tex., in 1893, and two years later was promoted to master mechanic, resigning in January, 1901, to become master mechanic of the Texas Central at Walnut Springs, Tex. He then returned to the Texas Midland as master mechanic, and nine months later again entered the service of the Texas Central as master mechanic, which position he held until his recent appointment as assistant superintendent of motive power, as above noted.

David McCoe, who has been appointed superintendent of track of the Toronto, Ont., terminals of the Grand Trunk, as has been announced in these columns, was born on February 24, 1859, at Portadown, Ireland. He began railway work on March 1, 1872, on the Vandalia, and during the next seven years was consecutively water boy, section and extra gang foreman on that road. From August, 1879, to November, 1888, he was extra gang foreman and roadmaster on the Wabash, and then to November, 1890, was roadmaster on the Kansas City & Southern, now a part of the St. Louis & San Francisco. He was then freight and passenger conductor on the Fort Worth and Rio Grande until March, 1892, and then during the next five years was freight and work train conductor on the Wabash. On April 1, 1898, he went to the Grand Trunk as roadmaster. In May of the following year he was promoted to general roadmaster, and in September, 1910, was appointed superintendent of grade separation, which position he held at the time of his recent appointment as superintendent of track on the same road, as above noted.

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George McCormick, whose appointment as assistant general manager of the Sunset-Central Lines of the Southern Pacific, with headquarters at Houston, Tex., has already been announced, was born July 15, 1872, at Columbus, Colorado county, Tex. He was graduated from the Agricultural and Mechanical College at Bryan, Tex., with the degree of Mechanical Engineer, in 1891. He began railway work in 1891 as apprentice in the shops of the Galveston, Harrisburg & San Antonio at Houston, Tex. In a short time he was transferred to San Antonio, Tex., as draftsman, returning to Houston in 1895 as chief draftsman. He was appointed mechanical engineer in 1900, where he remained until December 20, 1911, when he went to El Paso, Tex., as assistant superintendent of the El Paso division. He held the latter position until his appointment on February 17 as assistant general manager (mechanical) of all the Sunset-Central Lines, as above noted.

G. McCormick.

Purchasing Officers.

A. F. McCool, chief clerk to the purchasing agent of the St. Louis & San Francisco at St. Louis, Mo., has been appointed assistant purchasing agent of the south Texas and Louisiana lines, with headquarters at Houston, Tex., succeeding J. L. White, resigned.

Special Officers.

Allan Pollak has been appointed superintendent of dining cars, hotels and restaurants of the Pacific system of the Southern Pacific, with headquarters at San Francisco, Cal., to succeed D. Urquhart, resigned.

OBITUARY.

Otto Brendler, trainmaster of the Chicago, Milwaukee & St. Paul at Green Bay, Wis., died on February 28, aged 51 years.

Charles Greenleaf Wood, who, from 1900 to 1902, was treasurer of the Vera Cruz & Pacific, now a part of the National Railways of Mexico, died on March 2, at his home in New York, at the age of 61.

James Clark Young, signal engineer of the Union Pacific, died at St. Joseph's Hospital, Omaha, Neb., at noon on February 27, 1913, following an operation performed for the removal of a tumor. Mr. Young was born in Washington, D. C., March 15, 1876, and was educated at the Montana College of Agriculture and Mechanic Arts at Bozeman, Mont., taking a course in applied science. He began railway work in January, 1897, as apprentice in the signal department of the Southern Pacific at Los Angeles, Cal. On August 1, 1900, he was appointed signal foreman, and on December, 1901, signal supervisor on the Los Angeles division of the Southern Pacific. He was transferred to San Francisco and made assistant signal engineer on October 15, 1904. On April 5, 1906, he was appointed signal engineer on the Union Pacific lines east of Green River, Wyo., with headquarters at Omaha, Neb. His jurisdiction as signal engineer was extended to include the lines from Green River to Ogden, Utah, on November 15, 1907. He remained in this position until the time of his death. He was a member of Committee I. on Signal Practice, of the Railway Signal Association, and Committee X. on Signals and Interlocking, of the American Railway Engineering Association. He was buried at Los Angeles, and is survived by his mother and a sister, Mrs. Walter Harvey of Seattle, Wash.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Grand Trunk is considering the purchase of 100 locomotives.

The Pennsylvania Railroad is in the market for 144 locomotives.

The Sao Paulo & Rio Grande, Brazil, is in the market for 10 switching locomotives.

The Grand Rapids & Indiana is in the market for 4 six-wheel switching locomotives.

The Erie has ordered 10 Pacific type locomotives from the American Locomotive Company.

The Chesapeake & Ohio has ordered 9 locomotives from the Baldwin Locomotive Works.

The Chicago & Western Indiana is in the market for 5 six-wheel switching locomotives.

The New York Central & Hudson River is having 50 Pacific type locomotives converted into mikado locomotives.

The Kansas City Southern has ordered 4 six-wheel switching locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 20 in. x 28 in. cylinders, 50 in. driving wheels, and in working order will weigh 156,000 lbs.

J. D. McArthur Company, Ltd., has ordered two mogul locomotives from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 26 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 130,000 lbs.

The Canadian Copper Company has ordered one mogul locomotive from the American Locomotive Company. The dimensions of the cylinders will be 20 in. x 26 in., the diameter of the driving wheel will be 50 in., and the total weight in working order will be 155,000 lbs.

The Hang Yang Iron & Steel Works has ordered 2 four-wheel switching locomotives from the American Locomotive Company. The dimensions of the cylinders will be 14 in. x 22 in., the diameter of driving wheels will be 44 in., and the total weight in working order will be 50,000 lbs.

The Baltimore & Ohio has ordered 60 mikado locomotives and 30 Pacific type locomotives from the Baldwin Locomotive Works, and 10 Mallet locomotives from the American Locomotive Company. The Mallet locomotives will be equipped with superheaters, will have 26 in. and 41 in. x 32 in. cylinders, 57 in. driving wheels, and in working order will weigh 470,000 lbs.

CAR BUILDING.

The Seaboard Air Line is in the market for 1,500 freight cars.

The Pennsylvania Railroad is in the market for 307 passenger cars.

The Pennsylvania Lines West are in the market for 87 passenger cars.

The Erie has ordered 1,500 freight cars from the Western Steel Car & Foundry Company.

The Lehigh Valley is building 50 flat cars in the company's shops. On completion of this order an additional 50 flat cars will be built.

IRON AND STEEL.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 190 tons of bridge steel from the American Bridge Company, and 896 tons of girder span plates from the Wisconsin Bridge & Iron Company and the Chicago Bridge Company.

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Supply Trade News.

The Jennison-Wright Company announces that Frank W. Cherrington has become affiliated with it as chief engineer, with headquarters at Toledo, Ohio.

R. C. Fraser, representative of the Buffalo Brake Beam Company, has been made vice-president of the company, with headquarters at 30 Pine street, New York.

The personal property of the Allis-Chalmers Company was sold at auction on February 27, at Milwaukee, for $4,000,000, to James N. Wallace, John H. McClements and Francis S. Bangs, of New York, representing the reorganization committee. The real estate was sold on February 3, for $2,250,000.

The Equipment Improvement Company, 30 Church street, New York, has been organized to handle Markel devices for locomotives and the Perfection door stop. The directors of the company are as follows: Alexander Turner, Bronze Metal Company, New York; R. H. Weatherly, Pilliod Company, New York; Le Grand Parish, American Arch Company, New York; F. H. Clark, Watson-Stillman Company, Ampere, N. J.; T. H. Hopkirk, American Steel Foundries, New York; T. Rumney, formerly assistant to the second vice-president of the Chicago, Rock Island & Pacific; and P. H. Ferguson, Pittsburgh Steel Products Company, Pittsburgh, Pa. The officers are as follows: President, F. H. Clark; vice-president, W. E. Weatherly; and secretary-treasurer, R. H. Weatherly. In the near future the company will handle other devices in addition to those mentioned above.

TRADE PUBLICATIONS.

PNEUMATIC TOOLS.—The Chicago Pneumatic Tool Company has issued bulletin No. 126, devoted to its compression riveters, and bulletin No. 129, devoted to hose couplings and hose clamp tools.

STEEL BUNKS.—The Hagger & Marcurson Company, Chicago, has published an illustrated folder describing its Tiger steel bunks, which were especially designed for use in logging camps in the railroad construction work.

UNIONS.—The Jefferson Union Company, Lexington, Mass., has published another of its series of folders reviewing the lives of great men in history and relating the advantages of Jefferson unions. The historical character chosen for this latest folder is Oliver Cromwell.

OXYGEN AND HYDROGEN.—The International Oxygen Company, New York, has published pamphlet No. 9 on its system of generating oxygen and hydrogen for all industrial purposes. This bulletin is illustrated and furnishes clear and concise descriptions of its oxygen and hydrogen generators and describes their operation.

THREADING MACHINERY.—The Landis Machine Company, Inc., Waynesboro, Pa., has published catalog No. 21, of its bolt threading, pipe and nipple threading, bolt pointing and nut tapping machinery, screw cutting die heads and special threading machines. This catalog is well illustrated and gives full information on the various machines. It contains 80 pages and includes a convenient index.

NORTH COAST RAILWAY, NEW SOUTH WALES.—Work on the South Grafton-Glenreagh section of the North Coast Railway is reported to be progressing satisfactorily, and clearing has been completed on the entire length. The heaviest cuts were east of the Bluff, about 18 miles from South Grafton, where sandstone was encountered. The swamp at the rear of the town was crossed partly by a viaduct about a quarter of a mile long, and partly by earthworks, the latter being now almost finished. At the Grafton end the laying of ties has commenced. Work on the principal bridge on the section, that across Sherwood creek, is now under way, while the bridge over Alipou creek has been completed, together with the approaches to Wilson's Hill, where it is proposed to span the river with a drawbridge.

Railway Construction.

CANADIAN PACIFIC.—An officer writes that contracts have been let for double-tracking work on western lines as follows: From Kenmay, Man., to Virden, 40 miles, to J. D. McArthur, Winnipeg, Man.; Whitewood, Sask., to Grenfell, Sask., 31 miles, and from Regina to Indian Head, 44 miles, to Foley Brothers, Welch & Stewart, Winnipeg; Chaplin, Sask., to Swift Current, 57 miles, to Janse Brothers, Boomer & Hughes, Calgary, Alta., and from Hammond, B. C., to Ruby Creek, 57 miles, to Grant Smith & Co., & Macdonnell, Vancouver, B. C. (February 28, p. 411.)

CAROLINA & YADKIN RIVER.—An officer writes that in addition to the line in operation from Thomasville, N. C., south to Denton, 21 miles, an extension was recently put in operation from Denton southwest to High Rock, about 9 miles. A contract has been given to C. W. Lane & Co., Atlanta, Ga., to build an extension from the northern terminus at Thomasville northeast to High Point, about 8 miles.

CHICAGO & NORTH WESTERN.—An officer writes that the Iowa Southern to be constructed by the Chicago & North Western will be a small coal road to some new coal mines that the company is opening in the vicinity of Buxton, Iowa, where the railway company is operating mines for railroad purposes only. This is not a commercial road.

GRAND TRUNK PACIFIC.—An officer writes that a contract has been given to Foley Bros., Welch & Stewart to build the remaining section of 425 miles connecting the eastern and western lines, from a point at mile 195 east of Prince Rupert, B. C., to mile 1,124 west of Winnipeg, Man. The work will be heavy. Maximum grades will be 4/10 per cent., and maximum curvature 6 deg. The work includes terminals of Fort George, B. C., a 775 ft. tunnel at mile 1,153 and a 2,000 ft. tunnel at mile 1,181. A number of bridges are to be put up between mile 1,094 and mile 1,486. See Fort George, B. C., under Railway Structures. (February 28, p. 411.)

GULF, FLORIDA & ALABAMA.—An officer writes that the company is preparing to contract for the grading of a 20-mile extension to the line running north from Local, Ala., into Monroe county. The grading is through level country. There is considerable grubbing and clearing to do. The company would like to hear from contractors who will bid on this work.

IOWA SOUTHERN.—See CHICAGO & NORTH WESTERN.

KANSAS-OKLAHOMA TRACTION.—Incorporated in Oklahoma with $100,000 capital and headquarters at Nowata. The plans call for building from Coffeyville, Kan., south via Nowata, Okla., and Collinsville to Tulsa, about 70 miles. It is understood that the line will cost between $30,000 and $40,000 a mile to build. Incorporators include D. H. Siggins, Warren, Pa.; W. E. Ziegler, Coffeyville; J. E. Campbell and E. B. Lawson, of Nowata.

NEW YORK CENTRAL & HUDSON RIVER.—The report of this company for the year ended December 31, 1912, shows that four-tracking work has been carried on during the year on the Hudson division through Poughkeepsie, N. Y., between Hyde Park and Barrytown, from Storm King to Chelsea, between Tivoli and Germantown and at Stockport, and four-tracking from Spuyten Duyvil to Peekskill, and the electrification of the line from Spuyten Duyvil to Croton. Work was also carried out on the construction of a connecting line between the New York Central main line and the West Shore at Harbor, east of Utica, and has been continued on the changing of grade crossings in the city of Buffalo, which has been under way for a number of years. The organization for electrical operation of all passenger trains to Harmon on the Hudson river is about finished, and it is expected that the entire Electric division will be put in full operation in March, 1913.

OKLAHOMA NORTHERN.—Incorporated in Oklahoma with $50,000 capital and headquarters at Oklahoma City. The plans call for building from Vinita, Okla., northwest to Coffeyville, Kan., about 42 miles. The estimated cost of building the line is $35,000 a mile. A. King, G. D. Meikeljohn and H. L. Steen, Omaha, Neb., and J. W. Tolliver, Centralia, Okla., are interested.

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Oklahoma Roads (Electric).—C. H. Kellogg and associates have asked for a franchise at Henrycta, Okla. The plans call for building a line to connect with lines to Oklahoma City. The first section to be built will be from the Creek and Victoria mines to the mines at Dewar and at Coalton. It is planned to eventually extend the line west via Okemah to a connection with the Shawnee-Oklahoma City line at Shawnee.

Pennsylvania Railroad.—The report of this company for the year ended December 31, 1912, shows that the company has in contemplation many important and extensive improvements, including improvements at Broad street station, Philadelphia, Pa., and its approaches and facilities; improvements on the Allegheny division; elimination of grade crossings and elevation of tracks on the New York division, from Colonia, N. J., eastward, through Railway, to Bay Way, Elizabeth, and a slight change of line in Elizabeth, where the line has already been elevated, also the abolition of additional grade crossings in Philadelphia, Lancaster, Lilly, Johnstown, Freeport, Wilkinsburg, Pittsburgh and other points on its lines when the local authorities co-operate in making the eliminations. For the eastern section of the six-track system on the New York division between Colonia, N. J., and Waverly, west of Newark, additional right of way has been acquired. This work comprehends station improvements, the elimination of 15 grade crossings by the elevation of the four existing main tracks, and the construction of two additional elevated tracks between those points. Construction work is now proceeding between Colonia and Elizabeth, and should be completed in 1914. On the Bald Eagle Valley branch the grades are being revised and the line is being double tracked between Mount Eagle and the Howard Rolling Mills and passing sidings are being extended. In West Brownsville yard, Pa., the change of grade and extension of track facilities, to connect with the new double track Monongahela river bridge, are almost completed. On the Sunbury division the double tracking was further extended by constructing second tracks at Boyd and South Danville, and between Port and Honey Pot yard, Pa. Work on the New York Connecting Railroad, owned jointly by the Pennsylvania Railroad and the New York, New Haven & Hartford, is proceeding. Additional contracts have been let for foundations and masonry of Bronx viaduct; also of piers for Bronx Kills bridge, Randall's Island viaduct, Little Hell Gate bridge, and Ward's Island viaduct; for the bases and foundations of the East River bridge on Ward's Island and Long Island City; and for the Long Island viaduct; for foundation and masonry between Lawrence and Stemler streets; and for grading and masonry between its connection with the Pennsylvania Railroad & Terminal and the Long Island Railroads at Woodside avenue and Fourteenth avenue. To provide for increasing traffic between Pittsburgh and Buffalo via the Allegheny division and the Western New York & Pennsylvania, the construction of three tunnels and the reduction of grades and other improvements on the Allegheny division between Pittsburgh and Oil City, and the reduction of grades and improvements of the railroad and yard facilities between Oil City and Buffalo, via Brocton and the Chautauqua branch, has been authorized. On the Cambria & Clearfield, the Cherry Tree & Dixonville, and the Pennsylvania, Monongahela & Southern, various short branches were built to reach coal mining operations. Work of enlarging the Mount Vernon yards, Baltimore, on the Northern Central, was completed. The freight facilities at York, Pa., Highlandtown, Md., and at Marysville yard, are also being enlarged and improved to accommodate the increased traffic. These improvements will probably be completed in 1913. The Wilkes-Barre Connecting Railroad was incorporated during the year jointly by the Pennsylvania Railroad and the Delaware & Hudson Company to provide a 7-mile line from Buttonwood yard on the Pennsylvania Railroad, west of Wilkes-Barre, to Hudson on the Delaware & Hudson Company, to facilitate the interchange of traffic between the two roads.

Texas Roads.—According to press reports plans are being made to build from Knox City, Tex., east and southeast to Crystal Falls, 63 miles, and eventually east an additional 100 miles to Fort Worth. The line will traverse the northern part of Stephens county, where there are undeveloped coal fields. It is said that the towns of Knox City, Munday, Goree, Bomarton, Throckmorton and Woodson will furnish a right of way and land for stations. The estimated cost of the line is $1,650,000. G. W. Thomason, Haskell, may be addressed.

Toronto Eastern.—An officer writes that a contract has been given to Ewen Mackenzie, Toronto, Ont., to build through Pickering, Whitby, Oshawa and Bowmanville. Track has been laid on one mile. The grading work involves handling about 14,000 cu. yds. of earth a mile, and about 30 per cent. is finished. Maximum grade will be 2.7 per cent., and maximum curvature 10 deg. W. H. Moore, president, and B. W. Oliver, chief engineer, Toronto. (February 21, p. 374.)

RAILWAY STRUCTURES.

Chambersburg, Pa.—The Cumberland Valley has given a contract for a new passenger station at Chambersburg, to M. R. Rhoades, of Chambersburg, at $50,000 above the foundations. The cost of the foundations is about $16,000. The new building must be completed by October 1, 1913, and will face East Market street.

Eureka Springs, Ark.—An officer of the Missouri & North Arkansas writes that the company will build a new station at a cost of $15,000, at Eureka Springs, and re-arrange the yard at that place at a cost of $5,000.

Fort George, B. C.—The Grand Trunk Pacific will put up bridges between mile 1,094 and mile 1,486 as follows: At McLellan creek crossing 249 ft. long; Little Shuswap crossing 129 ft.; Rau Shuswap crossing 1,032 ft.; Cottonwood creek crossing 129 ft.; Fifty Mile river crossing 129 ft.; Goat river crossing 308 ft.; Dome creek crossing 129 ft.; Second Fraser river crossing 689 ft.; Third Fraser river crossing 968 ft.; Willow river 459 ft.; Fourth Fraser river crossing 1,227 ft.; Upper Nechaco river crossing 642 ft.; Bulkley river crossing mile 1,481, 154 ft., and crossing the same river at mile 1,486, 364 ft.

Harrison, Ark.—The Missouri & North Arkansas will construct general shops and terminals at Harrison, at a cost of $125,000.

Heber Springs, Ark.—The Missouri & North Arkansas will construct yard terminals and a roundhouse at Heber Springs, at a cost of $25,000.

Helena, Ark.—The Missouri & North Arkansas will put up a new station and construct a yard at Helena, at a cost of $50,000.

Leslie, Ark.—The Missouri & North Arkansas will put up a new station at Leslie at a cost of $7,500, and will also fill in a number of bridges at various places on the line at a cost of $30,000.

McAdam Junction, New Brunswick.—Bids are wanted by William Downie, general superintendent of the Canadian Pacific at St. John, New Brunswick, until noon, March 10, for the erection of a concrete machine shop, at McAdam Junction.

Moline, Ill.—The Chicago, Rock Island & Pacific has announced plans for the erection of a new two-story passenger station.

Mt. Clemens, Mich.—The Grand Trunk has announced that it will erect a new passenger station during the year to cost approximately $25,000.

New London, Conn.—See an item in General News regarding a new four-track steel bridge, to be built over the Thames river at New London, for the New York, New Haven & Hartford.

New York.—The report of the New York Central & Hudson River for the year ended December 31, 1912, shows that the entire work of reconstruction of the Grand Central Terminal at New York has progressed without interruption of train service. The concourse and waiting room on the express level of the main station building were opened for use on February 2, 1913. The suburban concourse was opened for partial use on October 27, 1912. Changes in the plans have delayed completion of the cross streets, and an extension of time was obtained. The whole of this work is expected to be finished during 1913. The more important work carried on during the year included improvements at Utica consisting of a new brick and stone passenger station, elimination of grade crossing at Genesee street, a new engine terminal, and increase of terminal yard tracks. Improvements at Rochester included a new stone passenger station, extension and

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reconstruction of several bridges, the closing of Joiner street, placing additional tracks, the building of a new power house and the erection of several auxiliary buildings. In connection with the four-tracking of the Hudson division new passenger stations were put up at Staatsburgh and at Rhinecliff. The work in connection with the four-tracking from Spuyten Duyvil to Peekskill and the electrification from Spuyten Duyvil to Croton includes changes of bridges, stations and signals, and the development of a new terminal of the Electric division at Harmon, also improvements at Yonkers consisting of the elevation of tracks and the construction of additional main tracks, a new passenger station, a new freight station, and a new freight yard layout, and a new passenger station at Glenwood.

OGDEN, UTAH.—The Oregon Short Line is said to be planning the erection of a large addition to its shops.

PHILADELPHIA, PA.—The report of the Pennsylvania Railroad for the year ended December 31, 1912, shows that the improvement of the passenger facilities in Philadelphia, Pa., is still receiving consideration, and will necessitate an increase in the tracks and platforms, and the enlargement and improvement of the station facilities at Broad street station and approaches as far as West Philadelphia station and yard; the widening of the bridge, and approaches, over the Schuylkill river and the adjoining entrances to Fairmount Park at Girard avenue, by the construction of two additional tracks; enlargement of North Philadelphia passenger station and approaches by the addition of four new tracks with high level island platforms, and other improvements, including the relocation of the junction of the Chestnut Hill branch with the New York division at that point, which is now under contract. An ordinance was obtained from the city of Philadelphia to erect a new eight-track concrete steel bridge across North Broad street near North Philadelphia station. Extensive repairs and additions are being made to the West Philadelphia stock yards, and the piers at Greenwich, Philadelphia, are being improved, and the dock extended. The company bought property during the year for passenger terminal and station improvements at Broad street station, and other points in Philadelphia, and for the enlargement and improvement of freight stations and yard facilities, at Hamburg Junction and Greenwich in Philadelphia, Elizabethtown, Altoona, Cresson, Uniontown, Tarentum, Peterson and New Kensington. The company also has in contemplation the construction of a new double-track steel bridge over the Allegheny river at Kiskiminetas Junction to take the place of the present single-track bridge. Work on the Cortlandt street ferry house and dock, New York, which are being rebuilt, will be completed in 1913. On the Newark Rapid Transit Line, the Summit avenue passenger station, Jersey City, has been finished. The Fourth street station in Harrison, N. J., on this line, will be completed early in 1913. On the Pittsburgh division four grade crossings are being abolished in Braddock, Pa., by the construction of three under-grade bridges and one overhead bridge; work is in progress on the elimination of grade crossings in Pittsburgh at Homewood avenue, and the work of eliminating all grade crossings in the borough of Wilkinsburg has commenced. At Montgomery, Pa., the 16-span double track steel bridge over the West branch of the Susquehanna river, replacing the single track bridge, will be completed this year. A fireproof grain elevator of enlarged capacity is being erected by the Girard Point Storage Company at Girard Point, Philadelphia, to replace the present elevator. On the Philadelphia, Baltimore & Washington, the work of reconstructing the bridges over the Gunpowder and Bush rivers will be finished during 1913. The reconstruction of the bridges over Stemmers run, Back river and Gwynn's Falls will also be undertaken in the present year.

SAN BENITO, TEX.—The St. Louis, Brownsville & Mexico and the San Benito & Rio Grande Valley have prepared plans for a new passenger station.

SEATON, TEX.—The Gulf, Colorado & Santa Fe is planning to enlarge the capacity of its roundhouse and to erect a new passenger station.

TORONTO, ONT.—Bids are wanted by B. Ripley, engineer of grade separation of the Canadian Pacific, Toronto, Ont., up to noon, March 20, for the construction of the sub-structures of subways at Davenport road, at Spadina road, at Holland avenue, and at Bathurst street, North Toronto.

Railway Financial News.

BALTIMORE & OHIO.—The Public Service Commission has conditionally approved the new $63,250,000 4½ per cent. convertible bond issue in order to allow stockholders to take advantage of their right to subscribe therefor on or before March 3. The order is not to become effective until the Maryland Court of Appeals has passed on the legal question involved.

BOSTON & ALBANY.—This company has asked the Massachusetts railroad commission for permission to issue $2,015,000 25-year 4½ per cent. bonds for improvements.

GALVESTON, HOUSTON & HENDERSON.—C. E. Schaff, president of the Missouri, Kansas & Texas, has been elected a director, succeeding Roger Campbell, resigned.

Speyer & Company, of New York, recently bought $2,000,000 new first mortgage 5 per cent. bonds which they are offering to exchange for a like amount of bonds falling due April 1, 1913; holders of old bonds receiving $10 cash in addition to a new bond for each $1,000 bond presented by March 24.

CHICAGO & ALTON.—The 3-year $2,500,000 notes which mature March 15 are to be paid from cash to be obtained from the sale of a block of new general mortgage bonds.

MISSOURI, KANSAS & TEXAS.—The Texas senate has passed by a vote of 22 to 6 (over Governor Colquitt's veto) a bill to permit the consolidation of the Wichita Falls & Northwestern, the Wichita Falls & Southern, the Texas Central and the Beaumont & Great Northern with the Missouri, Kansas & Texas of Texas. The house had already passed the bill over the Governor's veto.

NEW YORK CENTRAL & HUDSON RIVER.—The New York Public Service Commission, Second district, has granted the application of this company for permission to merge all of the subsidiaries of which the New York Central & Hudson River owns all of the stock. The commission has received an application for permission to consolidate a large number of other subsidiaries in which the New York Central owns directly or indirectly a large majority of the stock. Neither of these applications includes the New York & Harlem.

NEW YORK, NEW HAVEN & HARTFORD.—The directors have authorized President Mellen to make a lease of the Northampton division, north of Westfield, to the Boston & Albany. In all there are 66 miles of road which it is proposed to lease, reaching Holyoke, Easthampton, Northampton, Turners Falls and Shelburne Falls.

NEW YORK, ONTARIO & WESTERN.—Ladenburg, Thalmann & Company, New York, have bought from the company $1,980,000 general mortgage 4 per cent. bonds.

SALT LAKE & MERCUR.—The circuit court has appointed Lucius Laudie receiver. The road runs from Salt Lake City to Mercur, Utah, 62 miles.

RAIL CONNECTIONS BETWEEN VALENCIA AND MADRID, SPAIN.—The much talked of direct line from Valencia, Spain, to Madrid has not been included in the new law authorizing "complimentary" railways in Spain. The law only makes reference to the proposed line filling up the gap between the termini of existing lines at Cuenca and Utiel, and the Valencia people are not satisfied with this route, which is circuitous. On the other hand only 89 miles of line have to be built to connect these two termini, while of the proposed direct line via Motilla nothing is completed but the section from Valencia to Utiel. Valencia is the only large coast town which is not placed on one of the many direct lines which radiate from Madrid to the coast, although it is nearer than any other. As the crow flies the distance between the two cities is only some 186 miles, but the present route, via Encino, is 304 miles long, and the tri-weekly express takes 10½ hours to do the journey. By the Cuenca-Utiel route the distance would be reduced to 250 miles and considerably less again, via Motilla. Unfortunately, the latter route is through difficult country, and there is little hope of any local traffic of value, at least for a number of years to come, while the through passenger traffic is hardly sufficient to justify the present service of one daily mail train each way and an express every alternate week-day.

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[ADVERTISEMENT.]

ANNUAL REPORTS.

THE PENNSYLVANIA RAILROAD—SIXTY-SIXTH ANNUAL REPORT.

GENERAL OFFICE, BROAD STREET STATION, PHILADELPHIA,
February 28th, 1913.

The Board of Directors submit herewith to the Stockholders of The Pennsylvania Railroad Company a synopsis of their Annual Report for the year 1912:—

Rail operations—Revenues		$174,607,598.22
Rail operations—Expenses		126,637,944.56
Net revenue—Rail operations		$47,969,653.63
Auxiliary operations—deficit		1,147,985.23
Net Railway operating revenue		$46,821,668.40
Railway tax accruals		7,128,535.02
Railway operating income		$39,693,133.38
Other income:		
Income from securities	$14,527,491.56	
Hire of equipment, etc.	4,762,241.75	19,289,733.31
Gross income		$58,982,866.69
Deductions from gross income		16,828,902.66
Net income		$42,153,964.03
Disposition of net income:		
Appropriations to sinking and other reserve funds	$1,138,627.92	
Portion of principal of equipment trust obligations	2,901,727.99	
Cash dividends	27,198,918.00	
Appropriations for Additions and Betterments	8,365,479.53	
Construction expenditures on branch roads	888,107.06	$40,492,860.50
Balance transferred to credit of Profit and Loss		$1,661,103.53

CONDENSED GENERAL BALANCE SHEET.

DECEMBER 31st, 1912.

ASSETS.		
Property investment:		
Road	$282,948,637.64	
Equipment	134,130,678.53	
	$417,079,316.17	
Reserve for accrued depreciation—Cr.	14,086,588.29	
		$422,992,727.88
Securities owned		331,909,154.32
Securities under lease of U. N. J. R. R. & C. Co.		2,559,658.25
Miscellaneous investments		1,929,500.60
Cash		30,207,397.25
Materials and supplies		15,434,219.41
Cash and securities in sinking, insurance and other reserve funds		14,896,149.81
Cash and securities in Provident Funds		6,616,863.23
Other assets		39,843,342.50
		$886,179,022.27

LIABILITIES.	
Capital Stock	$453,877,950.00
Premium realized on Capital Stock from January 1st, 1909	7,050,200.00
Funded Debt of The Pennsylvania Railroad Company	152,468,940.00
Funded Debt of Companies whose properties have been acquired by The Pennsylvania Railroad Company	54,334,500.00
Guaranteed Stock Trust Certificates, Philadelphia, Wilmington and Baltimore Railroad and New York, Philadelphia and Norfolk Railroad Companies	14,708,250.00
Equipment Trust Obligations	21,888,827.71
Mortgages and Ground Rents Payable	3,456,622.36
Securities received with the lease of the U. N. J. R. R. & C. Co.	2,559,658.25
Liability on account of Provident Funds	6,616,863.23
Other liabilities	14,049,668.57
Additions to property since June 30th, 1907, through income	52,439,756.37
Reserves from Income or Surplus:	
Invested in Sinking, Redemption and other reserve funds	35,745,431.46
Reserve for Additions and Betterments and Car Trust Principal charged out in advance	8,447,378.70
Profit and Loss	28,534,975.62
	$886,179,022.27

The number of tons of freight moved on the five general divisions east of Pittsburgh and Erie in 1912 was 143,480,431, an increase of 18,305,363, or 14.62 per cent.; the number of tons moved one mile 72,267,887, an increase of 5,007,173, or 7.42 per cent.

The Railroad Company's west of Pittsburgh and Erie in which your Company is interested show satisfactory results. Detailed statements of their operations will be found in their respective annual reports, as well as in the full report of your Company.

The number of tons of freight moved on the lines west of Pittsburgh was 165,449,782, an increase of 26,672,392. The number of passengers carried was 34,326,381, a decrease of 335,869.

The operating revenue of all lines east and west of Pittsburgh for the year 1912 was $374,096,179.92; operating expenses, $291,867,178.81, and operating income, $82,228,801.11, an increase in operating revenue, compared with 1911, of $37,612,367.16, and an increase in operating income of $7,039,772.63. There were 473,174,093 tons of freight moved on the entire system, being an increase of 39,955,772 tons, and 178,811,733 passengers carried, an increase of 9,916,577.

There were expended during the past year for construction, equipment, and real estate on the Lines West of Pittsburgh $16,236,642.12.

The expenditures were principally for new ore docks at Cleveland, the elevation of tracks in that city, and also in Chicago and Fort Wayne, the construction of additional main tracks on the Pittsburgh, Fort Wayne and Chicago Railway, the Cleveland and Pittsburgh Railroad and the Pittsburgh, Cincinnati, Chicago and St. Louis Railway, land for new freight station at Indianapolis, increase in yard and station facilities at various points, and for additions to and improvement of the equipment.

GENERAL REMARKS.

The Income Statement is in the form prescribed by the Interstate Commerce Commission, effective July 1st, 1912, which requires the statement of certain parts of the Income Statement in greater detail; as well as showing the receipts and disbursements of certain accounts. The company is further required to include the Income derived by Sinking and other Reserve Funds as part of its Income; but as it is not permitted to charge as a payment interest on any part of its bonds which may be held in any of the Sinking or Trust Funds, such interest on bonds so held cannot be included in said Income. While these accounting changes result, therefore, in apparently swelling the Net Income of the Company to the extent of $786,270.60 yet it is offset by corresponding necessary appropriations to these funds out of net income, which appropriations were formerly included in fixed charges.

This Statement shows that the total Rail Operating Revenues were $174,607,598.22, the largest in the history of the Company, an increase of $17,120,185.52, or 10.87% as compared with 1911.

The increased express traffic resulted in a greater gross return to the Company. The future effect of the larger post on express revenue cannot as yet be determined, nor is it known what effect the change in express rates, ordered by the Interstate Commerce Commission, will have upon the revenue received from the Express Company operating over your lines.

In the transportation of United States Mails the revenue shows a decrease although the volume of the traffic increased. The rates are fixed by Congress, and there as a Congressional investigation of the subject at the present time. It is hoped that, if due consideration is given to the value of this service and to the special facilities it requires, remunerative rates will be placed.

Rail Operating Expenses are also the largest in the history of the Company, showing an increase of $14,495,351.56, or 11.84%, caused principally by the increased traffic, which necessitated not only greater outlays for transportation expenses, but also for repairs and renewals of roadbed, bridges, and buildings, signals and interlocking, and for other items which add to the safety and comfort of the patrons and employes of the road; as well as for repairs and renewals of equipment, and increased charges for Depreciation.

The expenses were further increased by the severe weather in January and February, 1912, and they also reflect increases caused by higher wages; the operation of the Extra Train Crew Law; increased cost of fuel and other materials, and improved standards of track and other construction to meet the requirements of heavier rolling stock.

In the wage questions that arose during the past year with the Enginemen and Firemen on the railroads in the Eastern District of the United States, represented by their respective Brotherhoods, a general strike was averted in the case of the Engineers by the appointment of a special Board of Arbitration, consisting of seven members, one selected by the railroad companies, one by the Brotherhood of Locomotive Engineers, and the other five appointed by the Chief Justice of the Supreme Court of the United States, the Secretary of Labor, the Commerce Court and the United States Commissioner of Labor, collectively.

This Arbitration Board was constituted after attempts had failed to settle the difficulty through mediation under the Erdman Act, and because the parties in the controversy, while agreeing to the principle of arbitration, would not accept arbitration under the provisions of that Act.

In the difficulties of the present year with the Firemen, represented by the Brotherhood of Locomotive Firemen, a strike was averted by the imperative lamentable consequences of a general strike, involving over fifty railroads, having over 25% of the mileage and handling 40% of the total operating Revenues and Operating Expenses of all the railroads in the United States.

Considering the magnitude of the interests in this Country and those Countries with which it has commercial relations that would be affected by the interruption of railroad traffic, and the serious results that would ensue therefrom; the stoppage of food supplies, fuel and other traffic, the inconvenience, losses and suffering to the general public whose interest is paramount, and to the workers in other industries dependent on a reliable transportation service and the consequent demand for railway disputes, and the failure of strikes to produce any permanent advantages to either the employes and their families or to the transportation companies, careful consideration should be given to the recommendations for the amendment of the Erdman Act, which have been made from so many sources interested in the well-being of the Country.

The experience arising from these larger wage controversies places a serious responsibility upon those whose duty it is to enact proper legislation governing the relations between employer and employe, to consider whether the Erdman Act should not be amended to increase the number of arbitrators and thereby constitute a Board of sufficient size to properly represent the public as well as the parties to the controversy, and to direct the necessary far-reaching investigations and fully share the responsibility of an impartial determination of the equitable and economic questions arising from such disputes. Power should be found necessary to provide a longer time than thirty days specified in the Act for the consideration of the subject and the rendering of a decision.

It may not be possible to prevent strikes or lockouts by requiring compulsory arbitration, but it is wise to consider whether an obligation should not be placed upon the employer and employe to advise the authorities of the questions at issue before any lockouts or strikes can become effective, so that by due publication and inquiry the Government and the public may be fully informed of the extent of the controversy and its causes.

The net revenue of rail operations shows an increase of $3,710,633.96. Taxes continue to increase, the charges for the present year exceeding those of the previous year by $332,649.28.

The tonnage for the year increased 14.52% and tonnage mileage increased 13.35%, while the freight train mileage increased only 10.95% due to an increased train load of 2.17%.

The passengers carried increased 7.42% with increased passenger mileage of 6.71%, while in the face of this, the passenger train mileage increased only 1.86% due to the average number of passengers per train increasing 4.84%.

In the deductions for lease of other roads the larger payments are due to the increased revenue earned on Roads operated on the basis of Net revenue.

The decrease in the interest deductions for funded debt, compared with

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1911, was due to the maturity and payment on May 1st, 1912, of the River Front Railroad Company First Mortgage Bonds; and on November 1st, 1912, of the Pennsylvania Railroad Company 3½% Convertible Bonds of 1902, and also to the payments of principal due on Equipment Trust obligations.

The Company has in contemplation many important and extensive necessary improvements, a large portion of which should not be charged to Capital Account, and for which the Reserve for Additions and Betterments will be utilized, such as the improvements of Broad Street Station, Philadelphia, and its approaches and facilities; improvements on the Allegheny Division hereinafter referred to; the elimination of grade crossings and elevation of tracks on the New York Division, from Colonia eastward, through the City of Rahway, to Bay Way, Elizabeth, and a slight change of line in the City of Elizabeth, where the line should be more elevated. It also contemplates the abolition of additional grade crossings in Philadelphia, Lanesster, Lilly, Johnstown, Freeport, Wilkinsburg, Pittsburgh, and other points on its lines, and will authorize co-operate in effecting the eliminations. The Company also has in contemplation the construction of a new double-track steel bridge over the Allegheny River at Kiskiminetas Junction on an improved line to take the place of the present single-track bridge.

The Capital Stock was increased over the previous year by $100.00, of which $50.00 was issued in exchange for Fractional Convertible Bond Receipts, and $50 for Dividend Scrip dated May 31, 1893.

The Funded Debt and Equipment Trust obligations were reduced as follows:

Redemption through Sinking Funds:

Consolidated Mortgage 3½% Bonds due July 1, 1945	$66,930.00
Equipment Trust Loan due 1914	121,000.00
Collateral Trust Loan Bonds 4½% due June 1, 1913	51,000.00
Philadelphia, Wilmington and Baltimore Railroad 4% Stock Trust Certificates due July 1, 1921	114,000.00

Payment at Maturity of:

Ten Year Gold Convertible 3½% Bonds	10,222,500.00
River Front Railroad Company's 1st Mortgage 4½% Bonds	212,000.00
Equipment Trust obligations	6,441,100.07

It will shortly be necessary for the Company to provide capital for the $10,222,500 of Ten Year Gold Convertible 3½% Bonds which matured November 1st, 1912, and for $212,000 of Collateral Trust 4½% Bonds due June 1st, 1913, together with maturing equipment trust obligations, and also for new construction, the acquisition and improvement of terminals, track and facilities, and the purchase of equipment. The manner in which the necessary funds will be raised for the purpose has yet been reached as to the form or extent of the proposed financing.

The issues of Equipment Trust Securities during the year consisted of $7,000,000.00 of Pennsylvania Railroad Equipment Trust, Series H, dated of 1912, of which the Pennsylvania Railroad Company's proportion was $1,572,100.00. There were thus issued for the Pennsylvania Railroad Company 875 steel underframe and steel body-frame refrigerator cars; for the Pennsylvania Company, 1,000 steel underframe and steel body-frame automobile box cars; for the Pittsburgh, Cincinnati, Chicago and St. Louis Railway Company, 3,000 all steel coke gondola cars; and for the New York, Philadelphia and Norfolk Railroad Company, 1,000 all steel underframe ventilated box cars and 50 steel underframe gondola cars, an aggregate of 5,725 cars.

During the year the final payments were made under the series of equipment trusts, the original issue of which amounted to $19,000,000. These series covered 3,325 steel underframe box cars, 3,000 steel hopper gondola cars, 6,000 steel underframe gondola cars, to serve the needs of the Pennsylvania Railroad; 500 refrigerator cars, 1,500 steel hopper gondola cars, 600 steel underframe long gondola cars, and 1,000 steel underframe box cars for the Pennsylvania Company; 210 steel underframe box cars, 300 steel hopper gondola cars, 400 steel underframe long gondola cars, and 1,000 steel for Pittsburgh, Cincinnati, Chicago and St. Louis Railway Company; 200 steel hopper gondola cars, sub-leased to the Cleveland, Akron and Cincinnati Railway Company; and 815 refrigerator cars leased to the Chicago, Peoria and Indiana Railway Company, representing in all 16,620 cars.

The cars therefore have become the property of the respective companies which paid the cost thereof.

The expenditures for acquisition of property during the year were mainly to cover additional right of way for new lines, elimination of grade crossings, and for passenger terminal and station improvements at Broad Street Station, and other points in Philadelphia, and for the extension and improvement of freight stations and yard facilities at Hamburg Junction and Greenwich in Philadelphia, Elizabethtown, Altoona, Creason, Uniontown, Turtentum, Peterson and New Kensington.

The block signal system on the main line between New York and Pittsburgh was further improved by the installation of automatic signals on the Philadelphia Division between Dillerville Block Station and Branch Intersection, and on the Pittsburgh Division between Youngstown and Niles, and the work will be continued next year on the Middle and Philadelphia Divisions.

The Cortlandt Street Ferry House and Dock, New York City, which are being rebuilt, have so far progressed that the two ferry slips are now in operation, and the remainder of the work will be completed in 1913.

On the Newark Rapid Transit Line, described in the Annual Report for 1910, the Summit Avenue passenger station, Jersey City, was partly completed and opened on May 30th, 1912, and has since been finished, and is accommodating a large amount of traffic. The Fourth Street Station in Harrison, N. J., on this line, was completed early in 1912.

For the eastern section of the six-track system on the New York Division between Colonia, N. J., and Newark, the work of the additional right of way has been acquired. This work comprehends station improvements, the elimination of three grade crossings by the abolition of the two existing main tracks, and also the construction of two additional elevated tracks between those points. Construction work is now proceeding between Colonia and Elizabeth, and will be completed in 1913.

The State of New Jersey, in which your Company and other lines have extensive mileage, is now considering the enactment of a new statute for the elimination of grade crossings. It has long been the policy of the Company to encourage the removal of grade crossings, and it has spent large sums of money for that purpose, and still further results in this direction would have been attained had the States and municipalities been authorized, or willing, to co-operate. The railroads in many instances have been the pioneers in the development of the towns, cities and territories served by them, and their existence has materially added to the population and prosperity of these communities. But with so many crossings still to be eliminated, the greatly increased payments for taxes and other items, and outlays for improvements in their railroads and equipment, which still confront them and are essential to public safety and convenience, it seems unfair and unwise to propose that the railroad companies should be burdened with either the entire cost, or an undue proportion of the cost, of eliminating many of these crossings which have been opened subsequently to the construction of the railroads, and against their strong protest. For these reasons and on account of the great increase of motor, street railway, vehicular and pedestrian travel, it is hoped that the legislation now pending will be so framed in the public interest, as to enable either the State, the municipalities or the railroads to take the initiative in the abolition of existing crossings, and to co-operate in carrying on the work by providing a fair and equitable division of the expenditure, as do the laws of New York, Massachusetts, Vermont, Ohio and other States.

The improvement of the passenger facilities in Philadelphia is still receiving consideration by the various departments in the service, and also by the Consulting Electrical Engineer of the Company. As outlined in the last annual report, it will necessitate (1) an increase in the tracks and platforms, and the enlargement and improvement of the station facilities at Broad Street Station and its approaches as far as West Philadelphia Station and the Market Street bridge, and (2) the bridge, its approaches, over the Schuylkill River and the adjoining entrances to Fairmount Park, Girard Avenue, by the construction of two additional tracks and a revision of the grades and interlocking, which are now proceeding, and (3) the enlargement of North Philadelphia passenger station and its approaches by the addition of four new tracks with high level island platforms, and other improvements including the relocation of the junction of the Chestnut Hill Branch with the New York division at that point, which is now under contract.

In brief the Philadelphia Terminal problem is to provide increased terminal facilities and approaches for approximately 20 years, for lines which equal eight double-track railroads.

An ordinance was obtained from the City of Philadelphia to erect a new eight-track concrete steel bridge across North Broad Street near North Philadelphia Station.

Pending the results of the investigation of terminal improvements for Broad Street Station, Philadelphia, satisfactory progress is being made in the acquisition of the necessary real estate.

Extensive repairs and additions are being made to the West Philadelphia shop yards of the Company, and at Overbrook, Philadelphia, are being improved, and the dock extended, to facilitate the loading of coal at both points.

On the Bald Eagle Valley Branch the grades are being revised and the line is being double-tracked between Mount Eagle and the Howard Rolling Mills and the passing sidings are being lengthened to provide for increased tonnage passing between the Main Line and the Erie Division via Tyrone and Lock Haven.

On the Pittsburgh Division four grade crossings are being abolished in Braddock, Pa., by the construction of three under-grade bridges and one over-grade bridge; work is in progress on the construction of grade crossings in the City of Pittsburgh at Homewood Avenue, and the work of eliminating all grade crossings in the Wilkinsburg Borough has commenced.

In West Brownsville Yard, Pa., the change of grade and extension of track facilities, necessary to connect the single track Monongahela River bridge, at that point are almost completed.

On the Sunbury Division the double tracking was further extended during the year by constructing second track between Port Trevorton, Penville, and between Port and Honey Pot Yard, Pa.

At Kittanning Point, Pa., the double track steel bridge over the West Branch of the Susquehanna River, replacing the single track bridge at this point, will be completed this year.

The aggregate expenditures for Construction and Equipment during the year upon the owned and leased lines of this Company was $16,322,247.38 for which the Company has been reimbursed at closed lines to the extent of $727,502.41. The sum of $888,107.06 was expended on the Western New York and Pennsylvania Railroad and Cleveland, Cincinnati, Chicago and Saint Louis Railway, and other Branch Roads, and charged against Income as Expenditures on Branch Roads for Construction. The expenditures on the line owned and on the Harrisburg, Portsmouth, Mount Joy and Lancaster Railroad and the United New Jersey Railroad and Canal Company, operated under long-term leases, comprising the main line between New York and Pittsburgh, amounted to $14,706,637.91, which has been disposed of as follows:

Charged to Income as Extraordinary Expenditures		$1,841,127.73
Charged to Reserve for additions and Betterments appropriated out of Income of previous year		3,652,567.37
		$5,493,695.09
Charged to Capital Account:		
Road	$3,602,489.93	
Equipment	5,610,452.89	
		9,212,942.82
		$14,706,637.91

Under the Balance Sheet prescribed by the Interstate Commerce Commission, the Road and Equipment Account includes not only these capital charges, but also similar expenditures made out of Income since June 30th, 1907. Therefore, the expenditures charged against Income and against the Reserve for Additions and Betterments, created in previous year have been so included.

The Additions and Betterments expenditures on the Harrisburg, Portsmouth, Mt. Joy and Lancaster Railroad and the lines of United New Jersey Railroad and Canal Company, both operated by this Company under leases for 999 years have also been included under the Road and Equipment Account as "Leased Lines—Road."

Expenditures during 1912	$1,979,160.61
Expenditures June 30th, 1907, to December 31st, 1911	9,940,950.10
	$11,920,110.71

An offsetting liability appears on the credit side of the Balance Sheet entitled "Additions to Property since June 30th, 1907, through Income," in which is carried not only the $5,493,695.09, but also the payments through Income on account of Additions and Betterments, in previous years, 727.99 for 1912, and $637,644.08 for previous years, aggregating $9,033,067.16.

On account of principal and interest of Water Supply Trust Certificates $324,313.81 were expended during the year and charged against Income.

The construction of the New York Connecting Railroad, owned jointly by this Company and the New York, New Haven and Hartford Railroad Company, and described in the Annual Report for 1910, is proceeding. Additional contracts have been awarded for foundations and masonry of Bronx Viaduct; foundations and masonry of Piers for Harlem River Lift Bridge, Bandalls Island Viaduct, Little Hell Gate Bridge, and Wards Island Viaduct; for the bases and foundations of the East River Bridge on Wards Island and Long Island City; and for the Long Island Viaduct; for foundation and masonry between Lawrence and Stemler Streets; and for grading and masonry between its connection with the Pennsylvania Tunnel and Terminal and the Long Island Railroads at Woodside Avenue and Fourteenth Avenue.

The increasing traffic between Pittsburgh and Buffalo via the Allegheny Division and the Western New York and Pennsylvania Railway requires the construction of three tunnels and the reduction of grades and other improvements on the Allegheny Division between Pittsburgh and Oil City,

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and the reduction of grades and improvements of the railroad and yard facilities on the said railway between Oil City and Buffalo, via Brocton and the Chautauqua Branch, to more fully utilize it as the principal route for passenger and freight traffic between these cities, and the work has been authorized. As the result of these improvements, the heavy grades will be restricted to relatively short distances between the said cities, and this route, which was objectionable because of heavy grades, will be over 58 miles shorter than the present route via Oil City, the Salamanca Branch, and Olean, and will have not only this advantage in distance, which will produce satisfactory operating economies, but its use will postpone for several years the double tracking and other expenditures on the present route.

To meet the Construction and Equipment expenditures on the Western New York and Pennsylvania Railway during the year, advances aggregating $525,212.36 were made by this Company, and charged against the net earnings of the Lessee Company which also be required to provide funds for the improvements heretofore mentioned on that railway during the year 1913.

On the Cambria and Clearfield Railway, the Cherry Tree and Dixonville Railroad, and the Pennsylvania, Monongahela and Southern Railroad, various short branches were built to reach coal mining operations.

This Company advanced $184,591.36 to the Cambria and Clearfield Railway Company to meet its construction requirements, which was charged against the net income of the Lessee Company.

It has been decided advisable to absorb the Cambria and Clearfield Railway Company, which for many years has been owned and operated by this Company in connection with its main line, the construction of that road and its several branches having been promoted by this Company for the development of the bituminous coal traffic in the Clearfield region. The necessity for maintaining that railway as a separate corporation no longer exists, and the agreement providing for its acquisition will, in accordance with notice given to the stockholders, be submitted for approval at the annual meeting.

The sum of $94,408.94 was advanced to the Pennsylvania, Monongahela and Southern Railroad Company for its construction requirements for 1912, for which it reimbursed this Company by the issuance of its stock in bonds in equal proportion.

A fireproof grain elevator of enlarged capacity and modern facilities is being erected by the Girard Point Elevator Company at Girard Point, Philadelphia, to take the place of the present elevator.

On the Philadelphia, Baltimore and Washington Railroad, the work of reconstructing the bridges over the Gunpowder and Bush Rivers is proceeding, and will be finished during 1913. The reconstruction of the bridge over Stemmers Run, Back River and Gwynn's Falls will also be undertaken in the present year.

The installation of automatic block signals on the Maryland Division has been completed between Washington and Baltimore, between Principio and Iron Hill, and between Ruthby and Wilmington, and the work will be continued next year.

On the Northern Central Railway the work of enlarging the Mount Vernon Yards, Baltimore, was entirely completed. The freight facilities at York, Pa., Highlandtown, Md., and at Marysville Yard, are also being enlarged and improved by the construction of additional tracks. These improvements will probably be completed in 1913.

The execution and delivery of the proposed lease by this Company of the railroad, property and franchises of the Northern Central Railway Company, is still delayed by litigation. Under its provisions, which have been fully explained in the Annual Report for 1910, the lease and rental payments beame effective January 1st, 1911, and an accounting between the lessor and lessee from that date will be necessary if and when the lease has been duly executed and delivered in conformity with its terms and conditions.

The Wilkes-Barre Connecting Railroad Company was incorporated during the year jointly by this Company and the Delaware and Hudson Company to provide a line, seven miles in length, from Buttonwood Yard on the Pennsylvania Railroad, west of the City of Wilkes-Barre, to Hudson on the line of the Delaware and Hudson Company, to facilitate the interchange of traffic between the two roads, and avoid the movement through the business centre of that city, and via the tracks of other railroads.

The surplus property frontiog on Seventh Avenue between Thirty-second and Thirty-third Streets, New York City, owned by the Pennsylvania Tunnel and Terminal Railroad Company, a subsidiary of this Company, has been conveyed to the Pennsylvania Terminal Real Estate Company looking to its future development.

During the year the Company made advances to the Long Island Railroad Company aggregating $2,625,000, for the improvement of its railroad and facilities, and the construction of new lines and equipment, and will receive therefor securities of that Company.

Minor advances were also made to the Pennsylvania Tunnel and Terminal Railroad Company in 1912, for which its certificate of indebtedness to this Company has been issued.

The pensions paid during the year amounted to $646,375.34.

The stockholders will be asked to authorize an increase in the annual sum set apart for pension purposes from $700,000 to $750,000 per annum and to give authority to the Board of Directors to hereafter increase the pension appropriation to such extent as may, from time to time, be necessary to meet the purposes for which the Pension Department was created; such increase to be reported to the stockholders.

The additional appropriation is necessitated by the increasing number of pensioned employees, especially between the ages of 65 and 69 years; and the advances in wages from time to time, which increase the average pension allowances.

The securities held by the Company, December 31st, 1912, at a valuation of $331,909,154.32, produced a direct income during the year of $14,527,491.56. During the year the Company increased its holdings of Norfolk and Western Railway Company Common stock, by $4,788,100.00 through the conversion of a like amount of the Norfolk and Western Railway Company Convertible bonds, to which it had subscribed at par, during the year, and also acquired $3,000,000.00 of Pennsylvania Terminal Real Estate Company stock.

Effective May 8th, 1912, the name of the Buffalo and Allegheny Valley Division was changed to Northern Division.

By order of the Board,

SAMUEL REA,
President.

STOCKHOLDERS MAY OBTAIN COPIES OF THE ANNUAL REPORT COMPLETE, BY APPLYING TO OR ADDRESSING LEWIS NEILSON, SECRETARY, BROAD STREET STATION, PHILADELPHIA, PA.

FORTY-FOURTH ANNUAL REPORT OF THE NEW YORK CENTRAL AND HUDSON RIVER RAILROAD COMPANY.

To the Stockholders of

THE NEW YORK CENTRAL AND HUDSON RIVER RAILROAD COMPANY:

The Board of Directors herewith submits report for the year ended December 31, 1912, with statements showing the results for the year and the financial condition of the company.

The mileage embraced in the operation of the road is as follows:

	Miles
Main line and branches owned	805.49
Proprietary lines	3.06
Lines leased*	2,626.13
Lines operated under contracts	81.70
Trackage rights	274.27
Total road operated	3,790.65

*The Dunkirk Allegheny Valley and Pittsburgh Railroad, 90.51 miles, is also leased by this company, but mileage and operations are not included in this report. Separate accounts are kept and independent returns prepared in its behalf.

Of the total road operated, 290.71 miles are operated in freight service only and 14.96 miles are operated in passenger service only.

The decrease of mileage of owned lines is due to abandonment of part of the Pardee branch of the Beech Creek Railroad and a change of alignment of the main line of the same railroad. The difference in the reported mileage of road operated under trackage rights is caused by a careful revision of previously reported figures by the engineering authorities of the various railroads interested. A statement showing the total miles of road and track operated will be found on another page.

The standard form of income account promulgated by the Interstate Commerce Commission was adopted by this company on July 1, 1912. No revision of figures for the previous year nor for the first six months of the year covered by this report has been made, therefore, some of the comparisons between the years 1911 and 1912 are somewhat distorted. The accounts principally affected by this change of form are "taxes accrued," part of the taxes which were previously charged to this account being now shown in "miscellaneous tax accruals" in the "deductions from gross corporate income" and "miscellaneous income" from which have been transferred to "miscellaneous rents" the amounts receivable as rental of property not used in the operation of the road.

The capital stock authorized is	$250,000,000.00
of which there is issued and outstanding	222,729,300.00
leaving a balance authorized but not issued of	$27,270,700.00
The mortgage, bonded and secured debt outstanding on December 31, 1911, was	$299,870,608.18

This has been added to as follows:

Gold mortgage bonds, bearing interest at the rate of three and one-half per cent per annum	$5,000,000.00
Gold debentures of 1912, bearing interest at the rate of four per cent per annum	9,156,000.00
Three year gold notes due March 1st, 1915, bearing interest at the rate of four and one-half per cent per annum	20,000,000.00

This company's pro rata liability in connection with the equipment trust certificates of 1912, bearing interest at the rate of four and one-half per cent per annum | 7,156,741.50

Equipment trust certificates on account of the Boston & Albany Railroad, bearing interest at the rate of four and one-half per cent per annum (see page 10) | 5,220,000.00

Mortgage on real estate in the city of New York, bearing interest at the rate of three and one-half per cent per annum | 1,000,000.00

Mortgage on real estate in the city of Utica, bearing interest at the rate of six per cent per annum | 2,500.00

	$47,535,241.50
	$347,405,849.68

and has been decreased as follows:

Payments of installments falling due during the year on this company's pro rata liability in connection with the certificates issued under equipment trust agreements, as follows:	
Trust of 1907, installment due November 1912	$793,660.12
Trust of 1910, installment due January 1912	433,964.42
Payment of mortgage on real estate in the city of New York	150,000.00
	1,377,624.54
Outstanding, as shown on the balance sheet of December 31, 1912	$346,028,225.14

In accordance with the consent of the Public Service Commission of the Second District of the State of New York, there have been acquired out of the proceeds of the issue of securities specially authorized for the purpose, 108,786 shares of common stock and 22,181 shares of preferred stock of the New York and Harlem Railroad Company of a par value of $6,148,350, at a cost of $21,493,053.16; 80,084 shares of stock of the Rome Watertown and Ogdensburg Railroad Company, of a par value of $8,008,100, at a cost of $10,250,368; and 9,322 shares of the stock of the Utica and Black River Railroad Company of a par value of $932,200, at a cost of $1,677,960.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

OPERATING INCOME.	1912.	1911.	INCREASE OR DECREASE.
	3,790.65	3,790.23	0.42 *miles*
RAIL OPERATIONS—	*miles operated*	*miles operated*	
Revenues	$109,900,015.57	$103,954,862.81	$5,945,152.76
Expenses	81,311,153.31	75,700,202.78†	$5,610,950.53
NET REVENUE FROM RAIL OPERATIONS	$28,588,862.26	$28,254,660.03	$334,202.23

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Percentage of expenses to revenue	(73.99%)	(72.82%)	(1.17%)
AUXILIARY OPERATIONS—			
Revenues	$5,579,083.89	$5,202,572.62	$376,511.27
Expenses	5,255,057.55	4,881,096.79	373,960.76
NET REVENUE FROM OUT. SIDE OPERATIONS	$324,026.34	$321,475.83	$2,550.51
NET REVENUE FROM ALL OPERATIONS	$28,913,886.60	$26,576,135.86	$336,752.74
TAXES ACCRUED	5,902,521.17	5,447,759.13	454,762.04
OPERATING INCOME	$23,010,367.43	$23,128,376.73	—$118,009.30
OTHER INCOME.			
Joint facilities rents	$1,929,498.22	$1,754,125.34	$175,372.88
Miscellaneous rents	406,368.82	309,579.61	96,789.21
Net profit from investments in physical property	62,073.62	.....	62,073.62
Dividends on stocks owned or controlled	12,791,889.90	11,649,589.23	1,142,300.67
Interest on funded debt owned	508,829.12	489,986.73	18,842.39
Interest on other securities, loans and accounts	1,785,987.82	1,616,736.54	169,251.28
Miscellaneous income	395,945.11	416,162.50	—20,217.39
TOTAL OTHER INCOME	$17,880,592.61	$16,236,179.95	$1,644,412.66
GROSS CORPORATE INCOME	$40,890,960.04	$39,364,556.68	$1,526,403.36
DEDUCTIONS FROM GROSS CORPORATE INCOME.			
Rentals of leased lines	$10,035,192.32	$10,036,832.20	$18,360.12
Hire of equipment	1,980,095.34	1,151,064.87	829,030.47
Joint facilities rents	624,602.85	556,026.51	68,576.34
Miscellaneous rents	838,920.77	565,593.96	273,326.81
Miscellaneous tax accruals	15,961.73	.....	15,961.73
Separately operated properties —loss	346,612.72	210,693.02	135,919.70
Interest on bonds	9,661,603.05	9,162,019.58	499,583.47
Interest on three year gold notes of 1911 and 1912	1,903,125.00	1,085,039.99	818,085.01
Interest on equipment trust certificates	1,031,538.64	742,979.81	288,558.83
Other interest	337,426.34	76,749.96	260,676.38
Transfer of income to other companies	35,800.80	.....	35,800.80
St L & A Railway: interest, rental, etc	74,000.00	138,600.00	—64,600.00
N Y & Ottawa Railway: interest on bonds	58,240.00	58,240.00	.....
Other deductions	48,003.13	276,267.74	—228,264.61
TOTAL DEDUCTIONS FROM GROSS CORPORATE INCOME	$27,011,122.69	$24,060,107.64†	$2,951,015.05
NET CORPORATE INCOME	$13,879,837.35	$15,304,449.04	—$1,424,611.69
DIVIDENDS, four each year at five per cent per annum	11,136,465.00	11,136,465.00	.....
SURPLUS FOR THE YEAR	$2,743,372.35	$4,167,984.04	—$1,424,611.69
Appropriation to cover replacement value of abandoned property including buildings at Grand Central Terminal, etc	.....	2,500,000.00	—2,500,000.00
BALANCE FOR YEAR CARRIED TO PROFIT AND LOSS	$2,743,372.35	$1,667,984.04	$1,075,388.31
Balance to credit of profit and loss (free surplus) December 31, 1911			$13,448,668.33
Surplus for the year 1912			2,743,372.35
Additions for the year: Adjustments of sundry accounts			203,994.51
			$16,396,035.19
Deductions for the year: Commissions and expenses, N Y C Lines equipment trust, 1912		$116,524.38	
Discount and commissions, gold mortgage bonds		625,000.00	
Discount and commissions, debentures of 1912		453,357.50	
Discount and commissions on three year notes of 1912		200,000.00	
Discount and commissions, one year notes		51,306.00	
Clearfield Bituminous Coal Corporation advances, interest, taxes, etc		307,307.01	
Transfer to special account, cancelling credit from profit on sale of parts of Trust equipment		265,673.20	
Transfer to appropriated surplus, amount of initial 10% payments on Trust equipment of 1912 made during year ended December 31, 1912		251,368.50	
Account of abandoned facilities at various places		130,291.24	
Sundry uncollectible accounts and adjustments		309,794.32	3,210,622.15
BALANCE TO CREDIT OF PROFIT AND LOSS (FREE SURPLUS) DECEMBER 31, 1912			$13,185,413.04

†Revised for purposes of comparison.

For the year covered by this report the revenue from transportation was $108,454,613.07, an increase of $5,903,734.81; revenue from operations other than transportation was $1,445,882.50, an increase of $41,417.95; revenue from auxiliary operations (connected with, but in addition to transportation by rail) was $5,579,083.89, an increase of $376,511.27.

The total gross revenue from all operations was $115,479,099.46, an increase of $6,321,664.03.

Freight revenue was $65,101,509.99, an increase of $3,968,200.07. The revenue freight carried amounted to 51,901,182 tons, an increase of 3,650,647 tons over last year.

Products of agriculture show an increase of 441,275 tons, chief of which are grain 208,196 tons, flour and other mill products 139,868 tons and cotton 42,703 tons. Products of animals show an added tonnage of 75,677; live stock, dressed meats and other packing house products show a decrease of 40,028 tons; wool, hides and leather an increase of 48,141 tons; milk increased 26,537 tons while dairy products fell off 4,876 tons. Products of mines show an increase of 1,815,306 tons, of which bituminous coal yielded 630,830 tons, anthracite coal 92,856 tons, coke 31,120 tons, ores 403,119 tons, and stone, sand and other articles 367,381 tons. Products of forests increased 287,711 tons. Manufactured articles increased 1,264,861 tons; cement, brick and lime showing 355,583 tons over last year's movement; metal productions increased 327,705 tons; bar and sheet metal show an increase of 154,342 tons; iron and steel rails declined to the extent of 34,367 tons. Commodities not classifiable decreased 218,183 tons.

There have been practically no changes in freight rates during the year, but owing to the large increase in medium and low class commodities transported the average revenue per ton fell from $1.27 in 1911 to $1.25 in the year 1912 and the rate per ton per mile declined from 6.513 mills to 6.26 mills.

The revenue from passengers amounted to $33,134,508.72, an increase of $1,375,270.74. There was an increase of 992,801 in the number of local passengers and of 1,158,715 in the number of commutation passengers, but the number of interline passengers decreased 100,683. The average amount received from each passenger showed a slight increase but owing to the increased volume of commutation business the average rate per passenger per mile showed a very small decrease.

The special service train revenue shows a apparent decrease of $133,298.25 due mainly to a revised method of accounting, a large part of the revenue which was formerly credited to this account now being credited to ordinary passenger revenue. The actual decrease is explained by the military movements to and from Pine Camp during the previous year, there being no corresponding source of revenue in 1912.

The total revenue of all passenger-train transportation was $41,586,413.41, an increase of $1,927,884.98 over the year 1911. Of this amount the revenue from express traffic was $4,451,904.69, an increase of $533,972.57 due to an enlarged volume of business.

The expenses of rail operations amounted to $81,311,151.31, an increase of $5,610,950.53. The ratio of rail operating expenses to the total revenues for the year was 73.99%, an increase of 1.17% over the ratio for the year 1911. Of the total increase of $5,610,950.53 the larger part was absorbed by increased expenditures in the upkeep of the road and equipment, the total increases being as follows: for maintenance of way and structures and equipment $3,283,255.34, for expenses of securing and transporting traffic and of general administration $2,327,695.19.

The operating expenses, by groups, were:

Maintenance of way and structures	$14,705,288.99	an increase of $981,379.79
Maintenance of equipment	20,440,446.48	an increase of 2,301,675.55
Traffic expenses	2,430,442.31	an increase of 136,220.02
Transportation expenses	41,052,202.08	an increase of 2,117,171.14
General expenses	2,782,772.45	an increase of 304,004.03
Auxiliary operations	5,255,057.55	an increase of 373,960.76

In the maintenance of way and structures the repairs of roadway and track cost $201,918.42 more than in 1911 and the maintenance and repairs of buildings, fixtures and grounds increased $393,867.78. Removal of snow, sand and ice necessitated an increased expenditure of $198,533.88. Improvements to signal apparatus increased $243,206.77.

In the maintenance of equipment the repairs of locomotives and cars increased $1,716,257.86, while the charges for renewals and depreciation of equipment increased $461,370.80.

Transportation expenses show large increases in the cost of labor, partly accounted for by the increase of 5 per cent of pay of the employees as explained in a subsequent part of this report. Other increases were consequent upon the enlarged volume of traffic handled.

Efficiency of operation of equipment is clearly indicated by the statistics of mileage of locomotives, trains and cars. Freight locomotive mileage decreased 686,021 miles, freight train mileage decreased 378,796 miles, while loaded freight car mileage increased 19,574,385 miles. Empty car mileage decreased 11,942,275 miles, due to heavy westbound traffic, and showing mileage decreased 72,653 miles. Passenger locomotive mileage increased 147,158 miles, passenger train mileage increased 212,580 miles and passenger car mileage increased 3,351,872 miles.

The average load per freight train mile increased 35.49 tons (over 8%) and the load per car mile increased seven-tenths of a ton. The consumption of fuel per mile run by freight locomotives increased three-quarters of a pound, and by passenger locomotives decreased over one pound or a half. The average cost of coal increased six cents a ton and the average cost of fuel per locomotive mile increased 0.61/1000ths of a cent.

In the operation of the Pension Department 135 employees were retired and placed upon the pension rolls. Of these retirements, 70 were authorized because of the attainment of 70 years of age and 65 because of total and permanent physical disability. Sixty-two pensioners died during 1912 and at the close of the year 700 retirements were carried upon the pension rolls. The average monthly pension allowance to these men was $74.19 and the total amount paid in pension allowances during the year was $201,536.31.

Auxiliary operations show an increase in the net revenue of $2,550.51. All the accounts under this head except the steamers except harbor terminal transfers with a decrease of $117,531.09 and dining and special car service with decreased $37,622.79.

The amount of taxes accrued during the year was $5,918,482.90, equal to 5.12% of the gross operating revenues of the year. The total was $470,723.77, or 8.64%, due to a general raising of the tax rates assessed on real estate. The Federal Government tax on income of corporations amounted to $128,245.84, a very small decrease from that paid in 1911. As in previous years, a large portion of this amount was paid under protest. Of the suits that were instituted to recover the amounts paid on accounts of lesser companies under the claim that they are not liable to the tax, those on behalf of the West Shore Railroad Company and the Mohawk and Malone Railway Company, selected as test cases, were tried in the city of New York and the judgment of the court was in favor of the two companies. The Federal Government has taken the whole question involved to the Supreme Court where arguments have been heard and final judgment is expected early in 1913.

In deductions from gross corporate income, rentals of leased lines have

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increased $18,360.12. The rental of the Boston and Albany Railroad was larger by $22,500.00, the amount of interest on Improvement bonds issued in 1912. The rental of the Dunkirk Allegheny Valley and Pittsburgh Railway decreased $6,041.68 due to the refunding of its bonded debt at a lower rate of interest during the year 1911.

In other income an increase of $1,142,300.67 is reported in the income derived from capital stock held by this company, due to the acquisition during the year of shares of the New York and Harlem Railroad Company, Rome Watertown and Ogdensburg Railroad Company and the Utica and Black River Railroad Company, as mentioned in a previous paragraph.

Interest on the funded obligations of this company increased $1,606,227.31, made up of interest on securities issued during the year as follows: Gold mortgage bonds, $173,000.00; Gold debentures of 1912, $326,583.47; Three year gold notes of 1912, $553,125.00; Equipment trust of 1912, $288,558.83; and an increase of $264,960.01 in the interest on three year gold notes of 1911, the difference between nine months' interest charged in 1911 and a whole year's interest charged in 1912.

Separately operated properties resulted in a loss of $346,612.72, being the amount of this company's proportion of the annual guarantee to the Merchants Despatch Transportation Company, $300,000.00, less the profit from the operation of the Dunkirk Allegheny Valley and Pittsburgh Railroad $22,467.32, the net result being an increase of $135,919.70 in the deductions from gross corporate income. No dividend was paid on the capital stock of the St. Lawrence and Adirondack Railway Company for this year, reducing the amount of dividends and charges on investments $64,600.00 and reducing deductions from gross corporate income by the same amount.

The rate of dividend for the year was five per cent, being the same as for the previous year.

The results for the year, after paying dividends, amounted to $2,743,-327.35, a decrease as compared with the year 1911 of $1,424,611.69.

Several very extensive and important additions to the improvement of facilities have been carried on during the year, chief of which are the following:

Improvements at Utica, consisting of a new brick and stone passenger station, elimination of grade crossing at Genesee Street, a new engine terminal, increase of terminal yard tracks, the installation of new signal apparatus, for which has been expended during the year the sum of $1,353,829.20.

Improvements at Rochester, comprising a new stone passenger station, extension and reconstruction of freight facilities, the closing of Exchange Street, placing additional tracks, the building of a new power house for heating the passenger station and other buildings and the erection of several auxiliary buildings, involving during the year an expenditure of $690,991.40.

Four-tracking the Hudson division through Poughkeepsie, between Hyde Park and Barrytown, from Storm King to Chelsea, between Tivoli and Germantown and at Stockport. Included in this plan are new passenger stations at Staatsburg and Rhinebeck. Charges on account of this improvement reached the total of $2,594,608.15 during the year.

Four-tracking from Spuyten Duyvil to Yonkers and the electrification of line from Spuyten Duyvil to Croton, including the eooesquent changes in bridges, culverts and waterway, to the amount of $2,156,274.20. To this is included the development of a new terminal of the Electric division at Harmon and an important and comprehensive plan of improvements at Yonkers, consisting of the relaying of tracks and the construction of additional main tracks, a new passenger station, a new freight station, a new freight yard layout and a new connection with the Putnam division.

The construction of a connection between this company's main line and the West Shore Railroad at Harlem, east of Utica, has cost during the year $325,012.31, of which amount $49,000.63 has been charged to the West Shore Railroad Company as advances for new construction.

The changing of grade crossings at cost of $2,156,274.20, which has been in progress for many years, has been continued at a cost of $268,177.04 for the work done during the year.

The total expenditures for additions and betterments to the property of this company during the year were:

Expenditures on road account	$10,196,570.08	
Additional tract equipment	7,972,796.85	$17,869,366.93
Credit value of equipment retired	$4,843,288.80	
Amount to equal equipment trust installments	1,748,240.66	
	$6,591,529.46	
Expenditures on equipment account	5,806,061.87	785,467.59
making a net addition to this company's property account of		$17,083,899.34

Expenditures on account of construction work on leased lines amounted to $12,229,631.31, making a grand total of extraordinary expenditures during the year of $29,213,530.65. Further details are shown on subsequent pages.

Under date of October 1, 1912, The New York Central and Hudson River Railroad Company became party to an agreement establishing the Boston and Albany Equipment Trust of 1912, under which, and subsequent leases, certain equipment will be acquired for use upon the Boston and Albany Railroad. The agreement provides that the total amount of trust certificates to be issued thereunder shall not exceed $2,000,000, or 80% of the cost of the equipment to be furnished. The certificates bear interest at the rate of 4½% per annum, and are to be paid in fifteen annual installments, the first being payable July 1, 1913. Of the certificates, almost issued $1,220,000 have been issued, covering out to exceed 90% of the cost of 1,000 refrigerator cars, 31 passenger train cars and 100 ballast cars. The New York Central and Hudson River Railroad Company and the New York New Haven & Hartford Railroad Company have entered into an agreement by which the New Haven Company assumes one-half of the payments under this equipment trust and becomes entitled to a one-half interest in the equipment, during the continuance of the trust, continues assigned to Boston and Albany Railroad use.

On November 20, 1912, the Trustees executed The New York Central and Hudson River Railroad Company, together with The Lake Shore and Michigan Southern Railway Company, The Michigan Central Railroad Company, The Cleveland Cincinnati Chicago and St. Louis Railway Company, The Pittsburgh and Lake Erie Railroad Company and The Toledo and Ohio Central Railway Company to enter into an equipment trust agreement, to be dated January 1, 1913, for the purpose of establishing the New York Central Lines Equipment Trust of 1913. This agreement will provide for an issue of $24,000,000 of equipment trust certificates, bearing interest at the rate of 4½% per annum; being not to exceed 90% of the total cost of the equipment to be furnished under the terms of the said agreement. The certificates are to be paid in fifteen annual installments, the first being payable January 1, 1914. Out of the $24,000,000 of certificates authorized there will be issued, early in 1913, $12,540,000. The cost of the equipment to be assigned to this company in connection with the issue of these latter certificates will be approximately $5,079,000, and the pro rata amount of the certificates, representing not to exceed 90% of the cost, will be approximately $4,436,000. Full particulars as to the character of the equipment to be acquired will be set forth in the report to the stockholders for the year 1913.

On another page will be found details with respect to the New York Central Lines Equipment Trust of 1912, showing the locomotives and cars acquired thereunder and the certificates outstanding.

The operation of the Boston and Albany Railroad under the agreement between this company and the New York, New Haven and Hartford Railroad Company, which became effective on July 1, 1911, and was outlined in last year's report, has resulted in a surplus of $71,601.60 during the year covered by this report, one-half of which amount is shown in deductions from income under the title "Transfer of income to other companies."

A special committee, appointed by the Board of Directors of Merchants Despatch Transportation Company, recommended the sale by that company to The New York Central and Hudson River Railroad Company and The Lake Shore and Michigan Southern Railway Company of all its refrigerator equipment, consisting of 5,388 cars and also 1,000 cars covered by the Merchants Despatch Equipment Trust of 1911, in proportion to the holdings of the two companies of the capital stock of the Merchants Despatch Transportation Company. On November 13, 1912, the Board of Directors authorized the cancellation of the agreement for the use of refrigerator cars dated November 1, 1901, between the Merchants Despatch Transportation Company, The New York Central and Hudson River Railroad Company, The Lake Shore and Michigan Southern Railway Company, The Michigan Central Railroad Company, The Cleveland Cincinnati Chicago and St. Louis Railway Company, The Pittsburgh and Lake Erie Railroad Company, the Peoria and Eastern Railway Company, the Rutland Railroad Company, the Lake Erie and Western Railroad Company and the Chicago Indiana and Southern Railroad Company, and on the same date authorized the purchase by this company of 2,868 refrigerator cars at cost, less depreciation; and 532 refrigerator cars covered by the Merchants Despatch Equipment Trust of 1911, the remainder of the Merchants Despatch Transportation Company 532/1000ths of the amount already paid for it on account of the 1,000 cars it was proposed to assume 532/1000ths of all future payments to be made under the agreement of lease known as the Merchants Despatch Equipment Trust of 1911, the cars to be transferred to this company on January 1, 1913.

Early in January the General Chairmen's Association of the Brotherhood of Locomotive Engineers, representing the engineers on fifty-six railroads in the Eastern Section of the United States, formulated demands for a general increase in wages and for certain modifications in the rules governing their employment; and these demands were submitted to the railroads on January 22nd.

On March 14th, 15th and 25th conferences were held between the representatives of the Brotherhood of Locomotive Engineers and a Conference Committee of Managers authorized to confer in behalf of the lines of the roads concerned; the Committee of Managers declined to grant the requests either in whole or in part.

A vote of the employees was taken, resulting almost unanimously in favor of a strike, whereupon the Honorable Martin A. Knapp, Presiding Judge of the United States Commerce Court, and the Honorable Charles P. Neill, United States Commissioner of Labor, tendered mediation under the Erdman Act.

Both parties declined arbitration under that Act, and it was finally agreed, on April 18th, to submit the matters in dispute to a Board of Arbitration to consist of seven members—one to be named by the railroads, one by the engineers, and these two to agree upon five others; or, failing to so agree within fifteen days, the Chief Justice of the Supreme Court of the United States, the Presiding Judge of the Commerce Court and the United States Commissioner of Labor should name the other five members.

The railroads selected Mr. Daniel Willard, President of the Baltimore & Ohio Railroad Company, and the engineers selected Mr. P. H. Morrissey, former General Master of the Brotherhood of Railroad Trainmen; these two representatives having failed to agree, the other five arbitrators were appointed by the Chief Justice of the Supreme Court of the United States, the Presiding Judge of the Commerce Court and the Commissioner of Labor, as follows:

Hon. Oscar S. Straus, New York.
Dr. Charles R. Van Hise, Madison, Wisconsin.
Mr. Frederick N. Judson, St. Louis, Missouri.
Dr. Albert Shaw, New York.
Mr. Otto M. Eidlitz, New York.

The Board so constituted held its first meeting in New York city, Friday, July 12th, 1912, electing the Honorable Oscar S. Straus chairman. Hearings were held at the Oriental Hotel, Manhattan Beach, from July 15th to 27th; Grand Chief Engineer Warren S. Stone represented the Brotherhood of Locomotive Engineers and handled the case with great ability. The evidence of a large number of witnesses on both sides was taken and a most exhaustive investigation of the question in all its details was made. The Board finally published its award on November 25th.

The Commission appointed by the Chief Justice of the Supreme Court, the Presiding Judge of the Commerce Court and the Commissioner of Labor was composed of men of high character and wide experience. Months of patient, painstaking investigation and study were given to the consideration of the subject, and the conclusions reached, as well as recommendations submitted, are worthy of the most careful consideration.

The statement that "there is a growing realization that labor difficulties from railroads affect the whole people" is too old to call for extended discussion. A complete suspension of service, as was threatened by the engineers on the railroads involved in this controversy, would, in less than one week, cause widespread distress and apprehension, on a large number of people.

The principle of arbitration in some form has been accepted by both sides, and it is safe to say that neither the railroads nor any organization of employees would precipitate a strike in the face of an offer to arbitrate the question at issue.

The Arbitration Commission, recognizing this, has suggested permanent commissions, both National and State, to investigate and decide controversies of this character.

The Commission recognized the fact that under existing methods, the findings of commissions selected to consider each case, with no data save that submitted at the time, are almost always in the nature of a compromise to secure a settlement of that particular controversy, rather than a thorough, painstaking investigation to ascertain the real merits of the case.

In speaking of the Erdman Act, the Commission states, as follows:

"That the Erdman Act marks a great advance in the settlement of railroad labor disputes is shown by the increased frequency with which the Act has been invoked. Within a year after the passage of the Act a fruitless attempt was made to utilize its provisions, but nearly eight years elapsed before another case occurred. In contrast with this, during the past five years the Act has been invoked in forty-six cases, of which only eleven were arbitrations. Thus the method of mediation has been much more frequently used.

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"Since the law was passed there has been no case of a great railroad strike; and, although the merits of the Erdman Act are great, indeed, certain defects in it have become apparent.

"In the cases of mediation there is no attempt on the part of the mediators to make a judicial decision wholly upon the basis of equity and justice. The primary purpose is to bring the parties together and avert a strike. This is accomplished by getting the parties sufficiently near together that suggestions may be made to which both agree. While whenever mediation is successful a strike is averted, the adjustments cannot always be regarded as based solely upon the merits of the case. Where the case is one of arbitration under the Erdman Act, the results in the 10 cases which are usually very similar to those of mediation. The arbitrators are three in number. Each side is represented by one arbitrator. It rests, therefore, upon the third arbitrator to bring the other two arbitrators as nearly as possible together, and if he cannot do so he must decide between them. This is accomplished by splitting differences, and the case may be adjusted without adequate investigation of the facts involved, in consequence of which the award may not rest upon the merits of equity.

"This method of splitting differences is very unsatisfactory, but it is an inevitable result of mediation or arbitration under the Erdman Act. Parties, in advance that a mediation or arbitration will result in giving only a part of what they ask, the men make maximum demands regarding compensation, rules of service, etc., with the expectation that these demands will not be fully awarded. Upon the other hand, the railroad officers, appreciating the tendency of mediators and arbitrators to split differences, make only minimum concessions, or none at all.

"By the above statement it is not meant to assert that the awards that have been made under the Erdman Act have not been reasonably fair, but that in regard to this matter the law is defective, nor is it possible for them to obtain, adequate knowledge upon which to formulate a judgment. Cases before the Interstate Commerce Commission, no more complicated than those which have come before the mediators or arbitrators under the Erdman Act, have required a year or more before a decision was made; while the Erdman arbitrators are expected to bring in their award in days, and this, notwithstanding the fact that the Interstate Commerce Commissioners have a larger expert staff, including a number of examiners who aid for them in taking evidence."

The recommendation of the Commission summarized is as follows:

"Instead of having a board for each case, whose members have other duties and wholly inadequate time in which to perform the work that there would be a continuous board, the members of which give their entire time to the adjustment of wages. This board should consist of not less than seven statisticians; it would be allowed sufficient time to investigate a case fully. Thus an award would be made upon the basis of merit instead of the basis of securing a settlement. The personnel, like those of the boards of the Canadian Industrial Disputes Act might be added, which provides for one representative from each party to the controversy, and a third person, and the board consisted of five or more members, it would have a permanent majority and a shifting minority. It can be urged in favor of this feature that each representative would intimately know the facts regarding the side of the case and the point of view of those represented. A board thus constituted would have a permanent controlling interest in matters of general equity, which might be assisted in its work by representatives of each of the parties to the controversy.

"Above all, the wage commissions proposed would represent the public. They would work in co-operation with the Interstate Commerce Commission and thus secure to railway officials the ability to act without question as to whether the employees are fully organized. Under the existing situation, well organized railway labor, through its brotherhoods, can paralyze, almost, a trainmen, etc., receive consideration from railroads not accorded to the classes of labor that are not so organized.

"It does not follow from the above that advances in pay to organized labor have been too frequent or too large, but merely that the question of an advance for a given class of labor engaged in work which public utilities should not depend upon organization, but upon justice. Especially for the public utilities it is important that they should pay fair wages, and if the existing wages are not adequate they should be increased. If a not just increase in wages given to railroad employees is granted, does not enable them to secure a fair return upon capital invested and maintain a proper reserve, they should be allowed to increase their rates until they are in that position. In short, public utilities should not impose any undue burden upon the public by paying higher wages than are reasonable, nor should the public repress the earning power of railroads to the end that labor does not receive fair compensation and capital its fair return. How important this statement is will be understood when it is appreciated that of the gross earnings of the railroads of the United States as a whole, over 42 per cent. goes to labor (excluding officials) and on the fifty-two railroads involved in this controversy, over 50 per cent.

"If the arguments above presented are sound, there seems to be no way to obtain justice for the three parties concerned—the railway companies, the railway employees and the public—except through a permanent board which shall have continually before them the problem of the adjustment of wages."

In concluding a singularly exhaustive and able report, the Board states:

"It is well understood by the Board that the problem for which the above plan is suggested of settlement is a complex and difficult one. The suggestion, however, grows out of a profound conviction that the food and clothing of our people, the industries and general welfare of the nation cannot be permitted to depend upon policies and the action of any particular group of men, whether employers or employees, nor upon the determination of a group of employers and employees combined. The public utilities of the nation are of such fundamental importance to the whole people that their operation must be uninterrupted, and means must be worked out which will guarantee this result."

Compulsory arbitration of course means that the railroads must submit the question of compensation for the performance of service of all employees to a commission having no interest in, or responsibility for, the financial result of the operations of railroads.

For the employee it involves the surrender to some extent of his liberty of action in deciding whether the wage he receives and the conditions under which he works are satisfactory.

The proposition is not an attractive one for either the employer or the employee, but it is doubtful if the latter will not be the gainer by both than the conditions which may arise without some such arrangement for settling controversies.

Whether by a permanent commission, or by mediation or arbitration provided in each case as it arises, there can be little doubt that future controversies between the railroads and their employees regarding compensation, conditions of service, etc., will be settled by some form of arbitration.

It is to be feared that the result of this will be a gradual increase in compensation of railroad employees. What this increase has been during the past seven years is shown by the following figures:

In the year 1905 the gross earnings of the New York Central road were $86,095,892. Of this amount, $36,570,212, or 42.47%, was paid in wages. In 1912 gross earnings were $115,479,099, of which amount $54,115,761, or 46.86%, was paid in wages.

Making due allowance for the additional force in service, this company paid its employees in 1912, $9,500,000 more than if the rates of pay of 1905 had been in effect. This increased payment on account of the higher level of wages was equivalent to 4.27% on the outstanding stock of the company.

For the year ended December 31, 1912, the New York Central handled the largest volume of traffic, both passenger and freight, in its history. The year was singularly favorable for handling this traffic at a moderate cost, with no casualties of a serious or unusually expensive character.

In October and November, 1911, contract was made by the New York Central Lines for delivery in 1912 of 1,400 standard steel underframe 100,000 capacity box cars at an average cost of $790 each. The best price obtainable for these cars for delivery in 1913 is $1,075, an increase of $285 per car, or 36 per cent, which would have made an increase in the cost of these cars of $4,132,500.

Two thousand five hundred standard 50-ton-steel self-clearing hopper cars were contracted for at the same time at $810 each. The price of the same cars contracted for in December, 1912, for delivery in 1913 was $1,113 each, an increase of $303 per car, or 37 per cent.

Eighty Pacific type freight locomotives contracted for in December, 1911, cost $72,456 each; the price of locomotives, identical in every way, in December, 1912, for delivery in 1913, was $26,030, an increase of $3,574 per engine. Twenty Pacific type passenger locomotives delivered and paid for cost $24,780 each, the price for 1913 delivery is $26,315 per engine, an increase of $1,535 each.

The aggregate increase in the cost of this equipment, if purchased in December, 1912, compared with the actual prices paid in the latter part of 1911, would amount to $5,206,000, or 33 per cent.

During the period covered by this report, every detail of operation has been watched constantly and intelligently, and no expense incurred not absolutely necessary to maintain the property in that high state of efficiency necessary for safe and satisfactory service to the public.

Notwithstanding the favorable conditions under which the business was conducted and the large gross earnings, the road earned five per cent on its stock, with a surplus of only $1,000,000. About 116 per cent on the stock—a slender margin from which to provide against less favorable years and to put something back into the property from earnings, which should, if possible, be done every year.

The Engineers' Arbitration Commission stated:

"If a just increase in wages places the public utilities in a position that does not enable them to secure a fair return upon capital invested and maintain a proper reserve, they should be allowed to increase their rates until they are in that position.

In the light of conditions present and immediately prospective, it does not seem that an application to the Interstate Commerce Commission for permission to make some increase in rates can be long delayed.

The preparation for electrical operation of all passenger trains to Harmon on the Hudson River is practically completed and it is expected that the entire Electric Division will be put in full operation in March, 1913.

The concourse and waiting room of the express level of the Grand Central Terminal main station building were opened for use on February 2, 1913, while this report was in process of compilation, thus placing in service the major portion of the facilities for the handling of passenger traffic in and out of New York city, work on which was begun in 1903.

The suburban station was opened for public service on October 1, 1912.

Changes in the scope of the plan have delayed the completion of the cross streets and an extension of time was obtained; the whole of this work will be completed during 1913. The Park Avenue Express Station at Lexington Avenue was completed and occupied early in the year. Vande.bilt Avenue has been reconstructed, and is now open for traffic. Work on the arrival station and the new hotel is progressing satisfactorily. The demolition of the hospital building, Lexington Avenue between 42nd and 43rd streets, and the old Grand Central Palace is now in process.

The entire work of reconstruction of the Terminal has progressed without obstruction to train service, and the prompt handling of the traffic without a single serious accident to a passenger from the construction, excavation and blasting necessary in the work is a matter of a high improvement of this magnitude, is most gratifying. The press and public have been unanimous in their approval of the result as embodied in the appointment and arrangement of the station facilities, which is practical as well as an artistic standpoint.

I desire to express my appreciation of the management of the unremitting efforts and loyal co-operation of the officers and employees of the Construction and Operating Departments whose efficiency and devotion to duty have accomplished these very gratifying results. Also to the public, whose patience in overlooking many discomforts and inconveniences incident to the reconstruction period has been unstinted in aid of the safe and rapid conduct of the work.

Appropriate acknowledgment is made to the Public Service Commission of the State of New York, the Massachusetts Board of Railroad Commissioners and the Interstate Commerce Commission for helpful co-operation in improving the service and in maintaining friendly and cordial relations between the road and the public.

Especial obligation is felt for the timely and efficient efforts of the Interstate Commerce Commission in expediting the movement and preventing the delay of traffic during the period which an unprecedented volume of traffic has been moved and the absence of any serious car shortage or congestion is due in no small measure to this wise and helpful co-operation.

An amendment to the by-laws has been adopted abolishing the Executive Committee as a standing committee and constituted a Finance Committee of which the following directors were made the members: William K. Vanderbilt, J. Pierpont Morgan, William Rockefeller, George F. Baker and Lewis Cass Ledyard.

The following changes in Executive officers were made during the year:

March 7th, William K. Vanderbilt, Jr., Assistant to the President, was made a Vice President of the Company and of all the New York Central Lines; April 3rd, Alfred H. Smith, New York Central General Manager of The New York Central and Hudson River Railroad Company, was made a Vice President of all the New York Central Lines, relinquishing his duties as General Manager; April 15th, Abraham T. Hardin was made Assistant Vice President of The New York Central and Hudson River Railroad Company.

The following appointments, all being promotions, were made during the year:

February 23d, George W. Porter, Paymaster, to be Assistant Treasurer to succeed Milton S. Barge, who was appointed Treasurer of the New York Central Lines West, succeeding Charles F. Cox, deceased. April 15th, Patrick E. Crowley, General Manager; Howard L. Ingersoll, Assistant General Manager; William J. Fripp, Assistant General Manager. October 7th, Stephen R. Payne, Assistant to the General Manager.

Grateful acknowledgment is made for the faithful, efficient performance of duty of employees in every department of the service during the year.

WILLIAM C. BROWN,
President.

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CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1912.

ASSETS.

PROPERTY OWNED AS INVESTMENT:			
Physical property owned:			
Road and equipment to June 30, 1907:			
Road	$155,206,678.71		
Equipment	59,106,588.77	$214,313,267.48	
Road and equipment since June 30, 1907:			
Road	$31,041,476.34		
Equipment	8,746,516.62		
General expenditures	389,358.71		
Trust equipment	28,260,447.01		
	$68,437,998.68		
Less Equipment replacement fund	$807,638.41		
Amount equalling trust installments	2,075,865.20		
	$3,783,503.61	64,654,495.07	$278,967,762.55
Securities owned:			
Securities of controlled companies, pledged: stock		$110,295,970.00	
Security of proprietary, affiliated and controlled companies, unpledged:			
Stocks	$44,911,919.37		
Funded debt	9,839,904.49	54,751,823.86	165,047,793.86
Other permanent investments:			
Physical property		$4,253,755.44	
Grand Central Terminal Improvement		29,960,582.01	
New York & Harlem Railroad Company		20,103,508.21	
Securities		7,007,586.98	61,325,432.64
Total property owned as investment			$345,340,989.05
WORKING ASSETS:			
Cash		$6,955,383.77	
Marketable securities:			
Stock	$27,211,116.81		
Funded debt	1,675,655.86	28,886,772.67	
Loans and bills receivable:			
New York State Realty & Terminal Company	$23,370,000.00		
Cleveland Cincinnati Chicago & St Louis Railway Company	2,500,000.00		
Oneida Railway Company	603,000.00		
Terminal Railway of Buffalo	990,000.00		
Clearfield Bituminous Coal Corporation	700,000.00		
New Jersey Shore Line Railroad Company	496,000.00		
New York State Railways	400,000.00		
Rutland Railroad Company	203,000.00		
Syracuse Rapid Transit Company	175,000.00		
Fair Land Realty Company	150,000.00		
Mutual Terminal Company of Buffalo	170,000.00		
Miscellaneous	249,680.13	30,006,680.13	
Net traffic, car mileage and per diem balance		5,405,033.11	
Net balance due from agents and conductors		3,846,838.79	
Miscellaneous accounts receivable		8,043,821.69	
Materials and supplies		8,731,957.74	
Unmatured interest, dividends and rents receivable		3,542,608.92	95,419,096.82
DEFERRED DEBIT ITEMS:			
Advances:			
Temporary advances to affiliated companies		$11,418.01	
Working funds		181,527.53	
Other advances:			
West Shore Railroad Company	$11,585,499.42		
Geneva Corning & Southern Railroad Company	3,032,102.13		
Rome Watertown & Ogdensburg Railroad Company	3,050,978.74		
Beech Creek Railroad Company	1,276,737.68		
Other companies	2,905,953.20	21,851,261.17	
Insurance premiums paid in advance		2,647.82	
Special deposits		5,572,832.61	
Cash in redemption fund		1,000.00	
Items in suspense		3,715,128.24	31,335,815.38
			$632,095,901.25

LIABILITIES.

STOCK:			
Capital stock, common		$222,724,400.00	
Consolidation certificates		4,900.00	$222,729,300.00
MORTGAGE, BONDED AND SECURED DEBT:			
Funded debt:			
Mortgage bonds:			
Gold mortgage bonds		$94,000,000.00	
Collateral trust bonds:			
Lake Shore collateral	$90,578,400.00		
Michigan Central collateral	19,336,445.00	109,914,845.00	
Debentures and notes:			
Debenture of 1900	$5,500,000.00		
Gold debentures of 1904	48,000,000.00		
Gold debentures of 1912	9,156,000.00		
Three year gold notes of 1911	30,000,000.00		
Three year gold notes of 1912	20,000,000.00	112,656,000.00	
Equipment trust obligations:			
Equipment trust certificates 1907	$7,936,601.18		
Equipment trust certificates 1910	5,641,537.46		
Equipment trust certificates 1912	7,156,741.50		
Boston & Albany equipment trust certificates 1912	5,220,000.00	25,954,880.14	
Miscellaneous:			
Spuyten Duyvil & Port Morris Railroad mortgage bonds	$2,500,000.00		
Mortgages on real estate	1,002,500.00	3,502,500.00	346,028,225.14
WORKING LIABILITIES:			
Loans and bills payable		$14,190,600.00	
Net traffic, car mileage and per diem balance		6,410,800.54	
Audited vouchers and wages unpaid		9,772,091.61	
Matured dividends, interest and rents unpaid		4,267,952.82	
Matured mortgage, bonded and secured debts unpaid		10,790.00	
Working advances due to other companies:			
Boston & Albany Railroad Company	$1,257,208.55		
Rome Watertown & Ogdensburg Railroad Company	112,999.39		
Geneva Corning & Southern Railroad Company	544,542.92		
West Shore Railroad Company	92,154.46		
Carthage & Adirondack Railway Company	25,402.44		
Wallkill Valley Railroad Company	59,349.37	2,091,657.13	
Other working liabilities		4,835.60	36,748,727.79
ACCRUED LIABILITIES NOT DUE:			
Dividends declared and interest and rents accrued, not due		$6,491,775.23	
Taxes accrued		521,954.65	7,013,730.38
DEFERRED CREDIT ITEMS:			
Unextinguished premiums on outstanding funded debt		$17,940.00	
Operating reserves:			
Reserves for replacement of property		651,159.82	669,099.82
APPROPRIATED SURPLUS:			
Additions to property through income since June 30, 1907		$5,608,735.49	
Invested in other reserve funds		112,669.68	5,721,405.17
FREE SURPLUS:			
Profit and loss			13,185,413.04
			$632,095,901.25

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY.
83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$6.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 10,550 copies were printed; that of these 10,550 copies, 9,000 were mailed to regular paid subscribers and 148 were provided for counter and news companies' sales; that the total copies printed this year to date were 96,809 copies—an average of 8,801 copies a week.

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THE appointments to the Interstate Commerce Commission made by President Wilson immediately after his inauguration give general satisfaction to railways and shippers. Commissioner E. E. Clark's reappointment was desired by most of those who were familiar with his work on the commission and who wished to see it maintained as a fair and efficient body. Many persons would like to see one or more experienced railway officers appointed to the commission. Aside from this there is little or no criticism and much commendation of the promotion of Secretary Marble to the membership made vacant by the retirement of Franklin K. Lane to become secretary of the interior. Mr. Marble has served the commission capably as an attorney and as its secretary. As one of its attorneys he conducted some important investigations into transportation conditions and practices. He is able, very industrious, and always has been considered fair. An active member of a state commission notorious for its baiting of railways was pressed for appointment to succeed Mr. Lane. Those directly affected by the commission's work, as well as the general public, may well give thanks, not only for Mr. Marble's appointment, but for the failure of the state commissioner in question to get appointed. The retirement of Mr. Lane as chairman and a member of the commission has taken from it one of its ablest members. If he had always been as fair as he was able, Mr. Lane would have taken rank among the greatest public utility commissioners that the country has ever had. Unfortunately for his work on the commission, his temperament is decidedly more administrative than judicial. This gave him a tendency to wish to manage the railways rather than simply to regulate them. As a cabinet officer he will be in a position better suited to his temperament and to the exercise of his unquestionably great talents.

A JOINT resolution was introduced in the Wisconsin senate the other day, and referred to the committee on corporations, which reads as follows: "Resolved by the senate, the assembly concurring, that whereas railroad travel is a most beneficent means of education, and broadening to the people of this state, and whereas the visiting of all parts of the state by its people is highly conductive to the welfare of the people of the state, and the development of its resources and business, therefore be it resolved, That the Railroad Commission of Wisconsin is hereby directed to investigate and report to the next session of the legislature to meet in 1915, the effect of an increase of freight rates and decrease of passenger rates to one cent per mile, and how much increase of freight rates would be required to make up for the reduction of passenger rates to one cent per mile, and its conclusions upon such reduction of passenger rates to one cent per mile of travel." In view of the beneficent and broadening effects which the Wisconsin senator attributes to railway travel, one might wonder perhaps that he did not instead present an amendment to the anti-pass law to permit everybody to ride free. However, we are considering in this instance an unusual type of state senator. He wishes to be fair to the railways without ceasing from his lifelong endeavor to be a friend of the people. Perhaps, too, he does not believe in pauperizing his constituents, and feels that the advantages of travel will be more highly appreciated if they are asked to contribute a small part of its cost just to show good faith. Shippers and consignees, while also developing the resources of the state, are engaged in the business of making profits out of the process of moving commodities from one place to another where their price will be higher. The passenger who is being beneficently educated and broadened may not be making money out of it. Therefore, instead of making the railways pay for his education and broadening, and perhaps lopping off some of their freight rates for good measure, the senator would impose the hurden on those who are deriving the greatest benefits from transportation.

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WE fear that our friend, the senator, will not be appreciated in his day and generation. It is true that the passengers have more votes, and that on government owned railways it is quite common for passenger fares to be low and freight rates high, but in Wisconsin and other parts of our great democracy the shippers are better organized. As for the Wisconsin commission's conclusions upon such reduction of passenger fares, they are readily available, if the commission has not changed its mind, in its decision rendered in 1907, reducing passenger fares in the state to 2½ cents per mile. The commission said at that time, "We are not concerned about what our right might be to reduce the passenger rates to a point where passengers were being carried at a loss and to recoup such loss by a species of piracy practiced upon the shippers of the state. . . . We believe not one good economic reason can be urged in favor of making the shipper bear a portion of the carrying cost of the passenger. Low freight rates are vastly more important to the people of the state than low passenger fares. . . . The freight rate is in reality an indirect tax. . . . actually paid by the consumer. . . . If it is excessive it may be more important that it be reduced to a proper level than that the consumer should have the privilege of riding at two cents a mile. He must use coal. He may not want to ride even at two cents." The senator apparently appreciates that *reductions* in freight rates do not always reach the consumer so directly as indicated by the theory which the commission elucidates. Therefore, he believes that the people will be more benefited by a reduction in passenger rates. He fails to recognize, however, that *advances* in freight rates nearly always do reach the consumer. Enough reasons have perhaps been indicated to keep the railways from becoming unduly elated by any hope of the advance in freight rates held forth by the resolution or from being unduly worried over the prospect of the proposed reduction in passenger fares.

MEDILL McCORMICK, who is one of the principal owners of a large Chicago newspaper, and also a leader of the progressives in the Illinois legislature, has introduced a full crew bill, after the defeat of a similar bill at the last session. The *Manufacturers' News*, the organ of the Illinois Manufacturers' Association, is moved thereby to comment as follows: "We are at a loss to understand why Mr. McCormick appears as the father of this measure. Last spring the newspapers of Chicago went to the mat with the labor unions because the pressmen's union was working a superfluous man or two on the press crew in some shops and wanted to in others. We cannot understand why it is not just as fair for the newspapers to pay for a man they do not need in the operating of a press as it is for the railroads to pay for a man they do not need in operating a train. We should think that if Mr. McCormick pursues the policy he is now following some one would get up in the legislature on behalf of the pressmen's union, and introduce a bill regulating the number of men necessary to operate a newspaper press." Special regulation of railways is only justified on the ground that they are public service corporations and that regulation is needed to cause them to render service in such a way and at such rates as will promote the interests of the public. Legislation to confer an advantage on the employees at the cost of the roads, which is not primarily intended and does not operate to confer an advantage on the general public, is no more justifiable than similar legislation regulating the relations between manufacturers and their employees, farmers and their employees, grocers and their employees, or newspapers and their employees. Consistency and principle demand that those who advocate such legislation as to some business concerns shall advocate it as to all, and that those who are not willing to have it applied to themselves shall not seek its application to others. Aside from the aptness of the parallel which the *Manufacturers' News* has drawn between the employment of superfluous labor on a printing press and on a freight train it is significant to note that as a spokesman of shippers it apparently appreciates the connection between unnecessary additions to operating expenses and the level of freight rates.

THE Webb bill to enable states to prohibit the shipment of intoxicating liquors into prohibition territory, which was recently re-passed by Congress after President Taft had vetoed it as unconstitutional, presents some interesting complications for the railways. It makes illegal the transportation of liquor in interstate commerce when it is destined to any place where its sale is unlawful. It would be a simple matter to keep track of the "dry" states, but prohibition legislation has not followed state lines. There are prohibition counties, cities, townships, villages and other kinds of prohibition districts. There are also places where it may be legal to sell liquor at a drug store—on presentation of the proper physician's certificate, of course—while it would be illegal to transport the commodity to a grocer in the same place. Must the overworked station agent add to the list of tariffs, classifications and their supplements with which he is supposed to be familiar, a compendium of prohibition legislation and a "wet and dry" map? The law becomes effective at once; and, pending the arrival of these data, the local agent seems likely to be in as bad a predicament as Flannery in "Pigs is Pigs," who was unable to deliver a consignment of guinea-pigs because of a dispute as to their classification. Not that the commodity under consideration is liable to the same tendency toward multiplication that troubled Flannery, but booze is booze, and it has often been said on good authority that railway tariffs and classifications are enough to drive wiser men than station agents to drink. Many railways have already abolished the sale of liquor in their dining cars, partly out of respect for prohibition sentiment, and partly because of the difficulty of complying with prohibition laws on the fly. The Illinois roads stopped the sale on their trains entirely last year after a law had been passed which left a few loopholes open. It is understood that they even had something to do with bringing about the passage of the law as a means of securing better order on some of the trains largely patronized by deadhead politicians traveling between Chicago and Springfield. If they have difficulty in complying with the new law it may be no greater than they and the express companies, by allowing their agents to deliver C. O. D. packages to John Doe or a "representative" of the local minister of the gospel, have in the past caused the local authorities who were charged with enforcement of the prohibition laws.

OXY-ACETYLENE welding and cutting has become fairly well established in the railway shops of this country, and Mr. Jacobs' observations of the extent to which it has been developed in Europe are particularly interesting at this time. Bad mistakes were made in introducing it here. One of the most serious of these was that the responsibility of its introduction was in some cases placed in the hands of salesmen who were not at all familiar with railroad work and the needs of the railway shops, or even with the apparatus itself. Too many claims were made for it, and usually the apparatus was left in unskilled hands before these claims were realized. Another feature that has not been fully appreciated has been the necessity for systematically instructing the men in the use of apparatus. As noted in Mr. Jacobs' article the German government has provided courses of study in the art of handling oxy-acetylene welding in the various trade schools, and special schools have been opened for giving instruction in this art; something should be done along these lines in this country. Mr. Jacobs was instrumental in installing several years ago in the Topeka shops of the Atchison, Topeka & Santa Fe, a stationary plant for generating the gases used in connection with oxy-acetylene welding and cutting, these gases being carried to various parts of the shop in the same way as compressed air is conveyed. As the possibilities of the process become better realized in the railroad

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shops of this country, this practice will undoubtedly be extended, for it is said to have given extremely satisfactory results at the Topeka shops. The work done there was fully described by Mr. Jacobs in the June 17, 1910, issue of the *Railway Age Gazette*, page 1535. Another serious mistake has been made in the past in that the limitations of the welding process were not fully understood. For instance, attempts have been made to weld cracks in fireboxes, although those in charge should have realized that the metal in the vicinity of the crack had been weakened by the stresses to which it had been subjected and that welding the crack would only cause the fatigued metal to crack again elsewhere in the same vicinity. Oxy-acetylene, or in fact any type of welding, is useless for this purpose and should only be used where a new piece is to be inserted, replacing all of the bad material. Even then it is a most difficult job and should only be attempted by expert welders.

A REFRESHING INNOVATION.

DIFFICULTY is often experienced by railroad passengers in learning the causes of delays to trains on which they are traveling. To remove this source of irritation, conductors should see, when traffic is interrupted, that trainmen pass immediately through their trains and freely announce the conditions, advising passengers without reservation the reason for the delay, and, if necessary, the best means of proceeding on their journey. When a train is disabled at or near a station, trainmen should notify the passengers as to the cause and probable extent of the delay in order that they may continue on their journey, or return, on any available train. If passengers desire to communicate with their friends from the station they should be accorded promptly the use of the telephone or telegraph. Station agents should post on their bulletin boards, or in other conspicuous places in their stations, a notice giving the location of any obstruction to traffic, the probable length of the delay, and any other information in their possession, as to the cause and extent of the difficulty. Passengers should have every opportunity to allay unnecessary anxiety on the part of friends or families, due to train delays or accidents. They have a right to prompt information as to the cause and the details of any delays either to the train on which they are traveling or that for which they may be waiting.

The foregoing is the substance of an order which, in mandatory form—"must" instead of "should"—has been issued to passenger conductors by the Pennsylvania Railroad. We do not put the words in quotation marks, because the thoughts are exactly like our own. If we have not put them in print with enough frequency and effectiveness, we have to that extent fallen short of the duty of a good preacher of perfect service. No superintendent or manager can be ignorant of the way in which, in innumerable instances, a passenger who is unexpectedly delayed is obliged to hurriedly revolve in his mind and compare, one with another, a half dozen different schemes for recovering as much as possible of the time that, by some slight accident, he has been compelled to lose. In very bad accidents, trainmen and station men have to some extent properly attended to passengers' interests heretofore, but the present order is significant because of its application to all circumstances. A delay of ten minutes often wastes an hour of some passenger's time; perhaps that of many passengers. The conductor or a wide-awake brakeman will often be able to save a passenger enough time in studying his routes to make the difference between catching a connection and losing it.

It is to be admitted that, if employees carry out successfully this idea of saving for passengers all the time that it is possible to save, they will be doing better than their superiors have done in the past. Theoretically, the despatchers advise agents and conductors of bad delays and, through the agents and conductors, the information reaches the passengers; but cases in which this process is intolerably slow are familiar to all experienced travelers. With the very general distribution of telephones now to be found on every railroad, there is no reason why this item of the passenger service should not be much improved, unless it be the neglect of the superintendent to order and insist on celerity. The present circular has nothing to do directly with despatchers, but the despatcher has an important connection with the matter, if the purpose of the manager is to be carried out properly.

Of course, if Pennsylvania trainmen are to tell passengers all they know they may sometimes tell things that had better be left unsaid until the superintendent can be consulted, or may lose the company a few cents by sending away a passenger who could be kept on the Pennsylvania's cars; but this bugaboo may well be ignored—if only to find out by actual test how big or little it really is. A trainman is not going to be really efficient in the promotion of passengers' comfort and convenience except as he has practice in the art, and it is high time that opportunity for practice in this branch be given. Precept has been well worked already. All of us acquire proficiency by learning the lessons of our mistakes. Trainmen, very generally, in the matter of assisting passengers in cases of delay have avoided mistakes—and have missed many good lessons—by shirking the duty entirely.

LIGNITE AS A LOCOMOTIVE FUEL.

ABOUT two years ago the Bureau of Mines in its bulletin No. 14, on briquetting tests of lignite, stated that there were about 150,000 square miles of workable lignite beds in this country; that the principal deposits were in the western half of North Dakota, in the northwestern part of South Dakota, and in the eastern half of Montana; and that in North Dakota alone there was a workable deposit of 31,000 square miles. If we take the weight of lignite as 50 lbs. per cubic foot, the weight given in a report of the Bureau of Mines, and consider the workable lignite beds as only 1 ft. deep (some of the beds are much deeper than this), we find that there are 104,544,000,000 tons of lignite available. This supply is mainly in territory where the cost of bituminous coal is exceptionally high, and the railroads in that section are thus especially interested in making use of it as locomotive fuel.

Realizing the vast opportunities for its use in locomotive service, the International Railway Fuel Association has appointed a committee, of which S. B. Flagg, engineer of the Bureau of Mines at Pittsburgh, is chairman, to report on this subject at its annual convention to be held in Chicago next May, and it is expected that some very interesting material and data will be presented. Not only has the Bureau of Mines made several investigations of lignite at its St. Louis plant, but the railroads themselves have given it a considerable amount of attention. The American Locomotive Company has produced a spark arrester especially designed for engines burning lignite, which has been applied to 21 locomotives on the Chicago & North Western. The Chicago, Burlington & Quincy has developed an arrangement whereby lignite may be burned without the danger of large sparks being thrown from the stack and setting fires along the right of way. The Oregon-Washington Railroad & Navigation Company is using a number of Mikado engines built by the Baldwin Locomotive Works, especially designed for burning this fuel. With the cost of a good grade of coal in the western sections of Nebraska, Wyoming and Colorado ranging between $5 and $6 a ton, it would seem that marked economies could be made with lignite from the mines in North Dakota, which would cost about $1.75 a ton.

It is true that lignite has its disadvantages. In its raw state it must be used a very short time after it is mined, for if allowed to weather too long it will slake and crumble into small particles. As a means of overcoming this difficulty, the lignite briquet has been developed, which will stand weather for a considerably longer time. The cost of briquetting is found to be a trifle over the cost of the raw lignite, but the heating value will be increased about 50 per cent., and the moisture, which in the raw lignite is in the neighborhood of 40 per cent., will be reduced to about 20 per cent. Assuming that the heat value of the available

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bituminous coals which come from Iowa is about 11,000 B. t. u., and that of the lignite briquet a trifle over 9,000 B. t. u. It will be seen that even with the added cost of briquetting the total cost of the fuel will be reduced. Tests of briquetted coals, not lignite, have shown that a very even fire may be maintained in locomotive fireboxes, that the boiler capacity will be increased; and that when the boiler is forced the efficiency of the briquets increases. The heat value of the lignite as taken from the mines varies between 6,000 and 8,000 B. t. u., and where coaling stations can be located near the mines the raw lignite may be used successfully; but when it must be stored more than four months exposed to the weather, or a much longer time under cover, the lignite should be briquetted.

The report on the mineral resources of the United States, by the United States Geological Survey for 1911, shows that only 8,451,365 tons of lignite were mined during that year. The lignite industry is thus decidedly in its infancy, and the possibilities of its use as a fuel for locomotives have but begun to be developed. With such a man as Mr. Flagg, who is thoroughly conversant with the coal resources of this country, as chairman of the committee for the Fuel Association, and with the backing of the railway fuel men on the committee, much can be accomplished to secure the consideration due it—although the mere fact that it is to be considered by the association, based on past records, insures a complete report and a thorough discussion.

SUGGESTIONS FOR LEGISLATION FOR ARBITRATION OF LABOR DISPUTES.

ONE of the most important problems that the welfare of the American public demands shall be solved in the near future is that of settling without lockouts and strikes and in an equitable way contentions between railways and their employees. The deficiencies of the Erdman act are generally recognized. It does not prohibit lockouts or strikes before mediation and arbitration, and it does not make sure enough that the settlements of controversies will be such as to protect the rights and interests of all. Various suggestions for the amendment of this law are being made. The *Railway Age Gazette* offers tentatively for consideration certain provisions which a federal railway mediation and arbitration law might contain.

The term "railroad" should be defined so as to cover interurban electric roads whose tariffs are filed with the Interstate Commerce Commission or which engage in interstate commerce. The provisions of the act should at least be sufficiently broad to take in all employees operating steam roads or electric roads owned or controlled by them.

There seems no good reason why the same provisions should not apply to interurban electric roads engaged in interstate commerce as to steam roads. With the progress of electrification of steam roads the differences between other characteristics of the two classes of railways, as well as between their motive powers, will tend to disappear.

It shall be unlawful for any employer to declare or cause a lockout, or for any employee to go on strike on account of any dispute prior to or during a reference of such dispute to the Mediation Commission or to a Board of Arbitration; provided, that nothing in this act shall prohibit the suspension or discontinuance of the working of any persons for any cause not constituting a lockout or strike.

Employers and employees shall give at least thirty days' notice of an intended change affecting conditions of employment with respect to wages or hours; and in every case where a dispute has been referred to the mediation commission or to a board of arbitration, until the dispute has been finally dealt with by such commission or board, neither of the parties affected shall alter the conditions of employment with respect to wages or hours, or on account of the dispute do or be concerned in doing, directly or indirectly anything in the nature of a lockout or strike, or a suspension or discontinuance of employment or work, but the relationship of employer and employee shall continue uninterrupted by the dispute, or anything arising out of the dispute; but if, in the opinion of the commission or board, either party uses this or any other provision of this act for the purpose of unjustly maintaining a given condition of affairs through delay, such party shall be guilty of an offense, and liable to the same penalties as are imposed for a violation of the next preceding section.

Any employer declaring or causing a lockout contrary to the provisions of this act shall be liable to a fine of not less than $100, nor more than $1,000 for each day or part of a day that such lockout exists.

Any employee who goes on strike contrary to the provisions of this act shall be liable to a fine of not less than $10 nor more than $50, for each day or part of a day that such employee is on strike.

Any person who incites, encourages or aids in any manner any employer to declare or continue a lockout, or any employee to go or continue on strike contrary to the provisions of this act, shall be guilty of an offense and liable to a fine of not less than $50 nor more than $1,000.

The board of arbitration that handled the controversy between the eastern railways and their enginemen recommended that some limitation should be put on the legal right of railway employees to quit work as well as on the legal right of railway managements to interfere with transportation service by lockouts. Strong objection has been made to any such legislation by some spokesmen of labor. They contend this would be an infringement on the liberty of working men. It would not, of course, be any more of an infringement on the liberty of railway employees than on that of railway managements. It is not proposed to prohibit any individual employee from quitting work or being discharged for ordinary causes. It is not even proposed to prohibit a disruption of the relations between the employers and the employees after mediation and arbitration. It is only proposed to prohibit a strike or lockout and the resulting interference with transportation service prior to and during the pendency of mediation and arbitration. The public's right to insist that transportation service shall not be stopped, or practically stopped, before employers and employees have presented their claims and the evidence in support of them to some impartial body representing the public, and until this body has reported on the merits of the controversy, seems clear. The only sound foundation of any legal right of any person or class of persons is that the existence of that legal right tends to promote the greatest good of the greatest number. If a legal right cannot be exercised except in opposition to the greatest good of the greatest number it is one that should be curtailed or abolished. Surely, neither a lockout nor a strike that interferes with transportation, nor the existence of the right to precipitate such a lockout or a strike before every reasonable means for preventing it has been exhausted, can be held to be in the interest of the greatest good of the greatest number.

A permanent commission of three members on mediation, conciliation and investigation shall be constituted, composed of the chairman of the Interstate Commerce Commission, another member of the Interstate Commerce Commission to be named by the chairman, and the United States Commissioner of Labor.

In the event of difference one member shall be added and shall be named by the railway employer and one shall be added to be named by the railway employees—parties to the difference.

Whenever a difference exists between any railway employer and railway employees and it appears to the Interstate Commerce Commission that the parties thereto are unable to satisfactorily adjust the same, and that by reason of such difference remaining unadjusted a railway lockout or strike has been or is likely to be caused, or the regular and safe transportation of mails, passengers, and freight has been or may be interrupted, or the safety of any person employed on a railway train or car has been or is likely to be endangered, the Interstate Commerce Commission may either on the application of any party to the difference or on the application of any municipality directly affected by the difference, or of its own motion, cause inquiry to be made into the same and the cause thereof, by the mediation commission.

The chairman of the Interstate Commerce Commission shall, in writing, notify each party to name a member of the mediation commission, stating in such notice a time, not later than five days after the receipt of such notice, within which this is to be done.

If either party within such time, or any extension thereof granted by the Interstate Commerce Commission, does not appoint a member of the mediation commission, the three members of the permanent commission may appoint any members in the place of those in default.

It shall be the duty of the mediation commission to endeavor by conciliation and mediation to bring about an amicable settlement of the difference to the satisfaction of both parties and to report its proceedings to the Interstate Commerce Commission.

In case the mediation commission is unable to effect an amicable settlement by conciliation and mediation the Interstate Commerce Commission may refer the difference to arbitration. In such case a board of arbitrators shall be established by the Interstate Commerce Commission, and shall consist of the permanent members, two other members selected by these three members, and one member to be selected by the railway employer and one by the railway employees. In case either party within ten days after the receipt of notice fails to name its member of the arbitration board, the five members of the board shall themselves select a member or members in the place of the party or parties in default, and the board of

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seven so constituted shall act as a board of arbitrators. In case of arbitration pursuant to the above provisions, the findings and recommendations of the majority of the arbitrators shall be those of the board.

The proper composition of an arbitration board has been the subject of much discussion and many differences of opinion. F. A. Delano, it will be recalled, has advocated in these columns the creation of a permanent, even-numbered arbitration court. The board of arbitration in the engineers's dispute recommended the creation of permanent wage commissions. It has been objected to proposals such as these that if such a court should render a few decisions in favor of either the railways, on the one hand, or their employees, on the other, it would become suspected of bias and its usefulness would be diminished. On the other hand, it has been contended in favor of a permanent commission always composed of the same members that it would have the advantage of becoming an expert body. Another suggestion that has been urged is that wage controversies should be settled by the same body that settles rate controversies, namely, the Interstate Commerce Commission, because it is desirable that the same body should look at both sides of the railway ledger.

It would seem that an arbitration board composed as suggested in the provision above outlined would meet many objections and have many advantages. As three of its members—the chairman of the Interstate Commerce Commission, another member of the commission, and the labor commissioner of the United States—would be practically permanent, they would acquire expert knowledge. As two of them would be members of the Interstate Commerce Commission they would help to enable the commission to look at both sides of the railway ledger. As each board of arbitration would include two representatives of the public who had not served on previous boards, there would be less danger of the board falling under suspicion of being biased in favor of one side or the other. These five members representing the public would constitute a clear majority. The addition of one member representing the railways, and one representing the employees would help the board to do better than it otherwise could, the points of view of both parties.

Immediately after the appointment of the board of arbitration the chairman shall promptly convene it, and the board shall in such manner as it thinks advisable make thorough and expeditious inquiry into all the facts and circumstances connected with the difference and the causes thereof, and shall consider what is reasonable and proper to be done by both of either parties with the view of putting an end to the difference and to prevent its recurrence, and shall with all reasonable diligence make a written report to the Interstate Commerce Commission setting forth the various proceedings and steps taken by the board, and its findings, including the cause of the difference and the board's recommendations with a view to its removal and prevention of its recurrence.

The Interstate Commerce Commission shall cause a report to be filed in its office and a copy thereof to be sent to each party to the difference and to any municipal corporation, or to the representative of any newspaper who may apply therefor.

Any other person shall be entitled to a copy on payment of the actual cost thereof.

The desirability of having all regulation of railways concentrated as far as may be reasonably practicable in the hands of the Interstate Commerce Commission, of having a permanent record of all the evidence taken, the findings made and the opinions rendered, and of having the attention of the Interstate Commerce Commission directed to the labor situation as well as to the railway rate situation, argue for the above provisions.

For the purpose of inquiry the board shall have all the power of summoning before it witnesses, and of requiring them to give evidence on oath, and, in general, shall have the same powers in respect to enforcing attendance of witnesses and production of testimony as are vested in any civil court.

Provision shall be made for payment of members of the commission and for expenses of witnesses.

No counsel or solicitor should be entitled to appear before the board except with the consent of all parties to the difference, but the parties to the difference may appear in person or by agents.

Courts should not have any jurisdiction to recognize or enforce or to receive in evidence any report of the board of arbitration or of the mediation commission.

The reasons for most of the foregoing provisions seem obvious. That providing that the courts shall have no jurisdiction to enforce awards is, of course, intended to make clear that while mediation and arbitration, if necessary to a settlement, are to be compulsory, there is to be no compulsion to give effect to the award. The enforcement of obedience to reasonable awards may safely be left, for the present, at least, to public opinion. The foregoing proposed provisions are offered tentatively for consideration and discussion.

NEW BOOKS.

Railroad Construction. By Charles Lee Crandall, professor of railroad engineering, Cornell University, and Fred Asa Barnes, assistant professor of railroad engineering, Cornell University. Size 6 in. x 9 in., 321 pages, 81 illustrations, cloth bound. Published by McGraw-Hill Book Co., New York. Price $3.

The authors have expanded into book form a series of notes which have been used for instructional purposes at Cornell University. It has not been felt until recent years that construction methods were sufficiently standardized to warrant the publication of such a book, and frequent revisions were made in the notes. The work of the American Railway Engineering Association and the very general exchange of ideas among railway engineers in recent years, has done much to make the practice on the various roads practically the same. The field covered by the book is a large one, and it is obviously impossible to treat each branch as exhaustively as is done in special books devoted to each of the various subjects. For class room instruction, which is perhaps the field in which the work will find direct application, and for young engineers who are not fortunate enough to be employed by a company which issues elaborate sets of standards, the book should furnish a valuable summary of methods of handling railway construction. It is divided into 10 chapters. The first is a general introduction covering estimates, classification, shrinkage, the mass diagram and overhaul. The chapter on earthwork considers briefly the various methods in current use for moving earthwork, with some typical cost data for each. Rock excavation, tunneling, masonry foundations, culvert and bridge masonry, trestles and bridges and track material and roadbed are each covered in a similar way in separate chapters. The last chapter is devoted to estimates and records with some miscellaneous matter. The book contains numerous references to current literature and the proceedings of engineering societies, and there is a bibliography covering the matter treated in each chapter.

Hand Book of Railroad Expenses. By J. Shirley Eaton. McGraw-Hill Book Co., New York. Flexible leather binding. 555 pages, 7¼ in. x 5 in. Price, $3.

Mr. Eaton's book on Railroad Operations—How to Know Them was for a good many years a standard book on railroad operating expenses as given in the annual reports made by the companies to their stockholders. Since the Interstate Commerce Commission has put into effect its uniform classification for operating expenses and for other accounts of railroads, a good many changes have been made by some roads in their system of accounts, and Mr. Eaton's earlier book became to a certain extent obsolete. In the present book is included Mr. Eaton's exposition of the various items under operating expenses and also the text of the Interstate Commerce Commission's classification of operating expenses, income account, balance sheet, etc. Under operating expenses the full text of the commission's classification and instructions is given, and there are incorporated in this text revisions which the commission has issued as supplements to its original orders. One hundred and fifty-two pages of the book are devoted to an index which is very complete. Mr. Eaton says that all existing indexes of expenses have been freely drawn on and acknowledges especially his indebtedness to the index in use on the New York Central & Hudson River.

The greatest importance of this book lies in this index. There has been a very distinct need, ever since the Interstate Commerce Commission promulgated its classification of expenses, for a field book of operating expenses. This book of Mr. Eaton's appears to supply this want admirably.

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Letters to the Editor.

AIR HOSE AND AUTOMATIC CONNECTORS.

St. Louis, Mo., March 3, 1913.

To the Editor of the Railway Age Gazette:

A number of articles have appeared recently in the *Railway Age Gazette* pertaining to economy in railway operation. Among them is an exhaustive article on "Air Hose." The maintenance of this particular equipment is shown to be enormous, but no definite solution has been offered as to its reduction, there being a difference of opinion as to whether or not under the present system of air couplings it would justify the railroads to invest in a better grade of rubber, owing to the severe abuse the hose is subjected to.

Eight months is the average life of an air hose, and it is very improbable that a more expensive hose would be economy in the long run, until the cause of an acknowledged fifty per cent. of hose failure has been eliminated; i. e., pulling couplings apart instead of uncoupling. The only permanent cure of the hose problem is automatic train pipe connectors. A practical automatic connector would reduce the physical abuse of the hose to a minimum and render the pulling stress on a hose impossible.

The hose question, however, passes into insignificance when compared with the real economy of automatic train pipe connectors. "Motion means money" is the slogan of one of our leading railroad men, and the automatic train pipe connector illustrates the statement strongly. There are approximately three million cars in the United States. Assume that one-half of this number are in service and that the air and steam hose are coupled and uncoupled once daily. Allowing the lowest possible average, it takes three-quarters of a minute to couple or uncouple the present hose connection. This shows that one million one hundred and twenty-five thousand minutes are consumed daily in operating the present hose connectors, which equals over two years. Figure this for one year and the result is over seven hundred years. The safety feature of such a device must also be taken into account and this will save a few more thousand dollars annually. While the efficiency engineer is at work, it would be well for him to give some thought to automatic connections for air and steam hose.

A. H. Burchard.

JAMES J. HILL'S STATISTICS.

Baltimore, Md., February 28, 1913.

To the Editor of the Railway Age Gazette:

One notes in your issue of February 21 a criticism by William J. Cunningham, assistant professor of transportation, Harvard University, of some of James J. Hill's transportation statistics. Mr. Cunningham undertakes to show that Mr. Hill's comparison of the rate per ton per mile of the United States with those of Prussia-Hesse and of the North-Eastern Railway of England is misleading because the Prussian and English rates include receipts from the service done in this country by the express companies; also because the English freight rate includes a collect and delivery service which the railroads in this country leave the shipper to do for himself. We do not think Mr. Cunningham has made much of an impression on the substantial correctness of Mr. Hill's statements for the following reasons:

(1) Mr. Cunningham is evidently not aware that some of the important railroads in this country are collecting and delivering freight for shippers out of their already meager freight rates.

(2) He overlooks the fact that both England and Germany have, and have had, for many years a parcels post very extensively used by the public. It is therefore very misleading of Mr. Cunningham to suggest that the European rates per ton per mile cover the whole service that in this country is done by the express companies. A large part of the high paying light weighing stuff goes into the post office and the railroads only get a part of the revenue on this. If they did all that the express companies have done here their average freight rate per mile would be higher.

Beyond this there are numerous and varied charges in Europe for use of station and other facilities, which are practically non-existent in the United States, and it is exceedingly doubtful whether these are included in the European freight rate per ton per mile. I refer to such charges as hire of sheets (tarpaulins), counting fees, weighing fees, advice-note fees, cost of waybill forms and stamps for same, all of which are additional to the freight rates and probably are reported under miscellaneous collections, thereby escaping inclusion in freight revenue.

It is the more misleading in that Mr. Cunningham permits himself to state that if the express business, both tonnage and revenue, were added to the freight business of the railroad companies the effect on the average ton mile rate "would be startling." Approximations of the ton mileage and the actual gross revenues of the express companies are now readily accessible, and it is therefore possible to state that inclusion of the express companies' business with the railroad companies' business would increase the rate per ton per mile on the whole business to about 8 mills, or 7 per cent. more than the rate per ton per mile accured on the freight business of the railroads in the United States for the year 1910. It will be observed there is still a very long way to travel in order to reach the 1.37 cents of Prussia-Hesse or the 2.30 cents of England. The slight increase on inclusion of the express business hardly seems to warrant the use of so strong an adjective as "startling" to describe the effect of the express business on the general average rate per ton per mile.

(3) But whatever additional service the European freight rates may cover, such additions are much more than fully cancelled when consideration is given to incomes in the two countries expressed in a common currency to obtain numerical relation. All incomes are from 50 to more than 100 per cent. lower in Europe than here with prices to correspond. A mere comparison therefore of incomes or freight rates stated in United States currency and where the European figures have been converted at the par of international exchange leaves out of the reckoning a very important factor in the equities of the case, that being what figure 1.37 cents cuts in the German income or price, and what 8 mills in the United States income or price. Of course to arrive at a conclusion on this point it is necessary to take account of the usufruct the United States railroad gets out of the ton of freight, for this has a direct bearing on the rate per ton per mile. Allowing therefore twice the haul to United States railroads, as per Mr. Cunningham, which approximates the actual figures, we still find that the United States railroad burdens income and prices less than the German railway. The United States haul being 140 miles, we have 140 multiplied by 8 mills, or $1.12, as the transportation charge in the United States; similarly the German haul being 70 miles, we have 70 multiplied by 1.37 cents, or 96 cents as the transportation charge in Germany; but 1.12 is only 1.12 per cent. of 100 (United States price or income), while 0.96 is 1.92 per cent. of 50 (German price or income), and as 1.12 is only 60 per cent. of 1.92, it seems plain the United States railroad is 60 per cent. kinder to the United States income or price than is the German railway to the German income or price—this, too, after tacking on express rates to railroad rates in the United States.

Mr. Cunningham's undertaking to show that when Mr. Hill calls attention to the fact that in the United States we move 272 tons one mile for every dollar of net revenue, while Germany only moves 172 tons, France 88 tons, and Great Britain but 58 tons, is advancing a comparison of no value and seems to be rather a splitting of hairs, especially in the case of the comparison between the United States and Prussia-Hesse. The difference between the United States 23 per cent. of operating revenue coming from passengers and the Prussia-Hesse 29 per cent. of operating revenue from the same source is too slight to materially lessen the gap between the 272 tons one mile of the United States and the 172 tons one mile of Germany. We do not think Mr. Cunningham's pronunciamento on this point has lessened the *comparative* value of Mr. Hill's figures.

M. B. Wild,
Statistician, Baltimore & Ohio.

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OXY-ACETYLENE WELDING AND CUTTING.

Recent Observations of the Development of This Art in European Commercial and Railway Repair Establishments.

By Henry W. Jacobs.

One development which was apparent in European railway practice, and which is undergoing the most thorough revolution in Germany was the application of the oxy-acetylene blow pipe to metal working of all kinds. Not only is the process being repeatedly applied wherever it is found to benefit the work, either in economy or quality, in various railroad shop operations, but it is also causing a revolution in many of the industrial metal working trades.

During the past ten years the whole practice of metal cutting throughout the world, and particularly in America, has been greatly improved by the introduction of the high speed tungsten alloy tool steels, there being scarcely a railroad shop in the United States that has not increased its production and cheapened its costs in such matters as turning tires, knuckle pins, boring cylinders, etc. Great as are the changes in shop practice due to high speed steels, the revolution that will be worked in the treatment of all kinds of metals by the oxy-acetylene flame in the forming, building up, repairing of worn or fatigued material, cutting apart and joining together, and, in fact, all kinds of metal forming and working, is bound to far overshadow it.

For instance, in the piping of buildings for all purposes, and whether the pipes are of iron, steel, or some non-corrosive material, metal working is undergoing a complete metamorphosis, from the ground up. Piping heretofore used has walls relatively thick compared with its inside diameter, necessitated by the method of joining the ends of the lengths of pipe together, which consists in cutting a thread on the end of the pipe so that it may be screwed into a coupling, elbow, or tee; the depths of these threads determines the thickness of the pipe wall. With pipes or tubes that may be joined together by being oxy-acetylene welded this thickness is not necessary, and a tube of thinner material may be used. These thin walled pipes are easily rolled and butt welded from the strip. I was told that this method of making these thinner pipes was more economical than the present method of making wrought iron or steel piping used for water, gas or steam purposes. Flat

The New Royal School of Machine Construction at Cologne, Germany.

bands of steel or iron are run through rolling machines to the desired diameter, and are then put through an automatic machine and oxy-acetylene butt welded.

In place of having unions, elbows and couplings, as is the present practice in piping a building, these are eliminated and the joints are welded as the piping is being put in place. It will be readily seen that with this method there is no chance of leaks due to threaded connections, and as the walls of the piping are thinner, a great saving is accomplished in the first cost of the pipe. When pipe is applied in a building, all of the joints and connections are as easily made in place as a wiped lead joint, and are much neater and stronger in proportion to the metal dealt with. I was informed by those in charge of this kind of work that joints made in this way were done more quickly and cheaply than with the threaded connections.

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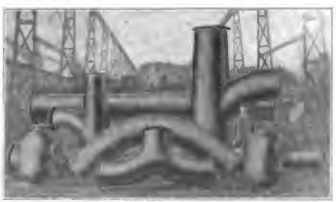
To indicate the scale on which this oxy-acetylene piping is being applied in buildings, the High Court of Justice building, located at Cologne, has 8 kilometers, or over 5 miles of welded piping and joints in it; and plumbers and pipe workers from all over Germany, and in fact from the other countries of Europe, are becoming expert in the new method as rapidly as they can. Pipes for railway usage may thus be applied in roundhouses, shops and water service installations, eliminating the losses due to compressed air, steam and water leaks—there being no me-

A Collection of Oxy-Acetylene Welded Articles in the Royal School of Machine Construction at Cologne.

chanical joints. The application of oxy-acetylene welding to piping is given as a striking example of the use of the new process, although it is only one of thousands that might be cited.

With the far-sightedness and the thoroughness with which the Germans prepare for any change in their methods, they easily recognized the importance of proper and careful training in the practice of doing this welding work. The Royal Prussian government has co-operated, and, to an extent, endowed and sup-



Examples of Large Heavy Piping Manufactured by Oxy-Acetylene Welding at the Works of A. Borsig in Tegel near Berlin.

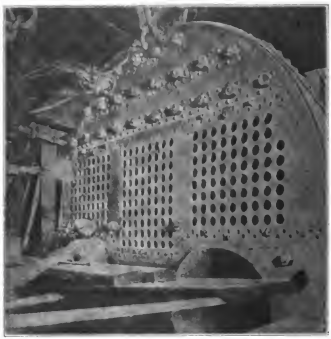
ported the foundation, first of a special advanced course in one of the largest technical industrial schools, where investigation and instruction as to the best and most skillful manner of applying oxy-acetylene welding and cutting to the different trades has been completely worked out. This school is known as the Königliche Vereinigte Maschinenbauschulen at Cologne. The first course in the new art was given in May, 1909, and since that time 29 successive courses of instruction in the different trades have been given. In the winter of 1911-12, for instance, 464 men from various trades and walks of life took this course at this particular technical school—this in addition to those receiving instruction at the 21 other Royal Prussian technical or trade schools, and also in addition to the instruction given in similar schools in the other German kingdoms.

The subdivision of these 464 students was as follows:

Factory owners	78
Factory managers and engineers	125
Foremen	116
Mechanics	113
Students	27
Others	5

Another classification according to the kind of trade is as follows:

Boiler inspectors	17
Boiler workers, etc.	118
Coppersmiths	18
Blacksmiths	12
Machinists	50
Ship-builders	12
Pipe workers	11
Electricians	9



Replacing Flue Sheet of Marine Boiler by Oxy-Acetylene Welding on the Steamship "Banal." At the Right the Welding is Completed, While at the Left it is in Progress. Flue Sheet is One Inch Thick.

Bicycle and automobile mechanics	11
Safe makers	6
Locksmiths	44
Employees of foundries and rolling mills	8
Gas works employees	6
Gun makers	1
Aluminum workers	12
Carbide manufacturers	1
Teachers in technical schools	27
Master foremen in technical schools	21
Merchants and others	47
Plumbers	33

There is just now being founded at Nuremberg a special school devoted exclusively to practical and theoretical instruction in this new art, the first building appropriation being about $40,000. In this school, as in all of the others throughout Germany and the rest of Europe, the instruction is being carried out along the best standard lines, each school being advised uniformly of the latest and best developments in the practice of oxy-acetylene welding, and through yearly meetings and reports from all of the schools and industries, the best developments are taken advantage of by everybody, and a very rapid general introduction of the art is being made.

One of the illustrations shows a typical example of the saving that can be made by oxy-acetylene welding of large broken

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gray iron castings which are too large to carry in stock for replacement. The sketches show a low pressure cylinder for a blower engine in a rolling mill. This cylinder broke as indicated. To cast and machine a new cylinder would have meant a delay of a month and would have thrown 400 men out of work for that time. The welding of cracks in a large complicated casting like this represents a very difficult feat, because of the tendency of cast iron to develop new cracks in the neighborhood of the weld. This is due to the strain set up in the metal when the casting cools after welding. To overcome this the cylinder was covered with asbestos on the outside and kept at a dull red heat by a wood fire inside of the cylinder, while being welded by the oxy-acetylene flame. The operators wore wooden shoes and heavy felt gloves and worked behind asbestos shields to protect themselves from the heat. After the weld was completed the cylinder was covered with insulation and allowed to cool very slowly. After two days the insulation was removed and the welds were found to be perfect. The cylinder was then given a hydrostatic and a severe endurance test, both of which were stood without a sign of a flaw.

Cutting Up the Bellot Bridge with Oxy-Acetylene Blow Pipe at Havre, France.

Main Base Casting of a Shear (Cast Iron) After Being Repaired with the Oxy-Acetylene Blow Pipe.

A Marine Boiler After Cutting Out Damaged Flue Sheet with Oxy-Acetylene Blow Pipe.

In railroad work applications are made to the welding of safe ends to flues; in the filling up of pitted spots on flues after they have been rattled; in the cutting out of all kinds of holes in steel sheets, such as fire-door holes before flanging; cutting out between frame jaws in plate frames; various classes of boiler repairs; equipping wrecking outfits with apparatus for cutting; welding together of cylinder and valve chest covers, dome covers, metal tool boxes, metal shovel handles, etc., and repairing blow-holes in all kinds of castings as is now done in the United States; and, in fact, an innumerable variety of work where it is required to cut two pieces of steel, iron or other metal apart, join them together, or add metal to worn or broken

Cutting Done by Oxy-Acetylene Blow Pipe.

Cutting Off the Riser from a Large Gun Carriage.

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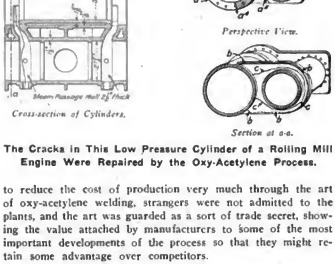
parts, or parts needing bosses or shoulders instead of having to use an originally thicker piece of metal.

Although I had letters of introduction from the best sources, and was freely admitted into the works where these processes were generally employed, I found that where manufacturing concerns had specialists on certain articles and had been able



The Cracks in This Low Pressure Cylinder of a Rolling Mill Engine Were Repaired by the Oxy-Acetylene Process.

to reduce the cost of production very much through the art of oxy-acetylene welding, strangers were not admitted to the plants, and the art was guarded as a sort of trade secret, showing the value attached by manufacturers to some of the most important developments of the process so that they might retain some advantage over competitors.

Cutting a Hole Through a Boiler Plate with an Oxy-Acetylene Torch.

In conclusion I would strongly urge the railroad mechanical department officers and mechanical engineers who will attend the meeting of the American Society of Mechanical Engineers, to be held in Europe this coming summer, to take advantage of the opportunity to visit the industries where the art of oxy-acetylene welding is being practiced.

RAILWAY EXTENSION IN TRINIDAD.—Work on the extension from San Fernando to Siparia was somewhat delayed until the middle of January by the continual heavy rains, and only one of the three locomotives used for carrying materials has lately been in use. Ballasting the track especially has been delayed, and there are two 120 ft. span bridges yet to be completed on the line.

THROUGH ROUTES ESTABLISHED.

*St. Louis, Springfield & Peoria et al. v. Peoria & Pekin Union. Opinion by Commissioner Meyer:**

The complainants are interurban electric railways under the common management of the Illinois Traction system. They have both passenger and freight terminal facilities in Peoria, Ill., and also a physical connection with the lines of the defendant. At present, however, there is no interchange of traffic between the complainants and the defendant, and the complainants request the commission to require the defendant to permit the complainants to construct a new physical connection as the present connection would not be adequate; and further to require the defendant to establish through routes and joint through rates and to exchange interstate traffic. The complainants' equipment and facilities will permit interchange with a standard gage steam road. The defendant conducts a general terminal transfer business in Peoria for the steam railroads which enter that city, and for the use of its property it charges $22,500 a year to roads which have no terminal facilities in Peoria. Two roads have freight terminals in Peoria, but no passenger terminals, and they pay the defendant for the use of its passenger terminal $2,000 a year. The lines of the Atchison, Topeka & Santa Fe connect with the defendant's lines at Pekin, and by paying a switching charge of $3 per car the former is enabled to have its traffic delivered at Peoria and to receive traffic therefrom. What the complainants request is nothing more nor less than an arrangement similar to that which exists between the defendant and the Santa Fe.

The commission found that the construction of a connection at the point mentioned in the complainants' brief is reasonably practicable; that it could be put in with safety, and that sufficient business would be offered to justify its construction and maintenance. The defendant contended that the commission was without authority to grant the relief sought by the complainants, because the compelling of switch connections did not apply to all roads but only to lateral branch line roads; and that the complainants' lines are not lateral branch lines, and are therefore not entitled to the use of the defendant's facilities, except upon such terms as the defendant sees fit to offer them; also that the defendant has the right to absolutely refuse the use of its terminals and facilities to complainants, but that it is willing to permit the use of the same upon the same terms as the roads which enter Peoria, but which have no terminal facilities there, are using them. The commission found that as the complainants' lines were independent lines and not lateral branch lines, the request for the switch connection should be denied. The question to be decided was whether this was a case in which to order the establishment of through routes between the complainants and the defendant over the existing connection. If the connection is not sufficient to render the service which the law requires, both carriers are under obligation to render the facilities adequate. The defendant asserts that the complainants seek the use of its terminals as embraced in the contract for which other roads paid $22,500 a year, for a compensation less than that sum. The commission did not agree with this assertion, as the complainants have their own facilities in Peoria, as previously mentioned. Owing to the present lack of interchange, interstate traffic shipped via the complainants and the defendant involves long drayage hauls and excessive loading and unloading. The commission disagreed with the argument of the defendant that when the defendant was required to transport traffic between the complainants' terminal and points on its line it was giving the complainants the use of its track and terminal facilities within the meaning of the third section of the act to regulate commerce. The commission found that shipments moving interstate generally pass through one or more terminals, and that the contention made by the defendant,

*Though this decision of the Interstate Commerce Commission is abstracted, the original language is preserved insofar as is possible.

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if admitted, would completely nullify the power of the commission to establish through routes. The commission found further that the defendant now discriminates against the complainants in favor of the three roads which at present use only a portion of the defendant's facilities, and that this practice showed that the defendant recognized the difference between an interchange, such as the complainants want, and the use of its terminal facilities as defined by it. The commission decided that the defendant has not the privilege to accord one carrier an interchange of traffic and to deny such an interchange to a competitor of that carrier, or to accord one carrier the use of part of its terminal facilities and to deny such use to another.

The defendant asserted that it has the right to "absolutely refuse" the use of its terminal facilities to the complainants. The commission found that though the terminal facilities of the defendant were private property, they were devoted to public use and were therefore subject to regulation. If the defendant had the right to refuse the use of its terminals and facilities to the complainants it could also refuse such rights to all other steam roads entering Peoria and literally seal Peoria through the instrumentality of its rails and hold that community as a closed domain. If a carrier receives fair compensation for service, how could it be claimed and argued that its property was being confiscated as a result of compulsory performance of such service? The commission found further that a common carrier is bound to accept a car for transportation whenever such car is offered at places where it can reasonably receive it. To determine whether or not it will transport the car the carrier cannot lawfully inquire into the ownership and origin of the contents, nor into the route over which it has been moved in order to reach its rails; it can only ask that it be given reasonable compensation for the service performed. The defendant in effect endeavors to compel the complainants to pay for services and facilities which they do not desire and of which they cannot make use. The commission decided that a common carrier can not arbitrarily require the purchase of its services when they are not wanted. The commission decided that the complainants are entitled to through routes and through rates with the defendant, that they are entitled to through routes on interstate traffic passing through Peoria to points on their lines and from interstate points to industries on the lines of the defendant in Peoria, and from such industries to interstate points reached by the complainants. If an agreement in regard to the rates is not made within 60 days, further proceedings will be had with a view to the issuance of a proper order.

Commissioner Prouty concurring, said in part: The defendant is properly a belt railroad; it was constructed for the express purpose of giving main-line railroads access to the various industries in and about Peoria; it has no main line, and it is entirely immaterial to it by what connecting railroad the main-line haul is performed. The commission may properly establish through rates to and from industries upon a terminal railroad of this character. The commission may order the through service, leaving the parties to provide the necessary connections. At any rate it is clear to me that the defendant should be required to handle the business of the complainants upon fair terms, and this commission should at least attempt to compel this. If we mistake in the making of our order the defendant has ample protection in the courts, while, if we err by denying the petition of the complainants it is not clear that this error can be corrected. (26 I. C. C., 226.)

RAILROAD EXTENSION IN SPAIN.—Under a recent concession the Alcoy & Gandia Railroad secured the right to construct and operate without government subvention a 12½ mile extension from Gandia northward along the coast to the town of Cullera. Work is under way, and when completed it will give Gandia a second route to Valencia, put the coast points in closer touch with the important fruit district of Alcira, and in general will establish more efficient communication between Valencia and the numerous agricultural communities to the southeast.

ARBITRATION OF THE FIREMEN'S WAGE CONTROVERSY.

The arbitration, under the Erdman act, of the controversy between the locomotive firemen and the eastern railroads was begun at the Waldorf-Astoria Hotel, New York, last Monday. W. W. Atterbury, the member of the arbitration board appointed by the railroads, and Albert Philips, appointed by the firemen having failed to agree on a third member, William L. Chambers, formerly chief justice of the International Court in Samoa and a member of the Spanish Claims Commission, was chosen, under the law, by the presiding judge of the Commerce Court and the acting commissioner of labor, acting jointly. There appeared for the firemen W. S. Carter, president, and Timothy Shea, assistant president of the Brotherhood of Locomotive Firemen and Enginemen. For the railroads there appeared Elisha Lee, assistant to the general manager, Pennsylvania Railroad, who is chairman of the conference committee of managers. Mr. Lee will be assisted, as occasion may arise, by his colleagues on the committee. Under the terms of the Erdman act the arbitration must be closed within 30 days from the date of the appointment of the third arbitrator, which was March 3, so that unless both sides agree to an extension of time, the decision will be announced by April 2.

Judge Chambers was selected as chairman by the other two members of the arbitration board. In his opening remarks he said, in part: "I am, of course, entirely ignorant of every question and every fact connected with this arbitration. My first consultation with anybody about the case occurred within the last hour with my colleagues. I do not own a share of railroad stock, nor a bond of a railroad, and I have paid my fare on railroads all my life. I have many close and intimate friends among the officers of railroads and I have perhaps as many in the brotherhood. If I were not a lawyer I expect I should be a railroad employee. We expect these proceedings to go along, not only peaceably, but with that feeling which I know from experience really exists between the railroad managements and the brotherhood. I have presided in a number of arbitrations, not only under the Erdman act, but in several other instances, and with very rare exceptions I have found that both the representatives of the railroads and of the brotherhoods have been controlled by high principles and a sincere desire to reach conclusions to the general interest of the railroads and the brotherhoods and equally in the interest of the public. In a sense I feel that, as the presiding arbitrator, I represent the public.

"The proceedings will be along the line of court proceedings, but not with the strict application of court rules. We are going to admit evidence which, in a court of justice, might be ruled out because it was hearsay or irrelevant. Our desire is to learn everything possible about the facts in the case. I believe my colleagues are as impartial in this investigation as I am myself. . . ."

In opening the case for the firemen, Mr. Carter emphasized the point that the firemen's requests had been twice amended; had they known what the final method of settlement would be they would probably have presented larger claims. Samuel T. Steinberger, a clerk in the general office of the Brotherhood at Peoria, was the first witness. He said that he had prepared a statement showing regulations and rates of pay existing on lines participating in this arbitration as compared with those of western lines and with the rates now asked for. It was evident that Mr. Carter's purpose was to emphasize the higher rates and more favorable conditions on western roads as compared with those in the East. Mr. Steinberger gave averages of the pay received by the firemen on different classes of engines according to weight on drivers for both the west and east, against which Mr. Carter set the demands now made, showing that they were based on the western rates, but were a little lower. The rates for the eastern roads gave no information regarding the practice with heavy freight locomotives seldom used on passenger trains, but the present demands include rates for such engines, in such work;

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and no rates were given for the present demands for freight service in the case of locomotives weighing 200,000 lbs. or more on drivers, as in this case two firemen are asked for. In the cross-examination, Mr. Lee brought out objections to the methods used in obtaining the average rates shown in the tables. Asked by Mr. Lee if he considered it fair to compare the eastern and western rates in this way, Mr. Steinberger admitted that it was not exactly correct, but it was as near as he could get to it. Mr. Lee then informed the board that the railroads objected to the method used in obtaining the rate and promised to submit a correct statement.

The next witness was J. W. Lott, of Elkhart, Ind., employed on the Lake Shore & Michigan Southern as fireman and extra engineman. On that road a fireman is called two hours before the leaving time of his train in freight service and three hours before in passenger service. It is part of the fireman's duties to put the tools on the engine and fill the lubricator. The witness claimed that this work should be done by someone else, and characterized the filling of lubricators as dangerous. On the division on which he worked, which is 95 miles long, 75 per cent. of the trips on freight trains occupy, he said, from 12 to 16 hours. The witness also admitted that given the same tonnage, a locomotive with a superheater burned less coal than a similar locomotive using saturated steam, but he claimed that the superheater locomotives actually burn just as much coal as the others, as they haul heavier loads. He also claimed that those equipped with superheaters are no better at starting a heavy train than those using saturated steam.

E. L. McGinnis, a fireman on the Pittsburgh division of the Pennsylvania Railroad, said that on that division, in the last few years, there had been an increase of 200 tons in the rating of certain locomotives without any changes being made in them.

Mr. Cory, a fireman on the Cleveland, Cincinnati, Chicago & St. Louis at Indianapolis, Ind., said that he had been told by the road foreman of engines, in taking up the matter of a fireman being called out of his turn, that the fireman broke the rules daily regarding the cleaning of locomotives and that therefore the company could not be held to account for breaking other rules.

James A. Bell, New Castle, Pa., a fireman on the Pennsylvania Lines west of Pittsburgh, gave testimony regarding the difficulty of a fireman's shoveling coal ahead on freight engines. Cross-examined by Mr. Lee, he admitted that there had been four recent increases in wages, but claimed his wages would not go any further now than previously.

David May, of the Baltimore division of the Baltimore & Ohio, gave similar testimony to that of Mr. Lott regarding superheaters. He said that on his division automatic stokers had been a failure; but he believed the locomotives so equipped were now working satisfactorily on another division. He caused considerable amusement when he declared that a thermometer which he carried on the locomotive during the summer had burst from the heat when passing through a tunnel.

W. F. Heckenberger, a fireman on the Philadelphia division of the Pennsylvania, said that in cases of accident both enginemen and firemen were disciplined, but admitted that the enginemen were held principally to account.

J. E. Weaver, of the Lake Shore & Michigan Southern at Elkhart, Indiana, said that firemen are frequently disciplined for making black smoke in Chicago. He claimed that the poor quality of the fuel was to blame. He said that it was often necessary for the fireman to assist the engineman in reversing the large engines. This completed the testimony for the first two days.

C. A. Kauffman, of the Philadelphia division of the Baltimore & Ohio, was the first witness called on Wednesday morning. He stated that at his terminal there was no difficulty in getting supplies placed on locomotives previous to a trip, but he understood there was trouble at some terminals of the road. He stated that there had been a great reduction in the number of engine crews since the introduction of the Mikado type locomotives. F. A. Murphy, of the Cumberland division of the Baltimore & Ohio, followed. He said that a number of locomotives on that division are equipped with the Street locomotive stoker, but that they are not popular with the firemen and that the oldest men choose the hand-fired engines when they are available. He claimed that the stokers require constant attention and that therefore the firemen get no chance to rest while in sidings; that the fireman has to fire by hand about 50 per cent. of the coal burned, and that the coal that goes to the stoker must be dry and passed through a screen which will take nothing larger than 2½ in. square, requiring much labor in breaking coal. The dust resulting from this, he said, is excessive. On this division screened coal for the stokers is supplied at one terminal only. T. E. Ditto, also of the Baltimore & Ohio, said that several firemen on his division had been paid $1 per day extra to go to the Cumberland division to fire because of the difficulty of keeping men on the large locomotives there. His experience with the automatic stokers was confined to six trips. He also claimed that he could see no saving of coal under any conditions with a superheater. J. A. Davis and C. B. Hubler, of the Buffalo division, Delaware, Lackawanna & Western, both testified to the use of two firemen on certain large locomotives in road service, but these locomotives have since been placed in pusher service.

Warren L. Adair, a fireman on the St. Louis division of the Cleveland, Cincinnati, Chicago & St Louis, testified regarding the use of the superheater. He stated that a superheater is satisfactory when new and in good condition, but that the large flues soon become blocked with cinders around the superheater units and leaks develop at the joints. On cross-examination by Mr. Lee he admitted that a saturated steam locomotive is as bad as one using superheated steam when in a run-down condition. In questioning Mr. Adair, Mr. Carter explained that he had to depend on firemen for the technical testimony regarding such devices as the superheater as he was unable to obtain a mechanical expert anywhere who was willing to testify on the men's side. Mr. Lee offered to lend him an expert for testimony but Mr. Carter refused the offer.

N. W. Ayers, of the Lake Shore & Michigan Southern, at Erie, Pa., said that three Street stokers in use on that road about a year and a half had been removed because unsatisfactory. He claimed the parts of the stoker were in the way and bothered a fireman in the performance of his duties. Firemen Lieban, of Harrisburg, Pa., and Lienhardt, of Tyrone, Pa., both Pennsylvania men, followed in the lines of several previous witnesses. E. G. Boling, of Terre Haute, Ind., a fireman on the Vandalia, stated that he had had no personal experience handling an automatic stoker, but had ridden a locomotive equipped with one for some time and watched its action. He did not state the type used, but claimed that conditions must be ideal in order to get satisfactory results. He said the stoker would only work satisfactorily with good coal, and compared its use with the instruction of a student fireman, saying that it was necessary to watch it closely and help out frequently by hand firing. Mr. Carter at this time added to his statement regarding his inability to obtain expert testimony, and compared the superheater and such devices with the compound locomotive, which, he said, after having cost "millions and billions of dollars" had been abandoned as unsatisfactory. He said that the superheater was supposed to make a saving in the fireman's work but that no such result was obtained, and classed it and the compound locomotive together as fads. When Mr. Atterbury said that information concerning tests at the Altoona testing plant of the Pennsylvania were available to Mr. Carter the latter replied that such results showed testing plant conditions only and were of no use for what he wanted. He then attempted to bring out, in questioning Mr. Boling, that bad water is worse to contend with on superheated than on saturated steam locomotives, owing to the scale forming in the superheater tubes and reducing their conductivity. J. M. Dunlevey, of the Pennsylvania division, New York Central & Hudson River, stated that the heat on the Mallet compound locomotives which he fires is so intense that his overalls and trousers are frequently burned through. Mr. Carter suggested that the company make "an appropriation for pants" for the firemen on these locomotives.

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EDGAR E. CLARK.

The reappointment of E. E. Clark to the Interstate Commerce Commission for another term of six years was noticed in our issue of March 7, page 451. On the eighth, Mr. Clark was chosen chairman of the commission for the current year, taking the place of Mr. Lane, who leaves the commission to enter the President's cabinet as Secretary of the Interior.

Mr. Clark has been a member of the commission for six years, and during that time has made a reputation for integrity, impartiality, and assiduous devotion to the duties of his position. These are essential qualifications for the head of this important body, and it is, therefore, to be expected that he will fill his new post with credit to himself, and to the interest of the public.

Mr. Clark was born in Lima, N. Y., February 18, 1856, and was educated at Wesleyan Seminary in his native town. He moved west in 1871, and began his railroad career as a brakeman. He was soon promoted and rose through the usual channels to the position of passenger conductor, which he held in 1889, when he was selected grand senior conductor of the Order of Railway Conductors, at the convention in Denver, Colo., in May of that year. The following year, 1890, he was chosen grand chief conductor; and he remained the head of the order up to the time that he was appointed by President Roosevelt a member of the Interstate Commerce Commission in 1906. As leader of the brotherhood Mr. Clark enjoyed an enviable reputation for fairness, public spirit and progressive views. During his incumbency the membership of the conductors' brotherhood increased from 12,000 to 38,000. While in this position Mr. Clark was appointed by the President a member of the Anthracite Coal Strike Commission of 1902, a body whose strong, yet conservative conclusions elicited the general approval of the country.

Edgar E. Clark.

For several years past Mr. Clark has had direct charge of that part of the commission's work which has to do with the compilation of the passenger and freight tariffs filed by the railroads and the administration of the regulations under which this very troublesome work is managed by the railroads. As the reader will recall from the last annual report, recently issued, the number of tariffs filed in 1912, which was 108,766, represents a reduction of more than 50 per cent. in the number issued, as compared with 1908; a reduction, accomplished only by the most persistent attention to innumerable details and in the face of constant objection and criticism, which has proved as beneficial to the railways, in the simplification of work and the reduction of expense, as it has to the people who use the tariffs in added convenience.

Mr. Clark is the first and only member of the commission who is familiar with the actual physical operation of a railroad. The first chairman, Judge Thomas M. Cooley, had been a receiver, but was essentially a lawyer and an economist; Commissioner Yeomans had been superintendent of a small road for a short time; and Commissioner Clements had been president of a small railway for one year; but the man who knocks around on freight trains for five or ten years, as did Mr. Clark, and who also has the qualifications of mind and character to rise to a position of leadership, gets a schooling and an experience which can be secured in no other way. He becomes familiar with the feelings and needs of the employees, and also with the views, motives and responsibilities of operating officers. At the same time he learns the feeling of the public—the railroads' patrons. As, during the past six years, Chairman Clark has become sufficiently acquainted with public sentiment in those phases wherein the railways do not satisfy it, to offset any undue sympathy with railroad employees which he may have had, we may now expect him to be the most impartial of judges. Evidence that he has the judicial temperament we already have, as has been noted.

BALTIMORE & OHIO IMPROVEMENTS.

Extensive improvements are to be carried out by the Baltimore & Ohio on the Somerset & Cambria division between Johnstown, Pa., and Rockwood, at a cost of about $1,500,000. The work will be started as soon as the consent of the city authorities of Johnstown can be obtained. The new passenger and freight houses and yards in Johnstown will more than double the present facilities at that place. There will be new passenger and freight facilities at Somerset, a number of long passing sidings, and five steel bridges; a new passenger station at Rockwood, and a new track, low-grade, between that place and Garrett. The passenger station at Johnstown will be of stone, 28 ft. x 100 ft. The freight house will be brick, 28 ft. x 300 ft., with concrete foundations. It will have covered platforms 14 ft. wide x 200 ft. long. The building will have a refrigerator room and two team tracks. A new roundhouse and other terminal buildings will be put up in Johnstown, which with yard improvements will cost $500,000. The yards will have a capacity of 240 cars. An engine house with a turntable 80 ft. long will be built, and there will also be a 70-ft. ash pit.

The new freight yard at Somerset is to have a capacity of 500 cars, and the roundhouse and other buildings at that place will cost about $400,000. Steel bridges will replace lighter structures at Holsople, at Skew, at Paint Creek at Hog Back Tunnel, and at Stony Creek. Work on the low-grade line between Rockwood and Garrett, to be 8 miles long and cost $500,000, has been started.

Regarding the recent report that the Baltimore & Ohio would spend $27,000,000 for new tracks and other improvements, an officer writes that the report was based on a tentative statement made by President Willard before the Public Service Commission of Maryland, referring to improvements that it may be necessary to carry out on the Baltimore & Ohio during this and future years.

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THE KIANGSU-CHEKIANG RAILWAYS.

Progress That Has Been Made Towards a Modern System of Railroads, Remarkably Low Costs of Labor for Operation.

By Lewis R. Freeman.

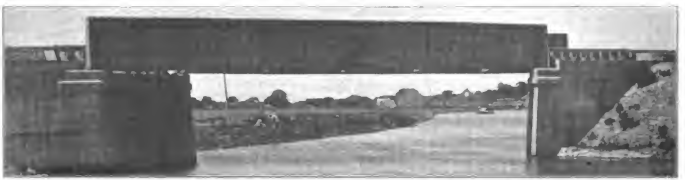
The railway question which China is facing today is not whether the thousands of miles of line, which are soon to be constructed, shall be built by foreigners or by themselves—that question seems already to have been settled—but rather whether they shall be built with borrowed or with Chinese money. The question will doubtless take a long time to decide, but eventually the Chinese will probably borrow the money for their great enterprises, retaining as complete control of the expenditures as possible, while the smaller lines will be financed and built by local capitalists.

Country Station, Showing Platforms of Concrete and Macadam.

The Shanghai-Nanking Railway is undoubtedly the best built road in the Chinese Empire, a product of foreign financing and engineering, and now being largely operated under foreign direction. In the Peking-Kalgan, the Chinese government, taking advantage of men trained under European supervision, and using the profits of one of its own foreign built lines, overcame serious engineering difficulties and constructed a 132-mile line more economically than a similar work has ever before been done. In the present account of the Kiangsu-Chekiang Railway I shall tell something of a line—two connecting lines really—that was financed by the Chinese gentry of the interested provinces, built by Chinese engineers, and is now being operated without the aid, even in an advisory capacity, of a single foreigner. The most notable fact regarding these lines is that their cost of construction and operation have proved lower than those of any other important road in China.

The Kiangsu-Chekiang Railways, passing through a section of country almost identical in character with that traversed by the Shanghai-Nanking Railway, were built at a cost of approximately $20,000 a mile (the Chinese claim even considerably less than that figure) against $55,000 a mile for the British-built Shanghai line. Foreigners claim that the Kiangsu lines are poorly constructed in every respect, that the ballast is neither of good quality nor properly laid, that the ties are culls which could not be sold elsewhere, that the rolling stock is mostly a heterogenous collection of antiques from all parts of the world, and that such of it as is up-to-date is rapidly being ruined by incompetent and careless handling. The Chinese, denying all these charges, maintain that even if they were true the margin of advantage—$35,000 a mile—which their lines have over the Shanghai-Nanking Railway will allow them something to draw upon for renewals. The fact that the through line from Shanghai to Hangchow has operated for over a year now without any serious defects cropping out, and at a most handsome profit, cannot be lost sight of in passing on the merits of the question.

Foreigners in Shanghai shook their heads doubtfully when it was announced by the Chinese that the itinerary of the Pacific Coast Commercial Commission included a trip to Hangchow and back by a special on the Kiangsu-Checkiang Railways. They warned the Chinese that a railway accident, however trivial, at the outset of the visit might upset the plans for the whole tour and do irreparable harm. They finally induced our hosts to "minimize the chances" by arranging that the down trip should be made in house-boats via the Whangpoo and the Grand canal. Even after our arrival strenuous endeavors were made to arrange that the journey in both directions between Shanghai and Hangchow should be made in house-boats, but the plan of returning by train was adhered to by the Chinese.



Girder Bridge on Concrete Abutments.

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Our introduction to the Chekiang section of the railway came a few days sooner than was expected, however, and under circumstances which gave us a much fairer opportunity of judging the line than would have been possible by the night trip in the special alone. Contrary tides and the inability of the launches to keep up to schedule with their heavy trains of house-boats brought us to Kashing, the half-way point between Shanghai and Hangchow, so far behind time that it was found necessary, in order to meet our luncheon engagement at Hangchow, to abandon the boats and take the morning train on its way through from Shanghai.

Shanghai Terminal; Kiangsu-Chekiang Railway.

The commodious and substantial brick station has large and comfortable, first, second and third class waiting rooms, and is finished throughout, plainly but attractively, in teak. There are gates for regulating the movement of passengers, and a viaduct for crossing to and from the main platform in leaving and taking the down trains which came in on the farther siding. The platform is strongly built of well tamped macadam in brick retaining walls, and extends for some distance beyond either end of the station.

The track is heavily but rather loosely ballasted. The ties are Japanese hardwood, and all of these which we saw, not only at Kashing, but at a number of other stations as well, appeared of fair quality and in good condition. They are 6 in. x 8 in. x 8 ft. long, and spaced 2 ft. 4 in. between centers. They cost fifty cents gold apiece, delivered, and are expected to have a life of from six to eight years.

The limestone and sandstone ballast did not appear—and is not, in fact—of the quality of the granite that was used in the Shanghai-Nanking roadbed. It was brought from a quarry situated at the end of a spur near Hangchow, and was furnished at the very reasonable cost of 25 cents per cubic yard. It was laid 10 ft. wide and 6 in. deep.

Seventy-five pound rails were used. They were 33 ft. long, of standard section, and were laid with even joints. They bore the marks of the Hanyang Iron Works, the greatest manufacturing concern of China. I may say, in this connection, that it is only a matter of a few years before China will make all of her own rails, as well as all the other more simple iron and steel products.

Bridge Over Taoling River.

The nine or ten-car Shanghai-Nanking train came into Kashing behind its American Locomotive Company locomotive, and three or four of us found ourselves in a bright, well-finished American-made car, where we rode in comfort for two hours and a half before discovering that we were in the second-class section of the train. This car, in fact, with its easy cane seats, Pintsch lights, large luggage racks and commodious and well-appointed lavatories, was more comfortable than many of the so-called first-

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class cars in which I have ridden in western America. The seats were arranged facing each other in twos, and when tea or refreshments were ordered a folding table was swung up between them from the wall where it had been hanging. This we found a common arrangement on many of the Chinese roads, where the traveling public is much given to lunching and tea drinking through all hours of the day and night.

Many of the cars of the Kiangsu part of the line have a stork-like appearance caused by the fitting of American built bodies and trucks upon the large Chinese standard wheels. The cars and trucks were ordered from America, as were also the engines. The latter from the American Locomotive Company, were ordered to meet the requirements of the Chinese Railway Board's rule that the height from the top of the rail to the center of the drawbar or coupling should be 3 ft. 7 in. The cars were ordered to be built according to American practice, which stipulate a height of 2 ft. 9 in. To the American car and the American truck has been fitted the standard Chinese wheel, 3 ft. 6 in. in diameter, or 9 in. more than the American standard. To give clearance to this

Interior of Third-Class Coach; Kiangsu-Chekiang Railway.

wheel the car bodies have been blocked up at the kingbolt and on the sides about 9 in. The result is neither graceful nor conducive to stability.

Our journey down to Hangchow, and our later return from there in the really luxurious special which the directors of the two roads put at our disposal, gave us little opportunity for investigating any of the multifarious defects which our foreign friends in Shanghai harped on so continuously. On the score of comfort, even on the train which we boarded without warning at the wayside station, there was nothing to be desired. In fact, the only disagreeable feature noted was the very considerable jar and rattle while the train was in motion, which made sustained conversation almost impossible. This trouble is doubtless due partly to the patched up cars, as well as to the roadbed.

Neither on the trip from Kashing to Hangchow, nor from Hangchow back to Shanghai, nor in three or four short side trips about Hangchow, was there an accident of any kind, nor the least hitch in the by no means simple arrangements for handling so large a party. Quite naturally, considering what we had been led to believe would happend to us if we traveled over these lines, the Commercial commission was agreeably surprised in the Kiangsu-Chekiang Railways. For my own part, the favorable opinion formed at that time has not materially been altered by a couple of recent trips which I have made over the roads at my leisure.

An interesting fact in connection with the Chekiang Railway, which operates the 78 miles of line from Fengching to Hangchow, and is building the important extension from the latter point to Ningpo, is the large number of stockholders it has. Only Chinese were permitted to subscribe for stock, and the capital of $10,000,000 is divided between 53,000 different individuals. Forty-thousand of these are coolies, tradesmen and small farmers, and

Third-Class Waiting Room, Built of Brick, Concrete and Tile.

it is said that subscriptions for as low an amount as $5 were accepted.

The economy with which this line is run may be judged from the fact that the president and vice-president receive no salaries, and that the chief engineer, a graduate of the University of California and a perfectly competent man, gets $2,750 a year. Locomotive enginemen receive from $28 to $37 per month; station masters, $8.50 to $16; track foremen, $4.50, and coolie section hands, 15 cents a day. If graft were cut down at all it would readily be seen not only that this road could have been built inside of the figure which the Chinese claim—$20,000 per mile—but that its operating expenses must also be about as low as those of any road in the world. On the recently completed Sunning Railway in Kwantung province, near Canton, the salaries average even lower than these, the president and general manager receiving $38 a month; locomotive enginemen, $20; firemen, $8, and section hands 13 cents a day.

The Chekiang Railway, from Fengching to Hangchow, is 78

Gates at Grade Crossing.

miles long on the main line, with about half that length of sidings. There are a total of 144 steel girder bridges, supported on concrete abutments, and 157 culverts. All of the girders were purchased from the American Bridge Company of New York. The longest bridge on the road is a 60-ft. span. The average span of all bridges is 45 ft.

I find this comment on the method of bridging many of the waterways where there was difficulty in finding good foundation, or where regular practice would have been inconvenient: "The country traversed by the Chekiang and Kiangsu Railways is a network of canals and creeks, the natural highways of commerce and trade in this low-lying section. The closing or narrowing of those

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streams by cofferdam to the detriment of the great junk and river traffic was prohibited by the authorities, so in many instances the railway engineer put into practice the old scheme of building one abutment at the water's edge, the other on dry land to one side, and, after completion, diverting the shallow canal from its old channel to its new one between the abutments. There is nothing remarkable about this practice, though a London paper has used it as an argument to criticize the professional ability and capacity of the engineers. . . . The mere fact that such a practice could be resorted to is an indication of the harmlessness and sluggishness of the water, and as nearly all are tidal canals it rather reflects on the good judgment of the engineer than otherwise, as the best method of keeping the narrow channels open to junk traffic during the construction of the road."

The Chekiang Railway has 15 stations, and the Kiangsu line 10. All of the station buildings on both lines are of brick, of which the one I described at Kashing is a fair type.

The Kiangsu line has 48 bridges, exclusive of culverts, some being stone arches and some steel girders. The longest is over the Zia Tang. It is 440 ft. long, in two spans, and has proved the most expensive undertaking in the construction of the road. Three other bridges, 400, 300 and 100 ft. long, respectively, were constructed cheaply and quickly.

Nearly all the rolling stock on the Kiangsu line is American, and except for the appearance of the American car bodies on Chinese wheels, it is a very creditable assortment. The Chekiang road has been aptly described as a menagerie of rolling stock, no less than a dozen different types being in service on the 78 miles of line. Several factories of the United States, Germany and England are represented, with the result that some of the yards have the appearance of an international exhibition of railway equipment. The company stoutly maintains that it knows exactly what it is doing, and that the motley array was bought with the idea of experimenting with everything the market afforded and with the idea of determining for itself which was best. This is possibly true, but it gives one the impression of being rather a wild piece of extravagance for a road which in other respects has made such a strong showing on the score of economy.

To the charge that the Chinese are sacrificing quality for economy in the construction of those roads which they are building independently of foreign direction, George Bronson Rea, in a last year's number of his *Far Eastern Review*, makes the following convincing reply:

"In the building of such roads as the Peking-Kalgan, the Kiangsu, the Chekiang and the Sunning, under purely native supervision and control, China has demonstrated to the world that she is fully competent to develop her transportation facilities at figures defying foreign competition. At a cost of $20,000 to $30,000 per mile there is very little scope for dishonesty. The roads may not be up to accepted foreign standards, but there are many new roads throughout the world of which the same may be said; and if China is satisfied and willing to construct a cheap road at first, and improve it as receipts increase, she will only be following a precedent set by successful pioneer railway builders in all countries."

RAIL PRODUCTION IN 1912.

Statistical Bulletin No. 2, of the Bureau of Statistics of the American Iron and Steel Institute, Philadelphia, Pa., shows that the production of all kinds of rails in the United States in 1912 amounted to 3,327,915 tons, against 2,822,790 tons in 1911, an increase of 505,125 tons, or over 17.8 per cent. Included in the total for 1912 are 174,004 tons of girder and high T steel rails for electric and street railways, as compared with an output of 203,409 tons of similar rails in 1911.

Of the total production of rails in 1912 3,165,939 tons were rolled from Bessemer, open-hearth, and electric steel blooms or billets; 42,586 tons were rolled from new seconds, defective new rails, and steel crop ends; and 119,390 tons were rerolled from old steel rails or were renewed steel rails. No iron rails are reported for 1912.

The production of Bessemer rails in 1912 amounted to 1,099,926 tons, against 1,053,420 tons in 1911, an increase of 46,506 tons. Of the total in 1912 1,070,480 tons were rolled from ingots and 29,446 tons were rolled from new seconds, defective new rails, crop ends, etc. The maximum production of Bessemer rails was reached in 1906, when 3,791,459 tons were produced.

The production of open-hearth rails in 1912 amounted to 2,105,144 tons, against 1,676,923 tons in 1911, an increase of 428,221 tons, or over 25.5 per cent. Of the total in 1912 2,092,004 tons were rolled from ingots and 13,140 tons were rolled from new seconds, defective new rails, crop ends, etc. Almost all were rolled from basic steel. The maximum production was reached in 1912. It will be noticed that the production of open-hearth rails in 1912 was almost twice that of Bessemer rails in the same year.

In 1912 the production of rails rolled from steel made in electric furnaces amounted to 3,455 tons, as compared with 462 tons in 1911. In 1909 and 1910 small quantities of rails were also rolled from electric steel, but these rails were included with the Bessemer and open-hearth rails reported for these years.

In 1912 the production of steel rails rolled from new seconds, defective new rails, crop ends, old steel rails, etc., including renewed rails, amounted to 161,976 tons, of which 42,586 tons were rolled from new seconds, etc., and 119,390 tons were renewed rails or were rerolled from old steel rails. Of the 42,586 tons rolled from new seconds, etc., 29,446 tons were rolled from Bessemer steel and 13,140 tons were rolled from open-hearth steel, and are therefore included in the totals given for Bessemer and open-hearth rails for that year. But, as the 119,390 tons of rails rolled from old steel rails in 1912, and the renewed rails as well, could not be classified by the manufacturers they are not included in the Bessemer or open-hearth rail output for that year, but are grouped under the general heading of electric and rerolled steel rails. Prior to 1911 all rails of this class are included with Bessemer or open-hearth steel rails.

No iron rails were rolled in 1912. In 1911 the production was 234 tons, all rolled in Illinois, and all weighing less than 45 pounds to the yard, against 230 tons in 1910.

The table on the following page gives the production of all kinds of rails in 1912, classified according to their weight per yard, and totals according to weight since 1902.

Stone and Concrete Bridge Over Canal.

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Kind of rails—Gross tons.	Under 45 lbs.	45 lbs. and less than 85.	85 lbs. and over.	Total. Gross tons.
Open-hearth steel rails	75,203	488,695	1,541,246	2,105,144
Bessemer steel rails	103,826	591,744	404,356	1,099,926
Electric and other steel rails	69,643	38,153	15,049	122,845
Iron rails	None	None	None	None
Total for 1912	248,672	1,118,592	1,960,651	3,327,915
Years—Gross tons.				
Total for 1911	218,758	1,067,696	1,536,336	2,822,790
Total for 1910	260,709	1,275,339	2,099,983	3,636,031
Total for 1909	255,726	1,024,856	1,743,263	3,023,845
Total for 1908	183,869	687,632	1,049,514	1,921,015
Total for 1907	295,838	1,569,985	1,767,831	3,633,654
Total for 1906	284,612	1,749,650	1,943,625	3,977,887
Total for 1905	228,252	1,601,624	1,546,053	3,375,929
Total for 1904	291,883	1,320,677	672,151	2,284,711
Total for 1903	221,262	1,603,088	1,168,127	2,992,477

The production in 1912 of rails weighing under 45 pounds to the yard shows an increase of 29,914 tons as compared with 1911; rails weighing 45 pounds and less than 85 pounds show an increase of 50,896 tons; and rails weighing 85 pounds and over show an increase of 424,315 tons. In 1912, over 41 per cent. of the rails weighing less than 45 pounds to the yard, nearly 53 per cent. of the rails weighing 45 pounds and less than 85 pounds, and over 20 per cent. of the rails weighing over 85 pounds were rolled from Bessemer steel, while in the same year over 30 per cent. of the rails weighing less than 45 pounds per yard, over 43 per cent. of the rails weighing 45 pounds and less than 85 pounds, and over 78 per cent. of the rails weighing 85 pounds and over were rolled from open-hearth steel.

In the following table the production of all kinds of rails from 1903 to 1912 is given by processes. Of the total production of rails in 1912 about 33.05 per cent. were rolled from Bessemer steel, about 63.25 per cent. were rolled from acid and basic open-hearth steel and about 3.70 per cent. were rolled from electric steel and from old steel rails. As previously stated no iron rails were rolled in 1912.

Years—Gross tons.	Bessemer.	Open-hearth.	*Iron and all other.	Total.
1912	1,099,926	2,105,144	†122,845	3,327,915
1911	1,053,420	1,676,923	†92,447	2,822,790
1910	1,884,442	1,751,359	230	3,636,031
1909	1,767,171	1,256,674	...	3,023,845
1908	1,349,153	571,791	71	1,921,015
1907	3,380,025	252,704	925	3,633,654
1906	3,791,459	186,413	15	3,977,887
1905	3,192,347	183,264	318	3,375,929
1904	2,137,957	145,883	871	2,284,711
1903	2,946,756	45,054	667	2,992,477

*Iron rails only from 1903 to 1910 inclusive.

†Include 234 tons of iron rails in 1911 but none in 1912; also 462 tons in 1911 and 2,435 tons in 1912 of rails rolled from electric steel; also 91,751 tons in 1911 and 119,390 tons in 1912 of renewed rails or rails rerolled from old steel rails which the manufacturers could not classify as Bessemer or open-hearth steel rails.

Included in the 3,327,915 tons of steel rails rolled in 1912 are 149,267 tons of alloy rails, against 153,989 tons in 1911. The following table gives the production of titanium, manganese, and other alloy steel rails by processes from 1909 to 1912.

Alloy rails—Gross tons.	Bessemer.	Open-hearth and electric.	Total.
Titanium steel rails	103,941	37,832	141,773
Manganese, copper, and nickel	4,933	2,561	7,494
Total for 1912	108,874	40,393	149,267
Total for 1911	115,450	38,539	153,989
Total for 1910	229,935	27,389	257,324
Total for 1909	35,699	13,696	49,395

In the following table the production of titanium, manganese, and other alloy steel rails is given by kinds since 1909.

Alloy rails—Gross tons.	1909.	1910.	1911.	1912.
Titanium steel rails	35,945	256,759	152,990	141,773
Manganese, copper, nickel, etc.	13,450	565	999	7,494
Total	49,395	257,324	153,989	149,267

In addition to the rails rolled in 1912 we imported 3,780 tons of iron and steel rails. During the same year we exported 446,473 tons of steel rails. In 1911 our exports of rails, all steel, amounted to 420,874 tons and our imports to 3,414 tons.

NEW VIEWS CONCERNING RAILWAY COMMISSIONS.

For the last twenty years the public has intrusted its interests to state railway commissioners whose only claim to their positions is their ability to cozen the voters into electing them; their principal asset, political ability; their experience, legal "hair-splitting," combined with an egotism begotten of elevation from a sphere where the question was where tomorrow's bread and butter was coming from, to an office where the earning power of hundreds of millions of dollars was affected by their actions. From a position of little or no importance to one where they assumed to dictate to leaders in the world of transportation and of finance. . . The *St. Louis Republic* announces the failures of efforts to regulate railways by commissioners, and states that there exists a demand for a change. The "Public Utilities" bill now before the Missouri legislature says:

"The people of Missouri have had exactly the same experience with elected railroad commissioners that every other state that has tried them has had. It is because this method of railroad regulation has been a practical failure the country over that the states are turning to expert commissions, chosen by executive appointment. The present plan of railway control has so worked in Missouri that there is general demand for an appointive commission to take up railway regulation."—*Railway Record.*

THE GEE LOCOMOTIVE STOKER.

The stoker shown in the illustrations has been developed and patented by N. E. Gee of the mechanical engineer's office of the Pennsylvania at Altoona, Pa. It is of the over-feed type, using steam jets for distributing the coal over the grate.

Four main parts are embodied in this stoker—the source of power, the coal crusher, the coal conveyor and the coal dis-

View of the Stoker Showing the Fireman's Control Lever.

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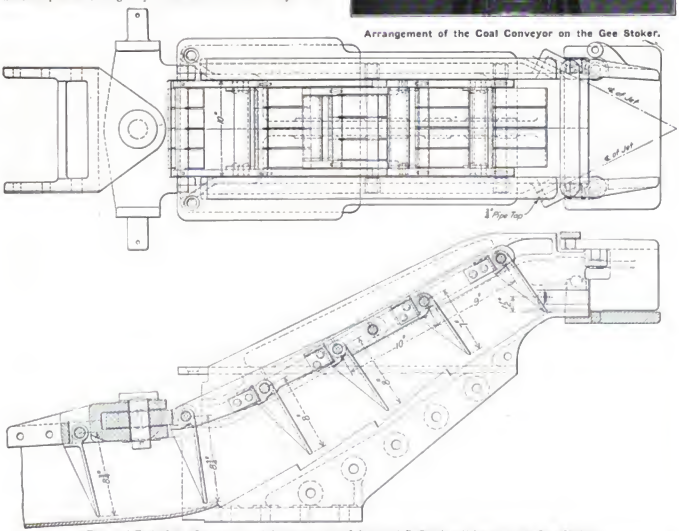
tributer. The first three are of the same general style as those used on the Crawford stoker. The source of power is a cylinder 18 in. in diameter x 11½ in. stroke, secured to the locomotive frame below the cab, which transmits reciprocating motion through a jack shaft to the coal crusher and the conveyor. The crusher is located beneath the rear end of the coal pocket in the tender and the conveyor is in a trough below the tender floor and transfers the coal from the crusher to the distributer. It is horizontal to the end of the tender and is then inclined upward, terminating at an opening in the back head of the boiler just below the fire door. This opening is the lower part of an enlarged fire door opening of the ordinary construction. The conveyor is of the reciprocating type with swinging fingers and the trough of the inclined section is of cast steel, the bottom having notches or steps which prevent the coal sliding backward.

The coal distributer is simple in its arrangement and consists of a flat cast iron plate or apron extending inside the firebox, two vertical, cast iron wings, one on either side, which are hinged at the rear, and two stationary steam jets which discharge from a point just back of the wings, diagonally across the apron. The angle of discharge is such that the centers of the two jets meet at a point a few inches in front of the center of the plate. The two wings are connected by a cross bar, giving them simultaneous movement, and are operated by a connection to the fireman's control lever.

The steam jets are intermittent in their action, and are open only at the extreme forward end of the stroke of the conveyor. This is accomplished by means of a nozzle control valve which embodies two separate and independent piston valves, one regulating the amount of the steam discharge through either of the two jets, and the other the intermittent action of the blast. The latter is operated through a yoke connected to the conveyor driv-

Arrangement of the Coal Conveyor on the Gee Stoker.



Forward End of the Conveyor and Arrangement of Jets and Deflecting Wings on the Gee Stoker.

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ing arm and consists of a differential piston held in a closed position by the steam pressure, except as it is opened by the yoke. The other valve is connected to the fireman's control lever and reduces or entirely closes the passage to one or the other of the nozzles as desired. When the control lever is in the center, the deflecting wings stand parallel to the sides of the conveyor and steam is admitted to both of the jets. In this position the coal is distributed evenly across the grate except in the back corners. When the control lever is pulled to its extreme backward position the deflecting wings are swung to the left and the left jet is shut off while the one on the right is wide open. In this position the coal is discharged to the left back corner of the firebox. When the control lever is thrown forward it supplies the right back corner. Intermediate positions between these extremes will place the coal at any desired location on the grate.

The stoker occupies but little room in the engine cab and in no way interferes with hand firing. The apron and the distributing wings are so arranged that they may be easily removed from the outside of the firebox and can be replaced with spare parts if necessary. These are the only parts of the apparatus that are exposed to the action of the fire. It is claimed that it is possible to fire any kind of coal with this device at any rate up to 18,000 lbs. an hour and that it readily operates with 40 lbs. steam pressure. The stoker has successfully fired a large locomotive for over fifty trips.

LARGE CAPACITY WRECKING CRANE.

Two wrecking cranes of greater capacity than any heretofore made have recently been built for the Norfolk & Western by the Industrial Works, Bay City, Mich. They were designed to meet the needs of the modern heavy equipment which has developed so rapidly during the past few years. It is only a short time since the 100-ton cranes were standard, and these were soon followed by the 120-ton cranes, which were then adequate for almost any class of work. These new cranes have a capacity of 150 tons at 17 ft. radius and almost any obstruction to traffic may be easily handled by them. They are also valuable in other work where heavy loads are to be handled, such as in modern construction work, bridge replacements, etc.

Each crane is provided with a system of telescope outriggers so that a load that would be too great a strain on the track may be distributed over a large area of the road bed. Where extreme loads are to be handled, or where the ground close to the track is not firm enough to give sufficient foundation, a special outrigger is used. This is 10 ft. long and is located in the center of the car body. It may be extended over to one side or the other about 7 ft. beyond the side of the car.

The framework of the car is 27 ft. long by 10 ft. wide, and is constructed entirely of steel and cast iron, with heavy end and longitudinal sills, all strongly reinforced and tied together. Two four wheel trucks with steel wheels are provided, with hubs of special weight to suit the large axles used. Complete air brakes, with engineer's valves, etc., are connected to each truck, and in addition a hand brake is connected to one truck. The draft rigging, attached to both ends of the car, is of extra heavy weight and the automatic couplers are of the standard type. The weight of the crane, in working condition, is about 143 tons, which weight is distributed over a wheel base of approximately 20 ft. All of the M. C. B. requirements are included in its construction. The load of the crane is distributed to the heavy cast steel bed plate through a system of rollers which operate on a path turned on the bed plate. The rollers are made of cast steel, and are arranged with equalizers to provide an equal bearing on the base plate. In addition to the equalizers a simple form of adjustment is provided for each roller.

A noteworthy feature in the operation of the crane is the air control for some of the movements. The main hoist, auxiliary hoist, boom hoist and slewing are all operated by means of air clutches controlled by valves, which gives an easy and quick means of control. The main and auxiliary hoist brakes are of the screw types and are operated by a hand wheel. They will hold the maximum loads in any position, or will lower them at a slow rate of speed. The operator's platform is so placed that the handles of the operating levers are readily accessible, and so that the operator may have a clear view of the work.

The boiler is of the vertical type, being designed for 150-lbs. pressure, supplying steam to two engines located on each side of the crane. All of the principal bearings are accessible for inspection. The crane will hoist its maximum load at the rate of 10 to 15 ft. per minute, and the boom may be raised or lowered while handling this maximum load. The operations of hoisting with either the main or auxiliary block, raising or lowering the boom and slewing may be performed independently and simultaneously with loads up to the capacity of the engines.

ELECTRIFICATION ON THE NORTH EASTERN RAILWAY, ENGLAND.—The North Eastern Railway has decided to electrify its mineral line between Shildon and Newport, near Middlesborough. This distance is 18 miles, and the total length of the track, including sidings, will be about 50 miles. A great amount of mineral traffic passes from Shildon to Newport, the average weight of the trains being more than 900 tons. It is said that ten electric freight locomotives are to be built by the company at Darlington; each of them will be capable of starting and hauling at a speed of 25 miles an hour a train weighing 1,400 tons.

150-Ton Wrecking Crane for the Norfolk & Western.

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Maintenance of Way Section.

ONE point emphasized in several of the contest papers published in this issue is the advisability of preparing for the winter during the entire preceding season. In other words, the time to begin to prepare for next winter is when the frost leaves the ground this spring rather than to wait until next October or November when labor forces will have been reduced and many odds and ends will remain to be cleaned up.

THE standard practice regarding the construction of station platforms varies widely. The actual practice regarding the maintenance of these platforms varies even more widely. With his intimate knowledge of their relative importance from the standpoint of safety, the average supervisor of structures is inclined to slight the platforms in favor of the bridges or larger buildings. However, aside from the question of personal injuries and claims, defects in the station platform are much more evident to the average person and will give rise to much more complaint than those on a bridge or more complicated structure, which most people know nothing about. On the other hand, well kept buildings and platforms will compensate for many other faults in the eyes of the traveling public, and will be reflected in more general good will towards the company.

NINE papers were received in the contest on "Winter Maintenance Methods." These papers were submitted to E. S. Koller, assistant general manager, Chicago, Burlington & Quincy, H. G. Clark, assistant to the vice-president, Chicago, Rock Island & Pacific, and H. H. Decker, engineer of maintenance, Chicago & North Western. The paper by A. M. Clough, supervisor, New York Central & Hudson River, Batavia, N. Y., was awarded first prize, and that by S. C. Tanner, master carpenter, Baltimore & Ohio, Baltimore, Md., second prize. Other papers were submitted by F. M. Patterson, assistant engineer, Chicago, Burlington & Quincy, Chicago; F. W. Fuller, roadmaster, Northern Pacific, Dilworth, Minn.; L. C. Lawton, division engineer, Atchison, Topeka & Santa Fe, Newton, Kan.; J. H. Markley, master bridges and buildings, Toledo, Peoria & Western, Peoria, Ill.; A. S. Markley, master carpenter, Chicago & Eastern Illinois, Danville, Ill.; F. A. Kell, roadmaster, Missouri Pacific, St. Louis, Mo., and Joseph J. Morgan, New York Central & Hudson River, Kingston, N. Y., all of which are published in this issue.

NEARLY two years ago we conducted a contest entitled, "How the Roadmaster Can Promote Efficiency." Since then we have received several requests for a similar contest covering the bridge, building and water service departments. We have, therefore, selected as the subject of the next contest, "Efficient Methods in the Bridge, Building and Water Service Departments." On many roads these three departments are combined. Contributions describing the organization, distribution and management of the different regular and extra gangs, special methods or kinks in the construction or repair of any structures, and in fact, all ideas tending to promote efficiency in these departments, will be acceptable. In addition to the ordinary bridge structures, this contest will include the maintenance of water tanks, pumping plants, coal chutes and other yard buildings; station buildings and platforms, and any other structures ordinarily coming under the supervision of this department. The judges will give special consideration to statements and data regarding the actual results secured by the improvement described, so that all information of this nature should be included. We will pay $25 and $15 for the best and second best papers received, and will pay for all other contributions accepted and published at our space rates. All contributions should be sent to the Civil Engineering Editor, *Railway Age Gazette*, Transportation Bldg., Chicago, and must be received before April 25.

THE adaptability of steam for melting snow and ice around switches, track pans, turntables, etc., is brought out in a number of articles on various phases of winter maintenance in this issue. The clearing of tracks by melting the snow and ice is more satisfactory than by sweeping or picking them out, although direct radiation from steam pipes is only one of the methods in use for melting them. The local conditions must, of course, be the deciding factor in the choice of methods. The use of steam for this purpose is naturally particularly applicable at points where boilers are already in use in regular service, as at track pans, turntables or yard switches, located near pumping plants or terminal powerhouses. This method may also be used to advantage when old portable boilers are available. In many cases the boilers used for hoists or concrete mixing plants during the summer, are idle all winter and could as well be used for this purpose. The installation of steam pipes for keeping switches clean is not necessarily difficult or expensive for the installation can be of a temporary character, with the pipes taken out and stored during the summer. As it is usually customary to skeleton the track at switches during the winter to secure free drainage, the only cost chargeable to the installation of the steam pipes is the labor necessary to lay and connect them. As the pipe is laid with coils or bends between the ties, there is no difficulty with expansion and contraction, and condensation can easily be handled by inserting a drip cock at the low point in the line. Installations of steam pipes at track pans and turntables may well be of more permanent character, carefully located to secure the best results and provided with steam traps to care for the condensation. In addition to the uses mentioned above, steam can frequently be used to good advantage in ordinary maintenance work in keeping concrete aggregate ready for use and maintaining sufficient heat in new concrete until it can set. The suggestion in one of the articles in this issue that coal cars and cinder cars be equipped with steam pipes for facilitating the unloading of materials from these cars in cold weather, is also worthy of consideration.

THE amount of attention now being paid to screw spikes and other details of more permanent track construction emphasizes the temporary nature of our present standard construction. The distinction between temporary and permanent railway structures is, however, only relative. We commonly call a timber bridge with a life of eight or ten years a temporary structure as compared with one of steel or concrete. On the other hand, our so-called permanent track construction has a life even shorter than that of a timber bridge, for the average life of rail and untreated ties which are still largely in the majority may be safely assumed to be seven years. As the ballast will need replenishing at least this often, it may be said that the entire track structure must be replaced every seven or eight years.

The report of the Interstate Commerce Commission for the year ended June 30, 1911, gives the cost of maintenance of way and structures as $1,550 per mile of line, or $1,040 per mile of track, including all tracks. The amounts expended for main tracks exclusive of side tracks would probably therefore be about $1,350 to $1,400 per mile. While not all of this was expended on the track, this report indicates that at least three-fourths of it, or $1,000 per mile, was. This is an annual charge for maintenance in excess of 10 per cent. of the original cost of the average track structure above the sub-grade. Such construction, requiring such a high expenditure for maintenance, cannot be accurately termed permanent. Analysis of the expenditure for

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maintenance of way and structures for the year ended June 30, 1910, which is the last year for which the complete statistics of the Interstate Commerce Commission are available, shows that 20.693 per cent. of the total operating expenses fell in this subdivision. With the exception of labor, the largest single item is that for ties, which is 3.099 per cent. of the total operating expense, or over one-sixth of the entire expenditure for maintenance of way and structures. This amount is three times that spent for rails and considerably greater than that spent for ballast, rail and all other track material combined.

It is evident, therefore, that one of the greatest fields for a study of possible economies lies in the tie, because of its great influence upon the total result. Screw spike construction is one result of this study; the steel tie is another. As with almost any new form of construction designed to decrease the annual charges, the first cost of installation is increased. This was so with the treated tie and is so with the screw spike. This, in itself is sometimes, although perhaps less frequently than formerly, the stumbling block in the way of the adoption of new types of construction. While our present track construction is the result of more than a half century of development, we are far behind European practice in our adoption of permanent construction notwithstanding the fact that the service demanded there is less severe than in this country. It would seem that the expenditures for the maintenance of our track are out of proportion to the maintenance of other structures and that, with the constantly increasing service demanded of the track, a more permanent construction is fast becoming necessary.

COMPANY VERSUS CONTRACT CONSTRUCTION WORK.

AT this time, when the construction and betterment work to be done this year has been largely decided on and plans are being prepared for its prosecution, it is well to consider the relative advantages of doing this work by contract or by company forces. This subject has been the theme of controversy for years, and there is much to be said on both sides. While the decision as to each piece of work should depend largely on local conditions, including the nature of what is to be done and the experience and character of the organization of the particular road, most of it is handled in accordance with some well defined policy of the individual railway.

The subject at once divides itself into two quite different problems—the construction of new lines, and the betterment of existing lines. The practice on most roads in new construction varies only in respect of the extent to which the work is done by contract. Some roads contract all parts of new construction from the clearing of the right of way to track laying and ballasting, and take over the line when it is ready to operate. But this is not the general practice. While the grading is usually contracted, most roads lay their own track and ballast it. Most roads also erect their own steel bridges, while many also do all their own concrete work, as the Chicago, Milwaukee & St. Paul is doing on a portion of its new line between Great Falls, Mont., and Lewistown, where about 400 men are now employed. The advantages of contract work are greatest on new extensions, in the building of which a large amount of equipment is required. The contractor is frequently justified in securing more elaborate equipment and developing a more complete organization than an individual railway, because he can count on being able to use them on different railways year after year.

With maintenance and betterment work, however, the conditions are different, and with the rapidly increasing ratio which the expenditures for this work bear to the total expenditures for improvements and construction, the tendency of the roads to do more and more of these classes of work with their own forces is becoming increasingly important. A number of large roads maintain strong organizations to do practically everything of this nature, others are securing new equipment and doing an increasing amount each year, and practically all have sufficient facilities to load ballast and do many small pieces of work which it is not practicable to contract for. The Burlington has long followed the policy of doing its own betterment work and now operates about 15 steam shovels and two large suction dredges on the lines east of the Missouri river alone, while additional steam shovels and another dredge are now being built. While perhaps few other roads have gone so far in this direction, several operate 8 or 10 steam shovels each in ballast pits and on the smaller improvement work. The Atchison, Topeka & Santa Fe requires 20 steam shovels with the necessary auxiliary equipment for this miscellaneous work alone, without attempting to do any of the heavier work. One large road has just placed an order for five steam shovels for this spring's delivery.

Two conditions not present in the construction of new lines greatly favor the handling of betterment work by company forces. One of these is the very frequent necessity of interfering to a certain extent with the operation of trains and of maintaining structures in safe condition for their passage. The other is the practical continuity of betterments from year to year. The first is the most important consideration. When improvements are being made alongside existing tracks a certain amount of interference with the main tracks and with the operation of trains may be necessary. To insure the protection of trains it then becomes requisite for the railway to have someone in charge who is thoroughly familiar with train movements and whom the company can hold directly responsible. If the work is done by contract this requires the placing of a company representative on the ground whose authority must be supreme whenever train movements are concerned, frequently leading to more or less friction with the contractor. Where more or less delay because of traffic is to be expected, the contractors are likely to base their bids on the maximum delay which may be expected, while company forces can take the delays as they come, light traffic tending to reduce the cost of the work.

With bridge work under the main tracks absolute safety of the structures at all times is essential, and several roads that are willing to contract grading along the main tracks do all of their own bridge work. The Chicago, Milwaukee & St. Paul has at the present time 2,300 men employed on work of this nature on the lines east of the Missouri river, while the Burlington has 21 concrete gangs on one division alone. Both of these roads do all bridge work along existing lines, and much on extensions, with company forces. A number of other large railways do likewise, while others, such as the Illinois Central and Lake Shore, do a large and increasing proportion of this work in the same way.

The practical continuity of betterment work from year to year, has enabled the railways to build up organizations for it. In past years the first cost of construction equipment has often prevented the adoption of a policy of handling betterments with company forces, but this obstacle is rapidly being overcome as the advantages of this practice are more generally realized, and several roads are this spring buying more of the kind of equipment mentioned than ever before. The demands upon the railways for additional facilities require a large amount of work to be done each year, and because of this pressure improvements are not subject to the variations that the building of extensions is. With construction equipment directly under its control, a railway company can adapt its program for the year more closely to the traffic conditions than would be possible with a number of individual contracts.

Besides enabling a railway to arrange a more flexible program for its season's work, the possession of this equipment is an advantage in emergencies, such as slides and washouts, the value of which it is impossible to estimate, but which nevertheless exists. Much of it is also available for other service when not required for construction. A number of roads use their construction cars for carrying coal and other revenue traffic when out of construction service, while the steam shovels are frequently used to load storage coal, etc.

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Letters to the Editor.

HAND SIGNALS FOR ENGINEERS.

WILKESBARRE, PA., February 22, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have noted the hand number signals for engineers, printed on page 351 of the *Railway Age Gazette* of February 21, and while these signals are very good, it would seem to me that there might be opportunity for several of them to be mistaken or confused when read from some distance. I give herewith a code of signals used for the same purpose by some of the engineering corps in the construction department of the Pennsylvania on

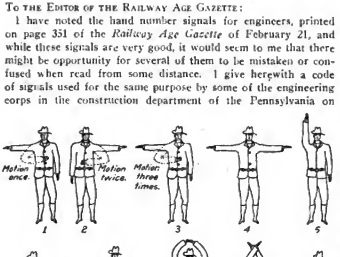


Fig. 1—Hand Number Signals Used on the Pennsylvania.

the lines east of Pittsburgh and Erie, which I think give less liability for error.

W. W. PORTSER,
Assistant Supervisor, Pennsylvania R. R.

[Another system of signals which has been used on some of the western roads with good results and with little confusion is to a certain extent a combination of the two systems. As shown

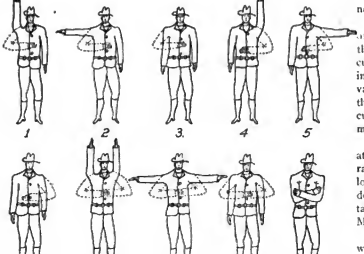


Fig. 2—Hand Signals Used on One of the Western Roads.

in Fig. 2, the right arm in the vertical, horizontal and lowered positions, indicates the first three numerals; the left arm in the same positions the next three, and both arms the following three, while the arms crossed indicate the zero.—EDITOR.]

STAKING TRACK CONNECTIONS ON ACTUAL CENTER LINES.

CHICAGO, February 25, 1913.

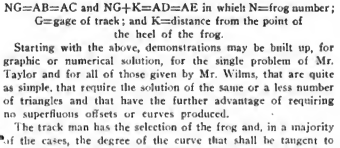
TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In the issue of January 24, 1913, there appeared an article by W. H. Wilms, entitled "Notes on Staking Out Track Connections," which was very interesting.

Early track experience convinced me that none of the then published field books, or books on track, contained either practical or correct formulas for the location of track connections. As a result I worked out independent solutions for track problems, in which the same offset method was employed which was advocated by Mr. Wilms.

There is no doubt about the correctness of the results obtained by this method, or the method outlined by J. L. Taylor, in your issue of February 21, under the title of, "A Short Method for Locating Frog Points." However, my work and the opinion of other experienced track men seem to justify the statement that the simplest and most expeditious method of solving track problems, either for office or field work, is generally to use the actual center lines and the heel of the frog, rather than an offset line and a curve produced, as in the articles mentioned above.

About 13 or 14 years ago, the importance of the basic prineiple shown in the following sketch was impressed upon me as being the key to the simplest practical and, at the same time, theoretically correct track work.



Method of Staking Out a Frog.

NG=AB=AC and NG+K=AD=AE in which N=frog number; G=gage of track; and K=distance from the point of the heel of the frog.

Starting with the above, demonstrations may be built up, for graphic or numerical solution, for the single problem of Mr. Taylor and for all of those given by Mr. Wilms, that are quite as simple, that require the solution of the same or a less number of triangles and that have the further advantage of requiring no superfluous offsets or curves produced.

The track man has the selection of the frog and, in a majority of the cases, the degree of the curve that shall be tangent to the heel of the frog. As Mr. Wilms states, the most practical curve to use is generally one of the same degree as the curve in the switch lead. A table giving the location of the frog for various angles between the principle and diverging track, so that the frog shall be tangent to a curve of the same degree as the curve in the switch lead, will be of practical value to the track man.

If the frog location, taken from such a table, did not fall at a joint, and space permitted moving the frog to avoid cutting rail, the frog may be placed at onee at the joint near the table location that will give a curve back of the frog of slightly less degree. The proposition then is a curve problem with a fixed tangent distance and central angle, and is outside the pale of Mr. Taylor's tables.

There can be no doubt that many expensive mistakes in track work are due to improperly set stakes or to insufficient understanding between the engineer and track foreman, or to both. In switch work, I have always preferred to set two stakes on the center line, one a foot ahead of the point of the switch rail, and one a foot ahead of the actual frog point. Or, in very exact work, three stakes, one a foot ahead of the point of the switch rail, and one each at the toe and heel of the frog. In such positions, the stakes stand between ties.

S. S. ROBERTS,
Division Engineer of Construction, Illinois Central.

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WINTER MAINTENANCE METHODS CONTEST.

Nine Papers Discussing Means of Meeting Problems Incident to This Season and of Preparing for Them in Advance.

FIRST PRIZE—HANDLING MAINTENANCE WORK IN WINTER.

By A. M. Clough,
Supervisor of Track, New York Central & Hudson River, Batavia, N. Y.

"Prevention is better than cure!" Many things can be guarded against in good weather to simplify and make easier the handling of tracks, switches and traffic when extreme cold weather prevails.

In the open country, where permanent snow fence cannot be maintained, properly constructed portable snow fences should be placed at the proper distance from the tops of cuts that are known to give trouble. These fences, of course, are placed on the land adjacent to the right of way, for which privilege a small rental has to be paid. Where the width of the Right of Way will permit, stationary snow fence should be built. In some cases planting trees along the top of cuts has been found efficient. Trees, however, suffer from fires in summer and have been known to be broken down and smothered with snow and ice in winter.

Rails of the proper section should be laid on their side in the flange way of all farm and highway crossings to keep the planks from being thrown out by the flanges of wheels. A little salt spread in those flange ways each day will keep them in excellent condition until the crossing can be shoveled off. The ballast should be removed from between the ties to a depth of four or five inches at all frogs, guard rails and switches, and in every case a system of drainage with a catch-basin having a grate covering at each switch in yards and a perfect system of surface drainge from all frogs and guard rails leading to them should be installed. In the open country this should also be done, the surface drainage leading to the side ditches. Salt should be used very sparingly at switches or frogs where the ground heaves as it tends to prevent heaving and when track heaves on both sides of a switch or frog at which salt has been used, high shimming is necessary, which is a very undesirable feature of winter track work. Where high shimming is necessary all shims ¼ in. and up to 1¼ in. thick should be at least 12 in. long and have holes bored for the spikes. Over this height they should be 18 in. long and 8 in. wide and in addition to the holes for the spikes, they should be secured to the ties by ten-penny nails and 8-in. track spikes should be used. Every foot of track that is known to heave at all should be carefully marked in winter and as soon as the weather will permit it should be thoroughly drained and no shimming will be necessary the following winter. The best way to keep main line tracks open in winter is to never let them get closed and this can only be accomplished by having the very best organization and equipment ready at all times, and as men are more plentiful in winter than in summer a substantial force of men should be kept working all the time, ditching, handling cinders, ties, coal, etc., to be ready for emergencies. A thorough canvass should be made of a division and a list of all men available made up and kept at division headquarters. Arrangements should be made with restaurants or commissary stores for a quick and efficient way to feed large gangs of extra men. Suitable cars for handling them should always be in readiness. Plenty of snow shovels, picks and brooms should be kept on hand ready for use and in giving them out each man should be given a check number and made to understand that he must take care of his shovel and return it before receiving his pay.

Snow-fighting equipment should be of the very best and kept at suitable places and in first-class working condition at all times. When a storm is imminent, engines and crews should be ordered immediately, and the flangers started over the most troublesome territory first. As the storm develops in severity or the snow gets deeper snow plows should be ordered out with one or two engines as the necessity arises, then as a last resort the rotaries may have to be called into service, particularly if the wind becomes high and cuts commence to fill up.

Section foremen, trainmasters and engineers should keep the roadmaster and despatchers advised of local conditions. The roadmaster should stay at his headquarters and not ride around on snow plows, etc., and should be in constant touch with the despatchers; direct the movement of his men and equipment; and augment or reduce his snow-fighting forces as the circumstances require.

By keeping the snow-fighting equipment constantly running and having enough of it, by having fresh crews and engines always ready to take the place of men tired out and engines frozen up, it is seldom that tracks will get blocked. If, however, a train gets stuck in the snow, instant measures should be taken to release it. A train with a good force of men and with a snow plow ahead should be immediately despatched to release the stalled train. The plow should be run as close up to it as possible and the men unloaded, the plow taken back and placed on the nearest siding, the engine returning to the train in the snow and the men having shoveled up to and alongside and under the cars. The cars should be uncoupled in groups small enough to be handled and pulled back. The tracks can then be cleaned and the proceeding repeated until the whole train is released. It is never wise to handle too many cars at once as draw heads will be pulled out or wheels derailed, that will greatly delay the work.

On two, three or four track lines after continued heavy snow storms, when the flangers and plows have been run frequently and the space between the tracks gets filled up, a special snow wing made to be put on a roadbed spreader should be used to remove all snow from the tracks, level with the top of the rail. In using this machine careful flagging is necessary and the assistance of the despatcher is very essential, as two tracks are always occupied while at work, but the saving in manual labor and the efficiency of the work accomplished are well worth all the extra efforts put into it.

Track water pans are perhaps the most expensive and troublesome adjunct to a trunk line of railroad in winter and make necessary heroic efforts to keep the track open and smooth in severe weather. At least one-half of the water in the pan is spilled over onto the track every time an engine scoops up the other half, and no other means has yet been devised to remove the ice from between the rails and alongside the pans but the pick and shovel when preparing the track for shimming. After removing the heaviest part of the ice, a steam hose connected to the pipes which convey the steam to warm the water in the pans, helps wonderfully to clean off the ties and make shimming the track easy. A roadbed spreader used to remove the loose ice from the adjacent tracks or from the shoulder outside the tracks can do the work of 100 men in 30 min.

Melting snow and ice from switches, which is gradually gaining favor, can only be utilized fully by having perfect drainage as before described. While yet in its experimental stage this method is found to work best in daytime, the glare of the strong light having the effect of blinding men working around it at night and has been the cause of accidents.

In yards a snow train with a large force of men should be kept constantly employed when snowfalls are frequent or continuous. After a heavy storm, all snow should be drawn away to make room for more.

SECOND PRIZE—HANDLING MAINTENANCE OF WAY WORK IN WINTER WEATHER.

By S. C. Tanner,
Master Carpenter, Baltimore & Ohio, Baltimore, Md.

The maintenance of water stations in winter is very important, as we cannot operate a railroad without them, and if they are

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frozen up they are of no use. It is only where water tanks are much exposed and in severe weather that the water in the tanks will freeze. Some years ago, however, we had a case at Oakland, which is located in the mountains, where the tank became frozen to such an extent that we had a shortage of water. With a few hours work of two men we turned the exhaust pipe from the pump down into the tank of ice and water, and in a very short time the ice was all melted and we had no further trouble. We also ran a coil of pipe into the penstock pits and used the exhaust steam to keep them thawed out. This can be done at a small expense at any place where the pump house is not too far from the tank. This plan always proves efficient and is about the only way to prevent track water pans from freezing. On account of the length of such pans live steam is required.

Our new water tanks are made frost proof, and where tank spouts are used, the outlet spouts are placed at an angle of about 45 deg. leading from the tank valve so that water will not remain in the outlet spout long enough to freeze. Our new pen-stocks are of the anti-freezing type placed in frost-proof pits. Where snow and ice accumulates on tracks adjacent to penstocks and tanks, the best method of taking care of it is by running steam lines from the pump house if not too far away. In case the pits are over 500 ft. from the pump house, salt freely sprinkled on the ice will remove it.

Success has been had in keeping snow and ice from yard switches where steam is available by placing steam pipes between switch ties below the ballast, the steam being turned on as needed, but the most convenient and effective method is the use of the snow melting device now on the market. Salt sprinkled on switches is also very effective.

To keep the line open for traffic it is best to prevent snow from drifting onto the tracks if possible. This is easily accomplished by setting up portable snow fences where snow is liable to drift. These are made of 1 in. by 6 in. chestnut, 16 ft. panels, 6 boards high and set up like a sawbuck, joining the panels together at the ends and making the fence as long as required. These fences should be placed 50 ft. from the track on the side the snow drifts form, and as many strings of fences 50 ft. apart as the local conditions may require. When tracks become covered, snow plows and flangers are about the only means we have of keeping the tracks open and these should be run over the tracks as often as the conditions require.

Concrete for bridges or other construction should not be placed in freezing weather, but when it is necessary to do so the aggregate and water should be warmed and after the concrete is in place, small camp fires built around it will prevent freezing until it sets, or if this cannot be done the concrete should be covered with building paper and that covered with warm sand or cinders.

Other bridge work can be handled in winter as well as summer, but to protect men from slipping when the structure is covered with ice, we sprinkle cinders or sand where the men are to walk to make it safe for them. Much trouble is also experienced with some of our safety crossing gates freezing up in the winter months. Proper drainage is about the only help for gates which are not of the anti-freezing type. Gates which are directly pipe connected, with the pipe placed in a larger one and run through stuffing boxes or the pneumatic type do not freeze.

Track scales are also troublesome in freezing weather, and where steam plants are available we place pipe coils in the pits and use steam to keep them thawed out. Where steam plants are not located near enough for this use, the scales are quickly thawed out with steam from yard engines used through a steam hose and applied directly to the ice.

One of the most important parts of winter work is the maintaining of water lines and water barrels for fire protection. We locate all water lines as much as possible where the frost will not reach them. This is best done by placing them in the ground below the frost line. Where risers come up into buildings, when conditions will permit, a frost-proof valve is placed at the intersection of the main line and riser, which is operated with a long stem key reaching below the frost line, the valve being properly drained. Where this cannot be done, the pipes must be well covered with frost-proof covering, and when the weather is severe and there is danger of freezing, a 3/16-in. tap made in the extreme end of the fire line and left open will cause a light movement of the water and prevent freezing.

In water barrels used for fire protection on bridges and buildings we use ½ bushel of rock salt well dissolved in each barrel of water. We also place in each barrel a box 10 in. by 10 in. x 6 in. made of cheap rough lumber, with a stick 2 in. x 2 in. for a handle placed in one corner of the box long enough to reach the top of the barrel when the box is at the bottom. The stick will prevent the barrel from bursting if the water should freeze, and at the same time provides a dipper to be used in case of fire. These dippers are of no value for any other purpose and are therefore never disturbed or removed from the fire barrels by outside parties, whereas, if fire buckets were used they would not remain in place over night. The rough box with the long handle costs less than half as much as a regular fire bucket.

THE UTILITY OF THE WINTER FORCE.

By F. W. Patterson,
Assistant Engineer, Chicago, Burlington & Quincy, Chicago, Ill.

Perhaps the best advice as to handling any but the absolutely necessary maintenance or construction work in winter is that of Punch to the young couple about to be married—"Don't." All work done during the summer season should be performed keeping in mind that period of the year when forces are reduced and weather conditions are such that the efficiency of the men is lowered.

Aside from the removal of snow and ice, perhaps the greatest amount of work to be done during freezing weather is shimming, necessitated either by low joints or by heaving. The underlying cause of both of these conditions is poor drainage and should be removed during the summer months by the use of tile. Perhaps there is no expenditure that will yield so large a return on the investment as the intelligent use of tile drainage, and while it is extensively used there are still many places where it could be employed profitably, especially on branches of light traffic, where the winter forces resemble a Central American army on a peace footing—all officers and no privates. Shimming in itself is expensive work besides containing elements of danger, increasing the liability to spreading track and broken rails.

An important item of "winter work" during the summer is the care of portable snow fences. As soon as the necessity for their use is over they should be piled carefully at some convenient place on the right of way and protected from fire by keeping all grass and rubbish cleaned away from them.

As winter approaches the ballast should be dug away from under all switch points and spring frogs nearly to the bottom of the ties so that snow and ice may be easily removed before they interfere with the moving parts of the turnout. Yard and side-tracks should be thoroughly "cleaned up" not only as a matter of safety, but also to facilitate the removal of snow.

The question of the size of the gangs for the winter is one requiring close study and is one that is particularly vexatious in that large portion of the country between the Allegheny and the Rocky mountains, and the Ohio river and the latitude of Chicago. Over this area the winters are sometimes mild enough to allow and even demand surfacing and lining almost all of the time while others are so severe that it is impossible to do such work from the first of November until March, and the winter force must confine its activities in track work to shimming and spike lining.

With such diverse conditions to be looked for it is clearly difficult to provide a fixed limit for the size of the gangs and the roadmaster and section foreman should be allowed some discretion in increasing their forces to meet emergencies, care being taken that this latitude be safeguarded against abuse. There are, perhaps, few easier ways to waste money than by maintaining section forces when weather conditions render efficient work impos-

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sible, but on the other hand there is no season in the year when the proverbial "stitch in time" will save more needlework in the future.

Increasing forces for the beginning of spring work affords as good an opportunity for saving or wasting money as does the size of the winter force. While it is most desirable to begin work at an early date, there is such a thing as getting too early a start and paying out money for work that is not done, or if done, is of no real benefit. Branches of light traffic, having either "mud track" or only a light application of ballast offer chances for real economy by taking care that forces are not increased until good work can be done. This was impressed on the writer's mind most vividly some years ago on a branch line where the usual winter section force comprised the foreman only, and where it had been customary to increase to the spring rating on March 15. In the year in question the early part of March was very wet and it would have been impossible to do efficient work, even if the gangs had been put on. Accordingly, each foreman was seen and told that while authority had been given the roadmaster to put on additional men on March 15, none would be put on until weather conditions would permit satisfactory work to be done, except in emergency cases when the foreman would be allowed to hire men temporarily, making prompt report to the roadmaster in each case. A few demurred, but after a little argument all agreed that it was a wise policy. The wet weather continued and it was almost the first of April before orders were given to put on the men. Just as the order had gone out the roadmaster of an intersecting branch line of another road was met who had a tale of woe to unfold concerning such fine weather with no men for the sections. As it was known that this road had increased its forces on the fifteenth the roadmaster was asked what had become of his men. "Oh," he replied, "we've exhausted our appropriation for this month and have to lay them off until the first of next month, and you ought to see the shape our mud track is in with the messing around they've done on it the past ten days."

The practice of doing as much winter work as possible in the summer, and of postponing spring work until spring will save money, frosted fingers and bad temper, all matters in which economy is highly commendable.

CONCRETING IN COLD WEATHER.

By A. S. Markley,

Master Carpenter, Chicago & Eastern Illinois, Danville, Ill.

In carrying on concrete work in cold weather where the work is exposed to the elements, numerous precautions must be taken. The placing of heavy tarpaulins or tents over the forms, securing them to the ground or to the floor to exclude cold air, is one means of protection. Inside the tarpaulins, which should be large enough to allow some circulation outside the forms, steam pipes from ¾ to 1½ in. in diameter should be placed with sufficient radiation to heat the interior. An ordinary vertical boiler of sufficient capacity to supply steam for heating both the enclosure and the water used in the concrete is necessary.

Water is best held in barrels in which live steam is run to maintain the proper temperature. Steam can also be utilized for heating the stone, sand, or gravel by piling these materials over pipes properly trapped at the outlet through which live steam passes. Another way of heating the materials is to secure a cylinder 12 in. to 18 in. in diameter made of No. 8 iron 12 ft. to 20 ft. long and open at both ends, in which a wood fire is kindled. Material piled over this will be heated and the frost excluded. With this arrangement, however, a night man is necessary to maintain the fires and to have material ready for the workmen on their arrival in the morning.

Where the concrete is submerged in water, forms should be properly built and allowed to fill with water. The concrete can then be deposited under water through an 8-in. tube made of galvanized iron with a hopper at the top sufficiently large to receive the mixture from wheelbarrows. The lower end should be kept sealed on the bottom and as fast as the pipe is filled with concrete it should be raised sufficiently to allow the material to escape at the bottom. A very uniform concrete can be made in this way, as where there is no fluctuation of the temperature the concrete sets uniformly. In addition, as it is submerged, all voids are filled in without the necessity of tamping or spading.

WINTER MAINTENANCE OF WATER STATIONS.

By J. H. Markley,

Master Bridges and Buildings, Toledo, Peoria & Western, Peoria, Ill.

Last winter was a very severe one on the water service branch of the maintenance of way department in this locality, and I am proud to say that not one locomotive pulled up to a tank on this road, but what secured water without delay, except in one case and this was at an isolated tank very seldom used, and which is fed by a spring. When the winter set in, as it did, very severe, I notified all pumpers to be on the alert, and when conditions were such that they could not properly handle them to let me know and I would send relief. Every man realized the situation and exercised an added interest in his charge, and every one of them mastered the work in hand successfully. Their highest aim was that no failure should take place and this interest brought them success.

Experience has taught us some priceless lessons on the care of water tanks during severely cold weather. The practice used to be to wait until it became very cold and then start out with a car load of sawdust and rough lumber to box up the gooseknecks and the discharge pipes of the tanks, and fill the boxes with sawdust. This did some good, but it was not a perfect success.

We use no sawdust now and where we have no return pipes from the tanks which must stand full of water, we use no protection whatever. The discharge pipe runs up through the center of the tank to a point above the water line, when the tank is full, and is drained as soon as the pump is shut down. We drain these pipes whether they are boxed in or not.

When tanks are connected to stand pipes or any return pipes that must stand full of water, we box up around the four center posts, by first setting up 2 in. by 4 in. studding, faced with the out side of the post. On the out side of these timbers is laid a very heavy tar paper, then drop-siding. The paper keeps the wind from coming in contact with the pipe. On the inside of the studding is a lining of No. 2 flooring. This forms the first and important dead-air space. After the return pipes are installed they are boxed in also. This makes three dead-air spaces, and so far has proved a success. The door to this inclosure is made similar to those on refrigerator cars, including its fastening.

At two points on our line where we got our water supply from ponds or creeks, we have trouble during extreme and continuous cold weather with ice forming on the bottom and around the inside of the staves. At one of these points where we have a gasoline pump we installed a small 24 in. by 60 in. steam boiler in the pump house and laid a ½-in. pipe from the boiler into the tank to thaw the ice with steam. In the spring the pipe is taken down and stored in the pump house. At another point where we have a steam pump, we laid a ¾-in. pipe alongside the discharge pipe, extending about 2 ft. above the ground under the tank. When necessary a pipe can be connected to it and used with the same result as explained in the former case.

Another very important feature in connection with tanks during cold weather is the outlet valve. We are using the stopper valve, which I think is the very best. It sets up 12 in. from the bottom of the tank and the seats are made of the best grade of harness leather. These valves have always proved reliable in the extreme cold weather.

SOME METHODS OF HANDLING SNOW AND ICE.

By F. W. Fuller,

Roadmaster, Northern Pacific, Dilworth, Minn.

We plan for and usually get six months of winter up here, and the snow when not falling is being blown around. We begin to prepare for this in September by seeing that all grass on the right of way is burned and all weeds mowed. The next thing is to place the portable snow fence so as to protect all small cuts,

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and see that all large cuts are protected in like manner or by a six-foot permanent fence, built from 100 to 300 ft. from the track. All switches and sidings are protected in like manner.

Keeping switches in service is no small matter in so cold a climate, as we find the use of salt in zero weather does more harm than good. It starts the snow to melting, which then freezes hard. Cleaning switches by digging the dirt all out down to the bottom of the tie in the fall gives some room for loose snow. Then we leave at each switch a broom, an old No. 2 shovel and a chisel made from an old file, which is sharpened at one end and fitted to an old ferrule from scuffle hoe or fork, so that it will slip onto the broom handle. This can be used to clean ice from the switch point, and will save many calls on the section forces at night as the train crew can clean a switch so as to get through safely.

In cleaning around stations we find the use of a team and a snow scraper such as is used to haul the snow off the ice by ice cutting gangs, a very convenient and cheap tool, taking the place of fully a dozen men with snow shovels. We also use the Jordan spreader in cleaning up the passing tracks and yards, using it on snow in the same manner it is used on ballast. Of course, we keep the necessary wedge, Russel and rotary plows in good shape and in use when necessary. All engines are equipped with air flangers, forward of the pony trucks, operated by the engineer as needed.

WINTER TRACK WORK.

By L. C. LAWTON,

Division Engineer, Atchison, Topeka & Santa Fe, Newton, Kan.

We have found that much of the track work usually done in winter can be done to much better advantage in the fall, both as to cost and standard of track. This is especially true on the many western branch lines with little or no ballast, but will apply to main lines as well. Last winter we had a record amount of snow, with heavy winds which filled cuts time and again. Our cuts were 20 or 22 ft. wide, but snow was so packed in the space between slope and track that melting snow could not be drained, and as a result during several thaws, the track was flooded. To avoid this, the cuts were re-tied early last summer so that the roadbed would be as compact as possible by winter. In several places holes caused by sinking of ballast, which held water under the track, were sub-drained. A thorough campaign was then made over the division and a spirited contest aroused between roadmasters as to who would have the best drained cuts. Cuts were widened to full section, either with team or train, and ditches made as low as possible, always making the inside slope of the ditch start from the ends of ties. The grade of the ditch was also increased as much as possible.

Another protection to those cuts which gave the most trouble last year was an increase in snow fences, built in a more scientific method. Those built within 50 ft. of the track were made tight and close to the ground, and placed to best advantage on waste banks to get the largest possible drift of snow behind them. In a few places two lines of fence were built where cuts were deepest. This has reduced our snow bucking to a minimum, and the snow left in the cuts has drained freely with no injury to the tracks so far this year. This is partly brought about by section men cutting a trench through drifts a foot or so outside the ends of ties. Unless we have an unusually wet spring, we are quitting the winter at least two months ahead of our usual schedule in track work. The great saving, however, comes in having safe track for operation of our trains. We have added to the efficiency of our trains and rolling stock by doing away with slow orders and added not a little to the safety of all employees.

WINTER CONDITIONS AND THEIR REMEDIES.

By JOS. J. MORGAN,

New York Central & Hudson River, Kingston, N. Y.

Probably no more serious conditions are encountered as the result of blizzards, than those existing in large yards at terminals, etc. In order to clear certain main tracks of snow it is often necessary to block other less important tracks in the yard, which in turn have to be cleared. Why not take care of this snow in the first place? After the main tracks have been cleared with snow plow, a gang of men can follow up the plow, loading the snow on cars and dumping it at some safe point. The advantages of this method are numerous. Warm days frequently occur during the winter when the snow which is piled between tracks (an unsafe practice in itself), melts, the water running around the switches and freezing during the night, resulting in much annoyance, delay and the expense for its removal.

It is a well-known fact that rail breakages are numerous during the winter season, especially after sudden cold periods. Everything is being done to minimize these breakages; but, it seems at present that rails will break under these conditions notwithstanding the closest study. Therefore additional attention should be expended in looking out for such breaks by placing extra trackwalkers on each section, so as to admit of more frequent and careful examination of all rails in main tracks, thus insuring "safety," the watchword of the present day.

The changing of seasons seems to be occasionally overlooked by the foremen, in that they allow their stock of winter necessities to remain very low, if not entirely exhausted, until the time arrives when such items are actually needed for use. In order to insure the prompt handling of the difficulties which subsequently arise as a result of cold weather, it would be well for supervisors to issue a "reminder" to their foremen some time prior to December 21, calling their attention to the necessity of having an adequate supply of snow shovels, snow brooms, track shims, etc., on hand, so as to be prepared for such conditions.

The winter season can be handled just as expeditiously and profitably as any other season if there exists: First—An absolute preparedness to cope with the conditions incident thereto. Second—An unflinching carefulness on the part of all concerned. Third—A considerable amount of special attention given to rails and fastenings in main tracks, which are liable to be affected by winter conditions.

WINTER TRACK WORK.

By F. A. KELL,

Roadmaster, Missouri Pacific, St. Louis, Mo.

To make the handling of maintenance work economical during the winter, the track must be so handled during the summer months that at the beginning of the winter it will be in as near a perfect condition as possible. All ties actually needing renewing during the year should be renewed before winter. All tracks should be surfaced and lined and the ballast properly dressed. All ditches should be cleaned out to the standard width and uniform depth so that the water will quickly drain from the roadbed.

The old leaves, grass and other rubbish should be cleaned from the ends of all culverts, sluice drains or sewer pipes so they will not become clogged up and cause an undue amount of rain or snow water to stand in pools and soften the roadbed. After a heavy fall of snow, or especially when snow commences to thaw, where practicable, a ditch one or two shovels widths wide should be cut through the snow in the ditches so that the water from the snow melting will run off and not stand in the ditch or the roadbed. A few dollars spent in this way at the proper time may keep a soft spot from forming in the roadbed which would cost a great deal more to remove, to say nothing of slow orders that might be required to properly protect trains over this soft spot, and possible wrecks. Good drainage is the chief factor in economical maintenance of track. A good, live, energetic foreman will not neglect the drainage of his track at any time of the year, especially in winter weather.

After the track has been put in first-class condition by well organized gangs during the summer, the forces should be reduced as much as practicable, taking into consideration importance of track, amount and kind of traffic, and climate. All track and frog bolts should be inspected once a month throughout the year and the loose bolts tightened. This is far more important work than some seem to think and requires the special attention of the

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section foreman to see that this is properly done and especially in the winter when it is freezing and thawing and joint ties have a tendency to churn if the ballast is not properly taken care of. A foreman that takes the proper interest in his work can tell at a glance if the bolt is loose or not, and if not loose it should not be touched, for if he tries to make it tighter he will probably strain or break the bolt, causing unneeessary labor and waste of material.

If track bolts are allowed to become loose and remain so, it will not be long until the angle bar and both ends of the rail where angle bars and rails come in contact with each other will begin to wear, and in order to make a good joint new angle bars and all new bolts will be required. This means a heavy expense, also damage to roadbed and additional cost for raising low joints and surfacing track, when a small per cent. of the total amount spent at the right time for keeping all bolts tight would save angle bars, rail, ballast, and labor. In yards and terminals, the tightening track and frog bolts should not, under any circumstances, be neglected.

During the winter as in all other seasons, yard and terminal tracks should be kept clean of all dirt and trash. In busy terminals, especially in the freight yards and lead tracks, there is a great amount of dirt and rubbish which falls from cars during switching. This is more economically cleaned up by regular yard cleaners who are assigned a certain territory with suitable shovel and wheelbarrow. If possible, in large yards there should be short spur tracks built at several points in the yards if there is no other track that could be used for this purpose on which to keep dump coal cars so that yard cleaners can wheel cleanings to these cars and load them. By doing this, unsightly piles of dirt in the yard are avoided and tracks are always kept clean without the extra expense for work train in loading this dirt.

The accumulation of dirt in large terminals stops up drains and water ways and when sand and dirt get under the rails they cause the rails to cut down in the ties faster than when kept clean.

During the winter months when there is not too much frost in the ties, on all track that is getting out of gage or rails turning, the ties should be properly adzed and old spike holes plugged and track put to good gage. This will save a great amount of labor when renewing ties the following year if ties do not have to be renewed out of face which would not seem practical except under certain conditions.

At the commencement of winter all switches should be gone over and the dirt properly cleaned from around switch rods and under switch points between the ties. Good judgment should be used in this, as I have noticed some men clean the dirt out very near the bottom of ties, leaving a large deep hole for water to stand in, or some switchman to step in; also requiring unnecessary labor to remove this dirt and haul it away.

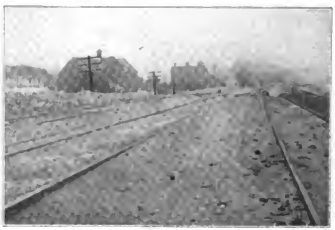
The handling of maintenance work during the winter months makes necessary a reorganization of forces which must be handled with diplomacy if the proper results are acquired. As the forces are reduced, foremen are too apt to get the impression that they have not enough men to do much work and do not make any effort to show an improvement, but simply put in the time some way until the next spring when they will get more help. Any improvement made, no matter how small, will show in the next year's work and if there is no improvement there is a tendency to go backward.

GENERAL COMMITTEE MEETING, ROADMASTERS' ASSOCIATION.

At a general committee meeting of the Roadmasters' and Maintenance of Way Association, held in Chicago on February 15, 63 roadmasters from 22 different railways were in attendance. The meeting was called for the purpose of discussing economical maintenance methods outlined in the work of the various committees of the association for the coming year. The large attendance at this meeting indicates the widespread interest of the members in the work of the association this year.

HEATING THE EMBANKMENT ALONG TRACK PANS.

One of the most serious maintenance problems encountered on roads using track pans at water stations is the removal of ice which collects in large quantities between the tracks because of the large quantities of water thrown from the pans by engines taking water when running at high speeds. To eliminate this trouble by preventing the formation of the ice, a steam heating



Ice on Departing End of Track Pans.

system between the tracks has been installed at Dola, O., and Davis, Ind., on the western division of the northwest system of the Pennsylvania lines. At these points two lines of 3 in. pipe are laid about 3 ft. 10 in. apart and about 21 in. below the top of the ballast between the tracks in which the track pans are constructed. One inch oak boards are placed under and on top of the pipes, which are then covered with ordinary stone ballast. These lines are crossed at intervals of about 300 ft. in concrete pits where condensation traps and swing joint expansion con-

End of Track Pans, Showing Steam Pipes.

nections are provided. The pipes are also anchored at intervals of about 300 ft. midway between the expansion pits. The lines of pipe are carried about 35 ft. beyond the ends of the track pans to dead ends with valves for the exhaust of air.

The two lines of pipe are supplied with exhaust steam at about 25 lbs. pressure from a 6 in. line leading from the power house to a point midway between the ends of the track pans. An arrangement is provided enabling live steam to be supplied at a greater pressure if necessary.

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It has been found that these pipes effect an important saving in the labor otherwise required to remove the ice from around the track pans. It has also been found that this arrangement can be improved by extending the heating pipes about 150 ft. beyond the ends of the pans. As now installed, this system does not entirely eliminate the collection of ice along the outside of the rails, but it is expected that this situation will be improved by laying a system of hot water pipes along the outside of the rails within the limits of the track pans, crossing it under the rails at the ends and then extending it alongside the rails about 150 ft. at the leaving ends of the track pans, this arrangement being only temporary and to be removed during the summer. At both of these stations there are sidings beside the track pans and it is proposed to construct similar heating arrangements between the main tracks and sidings.

We are indebted to Guy Scott, division engineer of the Western division, for this information.

SNOW REMOVAL BY STEAM RADIATION.

By J. W. FOOTE,
Division Engineer, Erie, Salamanca, N. Y.

Of the various kinds of snow and ice removal by heat, that by steam radiation is probably the most efficient. At a terminal where steam is avilable this system is particularly effective and economical and it is included in the standard practice of the Erie where it is giving good results. The simplicity of the arrangement commends itself. It consists of two 1 in. pipes, joined together by a return bend, placed between the switch ties, in a series consisting of four to six return coils for each switch. Each switch installation is connected with a main lead pipe which varies in diameter from one inch, for four to eight switches, to two inches, for nine to fifteen switches, not more than fifteen installations being connected in series. Each switch installation is equipped with a ¾ in. steam trap at its lowest point so that the condensed steam drains off automatically. The ballast is first removed at the locations of the installation to a depth of three or four inches below the base of rail and the ends of the steam pipes are supported above the roadbed upon wooden blocks. The steam pipes are not perforated but perform their function by direct radiation. The lead pipe is covered and is above the ground.

Once the plant is installed it is a simple matter to remove the pipes at the close of the winter and store them for the following year, when they may be set up very quickly at a nominal expenditure. Where this arrangement is in place, no attention need be paid to the points, provided the steam pressure is ample. The snow is melted as it falls and the points are kept perfectly dry and free from snow and ice. This scheme, of course, is applicable where team is already available and at points where it would pay on account of a large number of switches to install a power plant. However, as a general thing the outlying switches on most railways are so few in number on main line sections that the usual winter force can adequately take care of them by hand, and in fact can find no other work to do in time of snow.

This same principle is applied by many railways to keep the pit rails and the centers of turntables free from snow troubles. A single steam pipe line equipped with a trap will keep the pit rail perfectly clear of snow at all times, and a series of pipes laid in circles around the center does similar service there. At a busy terminal the advantage of a free turning table is too apparent to require any explanation of its help to keep traffic moving.

Another cause of the high cost of winter operation is the unloading of cars of frozen material, such as coal, cinders and sand. Railways engaged in the unloading of coal in large quantities maintain systems of coal steaming. In some cases perforated steam pipes with pointed ends are driven into the coal and the escaping steam drives out the frost. This results in a great loss of the energy of the steam and at the same time is expensive. In other cases large steaming houses are provided. These houses are lined with sheets of galvanized or lohmanized iron, and provide room for steaming eight or more cars at a time. This system depends on air heated to a high temperature by coils of steam pipe thawing out the coal and in time of severe weather several hours are required to secure the desired result at a high cost and loss of time in unloading and in switching in congested territory. It would seem feasible to equip cars engaged in this service with steam coils and secure the radiation of the steam pipes directly upon the frozen matérial. These cars could be placed upon a steam line and thawed dry in a short time, eliminating the present heavy maintenance cost of buildings and the loss of time. Of course, this would mean a large first cost, but if it were made a part of the standard equipment it should fully repay the first cost. In any event, cars assigned to cinder service could be so equipped.

WATER REQUIRED BY A LARGE RAILWAY SYSTEM.

A paper was presented before the annual meeting of the Illinois Water Supply Association at Champaign, Ill., on March 11, by C. R. Knowles, general foreman of water works, Illinois Central, from which the following abstract is taken:

The consumption of water by railway systems has greatly increased, and it has been necessary to raise the standard of the supply both in quantity and quality to meet traffic conditions. In former years it was the practice to erect a tank and establish a water station at any point where water of any kind was most convenient, with little regard to the quality or future requirements. This has necessitated many changes to meet the new conditions and added requirements, such as relocating water stations with due regard to curvature, grades and the many previously unknown expedients of operation.

To accomplish these results it is often necessary to pipe water a considerable distance, or if an ample supply is not otherwise available, to sink wells or construct a reservoir impounding a storage supply. In the event that the available supply is not satisfactory in quality, it is often necessary to erect treating plants to convert it into a suitable water for locomotive purposes. All these changing conditions and increasing requirements have made it necessary to maintain a water works department organization whose duties are similar to those of a city water works department.

The amount of water required for all purposes by one railroad 6,500 miles long is approximately 16,500,000,000 gal. annually. In the state of Illinois on 2,000 miles of road, 4,236,838,000 gal. of water was used for locomotives alone, of which 1,751,790,000 gal. is purchased from municipal and privately owned water works plants and 138,645,000 gal. is treated by purifying plants owned by the railroad. It is necessary to maintain 123 water stations to distribute this water to locomotives. In addition to the above, the washing and filling of locomotive boilers at terminals requires approximately 950,000,000 gal. per annum, which is provided by the same pumping plants with additional facilities for maintaining the desired pressure for washing the boilers and the necessary pipe line for the distribution of this water under pressure.

Stationary power plants also require approximately 300,000,000 gal. per annum, including water used for condensing engines, of which 125,000,000 gal. is city water. It is estimated that 250,000,000 gal. additional is required for miscellaneous purposes at shops, roundhouses, offices and stations. This makes a grand total of 5,736,838,000 gal. of water used for all purposes by this one road in Illinois alone.

NEW LINE FOR ECUADOR.—Plans and specifications will be received up to March 20 at the Dirección de Obras Públicas, Quito, for construction of a railway between Puerto Bolivar and a navigable point on the river Zamora, with the object of opening up the districts of Zaruma and Loja.

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EARLY TRACK WORK.*

By Engineer.

The coming season is likely to be one in which it will be hard to obtain men for manual labor. The wars in Mexico and Europe are likely to cause a scarcity of immigration of laborers from Mexico, Italy, Austria, Greece and all Southern Europe, from which localities the greatest number of our laboring men have been coming in recent years. It is reported that an Austrian government edict forbids any male citizen between the ages of 18 and 40 to leave any Mediterranean port during 1913 or until the edict is removed. In Italy, the newspapers are attacking laws on the rights of aliens passed by a number of states to try and discourage emigration to this country. Emigration from both Italy and Austria was unusually low for the month of February, when it is normally very high. A larger number of these nationalities than usual returned to their native lands last year, so that the indications are that men will be few and scarce. Consequently, railroads which employ and get their laboring forces on the ground at the earliest date possible will have a very great advantage over the other roads in getting their work completed.

Under usual weather conditions the coming month of April is the proper month to begin track work throughout the northern states, and it can not be too strongly emphasized that forces should be organized and started to work at the very earliest opportunity. This not only gets the work under way in the proper season, but gives the roads first on the ground the advantage of getting the best men and the gangs that are best suited for the different kinds of work. The gangs for rail laying and heavier work should as far as possible be men of larger size and greater physical strength; men from northern Europe, negroes or hobos.

All of the nationalities of Southern Europe furnish gangs which are good track men and also gangs which are poor track men. Their quality depends to a large extent upon the interpreter and foreman; also there is the usual difference arising because men of the same "calibre" and same class in life seem to congregate.

The local laborer is by far the best of all, and the earlier in the season the work is started the more likelihood there is of being able to obtain local men to fill out the ordinary section and bridge gangs, and when these men are once employed they are much more likely to stay with the company throughout the season. The railroads are not likely to obtain them at all if they wait until later in the season.

The railroads have apparently planned on much new work for the coming season and on account of the scarcity of labor, wages are likely to be high, and this without increasing the supply very materially. Indeed, some of the roads have already begun to raise wages in order to offer a little more than their competitors.

It is a wise policy to arrange for more comfortable and sanitary camps than is customary in order to retain the forces which are hired. All men are human and even the poorest laborer prefers a clean place to sleep and clean, wholesome food to eat. Bunk cars and all boarding cars should be properly made and equipped for the season's work. Screens should be prepared so that at the proper time they can be used, and cars should be furnished in perfect sanitary condition in such numbers that the laborers will not be crowded.

As soon as the frost begins to go out of the ground the section men should as rapidly as possible take out all the shims and surface up the low spots so as to get the track in good surface and well drained. Extra gangs should be started laying rail, putting in ties and ballasting. This naturally pre-supposes that rail has been shipped and that the ties are on the ground or on the way, and that the ballast pits are open and ready for the steam shovel. If the rail is not on the ground it is time to get after it and hurry it all possible. It is also time to have the ties distributed, and efforts should be made to get them delivered as soon as possible.

The section men should clean up around the depots, open all ditches, clean up the right of way, look after the road crossings, cattle guards and fences, straighten up signs that have sagged as the frost has gone out of the ground, and get everything in neat shape and ready for spring track work so that they can give the latter their undivided attention until completed.

Where construction work is to be done, it is time to get the teams started, steam shovels under way, which will require a release of equipment which may have been in coal or other service and which can now comfortably be released from that service and repaired, equipped and put into the construction work. Where dredge work is to be done preparations should be made so that as soon as the ice is gone from the water where the dredge is to operate it can be put into operation.

Concrete gangs should be equipped and located on the ground and material for them should be looked after so that work can go ahead which may not have been economical in the winter on account of its location or on account of the severity of the weather. However, this class of work can often be carried on to advantage throughout the year. Bridge repairs should be pushed and all pile bridges and culverts should be fixed in good repair with as little delay as possible, and the pile drivers should begin operations so that they may finish their allotted work.

Material which has been ordered should have begun to come before this, and if not it should be looked up and hurried. Any additional material needed should be ordered without delay. Tools should have been properly repaired, but if this has not yet been done they should be put in shape at once for the season's work. There is a great loss of labor if tools and materials are not on hand when they are ready to be used. This loss is very apparent to the men in charge of the labor and they should give the supply department all assistance possible in getting material on the ground by ordering promptly so that there will be no delay on account of insufficient notice.

On the other hand there is a loss of capital invested if the supply of material on hand is too large and much material will deteriorate if held too long before being used. Consequently, the most perfect arrangement for handling material is to have it delivered just as it is to be used, and the nearer this stage is reached the cheaper work can be done. As this can not be perfectly accomplished and the promptness of delivery depends to a large extent upon the assistance given the supply department by the operating and construction departments, it behooves the superintendent, the roadmaster, the supervisor, the master carpenter, the engineers and all foremen, to find out what material they need, see that it is ordered and find out if it is coming on time, and if not, get after it.

As April is the time for beginning farm work, so it is also the time for beginning railroad work throughout a large portion of the country. A good start in the month of April by the track men, the bridge men, the section men, the signal men and, in fact, all maintenance and construction men will get the season's work well under way, and will insure getting it through on time.

About two years ago one of our large systems decided to begin work early in the season, and in 1911 had over 8,000 maintenance men at work in April, which number was increased to 10,000 in May. The results were good and in 1912 they put over 10,000 at work in April and increased this to over 12,000 in May. The results were excellent, for by the first of June a very large part of the rail laying, tie renewals and ballasting were completed, allowing work in the hot summer months to be slacked up and the work to be kept well in hand throughout the season at much reduced expense. This year will probably see as good or better advancement of the work on this system. April is the month for beginning, and a good beginning is half the battle. One day's work in April or May is worth two in July or August.

*The second of a series of articles on this subject. The first appeared on page 351 of the issue of February 21.

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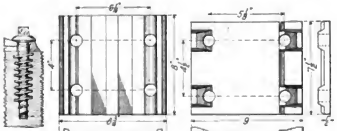
DEVELOPMENT IN THE USE OF SCREW SPIKES.

This Type of More Permanent Track Construction Now Used on 730 Miles of Track. Nearly 200 Miles Installed Last Year.

No problem connected with the maintenance of track, with the possible exception of that of securing sound rails, is receiving so much attention from railway men at the present time as that of the future tie supply. The number of ties required annually is so large and constitutes such a drain upon the timber resources of the country that it is evident that something must be done in the near future to alter conditions. Either the demand for tie timber must be reduced or a substitute for tim-

Screw Spike Track on the Lackawanna.

ber must be found. Much attention is being given to both solutions and definite progress has been made in each. Many designs of steel, concrete and composite ties have been made, and in some instances with good indications of success. However, greater attention has been given to the development of methods for securing a greater life from wood ties, in this way reducing the demand for timber, for it is evident that if the



Harriman Lines Standard 90-lb. Screw Spike Tie Plate and Screw Spike with Helical Screw.

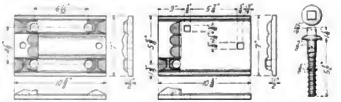
Atchison, Topeka & Santa Fe Standard 90-lb. Screw Spike Tie Plate.

average life of the tie can be increased, the number required for renewal will be correspondingly reduced.

DESTRUCTIVE AGENTS.

A tie is subject to destructive action by decay and by mechanical wear. The former is retarded by treating the timber. Although a comparatively new industry, timber preservation is being extended very rapidly, until it is probable that within a few years most of the ties in track will be treated by some process. Over 75 per cent. of the ties now in track on the Santa Fe are treated, this road being a pioneer in this work and probably having a larger proportion of treated ties than any other large system in the country. However, other roads, such as the Union Pacific, Southern Pacific, Illinois Central, Burlington, Lackawanna and Rock Island also have large numbers of treated ties in service.

The total number of ties purchased in 1910, the latest year for which records are available, as reported by the United States Department of Commerce and Labor, was 148,231,000, of



Intermediate Joint, D. L. & W. Standard 101-lb. Screw Spike Tie Plate and Screw Spike.

which 30,544,000, or 21 per cent., were treated. This represents an increase of nearly 7,000,000 in the number of treated ties bought over 1908, the previous high year. At least seven or eight new treating plants are under construction, and as many more have been completed within the past year, so that this increase bids fair to be sustained. This large proportion of treated ties is already exerting an important effect on the tie consumption as is shown by the requirements for maintenance purposes

Ratchet Wrench for Driving Spikes.

on the Santa Fe for this year, which are decreased by 600,000 ties as compared with previous years. This is attributed to the increased life of treated ties, which have now been in the track sufficiently long for the effect to be evident.

As the life of the ties has increased with treatment, the proportion removed from the track because of mechanical wear has increased. This mechanical wear very largely arises from two causes; rail cutting and spike killing. To strengthen the tie

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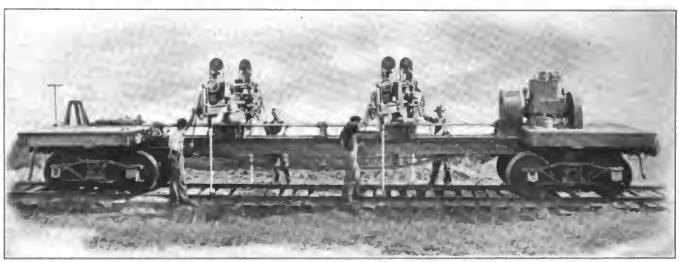
against the former action, tie plates are being used in largely increased numbers, while the size of the plates themselves has been increased to distribute the loads over the ties without cutting into them. This has been largely successful, but it has not been possible to make the plate as closely an integral part of the tie as is desired and the movement of the plate on the tie is frequently the cause of damage to it.

Spike-killing is a source of injury to the tie which becomes more serious as the life of the tie is increased. Tie plugs are generally used to reduce the injury as much as possible, but they are a partial remedy rather than a preventative. At best, spikes must be re-driven when rail is relaid, which occurs on an average of every seven or eight years on main lines. Re-gaging of the track, spacing of ties in connection with ballasting, etc., also greatly increase this spike killing. In this way the mechanical life of the tie is in many cases the governing condition and a number of roads are only injecting sufficient preservative into the timber to give it a protection against decay equal to the mechanical life. As this mechanical life is increased, heavier treatments can be given.

The screw spike is considered by many men to offer the most practical means for increasing the mechanical life of ties. It is effective in greatly decreasing the movement and consequent wear between the rail, tie and tie plate, and at the same time it largely eliminates the spike killing of the tie. The driving of a common spike is very destructive to the wood fiber, cutting and distorting it greatly. Also, after being driven, the spike does not possess a sufficient grip upon the wood to prevent loosening under the movement of the rail. After it has been driven down a few times the timber loses its grip and it becomes necessary to draw the spike and redrive it in another hole. On the other hand, when a screw spike is driven into a previously bored hole the destruction of the wood fiber is practically limited to that occasioned by the thrust of the screw threads. The grip upon the wood and the resistance to pulling are greatly increased by the greater surface exposed to contact. Tests conducted by the Bureau of Forestry at Purdue University several years ago showed that the ratio of the resistance of screw spikes to common spikes varied from 1.87 in white oak to 4.63 in longleaf pine. More thorough and exhaustive tests which are now being conducted by one of the prominent railways, tend to bear out these same conclusions.

When once properly driven, the screw spike does not loosen readily and retains its grip upon the rail for a long time. Cut spikes retard rail creeping only for a short time after being driven, while screw spikes remain tight and in this way greatly reduce the wear of the tie, tie plate and rail upon each other, retard creeping and eliminate noisy track. Equally important with the resistance to vertical pulling is the resistance of the screw spikes to lateral thrust. With its intimate contact with the wood fiber as well as its greater and more irregular cross section, the screw spike offers greater resistance here also. With the rapidly increasing proportion of soft wood ties, this additional resistance to wear is becoming more essential for from their nature these softer woods are more susceptible to treatment and if they can be protected from mechanical injury, a comparatively long life can be secured.

When discussing any type of more rigid-track construction, a strong difference of opinion always arises among engineers as to the point to which this rigidity and unity of motion of the rail and ties should be carried. With the common cut spike construction, the rail, tie plate and tie are all free to move more or less upon each other. With the screw spike driven down tight against the rail, nearly all this play is eliminated and the three act as a unit, greatly arresting the motion of the individual parts and thereby reducing the wear upon them. Some men do not consider it advisable to arrest this movement too closely, believing it introduces undue strains in the track structure, and even suggest that where screw spikes are used they be left with the head perhaps a quarter of an inch above the base of the rail so that a slight vertical movement of the rail will be possible without lifting the tie from its bed. In contrast with this, other engineers claim that one advantage of the screw spike is the self tamping effect which gradually brings the tie to an even, permanent bearing.



Large Greenlee Spike Driving Car.

DEVELOPMENT OF THE SCREW SPIKE.

The screw spike has only come into use in this country to any extent within the past few years, but recent installations have been of sufficient magnitude to justify its serious consideration. Over 730 miles of screw spike track is now in service on 14 railways in this country, which, however, is less than in Europe where this type of construction has been used for over 50 years. The French railways were among the first to experiment with the screw spike, its use on that system beginning about 1860. They rapidly adopted it as standard, and a number of French roads have used it exclusively for the last 30 years. While the German, Austrian and Belgian railways did not favor it for some time, they have also come to use the screw spike to a large degree, and since April 1, 1899, the Prussian railways have used them exclusively for maintenance as well as new construction. The British railways, however, with the exception of the London & North Western, use iron and steel spikes without points with trenails, driving them into previously bored holes. On the London & North Western, screw spikes are used.

The Atchison, Topeka & Santa Fe was a pioneer in the use of screw spikes in the United States, having about 120

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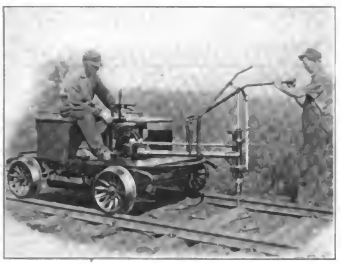
miles of screw spike track in service at the beginning of 1912. The first screw spikes on this road were inserted in 1905, 3,000 being placed in track at Rothville, Mo., nearly all of which have since been removed because of the decay of the ties. In 1908 about a half mile of screw spike track was laid in the main line a short distance east of Topeka, Kan., and in the same year 7,000 screw spikes were placed at Wyaconda, Mo. The first large installation was made late in 1910, when 55 miles of screw spike track was laid in the main line between Hutchinson and Kinsley in southwestern Kansas. The eastern 21 miles of this installation were equipped solidly with screw spikes, the ties being renewed out of face at the same time, while on the remaining 34 miles, screw spikes were placed in



Small Greenlee Spike Driving Car with Single Spindle.

all new ties, which were about 60 per cent. of the total. This single track line carries nearly all the heavy transcontinental freight traffic and most of the through passenger business. The following year, about 60 miles of new second track was laid in Arizona with screw spikes beside the old track which was equipped with common cut spikes, affording an opportunity for a good comparison of results under similar traffic and climatic conditions. Owing to the desire to observe the results secured from this large mileage already in, no further installation was made during the past year.

While starting somewhat later than the Santa Fe, the Delaware, Lackawanna & Western has gone into the use of screw spikes to a greater extent than any other road and has made them standard for all main line construction. During the past two years, this road has used screw spikes exclusively for all new construction and for maintenance purposes on main lines, inserting them in all new ties placed in main tracks. The Hopatcong cut-off, which was completed a year ago, was laid entirely with screw spikes, this cut-off being 28 miles long and built for two tracks with 13.5 miles of screw spikes in side tracks. At the end of 1912 over 4,000,000 screw spikes were in main track on this road, equivalent to over 330 miles of continuous track. All slip, movable point and simple switches within the limits of screw spike track are put in with the same type of construction.

The Chicago, Rock Island & Pacific is another large user of screw spikes, with about 110 miles of screw spike track now in service. Screw spikes are used with 100 lb. rail in all creosoted and soft wood ties having two or more years available service. As this weight of rail is standard for the important lines on this road, the amount of screw spike track will increase rapidly, about 50 miles being put in during the past year. About a quarter of a mile of this track has been in use on a high speed 4 deg. curve reversing on a 6 deg. curve about five years, the rest being installed during the last two years.

The New York, New Haven & Hartford also has a large mileage of screw spike track, over 84 miles being installed between New York and Boston. The first installation on this road consisted of one mile of track near Greenwich, Conn., which was placed in service since 1907. At the present rate of installation, it is expected that all four tracks between New York and New Haven will be entirely equipped with screw spikes within two years.

The Harriman lines have recently gone into the use of screw spikes to some extent. Six miles of screw spikes were driven in main track and 1.17 miles in side track on the Union Pacific in July, 1910. Late in 1912, 50 miles additional were installed, 25 miles on the Union Pacific and 25 miles on the Southern Pacific.

Among the other more prominent installations are those of the Pennsylvania Railroad, which has about 25 miles of screw spike track, mainly on the New York Terminal division, which has now been in service about two years; the Chicago & North Western with one mile near Janesville, Wis., placed in December, 1907; the Pennsylvania lines with 1.5 miles which has now been in service about two and one-half years in experimental track; the Erie with one mile which has been in service two years; the Baltimore & Ohio with one mile which has been in service three years; the Chicago & Eastern Illinois with one-third mile which has been in service five years; and the Northern Pacific with 5,276 screw spikes in main track near Plains, Mont., and 1,500 near Maywood, Wash., the spikes in both places being in experimental track under supervision of the United States Forest Service. In addition, screw spikes are used on bridges on the Baltimore & Ohio when ties are renewed singly or out of face, while the Nashville, Chattanooga & St. Louis has about half a mile of screw spikes in track entirely on bridges.

Believing that it is not advisable to hold the rail in close contact with the tie plate, the Pittsburgh & Lake Erie has adopted a form of track construction whereby the tie plate is made an integral part of the tie by the use of screw spikes and the rail is held in place by cut spikes driven through slots in the plate.

When using screw spikes it is essential that the tie be bored before treatment so that it will be fully treated where the

The Au-tra-kar in Use on the Santa Fe.

danger of exposure to moisture is the greatest. This boring at the treating plant is a development of the past two years, the first screw spikes being inserted in ties bored in place in the track. The first 18 miles of the 55 mile installation of the Santa Fe was placed in this way and all ties on the Lackawanna were bored in place for screw spikes until the completion of the new treating plant at Paterson, N. J., a year ago. This boring previous to treatment is also extending rapidly to ties used with cut spikes, and it is also becoming the general practice for the ties to be adzed before treatment in

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order that the mutilation at the time of placing in the track may be reduced to a minimum.

In Europe it is customary on many roads to insert hardwood dowels or plugs into the tie to receive the spike. This dowel gives a resistance to the spike equal to that of a hardwood tie and distributes the stresses transmitted to it by a spike so that they come within the limits of the crushing resistance of the softer wood. Some four or five years ago this same idea was seriously agitated in this country, and about 50,000 dowels were inserted experimentally in new ties on the Santa Fe. However, later practice has shown that it is not necessary to insert these dowels, at least during the early life of the tie, as when the wood decays about the spike the tie can then be bored and the dowel inserted at any time.

The Harriman lines have adopted a helical spring or liner for the 50 miles of track installed the past season, as shown in the accompanying drawing, this liner being inserted in the tie by means of a special mandrel at the treating plant. While this Thollier liner has been used for many years in Europe, this is the first installation of any magnitude in this country, the purpose of the liner being to provide increased resistance against crushing of the wood fibers.

THE SCREW SPIKE TIE PLATE.

While, as a general proposition the tie plate is now widely recognized as advisable with soft wood ties, it is essential with screw spikes for it is not economical to protect the tie against spike killing without at the same time providing against rail cutting. For this reason special attention has been given to the design of the screw spike tie plate and especially to the boss supporting the head of the spike.

At first these spikes were used with the ordinary flat tie plates and this practice is still followed by the New Haven, whose experience has not shown the necessity of a supporting lug. However, the general experience has been that the thrust

Early Type of Snow Car on the Rock Island Near Chicago.

of the rail soon bends the spikes outward, making it difficult to withdraw them. In a preliminary report just issued by the Forest Service on the results evident so far in four sections of test track, the conclusion is reached that "it is desirable to have some form of boss on the plates to reinforce the heads of the spikes against lateral thrust." The design of this raised portion varies to quite an extent. The first plates were made with the support for the entire head except that portion bearing on the rail. However, this was open to the objection that any irregularity either in the plate, in the spike or in its driving would prevent the head of the spike from taking full bearing on the rail. Therefore the later plates are now generally made to support the spike at the rear of the head only. A further development has recently been brought out consisting of a ball and socket washer, with an adjustable support to fit the head of the spike. While because of their irregular section the first plates had to be cast, later designs with a simple contact as those of the Harriman lines, can be rolled.

The Lackawanna has recently changed the design of the tie plate slightly by withdrawing the inner edge of the spike hole a short distance from the shoulder line to prevent the base of the rail from cutting into the neck of the spike in case of a derailment and making it difficult to withdraw the spike. The

Latest Type of Snow Spike Driving Car.

Lackawanna practice also differs in that a special plate slotted for one screw spike and two cut spikes is used at the joints.

SCREW SPIKE DRIVING APPARATUS.

The best method of driving screw spikes depends on a variety of conditions, including the density of traffic and the number of spikes to be driven. Where only a small number are placed, a hand wrench is generally used. Also, on very busy lines, such as the Lackawanna, hand wrenches are required, as it is impracticable to place any car on the track. The hand wrench is open to the objection that the spikes may not be driven uniformly. While one may be driven so as to injure the wood fiber or turn off the head, another may not be turned down far enough. Where screw spikes have worked loose, it has generally been attributed to this defect of hand driving. Hand driving is also slower and more expensive, although within the past year a ratchet wrench, shown in one of the accompanying photographs, has come upon the market.

The earliest type of power driving cars was brought out by Greenlee Brothers of Rockford, Ill., for use in laying the 55 miles of test track on the Santa Fe west of Hutchinson, Kan., in 1910. This car was similar in general design to that shown in an accompanying photograph, with the exception that it was provided with six driving spindles. This car is a double truck steel car driven by a 27 h. p. steam engine mounted on the platform and is provided with radial arm spike driving heads, permitting each spindle to reach four ties at one setting of the car. This car bored the ties for four spikes per tie and drove the spikes on a mile of track per day when laying the stretch referred to. As it was necessary for a locomotive to attend this car while working on the main line, a smaller self-propelling car with two spindles has since been built by the same company for this same road. This car is driven by a gasolene engine and is capable of running to sidings under its own power to clear trains.

Either of the above cars must run onto a side track to allow trains to pass, which causes considerable delay. For this reason there has arisen a demand for a lighter car, especially for maintenance work, which can be lifted off the track to let a train pass, and at least three different types of cars have been developed for this purpose. The Greenlee Company has built a small gasolene motor car similar to the ordinary section motor car with one spindle mounted on a pivot in the center of the car and free to

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swing to either side. This spindle is provided with a combined boring and spike driving head which can be used for either purpose. It is geared to operate at the same speed as the spindles on the larger cars and can drive the spikes for 1,500 to 2,000 ft. of track per day where no boring is necessary. If the ties must be bored in place, this distance will be reduced about 40 per cent. Among the roads on which this car has been used are the Santa Fe and Southern Pacific.

The Au-Tra-Kar, made by Burton W. Mudge & Co., Chicago, is another small self-propelling car which can readily be lifted from the track. This car is provided with two boring spindles on the front end and two driving spindles on the rear end. These spindles are free to swing laterally and telescope so that three ties can be reached without moving the car. Each spindle is equipped with a friction clutch which is adjusted to slip when the spike has been driven to the desired degree of resistance, thus insuring the driving of the spikes uniformly. The driving extensions are hung on cranes which support the tools, relieving the operator of this weight. This car has been used extensively on the Santa Fe.

A small car of a somewhat different design is the Snow car, made by the T. W. Snow Construction Company, Chicago. This car differs from other types in that electric power is generated for boring the ties and driving the spikes, permitting the car to be placed on the embankment to one side, clear of the main line. Power is carried from the car to the boring and driving spindles by cables, sufficient cable being provided to enable 2,000 ft. of track to be covered from one position of the car. In this way interference with trains is reduced to a minimum, for the car is at all times clear of traffic and requires no protection. The men can work until a train is almost upon them and with a quick throw of the cable, can step to one side to allow the train to pass. The first car of this type was brought out about two years ago. A car which has just been shipped for use on the Rock Island lines in Iowa, embodies several improvements. It follows closely the lines of automobile construction in the details of its design and is provided with practically all the accessories ordinarily placed on the automobile, except the steering gear. A 40 h. p. direct connected gasolene engine is installed for propelling the car, which also drives a 7½ k. w. generator when putting in spikes. The car is supported on cast steel flanged wheels, mounted on rigid journals and is capable of developing a speed of 50 miles per hour if desired. As the engine must drive the generator while the car is standing still, four times the ordinary area of front end radiation surface was required. The generator provides power sufficient to drive three boring tools and two spike driving tools, this ratio having been found to keep all tools working continuously and give a uniform rate of progress. Fuses are provided with each individual tool, which will blow out if the tools encounter increased resistance, in this way protecting the generator. The car weighs 3,400 lbs. and can carry 12 men, although only five are required to operate it. It is capable of boring the ties and driving 550 spikes per hour.

COMPARATIVE COSTS OF SCREW SPIKE CONSTRUCTION.

The cost of installing screw spike track is considerably more than for the ordinary construction. All the various details including the cost of the tie plates and spikes, as well as the boring and driving, add to the expense. Previous to the installation of boring machines at the treating plants, the ties were bored in the track. The early installations on the Santa Fe were placed in this manner, the 55 mile stretch in western Kansas being bored by the machine referred to above, which also drove the spikes, this boring costing about 1.25 ct. per hole. On the Delaware, Lackawanna & Western this hand work was done with a small portable tool working to template. Field boring is still necessary on this road at switch leads and other special track work. All boring of ties on the New Haven is done by hand with the common tools, although machine boring is being considered.

On the Rock Island the cost of placing two tie plates, boring four holes and driving the spikes has averaged 13.74 ct. when done by hand. This cost was reduced to 4.89 ct. per tie when using a machine with two drills and one spindle driving tool for scattered work and to 2.9 ct. per tie when using two drills and two driving tools for continuous work. The cost of preparing the ties for screw spikes, including drilling eight holes per tie, averaged about four cents per tie on construction work on the Pennsylvania Railroad while the cost of driving the screw spikes with an air drill machine averaged about 0.9 ct. per spike. The cost of driving the spikes on the New Haven averages about 0.7 ct. each; and on the Baltimore & Ohio, 1.1 ct. On the Pennsylvania lines the cost of preparing the tie, exclusive of the treatment, averaged from 5.3 ct. to 15 ct., while the cost of placing it in the track, exclusive of lining and surfacing, cost from 10.6 ct. to 19.5 ct.

While screw spikes have not been in use in sufficient quantities long enough to enable final results to be secured, some conclusions can be drawn from the small installations which have been in service for five years or more and from the more extensive stretches which have been in service for two years. The results so far secured indicate that maintenance charges will be materially reduced, especially in the items of lining and surfacing track and in tightening fastenings. Whether these savings will be reduced sufficiently to offset the increased first cost cannot be determined at the present time, although there is little doubt but that they will, on heavy traffic lines at least. It has usually been necessary to tighten the spikes about three months after driving and again after an interval of about six months, after which they require little further attention. A careful examination of the Santa Fe track in Kansas last summer failed to show any loose spikes and it was impossible to slip a steel tape between the head of the spike and the rail, although these spikes had not been tightened for a year.

The track men very frequently object to screw spikes at first because of the greater difficulty of withdrawing the spikes when making routine repairs or at times of an accident. This objection is most serious in the case of derailments or other accidents where the heads of the spikes are deformed so that a wrench cannot be placed upon them. In such cases it may be necessary to cut the spike off altogether or to square the heads with a chisel before the wrench can be used, as was necessary for a long distance on one road recently. The former method is objectionable as it prevents driving another spike in the same place. However, this very fact that the screw spike is more difficult to remove is of itself an important advantage in decreasing the damage done to the track by derailments. Opportunity has been afforded on the Lackawanna to observe the effect of derailments on this track in a number of instances, including one runaway, and it is found that the track withstands such punishment with far less injury than does cut spike track and can be gotten back into service much more readily. It has usually been possible to get in to a wreck over the existing track with few, if any, repairs, while accidents on other track frequently so tear it up that portions of it have to be rebuilt.

While more limited, the experience of the Santa Fe in this regard tends to corroborate that of the Lackawanna. In a derailment on screw spike track west of Hutchinson, Kan., in November, 1911, a freight train of 60 cars was running at a speed of about 30 miles per hour when a drawbar fell between the rails, causing two cars to derail on a fill and go down the embankment. The head trucks of the third car were derailed and ran on the ties for a distance of 10 car lengths before stopping. A large number of the heads of the screw spikes were badly dented on top, three of the spikes were badly bent and one tie plate was broken. Notwithstanding the severe lateral blows that the track sustained, it was not forced out of gage, although the track was driven out of line in two places but not sufficiently to prevent the passage of trains. With the exception of lining these places and the replacing of two or three broken ties, no other repairs were required. It is obviously impossible for a track to offer a greater resistance to derailments or other

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hard usage and not at the same time offer some greater difficulties for reconstruction. The roads which have gone into this type of construction feel that the advantage gained in this regard far outweighs the disadvantage.

The principal objections to the screw spike may be summarized as: the increased first cost and the increased difficulty and cost of making repairs or renewals. On the other hand, the advantages claimed are: the securing of increased life from the ties; decreased cost of maintenance, and greater strength and stability of the track.

ABSTRACT OF ENGINEERING ARTICLES SINCE FEBRUARY 21.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since February 21, 1913:

Attractive Stations for Small Towns.—The Buffalo, Rochester & Pittsburgh has given careful consideration to the design of attractive stations for small towns along its lines. Two standard plans have been adopted, which are used wherever local conditions permit. An illustrated description of five of these stations was published in the issue of February 28, page 383.

The Production of Sound Rail Ingots.—A paper on "Comparative Notes on Steel Rail Rolling" by Robert W. Hunt, and one on "Piping and Segregation of Ingots and Ductility Tests" by Dr. P. H. Dudley, both of which were read before the meeting of the American Institute of Mining Engineers on February 19, were abstracted in the issue of February 28, page 390.

The Crooked River Arch Bridge.—The Oregon Trunk has built a steel arch bridge over the Crooked river canyon which has a number of unusual features. The extreme depth of the canyon made its erection difficult and its design is such that it acts as a two-hinged arch for live load and three-hinged arch for dead load. This bridge was described and illustrated in the issue of February 28, page 394.

Grand Trunk Terminal at Ottawa, Ont.—An attractive station and hotel building have been recently completed by the Grand Trunk near the center of the city of Ottawa. An illustrated description of these buildings is published in the issue of March 7, page 435.

An editorial commenting on the policy of Canadian roads in operating hotels and eating houses as compared with the practice in this country, was published in the same issue, page 420.

SOUTHERN PACIFIC ANNUAL TRACK INSPECTION.

The Southern Pacific has just issued a booklet containing the results of the annual inspection of track and structures for 1912, and the names of the winners of the various prizes. For the purposes of this inspection, the Southern Pacific system is divided into three grand districts known as the northern, southern and central districts. The assistant chief engineer in charge of the maintenance department acts as inspector over all lines. The general superintendent, district engineer and the division superintendents and division engineers also assist in this inspection on the grand district on which they are located, no division superintendent or division engineer, however, taking part in the inspection on his own division. In addition to the track, the stations, pump houses, fuel oil plants and power plants are also inspected and rated. This inspection was started on September 23, and was concluded on December 12, 1912, requiring 34 days, and covering 6,630 miles of line.

As a result of this inspection, the Salt Lake division, T. F. Rowlands, division superintendent, was awarded the highest rating of 94.1; the Oakland district of the western division, L. Bulger, roadmaster, was pronounced the best roadmaster's district, with a rating of 95.5, and Section 19 of this same district, P. A. Devine, foreman, received the highest section rating on the Pacific system with a score of 99.1. A gold medal was awarded the roadmaster with the best district and the section foreman with the best section, while silver medals were awarded to 45 section foremen having the best sections on the various roadmasters' districts. Silver medals were also awarded to 32 agents having perfect stations, to 27 pumpers having perfect pump houses, to eight pumpers having perfect fuel oil plants and to nine engineers with perfect power plants.

FOREMEN'S MEETINGS TO DISCUSS ACCIDENTS.*

By Earl Barton,
Section Foreman, Chicago & North Western, Huron, S. D.

I have been a member of the Dakota division safety committee for the past 18 months, and I believe if every section foreman had the same opportunity to attend these meetings there would be a surprising decrease in the number of small accidents. While it is impossible for all section foremen to be members of a division safety committee, there should be some way to bring them face to face with the accidents which are occurring every day in the maintenance of way department. I think roadmasters could accomplish good results by calling a meeting of their section foremen every six months, probably just before spring work commences and just before the track freezes up in the fall. The roadmasters should act as chairmen of the meetings, and have a record of the accidents which had occurred on the division during the preceding six months. Each accident should be thoroughly discussed and the foremen should have the privilege of expressing their opinions as to the best way to prevent these accidents. After the accidents had been thoroughly discussed each foreman should be called upon to bring up for discussion any dangerous conditions which he thinks might cause an accident. The remainder of the day should be spent in talking over the safest and most efficient way of handling the season's work with foreign laborers. By conducting the meeting in this way the new foreman would derive much benefit from the experience of the older foremen.

I find when loading and unloading ties with a mixed gang of experienced and inexperienced men that when two men are required to handle one tie by working an experienced man with an inexperienced one we have less men injured. Also, in terminal yards where there is a large amount of rail to be handled, it is much safer to build skids on a level with a flat car for storing emergency and scrap rail. By using two short rails for sliding the rails on and off the cars, there is no chance for a man to be injured and there is no heavy lifting. A skid should be built for each weight of rail handled and one for scrap.

I have one man whose duty it is to take care of the switch lights and foot blocking in switches, frogs and guard rails. This man goes over the switches the first thing in the morning and repairs any defective blocks he finds. The foreman should accompany him as often as possible on this inspection tour. A good man should be chosen for this work who can be trusted. I have had very little trouble with my blocking and lights since adopting this system, and they are in a safe condition at all times.

The track at the ends of bridges should have a wide shoulder. The runway to handcar houses should be filled in level with the top of the plank so there will be no chance for switchmen and trainmen falling over them. Foremen should be very careful in regard to using bad order tools. A great many employees are injured from the use of defective tools. It is much easier to have such a tool fixed than to explain why you were using it. Roadmasters should make frequent inspections of the tools used by their foremen. Never trust a piece of work of a dangerous nature to someone else when it is possible for you to attend to it yourself.

*Received in the Safety contest, which closed October 25, 1912.

New Line for Spain.—A company has been formed for the construction and operation of a strategic railway from Malaga to Algeciras and Cadiz, Spain. The cost of construction of this line is estimated at about $8,640,000.

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THIRD AND FOURTH TRACK CONSTRUCTION.

Geological and Traffic Conditions Created Unusual Problems on New York Central Between Albany and New York.

The New York Central & Hudson River has been carrying on the construction of third and fourth tracks between Albany and New York for the past three or four years. Because of the location of this line on the east bank of the Hudson river where the high bluffs approach very close to the water's edge,

Building New Tracks on Trestles North of Staatsburg.

this work has necessarily been very difficult and expensive, especially since the alinement is being improved at many points by the elimination of curves and at other places by reductions in the degree of curvature. The existing two tracks have been

Deck of Trestle in Staatsburg Cut.

very badly congested for some time as a very heavy passenger business, nearly all of which consists of important fast trains, is handled in addition to a heavy freight movement. There are 43 scheduled passenger trains and an average of 30 freight trains daily. The natural conditions combined with this heavy traffic make progress on this work slow and render necessary the taking of many precautions to prevent interference to traffic.

As the conditions met in all the work on this road between New York and Albany are largely similar, a description of the problems encountered on the 11 miles between Staatsburg and Barrytown, which is now being completed, will be in a general way typical.

The geological conditions in this vicinity are very interesting and are to a large extent responsible for the difficulties encountered. The rock on both sides of the Hudson river is of a very uncertain character and rather than being regular, there exists a very uniform lack of regularity. Lying nearly in the region of the Appalachian upfolding, this rock has been distorted and twisted greatly until it is now very badly broken and is inclined at all angles and in all directions. As a result the rock is rotten in the extreme and is full of pockets of clay and quicksand which are encountered most unexpectedly. In

Rock Face in Front of Soft Material.

some places the rock slopes sharply towards the river with a bed of silt or clay clinging to it on which the roadbed must rest. Again it may incline away from the river and contain pockets of quicksand forming sink holes over which the track must be laid. In some instances the rock is nearly vertical and a slight movement will dislodge large masses which may descend on the tracks.

No records are available regarding the difficulties encountered in building the original road, and later the second track, but they were probably small compared with those recently encountered, as the early roadbed was narrow and the undisturbed

Completed Slope Showing No Indication of Rock Face in Original Cut.

portions of the foundation material were sufficiently stable to support the loads and maintain equilibrium.

Many of the sink holes are short, with rock cuts at either end; this condition of itself introducing serious complications

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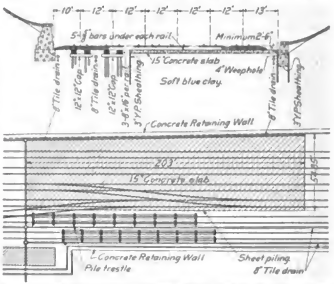
in maintaining smooth riding track under high speed trains. In one instance a ledge of rock projects under one rail while the other rail is supported on a bed of mud, necessitating in itself, very careful maintenance.

In the vicinity of Staatsburg a number of these sink holes were encountered. At one point there existed a peat pocket 300 ft. long and 10 ft. deep resting on rock. Sheet piling was driven adjacent to the main track, the bed excavated under the new tracks and the hole backfilled with rock on which the new tracks were laid. At another point where similar ma-

North Portal of the Astor Tunnel Showing Centering and Concrete Mixing Equipment.

terial was encountered, but to a greater depth, sheet piling was driven between the new and old tracks to prevent the flow of material from under these tracks. Piles were driven and capped under the new tracks and a solid floor of 12 in. x 12 in. stringers laid lengthwise with the tracks, on which the ties and track structure were placed. As the ground water level is practically at the surface, it is expected that this construction will be protected from decay for some time to come. The tracks have been placed on the land side of the old fills than when on the river side.

Near Rhinecliff, where a cut was to be widened for additional tracks on the land side, the face of the cut gave every indication of solid rock, and plans were made to excavate accordingly. When construction began it was found that this rock was but a surface shell a few feet thick and that back of it there was a pocket of very unstable material. When this was



Plan and Elevation of Concrete Slabs Required in Poughkeepsie Cuts.

discovered, plans for the handling of work had to be changed immediately and additional right of way secured to provide for the increased slopes. One of the accompanying photographs shows this condition when the steam shovel was uncovering the softer material behind the rock.

Owing to the close proximity of the old line, extreme care

Beginning Excavation for the New Astor Tunnel.

accompanying photographs show details of the work at this point.

As is to be expected under these circumstances, much settlement is encountered on fills and large mud waves frequently appear. These conditions interfered greatly with the estimates of material and made impossible the balancing of quantities with any degree of accuracy. One interesting fact noted is that the settlement has uniformly been greater where the new was necessary at all times when blasting rock. This was especially necessary because of the character of the material. Many times the effect of comparatively light shots was felt on the back of a ledge of rock at a distance from the point where work was being done; in some instances this effect being noticed at 20 ft. through apparently solid rock resulting in dislodging large pieces. In other instances large quantities have been removed by comparatively light charges because of the opening

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of numerous seams that were not known to exist. The rock crumbled readily when blasted so that nearly all of it could be removed by the steam shovel. This uncertain character of the rock made necessary constant inspection day and night to insure protection against detached pieces of rock being jarred loose and falling on the main tracks.

At several places the present line tunnels through points of rock extending into the river. In connection with the construction of additional tracks, these tunnels are in several instances being replaced with open cuts. At such places great care must be taken to prevent the rock from falling on the tracks, especially as much of the rock in the tunnel roofs is badly eaten by locomotive gases.

At the John Jacob Astor estate, two miles north of Rhinecliff, previous agreement required the maintenance of a tunnel. As the alinement was changed somewhat at this point, the new tunnel was built independent of the old line. By agreement with the Astor estate, the contractor was permitted to excavate an open cut, construct the tunnel in the open and then cover it, restoring the original surface. The accompanying photographs show this feature clearly. The tunnel consists of a flat concrete arch with a span of 58 ft. 1 in. and a maximum rise of 35 ft. above the top of rail.

The presence of large estates bordering the tracks with riparian rights extending to the river required, in many instances, special precautions to maintain slopes and to prevent injury to trees, etc. In several instances where bridges were raised and new embankments built, walled pits were left in the slopes about the trees.

Where the new tracks were built on the river side, less difficulty was encountered, although it was only possible to build on this side at certain places because of the great depth of the water. While the river is not wide enough for the wind to create waves of any magnitude, a number of fast steamers run on the river and create waves of considerable size which do damage to unprotected banks. For this reason, all new embankments were protected with riprap. A dry wall was first built at the toe of the slope of heavy stone brought from building excavations at New York and placed with derricks. Some of the filling material required inside of this wall was also brought up from New York on scows; the contractors securing it from building excavations there.

The track crosses a number of tidal bights where provision must be made for the passage of considerable quantities of water every 12 hours. Openings were made at these places, either by culverts or short bridges. Cast iron pipe and concrete boxes were used for the smaller openings while the bridges were built of I beams embedded in concrete and resting on concrete abutments.

A very interesting problem was encountered in Poughkeepsie where similar work is under way. While some difficulty had been experienced in holding the tracks to surface in several places, no unusual difficulties were anticipated. However, when the widening of the cuts was undertaken, trouble was suddenly encountered in holding the new tracks up. In two different instances these tracks were left in good condition in the evening and showed no signs of weakness under heavy traffic during the early portion of the night; however, towards morning they suddenly dropped, creating such a condition that traffic could only move over them with great care. In order to insure continuous operation, it became necessary to drive piling under these tracks the length of these pockets and build standard trestle construction. A wall of sheet piling was then driven between these and the adjacent tracks to prevent any movement of material and the material under the remaining tracks was then excavated. Following this a concrete slab was laid under the remaining tracks the entire length of the sink holes, resting directly on the mud, and designed to confine this material as well as to distribute the load. The results so far, indicate that this has been successful. This construction was required in three instances at Poughkeepsie. The length of concrete mats required ranged from 90 ft. to 910 ft., and they extended under four and five tracks.

This construction work was all handled under the direction of G. W. Kittredge, chief engineer; J. W. Pfau, engineer of construction, and R. E. Dougherty, district engineer, with George D. Evans, assistant district engineer, directly in charge.

ORGANIZATION OF FLOATING GANG TO TRAIN FOREMEN.*

By W. H. CLEVELAND,
Roadmaster, Atchison, Topeka & Santa Fe, Wellington, Kan.

A school for section men is often advocated in its various phases. One of the popular ideas is monthly meetings, held at some point on each division. This is good as far as it goes, but it merely provides for an exchange of ideas and explanations and social friendship. The only way that proficiency can be gained is by actual experience; by being brought in actual contact with the work, in all its varying conditions; by working under the supervision of some one who is master of the art. There must also be some object in view, something in sight to work for. There must be, first, present means of support, second, assurance of future promotion.

To provide a supply of competent foremen for the future, I would recommend the systematic organization of floating gangs. On each superintendent's division organize one small floating gang as large as the working conditions of the division will permit. Let this gang consist of from six to ten laborers. Let the men employed in this gang be selected from the ranks of American labor, of the proper age and of the highest intelligence that it is possible to obtain. Pay them wages as much above those of the foreign labor as the division conditions will warrant, taking into consideration, the wages paid locally to labor in other industries, and let them understand that they are in line for promotion as their experience and proficiency warrant. Place the most experienced foreman you have over this gang; a man who is master of the profession in all its features; a man whose qualifications place him in line for promotion to the position of roadmaster. Pay him the extra gang foreman's salary and let him understand that his business is to do a high standard of work, supervise all work, and act as instructor of the men under him, to fit them for positions as foremen. Place this gang in good comfortable bunk cars with a boarding car for the men, so that they will always be at home with the outfit. Let the foreman board the men. Equip them with the necessary tools for doing all kinds of work, including emergency work—wrecks, washouts, etc. Furnish them with standard blue prints and rules and literature. Then use this gang on any part of the division where it is needed. If there are switches to be laid or improvements of any kind to be made on any section, move this gang there and let it do the work in connection with the regular section gang, schooling the men in the art of switch laying and track laying to standard. In this manner the regular section gangs will get the schooling and instruction which will greatly benefit them. Make it the duty of the instructing foreman thoroughly to instruct each foreman and gang on whose territory he is working and make some part of every Sunday an information day for this gang and the foremen and men near where he happens to be stationed. Once a month let the roadmaster be present and make it a general instruction meeting, taking up the matters of timebooks and reports, book of rules, time cards, blue prints and estimates, and the subject of emergencies. In this way the entire division will soon become thoroughly informed on all subjects and will be experienced in all standard and emergency work. Then when you want a relief or permanent foreman you can promote a high class man from this gang and immediately fill his place in the gang with a new man. If you want a relief or permanent

*Received in the contest on The Foreman Problem, which closed March 25, 1912.

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roadmaster on quick notice promote the foreman of this gang and you will have a man that is qualified and acquainted with all parts of the division and its working conditions, and one of the best laborers in the gang can be promoted to relieve the forcman in his absence.

When there is no track laying or important work to be done, let this gang help out with the ordinary work on the division. If there is a small piece of ballasting to be done; if there are the renewals; if there is fence to be repaired, or new fence to build, use them for such work; and if there is no special work to do, then float them from one section to another, helping out the worst sections.

If at any time forces are short and a section foreman has a mile or two of rough track that he cannot reach in good time, then float this gang over to him and let them help him out a week or so and then pass them to the next section needing help. This will save the necessity of increasing forces and will permit division operation with much less force. In case of accidents, wrecks, washouts, and such emergencies, this gang in cars can be gotten on the ground quickly and their experience should make them very valuable. Any division can find continual work for such a gang, unless it is in severe winter weather, and the arrangement will insure a supply of foremen of a high class without gathering the foremen monthly to some fixed point on the division, which depletes a large portion of the division of foremen for one day and does not instruct the section laborer from whose ranks the foremen must be taken.

KILLING WEEDS WITH CHEMICALS.

The weeding of track, especially in dirt ballast, is a source of heavy annual expense to the railways. As the weeds offer serious impediment to trains if allowed to grow undisturbed, it is necessary that they be removed. The most common method of removal is by hand weeding with hoes or similar tools. On some of the western roads, weed burners are also used. Another method which has gained wide attention during the past

C. M. & St. P. Track, near Dunnville, Wis., Treated July 26, 1911. Photo Taken May 16, 1912.

two years is that of the destruction of weeds by the use of a chemical.

During the past two seasons the Atlas "A" weed killer has been used to such an extent that a definite comparison of results can now be secured. This material is a concentrated chemical solution weighing about 13.5 lbs. per gal. It is dark gray in color, with an odor similar to that of lye. Before applying, this liquid is diluted with water in the ratio of about 15 to 20 gal. of water to one of the chemical, the water serving simply as a means of distribution of the chemical. In general, about 10 gal. of the chemical is required for each one foot width of track one mile long, although this varies somewhat with the density of the weed growth, the nature of the ballast and soil, and the season in which it is applied. After the first year's application this amount can be reduced until the fourth or fifth year, when it is stated that the ground will be practically sterile and will support very little vegetation.

Where it has been tried it has generally been used in sufficient quantities to warrant the equipping of a tank car with a sprinkling device whereby the diluted liquid is distributed over the

Photographs of B. & O. Track on Shawneetown Branch Before and Eight Weeks After Treatment. Heavy Growth of Warren Weed Originally.

track. However, a small tank can be installed on a push car if desired and the material sprayed from that. Where a large car is used a spraying device consisting of a perforated pipe about 2½ in. by 8 ft. long is attached to the discharge pipe so that it is held about 8 in. above the rails. This pipe is drilled from end to end with three or four rows of 3/16 in. holes. Elbows are placed in each end of the pipe with the closed end turned up, the elbows being drilled with a number of holes located so as to throw the chemical out the required distance beyond the ends of the ties. The amount of flow can be regulated by a valve in the discharge pipe, which can be operated from the platform of the car. The chemical and the water are mixed by pumping air through the train air line into the bottom of the tank to agitate the solution. This same air line can be used to maintain a pressure in the tank while spraying is being done.

The applications should be made in a dry spell when the plants are thirsty and will quickly absorb the moisture. For this reason it is not advisable to apply the solution after a heavy rain when the plants are saturated. While the material may be applied at any time during the growing season, best results can be secured by using it early in the season before the vegetation has reached the stage where it will remain standing after being killed, for not only is it more sensitive and more easily killed early in the year, but no unsightly stalks are left standing. The chemical is poisonous and care is required to see that it is not used along the right of way where stock is grazing, for when the vegetation is moist it tends to attract cattle and kills them. However, a recent improvement has been made whereby it is said that this chemical has been made distasteful to stock so that they leave it alone. This has recently been tried on the Cuban railways where, due to the lack of dining car facilities, venders sell eatables at the various stations and much refuse is thrown from the windows of the trains, attracting pigs, goats and other animals. The use of this improved chemical has not only resulted in killing the vegetation but also in repelling the live stock.

While the cost of this material varies somewhat with the amount of the chemical used, it averages about $35 to $45 per mile of track for the first application and a lesser amount for succeeding years. As the cost of weeding ordinary dirt ballast track ranges from $30 to $50, the economy is evident, while the section forces are enabled to devote their time to more productive work.

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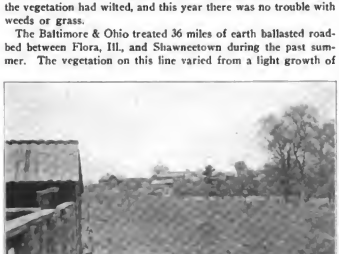
While this product has been used extensively in South America, Australia and other foreign countries, it has only been used here for the past two years. One of the first roads in this country to use it to any extent was the Chicago, Milwaukee & St. Paul, which treated 16 miles of track in northern Wisconsin in July, 1911, with an average of 62.5 gal. per mile at a cost, including the expense of the train crew, of $26.23 per mile. This

Removing Chemical from Supply Car to Spraying Car on Fort Dodge, Des Moines & Southern.

track was sprayed by means of a sprinkling apparatus attached to an old tank car. The track was not ballasted and was covered with sod. About 24 hours after the application was made the vegetation had wilted, and this year there was no trouble with weeds or grass.

The Baltimore & Ohio treated 36 miles of earth ballasted roadbed between Flora, Ill., and Shawneetown during the past summer. The vegetation on this line varied from a light growth of



Treated and Untreated Track on C. M. & St. P. at Downsville, Wis. Treated July 26, 1911. Photo Taken May 16, 1912.

grass to a heavy massed growth of foxtail and crab grass interspersed at various places with berry vine, milkweed and a very heavy growth of Warren weed. Due to continued wet weather in the spring the application of the weed killer was not made until the middle of July, at which time a width of 12 ft. was treated with 100 gal. of the chemical per mile. Within three days after the application was made most of the weeds began to die and the effect was very noticeable. The difference after an interval of eight weeks is shown in one of the accompanying photographs. The Warren weed was entirely killed while the foxtail and crab grass were very largely, although not entirely, destroyed—the application not being heavy enough to permeate entirely the thick mass of roots. This application was made at a total cost of $37.65 per mile, exclusive of $29.32 for equipping the car with a sprinkling device.

Forty miles of track of the Fort Dodge, Des Moines & Southern was treated in the same manner, this track being ballasted with gravel in which a considerable amount of soil which would support vegetation was mixed. Due to various delays, this track was not treated until quite late in the season after the weeds had made a strong start. However, with the exception of a few spots where wiry grass was present, the weeds were thoroughly killed.

The Pennsylvania Railroad applied this material at different points on the Delaware and Manhattan divisions during the last season. The mixture was prepared in the ratio of one gal. of the chemical to from 15 to 40 gal. of water, depending on the density of the weed growth. It was applied both with hand sprinkling cans and from cars carrying tanks connected to small pumps operated by air from a locomotive. The time required for applying it varied from about 30 min. for a train equipped with tanks to go over two miles of single track to 250 hours for sprinkling three tracks for a length of 1,850 ft. by hand. Among other roads which have also used this material for killing weeds is the Public Service Railway of New Jersey, which treated 65 miles of track during the past year.

PREVENTION OF ACCIDENTS TO MAINTENANCE OF WAY EMPLOYEES.*

BY W. E. DAVIN,
Supervisor, Pittsburgh & Lake Erie, McKees Rocks, Pa.

According to my observation a large number of accidents to employees in the maintenance of way department is due to dangerous practices and to the carelessness of the employees themselves. On many roads safety committees have been appointed and representatives from all of the various departments act on these committees and report in accordance with the policies outlined. In the work of the safety committees it would seem that nearly all of the efforts are directed toward the prevention of accidents to trainmen and shopmen, and comparatively little is being done by these committees toward the prevention of accidents to employees in the maintenance of way department. This lack of interest may be due to the failure of the supervisors, roadmasters and foremen who are actually in charge of the men and work in the field, and who have every opportunity to observe the conditions and practices that are causing accidents to employees in this department, to give this matter serious consideration.

Every supervisor, roadmaster and foreman, whether a member of a safety committee or not, should consider it his duty to give attention to all matters pertaining to the safety of the men employed under him. In addition to this all conditions that may seem dangerous or that might cause injury to trainmen or others should not be overlooked but should be reported to the proper officers. The primary work, however, of those in charge of maintenance should be to remedy defective and dangerous practices and conditions in the department which they represent. In this respect I have done a great deal of work on my division, taking up each case separately and applying a remedy wherever possible to prevent a recurrence and to eliminate the dangerous features and practices.

When employees in this department are injured report is made to the proper officers. The supervisor makes a thorough investigation and determines as far as possible the cause, and if it is found that the accident could have been avoided by some other

*Received in the Safety contest, which closed October 25, 1912.

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method or practice or by the use of other or better tools, a circular letter is sent to all foremen calling attention to this particular accident, how it occurred, the extent of the injury, and explaining in detail how it might have been avoided together with instructions to the foremen to explain the details to each man in his gang. Where foreigners are employed who cannot understand English, one of the foreigners in the gang explains to them the instructions in their own language.

Many dangerous methods are in use by trackmen in performing track construction and repair work and in handling tools. Many of these methods may have been used for years and have caused numbers of accidents. In order to bring these matters before the men in a practical manner special instructions are issued from time to time explaining the dangerous features and methods of handling work and tools and how to avoid injury from them.

Lack of system and bad practice are responsible for many injuries. When handling rails a good man at each end of the rail with a rail fork and the rest of the gang giving attention to these men is a safe method. The men at the ends of the rail should be competent. Rail forks are used when loading and unloading rail. Tongs are always used when handling and carrying rails. With the majority of foreigners it is common practice to do considerable talking. When performing hazardous work we aim to stop this as much as possible.

Rail cutters or chisels are kept in good repair. Battered head cutters are not used. It is just as important to keep the striking face of a cutter in repair for safety as it is to keep the cutting edge in repair for cutting. The use of spike mauls for striking chisels is not permitted. Striking hammers or sledges with wide striking faces are used. When cutting rails the practice of lifting the rail as high as the men can reach and allowing it to drop across a tie or rail is not permitted. The use of a rail bender is perfectly satisfactory.

Holding a spike maul on the head of a spike and striking it with another maul is a dangerous practice and is not permitted, a rail punch being used instead. Many injuries are due to the head flying off when pulling spikes and from pieces of steel flying from the bar and spike maul. If the spike is first tapped with the spike maul it will not be necessary to drive the bar under the spike head with a maul.

Track jacks are dangerous to operate and the most competent man in the gang is always assigned to this work. The use of tie tongs for handling ties not only prevents injury to the men but is a great saving to the ties compared with the old practice of handling them with picks. When trackmen are working at interlocked switches, in addition to a proper arrangement with the towerman, a block is placed in the points to prevent men from being caught in case the lever is accidentally thrown by the towerman. The use of a megaphone is of much assistance in handling men in busy yards and terminals and at points where the view of approaching trains is obstructed. Cutting or breaking track bolts out of joints has caused many accidents. If bolts must be cut out one should see that all other men in the gang are out of the reach of any parts that may fly from the bolt or cutter.

Jumping on and off moving cars and trains, crawling under cars, climbing over cars in yards, passing between cars standing close together, taking shelter from rain under cars, sitting under cars to eat lunch, getting on and off hand and push cars in motion, running hand and push cars or motor cars over interlocking switches without a clear understanding with the towerman, applying brakes on hand and motor cars without warning to the men on the car, allowing the men to leave track tools on or near track, standing, walking or working on tracks while trains are passing on adjacent tracks, riding on or standing close to a plow when unloading ballast or other material, standing near cables when ploughing off cars, sitting on brake wheels of cars at any time, thawing, handling or transporting dynamite or other high explosives, running hand cars and motor cars at a high rate of speed and too close together and standing close to track when trains are passing are some of the many acts of carelessness on part of employees which result in accidents and injury and to which we have given special attention.

Foreigners are the victims of many acts of carelessness and poor judgment on the part of the gang foreman who does not stop to think of the results that follow. They are easily confused and foremen should use more than ordinary care to keep them out of the way of trains.

When working on double tracks and four tracks at busy terminals trackmen can do much to prevent injury to employees in the transportation department by keeping the work cleaned up every day wherever it is possible to do so. When work is in progress that cannot be put in safe condition daily, a notice should be placed on the bulletin boards for protection of trainmen.

The unloading and piling of material at a safe distance from tracks is a very important matter that trackmen must strictly comply with. The use of improved machinery and tools for handling materials in connection with maintenance of way work has proven a large factor in decreasing the number of accidents and also in decreasing the cost of labor.

CREOSOTING PLANT NEAR CONNELLSVILLE, PA.

The creosoting plant of the Pittsburgh Wood Preserving Company, Pittsburgh, Pa., has just completed its first year in operation, which has proved thoroughly successful. This plant is located on the tracks of the Pittsburgh & Lake Erie and near those of the Baltimore & Ohio, the Western Maryland and the Pennsylvania at Broadford Junction, Pa., near Connellsville. The site includes 50 acres of property near the Youghiogheny river, on the hill side of the tracks, where good drainage is secured.

Beech, birch, maple, red oak, white oak and chestnut ties, red

Overhead Creosote Weighing Tanks.

End View of Cylinder House Under Construction.

oak piling and yellow pine structural timbers have all been treated and the plant caters to the commercial business throughout the Pittsburgh district. Last summer extensive tests were made of actual treatment with the empty cell process, and it was found that a thorough penetration of all sap wood could be secured in the above named species by a careful treatment of the seasoned wood. All ties at this plant are

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seasoned in the yard from six months to over one year before treatment.

The main buildings are located at the extreme end of the property and away from the main ladder track. The loading platform is between the ladder track and the cylinder house, and is 4 ft. high with tracks on each side spaced 44 ft. center to center. On top of this loading platform there are three 36 in. gage tracks. Between the cylinder house and the loading platform is located a standard 50 ft. track scale arranged for weighing all charges in and out of the treating cylinders. The main ladder track is constructed of 80 lb. rails throughout, and all storage tracks are three rail, 36 in. and standard gage, for handling the narrow gage trams and locomotive. An electric hoist is used to handle treated ties in the yard.

The treating plant consists of two 7 ft. cylinders, each arranged for a capacity of about 500,000 ties per year. The cylinders are set on concrete piers so that a man can walk under and around them. There are two special high pressure measuring, or working, tanks which are mounted on scales above the cylinders. Each tank will hold about 75 tons of creosote and, with the special arrangement, it is possible to weigh this heavy load within the graduations of 20 lbs. on the scale beam or, if further refinement and accuracy is wanted, the scales on the loading platform can be used as a check. Thus all creosote used is weighed in and out of the cylinders, and it is possible to secure very accurate results. The cylinder house is equipped with special rotary vacuum pump, air compressor, pressure pump, general service pump and circulation pump for the Card process. At one end of the building a room is partitioned off for the generator.

The boiler house is located about 125 ft. from the main building, and is arranged for two 150 h. p. boilers. The 40,000 lb. Porter yard locomotive is also housed here. The steam line from the boiler house to the main building and the exhaust line are carried overhead on steel supports.

An adzing plant is provided where all ties are faced to suit the tie plate and bored for screw spikes, before treatment. On the feed end of the adzing machine there is an automatic dumping arrangement which drops the ties from the trams onto the table which feeds the adzing machine. The tram cars drop down by gravity through a spring switch to the opposite end of the machine, ready for reloading. This adzing machine is driven by a 70 h. p. engine located in the same building. Adjacent to this adzing machine there is located a block cutting machine for the manufacture of blocks for shop floors and bridges.

For storing the creosote at this plant there are three very large storage tanks, sufficient for a year's supply of creosote. The creosote arrives in tank cars, and is dropped by gravity into the underground unloading tank, from which it is pumped to either of the three storage tanks.

Most of the railroad work at this plant is treated under the supervision of Dr. Herman von Schrenk, and the plant is managed by Grant B. Shipley of the Pittsburgh Wood Preserving Company.

Adzing Plant, Boiler House, Cylinder House and Storage Yard at Connellsville Creosoting Plant.

PROTECTION OF RAILWAY EMBANKMENT AGAINST STORMS.

The main line of the Louisville & Nashville between New Orleans and Mobile is located along the northerly shore of the Gulf of Mexico for many miles, and is subject to occasional damage from the storms which move inland from the Gulf. These storms are not unusual in the spring and fall, but seldom do much damage, lasting for only a short time. However, occasionally there comes a storm of greater violence which may continue for several days, doing much damage to the track and to property of all kinds. Such a storm occurred about two years ago, damaging the track for many miles and putting it entirely out of commission for a number of days. To avoid the repetition of such trouble this portion of the track had been rebuilt and anchored so that it is now believed that it will safely withstand further storms. This reconstruction work is now practically completed.

Panorama of Connellsville Plant with Cylinder House in Foreground.

The elevation of the subgrade of the new embankment has been established 6.5 ft. above the level of mean tide and it was made 22 ft. wide at the top and 48 ft. wide at the bottom. The center of the embankment is composed mainly of sand, which will facilitate drainage and the shoulders have been built of a tough, cohesive material, proof against wave and current action, secured from 12 to 15 ft. below the sand stratum. The shoulders of the embankment have been built to the height of the ties to shield the track from the direct wash of the incoming water and

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the growth of sea marsh cane will be encouraged on the slopes as a further protection against wash.

In order to increase the weight of the track rails of 90 lb. section are now replacing the 70 and 80 lb. rails formerly used. The track is anchored to the roadbed by Crouse-Hinds Co. harpoon anchors, which are driven in pairs, one on each side of the track, these double anchors being placed at intervals of 66 ft. along the track for the entire distance between Lakeshore, Miss., and Micheaud, La. These anchors were driven down until the tops were 24 in. below the base of the rail and were then drawn up 20 in. by means of track jacks to open the flukes or barbs. Each anchor has a holding power of 9,000 lbs.

The track is attached to the anchors by rail clamps loosely connected to the ring at the head of the anchor shaft by wraps of galvanized wire to admit of the rail "running." This anchor connection may be readily detached to admit of track adjustment. In addition to this, the bridges have in some cases been raised to a greater elevation and the construction of the superstructure altered in some cases to diminish the water pressure.

At another point on the line between Pascagoula, Miss., and Gautier, where the road is exposed to the full force of the storms from the Gulf for a distance of about two miles, the work of raising the rails to a point above the highest recorded storm tide, or 11 ft. above mean tide, is in progress. This embankment is being protected by strong sheet piling wherever channels created by bayous in the sea marsh extend at right angles up to the embankment.

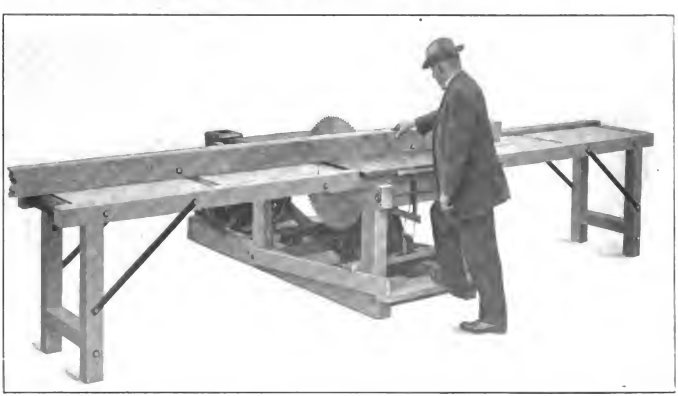
A HEAVY COMBINED RIP AND CUT-OFF SAW.

A new machine for ripping and cutting up heavy timbers for bridge and dock work, heavy framing, concrete form construction and similar work, has recently been put upon the market by the American Saw Mill Machinery Co., of Hackettstown, N. J. This machine is driven either by a gasoline engine or by an electric motor mounted upon the frame immediately behind and belt connected directly to the saw, or it is built without power with a countershaft mounted on the frame to attach to other available power.

The frame is of selected timber, accurately framed and strongly bolted together. The central section, or main frame, which is used for ripping, is entirely self-contained and is constructed of 3½ in. x 5½ in. timber with a hardwood top 36 in. x 58 in., which is hinged at the top to permit its raising to allow free access to the mandrel and other working parts. A substantial steel ripping guide is provided, which is adjustable to any position on the table by a clamp screw. The extension tables at the sides are made of 3½ in. x 3½ in. timbers, 23 in. wide and 6 ft. long and are fitted with three 3½ in. steel rolls. These tables are secured to the center section by steel plates which rest on steel dowels, so arranged that when the table top is raised these extensions can be readily detached and the legs folded up for convenience in moving. The mandrel of 1 11/16 in. steel with a 4 in. x 6 in. pulley and is designed for saws with a 1¼ in. hole. It is carried in babbitted bearings on a substantial iron swinging frame which is drawn forward by means of a foot treadle. A device is provided for locking this swinging frame in any desired position when used as a rip saw. A belt tightener is also provided for maintaining a constant tension on the belt.

This machine is equipped with one 30 in. rip saw and one 30 in. cut-off saw with a maximum projection of 11 in. through the table top. The table stands 34 in. above the floor. The entire machine requires a floor space of 8 ft. x 15 ft., and weighs 1,100 lbs. without power.

RAILWAY IMPROVEMENTS IN THE NETHERLANDS.—A new railway line is soon to be constructed from Hoogeveen, in the province of Drenthe, to Ommen, in the province of Overysel. The distance is only 15 miles, but the new line will traverse a territory without railway facilities at present. This section is a great peat district. The railroad yards at Hoogeveen will be enlarged to meet the wants of the new line. Another important improvement in that region, soon to begin, is the double-tracking of the line between Hoogeveen and Groningen via Meppel, about 55 miles, coupled with enlargement of railway yards at several towns along the line.



New Rip and Cut-Off Saw.

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General News.

The Sonora Railway—the Southern Pacific's line in the western part of Mexico—is reported to be in the hands of the rebels for a distance of 246 miles.

The *Railway Record* has added up the amounts of fines which it has found reported as imposed on railroads during a single week, and finds the aggregate sum $739,275.

The Chesapeake & Ohio has made an increase of 10 per cent., dating from February 1, in the pay of all clerical employees whose salaries have been less than $150 a month.

The Central Safety Committee of the Chicago & North Western has awarded the company's "Safety" banner for the best record of safety for the year 1912 to the East Iowa division.

The Grand Rapids & Northwestern has placed an order with the Great Lakes Engineering Works for three steel car ferries to be operated from Ludington, Mich., to Milwaukee and Manitowoc, Wis.

The Atchison, Topeka & Santa Fe is planning to build a very complete reproduction of the Grand Canyon of Arizona to be exhibited at the Panama-Pacific Exposition in San Francisco. The reproduction of the canyon will occupy five acres.

An electric car propelled by the storage batteries of the Federal Storage Battery Car Company is now in service on the Newton Lower Falls branch of the Boston & Albany. This branch extends from Riverside, Mass., to Newton Lower Falls, one mile.

A grain elevator in the freight yards of the Michigan Central at East One Hundred and Twenty-first street and South Park avenue, Chicago, was destroyed by fire on March 9. The fire spread to a large number of freight cars loaded with grain, and caused a loss estimated at $125,000.

Charles A. Lutz, chief examiner of carriers' accounts for the Interstate Commerce Commission, has resigned that position to become controller of the United States Express Company. George G. Thompson, chief clerk in the post office department, who has had an important part in the establishment of the parcel post, is also to take a position with the United States Express Company, that of general purchasing agent.

A suit has been filed in the United States district court at Chicago against the Chicago & Eastern Illinois to recover $3,900 in penalties for failure to report instances where employees were worked more than 16 hours a day. Fines aggregating $3,275 were imposed on the Chicago & Alton, the Chicago Junction, the Chicago, Milwaukee & St. Paul, the Grand Trunk, and the Wabash railways on March 4, in the United States court at Chicago for violations of the hours of service law, the safety appliance law, and the law regulating the shipment of cattle.

The Grand Trunk in Southern New England.

As reported last week, page 446, the special committee of legislators and citizens, appointed by the governor of Rhode Island to consider the question of guaranteeing the bonds of the Southern New England, made an unfavorable report. It is now said that the governor will accept the opinion of the committee. At Montreal this week, Mr. Chamberlin, president of the Grand Trunk, said that work on the Southern New England from Palmer to Providence could be started immediately, provided the state of Rhode Island should guarantee the bonds; but he added that if the state refused to give the guarantee there would be no immediate prospects of a resumption of the work.

Wireless Telegraph to Moving Trains.

The Delaware, Lackawanna & Western is to erect two wireless telegraph stations, one at Scranton, Pa., and one at Binghamton, N. Y., 65 miles north of Scranton, with a view to transmitting messages to passenger trains while they are moving on the road between the two places. Mr. Cullen, passenger traffic manager of the road says that if the experiments prove successful, receiving apparatus will be installed on all of the through passenger trains, and that he hopes to extend the wireless telegraph to Buffalo and to Hoboken—that is, throughout the length of the main line of the road, 410 miles.

New Car Shops at Ashtabula.

The Lake Shore & Michigan Southern has bought land at Ashtabula, Ohio, in the western part of the city, on which to build a shop for the repair of its steel cars. On account of the large number of steel freight cars now in use, and as ore and coal moves chiefly through Ashtabula, for which traffic the steel cars are largely used, the shop is to be located at that point. The plant, including the cost of the land which has just been purchased, will cost in the neighborhood of $1,000,000.

A Correction.

In the article on page 289 of the issue of February 14, entitled Superheater Switch Engines with Gaines Combustion Chamber, it was erroneously stated that a ⅞ in. bridge is used in the exhaust tip. This should be ⅜ in.

New Trains to the Pacific Coast.

The new Overland Limited train on the Chicago & North Western and the Union Pacific, to be placed in service on April 1, on a 64-hour schedule from Chicago to San Francisco, will leave Chicago daily at 7 p. m., arriving at San Francisco at 9:30 the third morning. Eastbound the train will leave San Francisco at 2 p. m., arriving at Chicago at 9 a. m. the third day. An extra fare of $10 will be charged. On the same day the Chicago, Milwaukee & St. Paul and the Union Pacific will put into service a 72-hour train between Chicago and San Francisco and Los Angeles without extra fare, to be known as "The Pacific Limited." It will leave Chicago at 10:45 a. m., arriving at 9:40 a. m. on the third day at both Los Angeles and San Francisco, running via the San Pedro, Los Angeles & Salt Lake to Los Angeles, and via the Central Pacific to San Francisco.

Unfilled Tonnage of the Steel Corporation.

The report of the United States Steel Corporation shows that on February 28, the unfilled tonnage was 7,656,714 tons, a decrease of 170,654 tons from the previous month. This decrease was about as expected, as the orders have been on the decline since October. In that month orders averaged about 80,000 tons a day; in November, 55,000 tons a day; in December, 46,000 tons a day; in January, 38,000 tons a day; and in February about 35,000 tons a day. The unfilled tonnage on January 31, 1913, was 7,827,368 tons; on December 31, 1912, 7,932,164 tons; on November 30, 1912, 7,852,883 tons; and on February 29, 1912, 5,454,200 tons. The present unfilled tonnage has been exceeded six times during the history of the corporation. The largest unfilled tonnage was on December 31, 1906, when it was 8,489,718 tons.

The Very Latest Thing in Signs.

The Chicago & North Western has just installed a novel electric advertising sign over the river front in Chicago, facing the Rush street bridge. The sign measures 50 ft. square, and shows a large passenger locomotive and part of a train. In front of the locomotive is a semaphore signal which automatically changes from the stop position to the clear position. When the change has been made the driving wheels of the locomotive are seen to revolve and a small ribbon of smoke is emitted from the stack. When the signal goes back to the stop position the wheels slow down and stop. Surmounting the sign is a large trade mark of the company in colors, and underneath the train are a few lines of advertising of its service. The sign stands on the roof of one of the company's freight houses, and is so located that it is seen by thousands of people. The sign contains 3,800 tungsten lamps, 29,500 lbs. of steel and 30,000 ft. of wire. Its total weight is 18¾ tons.

Railway Legislation.

An anti-pass bill has been defeated in the senate of the Utah legislature after it had been amended so as to allow most of the public officeholders of the state to ride free.

Both houses of the legislature of Connecticut have passed a bill amending the charters of common carriers so as to require

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them to furnish free transportation to members of the legislature when that body is in session.

Both houses of the Texas legislature have passed a bill authorizing the St. Louis Southwestern of Texas to purchase and operate the Stephenville North & South Texas. An amendment to require the company to purchase the state railroad, running from Rusk to Palestine, was defeated.

A bill has been introduced in the Ohio legislature requiring all railways in the state to equip their trains entirely with steel passenger cars, and to install automatic block signals throughout their lines after January 1, 1914. Wooden passenger cars operated in the meantime are to be attached behind the steel cars if there are any in the train.

Both houses of the Oklahoma legislature have passed a bill to make 2½ cents a mile the legal rate for passenger fares in the state until provided otherwise by the legislature or the corporation commission. The latter provision was inserted to enable the corporation commission to re-establish the 2-cent fare if the Supreme Court sustains the legality of that rate in cases now before it.

Both houses of the Indiana legislature have passed the bill drafted by Chairman Wood, of the railroad commission, providing for the elimination of grade crossings. The bill requires the newly established public service commission to keep on file a list of all highway crossings of railways, each to be designated by number, and provides for hearings before the commission, after which it may order a separation of the grades, at least three-fourths of the expense to be borne by the railway company, and not exceeding one-fourth by the county.

A Texas legislator thinks that some railway officers are not earning their salaries and has introduced a bill requiring the railroad commission to make such orders "as may be necessary to secure economy in the expense of operating the railways in Texas," and authorizing the commission to limit the salaries which railway corporations may pay, and such other orders "as may be necessary to prevent the dissipation of the earnings of railway corporations by unnecessary or extravagant expenditures to those performing no service, or unnecessary service."

Proposed Improvements at Springfield, Mass.

The State Railroad Commissioners of Massachusetts, acting as a special commission, under a law passed in 1910, has made a report on proposed new railroad lines in and near Springfield, Mass., to meet the demands of the city for the abolition of grade crossings and the enlargement of passenger and freight facilities in the city. Changes, according to various plans, have been under consideration for several years, but there is much difference of opinion between the several railroad companies, and between the railroads and the city, and it does not appear when the present plan is to be carried out; but the commission makes its report in accordance with the mandate of the legislature. The plan has been filed with the Hampden county superior court, at Springfield. In its main features it is similar to one presented by William Barclay Parsons who was engaged to study the problem in 1911. The commissioners estimate that the cost of the plan will be $9,415,000, which does not include an extension into the state of Connecticut which would be a necessary part of the scheme.

The main feature of the plan is a new line for the New York, New Haven & Hartford from the south, on the west side of the Connecticut river, which line would join the Boston & Albany at the point where it crosses the river. The Union station would be remodeled so as to permit passengers to cross from one side to the other beneath the six main tracks. At present the station is on the track level. Other features of the plan are a new connection to the Central New England about 4 miles west of Springfield; a connection from the Boston & Albany east of the passenger station northward to the Boston & Maine at Chicopee; a connection between the main line and the Highland division of the New Haven road, and the elevation of the Boston & Albany tracks near the river to permit two streets to cross beneath the tracks.

To Begin Work on Large Interchange Yards at Chicago.

The Belt Railway of Chicago has announced plans for beginning work at once on the improvements in the Clearing yards just outside of Chicago, including auxiliary yards and tracks, and several changes in the present alinement of the Belt, which will be necessary to put into effect the plan for using the Clearing yards for the interchange of through freight in the Chicago terminal district. The principal features of the plan by which thirteen of the principal railways entering Chicago become joint stockholders in the Belt, and have executed an operating agreement giving them equal rights to use the main tracks of the Belt for the movement of trains between their respective connections and yards and the clearing yards, were described in the *Railway Age Gazette* of March 22, 1912, page 693.

The Clearing property, including a hump classification yard with a capacity of 5,000 cars, has been acquired by the Chicago & Western Indiana, which owned the Belt, and leased to the Belt company, as reorganized, for a period of 50 years. The present yard, which has been lying practically idle for many years, is to be rebuilt and enlarged. The additions to it will include a group of receiving and departure yards located at the east and west ends of the present yard, which will be widened, additional ladder tracks in connection with the gravity mound, additional thoroughfare tracks connecting the west end of the yard with the main tracks of the Belt about one-half mile north of the present yard, new receiving and departure yards connecting the east end of the present yard and Hayford and a roundhouse, shops and office building to be located near the yard. Condemnation proceedings were started on March 8 to acquire about 150 acres of ground necessary for carrying out these plans, and it is expected that 3,000 men will be at work by April 1. When completed the work now planned will represent the first of a series of four parallel units planned to be built ultimately, and the first unit will have a capacity of about 10,000 cars. Later a large L. C. L. clearing house is to be built having a capacity sufficient for all of this class of traffic interchanged between the owners of the Belt and possibly for other roads in addition.

Transfers of through freight from east to west, west to east, and west to south, will be made in the yards at Clearing, thereby removing a large amount of interchange from the congested downtown terminals.

Louisville & Nashville Passenger Bulletin.

This is the title of a monthly circular issued by the passenger department of the Louisville & Nashville, at New Orleans, for the information of the station agents of the company in the territory south of Birmingham. It is a four-page sheet 8½ in. x 11 in., and quite similar in style to the bulletin of the Canadian Pacific, which was noticed in the *Railway Age Gazette* of February 23, page 330. A prominent feature is the "blue ribbon roll," a list of 33 stations, giving the name of the agent at each, where there was a marked increase in the sales of tickets during the month of January, as compared with January of the preceding year. There is a special paragraph about E. W. Speed, agent at Marianna, Fla., who is such a good solicitor that he secured, by February 13, the promise of 42 persons to go over the Louisville & Nashville to the inauguration of the president at Washington. Marianna, according to the atlas, has less than 2,000 population; though it is a county seat. To go north over the Louisville & Nashville passengers from Marianna have first to travel 135 miles westward. The bulletin contains a short article by the division passenger agent on courtesy and one from an assistant superintendent of the same nature. Reprinting a circular which was issued by the general passenger agent two years ago, the bulletin gives the following hints for the guidance of—

Experienced and Inexperienced Ticket Sellers.

"Complaints reach us from time to time that passengers, who have made inquiries of agents or experienced ticket sellers, during the day hours, concerning tickets which they desire to purchase for night trains, are unable to obtain such tickets at night, various reasons for failing to provide them being assigned —such as inability of men on duty at night to find tickets or tariffs, unfamiliarity with tariffs, not being permitted to sell interline tickets, etc.

"It is the duty of agents to assist passengers in all legitimate ways to obtain the benefits of any fares or arrangements authorized by tariffs, and pains should be taken to provide the tickets desired or to enable night men to carry out representations made by employees on duty in the day time. When inexpedient for night men to sell any particular tickets for trains departing at late hours, they should be issued during the day, but,

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even if night men are capable of issuing any tickets which may be called for, and passengers, especially when contemplating journeys of considerable length, prefer to complete their arrangements during the day, they should be accommodated. It is preferable, on the whole, that local tickets for comparatively short trips should not be issued, day or night, until the last train preceding that for which they are desired has departed, but such condition is not arbitrary, and should not be carried to the extent, reported in some cases, of agents positively refusing to sell tickets after departure of last preceding train, and compelling passengers to wait until half an hour or less before the time of departure of train on which tickets were to be used.

"It should be the rule for each and every employee who has given any passenger special information, based on painstaking examination of tariffs or schedules, and who may not be on duty when tickets to which such information relates are called for, to acquaint other employees with the particulars, so that no misunderstanding may exist. It often transpires that passengers receive certain information from one employee, and, supposing that other representatives of the company are in possession of like information, they apply for tickets without entering into details as completely as when making first inquiries, and discover later that they have not obtained tickets of the character or by the route selected when original inquiries were made."

Boston Not the Whole of Massachusetts.

The universal electrification of railroads is an ideal beautiful to contemplate, but the proposal has have the Boston & Albany spend a great deal of money for the benefit of the metropolitan district of Boston does not inspire great enthusiasm among the rest of us along the line. Vice-President Hustis, in his statement before the legislative committee (*Railway Age Gazette*, February 28, page 400), shows how in 1912, for the first time since the lease, the deficit has been turned into a surplus. The length of the state the property has been appreciated. Albany now complains of the Albany, and there is general confidence that Mr. Hustis is quite as much interested in serving the public as in making profits for the New York Central and the New Haven roads, who now share jointly the losses or profits of the Albany. Mr. Hustis said that the electrification for passenger service within the metropolitan district would cost over $6,400,000, and that there would be an added net loss in operation of nearly $550,000. This is a big burden for a small railroad to shoulder, particularly one just getting its feet on solid ground. The proposed electrification would again put the balance on the wrong side and would deprive all the rest of the road outside of Boston of improvements that it hopes for.—*Springfield Republican.*

Commodities, Operating Steam Railroads.

The *Railway Age Gazette* has received the following letter under a Constantinople date line, but bearing an American postmark, which indicates that "Aziz Bey" is not the earnest and unsophisticated inquirer for information that he seems:

CONSTANTINOPLE, February 15, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

On examining the fifth annual report of the Public Service Commission of your state of New York, Second district, I find in Table 111-A, a list of "Commodities, operating steam railroad corporations."

We have in this country of ours quite a number of animals operating steam railroad corporations, including men, old women and asses, but so far as I am aware we do not term them "commodities."

I notice, however, that two of the commodities named in your list are "Live Stock" and "Poultry," which would seem to indicate that in your country, like ours, asses are so occupied, and possibly geese.

In another table of the same publication, 108-B, I notice that one of the railways has "Available for Service," two-thirds of one locomotive, and this appears to be a six-wheeled switcher. From another table I learn that this two-thirds of an engine was "in service" on June 30, 1911. It would be very interesting to learn the service of which an engine is capable, from which one-third has been removed. Possibly this arrangement was made by one of the commodities referred to above.

In the hope that you can give me full information on these interesting subjects, I remain,

Your most obedient servant,

AZIZ BEY.

Drastic Grade Crossing Law in New Jersey.

Governor Fielder of New Jersey on Wednesday last signed the grade crossing abolition law. This was a bill which he introduced while serving as senator at the opening of the present session. The essential difference between the measure and that vetoed last year by Governor Wilson is that the present bill authorizes the public utility commission to determine what crossings shall be abolished, while the bill of last year made it compulsory upon railroads to do away with grade crossings at the rate of one for every mile of road each year.

President Rea, of the Pennsylvania Railroad had telegraphed to the governor, protesting against the approval of the bill, which provides for making the improvements at the sole expense of the railroads. Mr. Rea issued a statement showing the grave injustice done the railroads. He said:

"The Pennsylvania has long been committed to the policy of eliminating grade crossings as spedily as possible and is anxious that no laws be passed which will tend to deter, rather than encourage the rapid removal of all grade crossings.

"In the last 20 years the Pennsylvania has removed 110 crossings in the state of New Jersey, at an expense to the company of about $8,000,000, or $73,000 per crossing.

"There remain, however, some 1,200 grade crossings on the Pennsylvania system in New Jersey, the removal of which at $50,000 per crossing, would cost $60,000,000, an expenditure which would neither produce additional revenue, nor decrease expenses.

"It is to be hoped that the governor will appreciate the situation and veto the bill in the hope that one may be passed which will bring the state, the municipalities and the railroad together, insuring the apportionment of the cost in proportion to the equitable interests of all concerned."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DENTRACH OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Rogers, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 13, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—I. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

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BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clemesh H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Keller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. C. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Int. Ry. Gen. Supt. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotehford, Union Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—J. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, R. R. Engrs., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meeting with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meeting with M. M. Assoc., C. B. Assoc.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W. Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 233 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Monigomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. C. Macomber, Wolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Rumpo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday in each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The Intercolonial Railway is to establish a car ferry between Cape Tormentine, N. B., and Carleton Point, P. E. I.

The Mobile & Ohio announces a fast live stock train to be run twice a week from Meridian, Miss., to East St. Louis. The run of 520 miles from Meridian is to be made in about 24 hours.

The Great Northern, Northern Pacific, and Minneapolis, St. Paul & Sault Ste. Marie, have announced new rates on return shipments of threshing machines, engines or their parts, second-hand, which has been used or broken, worn or damaged, at 60 per cent. of the regular rates. The rates apply from stations in North and South Dakota to St. Paul, Duluth, Stillwater and other points.

The New York, New Haven & Hartford has opened a new freight station at Pier 70, East River, at the foot of East Twenty-second street, New York. This station will accommodate the wholesale silk and cotton goods merchants, who during the past few years have moved their stores from the old dry goods district to the neighborhood of Fourth avenue, between Union Square and Thirtieth street.

A committee of the Montana legislature has been holding an investigation of the freight rate situation in the state, and has reported its finding to the legislature with the recommendation that the legislature ask the railroad commission to reduce rates on carload shipments 25 per cent., or to 40 per cent. less than the rates for less than carload shipments. The railways have promised the committee to correct some instances of alleged discrimination found by the committee.

The next regular meeting of the Western Classification Committee is to be held in St. Louis, beginning April 1. The docket is unusually large and important, because this is the first meeting since that of July 7, 1911, at which classification No. 51, which was suspended by the commission for a year, until February 15, 1913, was adopted. The Southern Classification Committee will also hold a meeting on April 7, at Cincinnati, and a preliminary meeting of the Official Classification Committee will be held in Chicago on April 15.

Liquors in Interstate Traffic.

The law passed by the last Congress, and re-passed by both houses after being vetoed by President Taft, regulating traffic in intoxicating liquors, is Public Statute No. 398. It is entitled "An act divesting intoxicating liquors of their interstate character in certain cases." It says, in substance, that the shipment or transportation in any manner or by any means of any spirituous, vinous, malted, fermented, or other intoxicating liquor, from one state to another, which said liquor is intended, by any person interested therein, to be received, possessed, sold, or used in violation of any law of the state into which it is destined, is prohibited.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association in presenting statistical bulletin number 137-A, giving a summary of car surpluses and shortages by groups from November 22, 1911, to March 1, 1913, says: The total surplus on March 1, 1913, was 58,529 cars; on February 15, 1913, 52,700 cars; and on February 28, 1912, 44,984 cars.

The total shortage on March 1, 1913, was 27,148 cars; on February 15, 1913, 30,517 cars; and on February 28, 1912, 37,142 cars. Compared with the preceding period; there is an increase in the total surplus of 5,829 cars, of which 5,796 is in coal, 1,479 in miscellaneous, and a decrease of 842 box and 604 flat. The decrease in box car surplus is in groups 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 3 (Ohio, Indiana, Michigan and western Pennsylvania), 4 (the Virginias and Carolinas.), 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona). The decrease in flat car surplus is in groups 1 (New England Lines), 5 (as above), 8 (Kansas, Colorado, Oklahoma, Missouri and Ar-

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kansas), 9 (Texas, Louisiana and New Mexico), 10 (as above), and 11 (Canadian lines). The increase in coal car surplus is in all groups, except 4 (as above), and 7 (Montana, Wyoming, Nebraska and the Dakotas). The increase in miscellaneous car surplus is general, except in groups 1, 4, 5 (as above), and 6 (Iowa, Illinois, Wisconsin and Minnesota).

Compared with the preceding period; there is a decrease in the total shortage of 3,369 cars, of which 1,539 is in box, 3,841 in coal, and an increase of 1,873 in flat and 138 in miscellaneous. The decrease in box car shortage is in groups 4, 5, 6, 7, 8 and 10 (as above). The decrease in coal car shortage is in all groups, except 7 and 10 (as above). The increase in flat car shortage is in all groups, except 5 and 7 (as above). The increase in miscellaneous car shortage is in groups 1, 2, 3, 6, 8, 9 and 11 (as above).

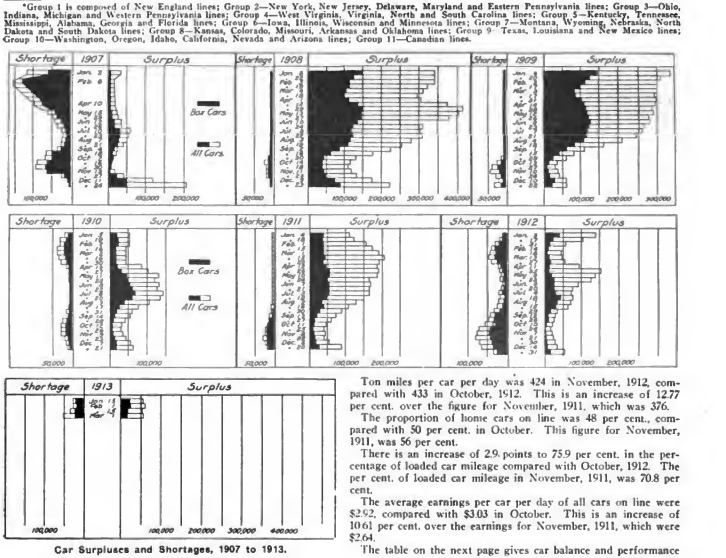
Compared with the same date of 1912; there is an increase in the total surplus of 13,545 cars, of which 6,943 is in box, 7,800 in coal, 1,368 in miscellaneous, and a decrease of 2,566 in flat car surplus. There is a decrease in the total shortage of 9,994 cars, of which 5,869 is in box, 4,758 in coal, 2,219 in miscellaneous, and an increase of 2,892 flat cars.

The accompanying table gives surplus and shortage figures by groups for the last period covered in the report and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—March 1, 1913	7	0	24	33	3	110	871	108	22	726	1,727
" 2.— " 1, 1913	34	468	59	1,196	252	1,975	438	1,186	1,939	14	3,577
" 3.— " 1, 1913	32	79	641	4,240	1,798	6,758	4,248	71	134	837	5,290
" 4.— " 1, 1913	12	5,475	127	952	947	7,501	844	674	560	0	2,078
" 5.— " 1, 1913	5	21	0	1,561	639	2,225	2,943	302	182	69	3,896
" 6.— " 1, 1913	33	1,929	1,061	3,163	2,727	8,880	4,404	684	193	351	5,632
" 7.— " 1, 1913	5	243	240	623	631	1,737	130	0	82	0	212
" 8.— " 1, 1913	18	1,158	360	2,645	2,374	6,537	437	39	13	83	573
" 9.— " 1, 1913	15	1,927	268	427	1,066	3,738	50	12	0	9	71
" 10.— " 1, 1913	26	4,133	1,593	3,149	8,796	17,651	649	26	30	167	872
" 11.— " 1, 1913	7	534	237	0	650	1,421	2,631	321	0	269	3,221
Total	215	15,967	4,650	18,039	19,873	58,529	17,645	3,623	3,355	2,525	22,148

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

Ton miles per car per day was 424 in November, 1912, compared with 433 in October, 1912. This is an increase of 12.77 per cent. over the figure for November, 1911, which was 376.

The proportion of home cars on line was 48 per cent., compared with 50 per cent. in October. This figure for November, 1911, was 56 per cent.

There is an increase of 2.9 points to 75.9 per cent. in the percentage of loaded car mileage compared with October, 1912. The per cent. of loaded car mileage in November, 1911, was 70.8 per cent.

The average earnings per car per day of all cars on line were $2.92, compared with $3.03 in October. This is an increase of 10.61 per cent. over the earnings for November, 1911, which were $2.64.

The table on the next page gives car balance and performance

Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 140, covering car balances and performances for November, 1912, says:

The miles per car per day, for November was 26.0, maintaining the same figure as in October and the highest of which we have record. This figure for November, 1911, was 24.4.

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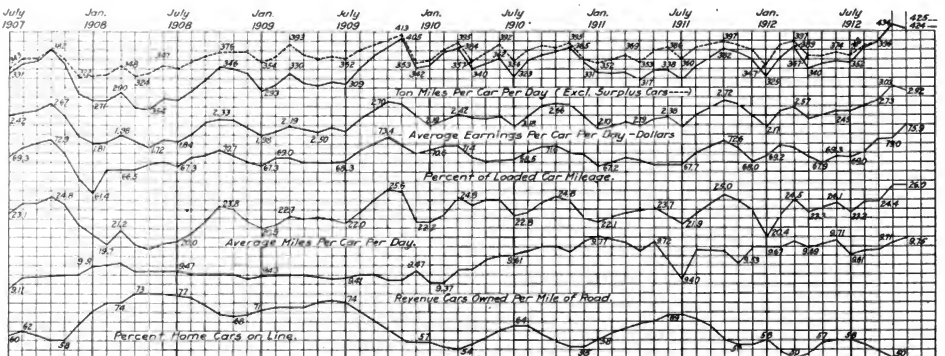
CAR BALANCE AND PERFORMANCE IN NOVEMBER, 1912.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	83,928	685,245	221,094	189,645	170,206	413,617	17,206	140,777	29,537	141,683	126,425	2,219,563
Average number of system cars on line	19,464	314,817	101,259	84,135	65,723	247,866	4,421	54,811	16,307	60,571	85,865	1,074,259
Railway-owned cars: Average foreign on line	59,586	323,217	120,251	78,323	77,895	191,756	13,304	77,261	37,116	64,525	61,424	1,104,658
Total Railway-owned cars on line	106,875	638,034	221,510	162,458	143,618	439,622	17,725	132,072	53,423	125,096	147,289	2,187,222
Excess	14,142	*47,211	416	*27,387	*26,588	26,005	519	*8,705	23,886	*16,587	20,864	*40,646
Per cent. of cars on line to total owned:												
Home	46	46	46	45	38	60	26	39	55	43	68	48
Foreign	71	47	54	41	46	46	77	50	126	45	49	50
All railways	117	93	100	86	84	106	103	89	181	88	117	98
Private cars on line	4,366	43,250	11,663	4,840	10,019	18,494	2,367	9,652	4,893	13,188	3,434	126,166
Total, all cars on line	111,241	681,284	233,173	167,298	153,637	458,116	20,092	141,724	58,316	138,284	150,723	2,313,888
Per cent. of cars in shop	6.66	5.33	8.04	6.71	7.29	6.93	6.37	6.78	4.88	4.43	4.08	6.22
No. of freight engines owned	1,419	10,459	3,173	3,456	2,830	6,623	539	2,785	872	3,007	2,139	37,302
Average cars on line per freight engine owned	78	65	73	48	54	69	51	51	67	46	70	62
Total freight-car mileage	58,653,660	534,611,178	160,279,050	134,905,524	126,556,800	354,474,967	32,138,533	102,194,510	43,132,159	139,835,529	121,291,072	1,808,072,981
Average miles per car per day	17.6	26.2	22.2	26.9	27.5	24.7	54.9	25.4	14.7	32.8	26.8	26.0
Per cent. loaded mileage	74.6	68.8	72.9	70.3	74.1	72.1	74.6	73.2	70.8	74.7	75.3	75.9
Ton-miles of freight, including company freight	704,97 2,821	9,182,186,012	3,004,486,228	2,241,163,888	1,914,270,106	4,192,994,423	$25,436,346	1,588,946,662	561,598,645	2,127,077,365	1,749,348,527	27,292,481,023
Average ton-miles, including company freight:												
Per car-mile	12.0	17.3	19.6	16.6	15.2	15.7	16.7	15.5	13.0	15.5	14.4	16.3
Per loaded car-mile	16.1	25.2	26.9	23.6	20.6	21.9	22.4	21.3	18.4	20.8	19.2	22.8
Per car per day	311	455	444	447	420	388	917	395	321	524	387	424
Gross freight earnings	$7,610,574	$53,749,486	$16,367,713	$13,881,466	$13,683,915	$39,536,914	$3,274,892	$14,126,105	$5,490,352	$21,253,309	$12,527,151	$202,501,882
Average daily earnings: Per car owned	$2.71	$2.61	$2.47	$2.44	$2.68	$3.19	$7.31	$3.25	$6.20	$5.14	$3.30	$3.04
Per railroad car on line	2.32	2.01	2.46	2.85	3.18	3.00	7.10	3.57	3.43	5.82	2.84	3.09
All cars on line	2.24	2.63	2.34	2.77	2.97	2.98	6.26	3.32	3.14	5.27	2.77	2.92

*Denotes deficiency.



Freight Car Mileage, Earnings and Performance, 1907 to 1912.

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in the month covered by the report, and the diagram shows car earnings and car mileage and different car performance figures monthly from July, 1907.

Car Location.

The accompanying table, which is taken from the car location bulletin No. 3-A of the American Railway Association, gives a summary of freight car location by groups on February 15, together with surpluses and shortages on the same date.

Car Location on February 15, 1913.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa. & So.	Va., W. Va., Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	85,764	675,917	790,171	200,042	124,575	384,193	16,416	149,955	32,179	129,819	129,555	2,349,926
Home Cars on Home Roads	42,841	345,725	97,296	102,454	72,202	278,014	3,072	66,351	13,556	65,632	82,270	1,169,490
Home Cars on Foreign Roads	44,863	330,142	192,873	97,588	101,368	186,581	13,344	83,604	18,623	64,167	47,285	1,180,438
Foreign Cars on Home Roads	37,163	309,636	204,924	94,727	89,434	292,961	11,559	80,895	30,475	64,317	52,860	1,202,862
Total Cars on Line	100,006	655,411	301,322	197,231	161,641	480,975	14,631	147,246	44,031	130,169	140,130	2,372,793
Excess or Deficiency	12,302	*20,106	11,151	*2,811	*11,934	16,380	*1,785	*2,709	11,852	350	10,575	22,865
Surplus	359	3,221	3,573	9,014	1,278	6,163	2,017	5,369	3,462	16,878	1,223	52,899
Shortage	1,373	5,461	4,071	3,692	4,797	2,424	464	1,357	71	1,191	2,189	31,121
Shop Cars—												
Home Cars in Home Shops	5,195	26,831	15,377	8,316	9,906	20,187	416	7,750	1,595	4,000	3,604	103,177
Foreign Cars in Home Shops	1,554	8,269	6,250	2,181	2,676	5,550	469	2,356	1,129	2,466	748	33,618
Total Cars in Shop	6,749	35,100	21,627	10,497	12,582	25,707	885	10,106	2,724	6,466	4,352	136,795
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	48.83	51.16	33.53	51.22	41.60	59.84	18.71	44.25	42.13	50.57	63.50	49.77
Total Cars on Line	111.84	96.97	103.74	98.59	93.12	103.53	89.13	96.07	136.83	100.27	108.16	100.97
Home Cars in Home Shops	5.93	3.97	5.30	4.16	5.71	4.35	2.53	5.23	4.96	3.08	2.78	4.43
Foreign Cars in Home Shops	1.22	1.22	2.15	1.09	1.54	1.19	2.86	1.46	3.51	1.90	.58	1.45
Total Cars in Shops	7.15	5.19	7.45	5.25	7.25	5.54	5.39	6.69	8.47	4.98	3.36	5.90

*Denotes deficiency.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended until June 28, certain items providing for the withdrawal of store-door and pick-up service at Washington, D. C., contained in certain tariffs.

The commission has suspended until June 14, certain items in the tariff of the Chicago, Milwaukee & St. Paul, which contain advances in rates for the transportation of grain from South Dakota points to Chicago and Milwaukee.

The commission has further suspended from February 25, until August 25, the schedules in certain tariffs, which publish new rules affecting the transportation of baggage exceeding certain dimensions both east and west of the Mississippi river.

The commission has suspended from March 12 until September 12, the operation of certain tariff schedules which contain proposed advances in rates for the transportation of lumber between points in Louisiana and Mississippi and Memphis, Tenn.

The commission has further suspended from February 26, until August 26, the schedules in certain tariffs, which advance rates for the transportation of linseed oil from St. Paul, Minn., and other points to Chicago, Kansas City, Mo., and other points.

The commission has suspended from March 1 until September 1, an item in a supplement to W. H. Hosmer's tariff, which contains proposed advances in rates for the transportation of asphalt and asphaltum from points in Kansas to St. Louis, Mo., and other points.

The commission has further suspended from February 26 until August 26, certain schedules in W. H. Hosmer's tariff, which advance rates for the transportation of pig iron in carloads, from points in upper Michigan and Minnesota to Kansas City, Mo., and other points.

The New Orleans Lumber Men's Association has filed a complaint with the Interstate Commerce Commission attacking the agreement recently made by the railways and steamship lines regarding demurrage and free time on through export bill of lading shipments of cotton, lumber and other forest products.

Illinois grain dealers have filed a petition with the Interstate Commerce Commission against a proposed readjustment of joint through rates on grain and grain products from Illinois, Iowa, and Indiana specific group points to points in eastern trunk line territory, which the shippers claim will bring about general advances ranging from one-half cent to one cent per 100 lbs.

The commission has suspended until July 8, the operation of certain tariffs, which advance rates for the transportation of grain and grain products, in carloads, from Chicago and South Chicago, Ill., and Whiting and Indiana Harbor, Ind., to points in Indiana, Ohio, Michigan, Pennsylvania and Kentucky. The advances range from ½ cent to 1 cent per 100 lbs., and affect a large number of points.

The commission has suspended from March 10 until July 8, the operation of supplements to certain tariffs which contain advances in rates for the transportation of lumber, piling and other forest products, in carloads, from Bena, Schley, Cass Lake and other points in Minnesota to Superior, Wis., and Duluth, Minn. The present rate between these points is 7 cents per 100 lbs., and the proposed rate 8 cents.

The commission has suspended until April 30, the operation of the schedules in certain tariffs which attempted to cancel the through rates now in effect for the transportation of lumber and other articles from north Pacific coast points destined to Missouri, Iowa, Illinois and points in other states east and west of the Mississippi river when moving via the Northern Pacific, Silver Bow, Mont., and the Oregon Short Line.

The commission has suspended from March 10 until July 8, the operation of a supplement to the tariff of the St. Louis & San Francisco which canceled through rates applicable to the transportation of lumber and certain articles manufactured therefrom, originating at points in Alabama, Miss., and other states, and destined to points north of the Ohio river, also providing that combination rates apply. The present through rate from Brownfield, Miss., to New York is 36½ cents per 100 lbs., and the proposed combination rate is 44½ cents. Similar increases were contemplated between other points.

Investigation of Water Connections.

In a general order to all railroads, the commission calls for a report, under oath, before April 15, showing what connections each may have in the transportation of freight or passengers by water. The information is to be used by the commission in the administration of the provision of the Panama Canal law, under which it will be unlawful, after July 1, 1914, for any railroad company to own, control, or have any interest in any common carrier by water operated through the Panama Canal *or elsewhere*, with which the railroad may be a competitor.

Investigation of Private Cars.

The Interstate Commerce Commission has begun an extensive investigation of private freight car lines, and of the business of all owners of cars other than railroad companies. The investigation will be in charge of Commissioner McChord, and the examination of carriers' and car owners' accounts will be made under the direction of George P. Boyle. Circulars containing requests for information have been sent to railroad companies, to car owners and also to users of private freight cars. All shippers or associations interested in the subject are requested

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to send in any information in their possession, and the replies are wanted in Washington by March 31.

No complete record of the freight cars in the United States has ever been made. All statistics hitherto gathered by the government, or by the American Railway Association have given either estimates or else no information at all, insofar as they deal with cars owned by other than railroad companies.

Reparation Awarded.

Henry H. Sheip Manufacturing Company v. Atlantic Coast Line et al. Opinion by the commission:

The rate of 63 cents per 100 lbs. for the transportation of a carload of cigar-box lumber from Tampa, Fla., to Philadelphia, Pa., was found to have been unreasonable to the extent that it exceeded 32.5 cents. (26 I. C. C., 178.)

Joe C. Sims v. Montpelier & Wells River et al. Opinion by the commission:

The commission found that the rate of 8 cents per 100 lbs. charged for the transportation of granite and stone blocks or slabs from Louisville, Ky., to Lebanon, Ky., as part of the through rate from Barre, Vt., and Bedford, Ind., was unreasonable to the extent that it exceeded 5½ cents per 100 lbs., and ordered that rate for the future. (26 I. C. C., 275.)

Complaint Dismissed.

Wharton Steel Company v. Central of New Jersey et al. Opinion by the commission:

The commission found that the rate of $1.15 per gross ton for the transportation of pig iron in carloads from Wharton, N. J., to Harrisburg, Pa., was not shown to have been unreasonable. (26 I. C. C., 166.)

Minneapolis Steel & Machinery Company v. Chicago, Milwaukee & St. Paul et al. Opinion by the commission:

The complainant was not found to have been damaged by reason of charges assessed for the transportation of carload shipments of structural steel from Minneapolis, Minn., to Miami, Ariz. (26 I. C. C., 193.)

Public Service Commission of Washington v. Northern Pacific et al. Opinion by Commissioner Harlan:

This case was originally decided in 23 I. C. C., 256, mentioned in the *Railway Age Gazette* of May 3, 1912, p. 1021. Subsequently the Great Northern asked the commission for a rehearing. The commission again went over the record in the light of the petition for a rehearing and of the suggestions filed in support of it, but adhered to its original decision and denied the petition of the defendant. (26 I. C. C., 272.)

Motorcycle Manufacturers' Association v. Baltimore & Ohio et al. Opinion by Commissioner Prouty:

On July 1, 1910, by official classification motorcycles were given a rating one and a half times first class l. c. l. and first class c. l. For some years previous the carload rating had been second class and the complainant attacked this advance as unreasonable. The commission found that the rates in question are just and reasonable as compared with the rates on bicycles and automobiles, and with the rates on motorcycles in other parts of the country. (26 I. C. C., 127.)

New Pittsburgh Coal Company v. Hocking Valley. Opinion by Commissioner Meyer:

The commission found that the rate of 85 cents per net ton on "lake-cargo coal" from the Hocking district of Ohio to the docks at Toledo, when for transshipment to points beyond, was not unreasonable at the time the complainant's shipments were transported. The commission is without authority to award reparation in any case unless it can conclude that the rate assailed was in violation of the act to regulate commerce during the period the shipments in question moved. (26 I. C. C., 121.)

Tone Brothers v. Illinois Central et al. Opinion by Commissioner Clements:

Under Western classification pepper is rated second class, any quantity, and under Official classification this commodity is rated fourth class in carloads and second class in less than carload quantities. The complainants contend that the classification of pepper under Western classification is unreasonable, as no special provision is made for shipments in carloads. The commission decided that as the classification of pepper under Western classification was under consideration in other proceedings, and as the tonnage shipped by the complainant was extremely light, it would be inappropriate to deal with that question in this case. (26 I. C. C., 279.)

Davis Sewing Machine Company v. Pittsburgh, Cincinnati, Chicago & St. Louis et al. Opinion by the commission:

On July 1, 1910, the rating in official classification on bicycles in carloads was advanced from second class to first class. The complainant contends that the first class rating on bicycles from Dayton, Ohio, to Chicago is unreasonable. In 22 I. C. C., 291, this was heard and the commission held that the advance had not been justified. Subsequently the defendant filed a petition for rehearing which was granted by the commission. The testimony shows that rates on all vehicles were advanced at the same time that the advances in question were made; also that the prices on bicycles had advanced. The defendant maintained that if the rates from Dayton to Chicago were reduced it would necessitate numerous other reductions. The commission found that the carriers had shown the advanced rate to be reasonable. (26 I. C. C., 282.)

Linseed Oil Rate Advanced.

In re investigation and suspension of advances in rates by carriers for the transportation of linseed oil from St. Paul, Minn., and other points to Chicago, Kansas City and other points. Opinion by Commissioner McChord:

The suspended tariffs propose to advance the rate on linseed oil from St. Paul, Minn., to Peoria, St. Louis and Missouri river cities and points beyond; from Milwaukee and Chicago to St. Louis and Springfield, Ill., and between other points. Minneapolis interests contend that the proposed rate is unreasonable and discriminatory in that they would be placed at a disadvantage as compared with other producing points. The advance is also opposed by interests at Des Moines, Ia., on the ground that that city would be placed at a disadvantage as compared with Minneapolis. As a general rule oils take fifth class rates which are materially higher than the rates proposed, notwithstanding the value of linseed oil is much greater than that of other oils. The commission found also that the conditions as regards competition had materially changed since the establishment of the present rates. The complainants place but little emphasis upon the claims that the proposed rates are unreasonable in themselves and apparently base their contention upon the fact that the present rates are of long standing. They contend that the advanced rates would result in a discrimination against Minneapolis in favor of Buffalo, because that city would have a lower ton-mile rate for short hauls. The commission found that though it was true, as a general rule, that the ton-mile revenue decreases with increased distance, that rule had application to hauls over the same line in the same direction, and therefore it did not follow that Buffalo and Minneapolis should take the same or relatively the same per-ton-mile rate to common territory. The commission found that the revenue from the transportation of linseed oil as compared to the revenue from similar products was not remunerative to the carriers. It was decided also that the fact that the rate on flaxseed from Minneapolis to Chicago was recently increased, was an argument for higher rates on linseed oil. The commission decided that with the exception of the rate from Des Moines the defendants had shown the proposed advances to be reasonable. The order of suspension was vacated.

With regard to the rate from Des Moines it was shown that at the time of preparation of the tariff in question the carriers did not know Des Moines was a producing point and that the rates had been decided upon without particular attention to that point. The defendants practically admitted that the existing adjustment between Des Moines and Minneapolis was not entirely fair to Des Moines. The commission found that the proposed advance in the rates from Des Moines would result in discrimination against that point in favor of Minneapolis and ordered the defendants to withdraw the advanced rate from that point. The commission found that some advance from Des Moines would probably be necessary and made it clear that nothing in this decision would prevent the carriers from adjusting the Des Moines rate with the rates found reasonable from Minneapolis. (26 I. C. C. 265.)

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, incl. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$308,893	$39,127	$419,230	$26,855	$33,182	$3,618	$55,844	$5,805	$125,344	$33,886	−$370	$5,225	$28,291	$4,228
Alabama Great Southern	309	295,653	113,224	447,761	47,355	109,382	14,665	143,903	10,377	326,084	121,677	−667	14,477	106,533	21,610
Ann Arbor	292	108,360	39,235	161,273	22,741	23,904	4,314	64,682	6,447	123,308	37,965	−1,369	12,930	23,666	6,556
Arizona Eastern	366	138,938	37,922	238,042	24,470	21,349	2,363	63,997	9,040	121,219	116,822	76	11,890	105,049	25,925
Atchison, Topeka & Santa Fe	8,208	5,279,808	2,271,744	8,156,443	1,524,792	1,400,145	189,062	2,538,107	163,938	5,807,544	2,350,959		340,579	2,010,380	401,675
Atlanta & West Point	93	55,233	40,831	107,564	13,548	21,564	6,794	35,777	4,948	82,610	24,980	397	6,344	19,033	−962
Atlanta, Birmingham & Atlantic	643	164,455	59,505	262,234	51,115	44,749	14,537	109,740	10,960	231,101	31,133		13,375	17,758	−3,489
Atlantic & St. Lawrence	167	130,500	16,730	162,286	17,832	25,660	6,190	96,614	4,304	150,603	11,502		4,000	−15,187	−4,187
Atlantic City	167	53,849	45,816	105,966	28,934	15,177	1,607	79,947	1,581	127,241	−21,255	−3,591	9,000	−32,846	977
Atlantic Coast Line	4,612	2,152,437	850,931	3,235,137	402,242	465,399	63,561	1,115,450	78,609	2,123,261	1,129,876		129,000	1,004,876	338,268
Baltimore & Ohio Chicago Terminal	22		27,177	31,409	2,076	548	638	19,429	1,462	113,052	18,586	837	19,133		−1,074
Baltimore & Ohio System	4,455	6,873,556	1,680,922	8,404,004	1,143,968	1,542,793	177,927	3,366,670	171,633	6,303,990	2,100,014	68,401	233,100	1,798,113	329,468
Bangor & Aroostook	431	168,986	31,708	213,647	39,377	33,256	2,935	96,857	12,595	185,061	28,585		13,315	15,088	−65,491
Belt Ry. Co. of Chicago	21			265,274	14,124	11,668	431	133,231	5,401	194,455	71,119		9,248	63,191	27,293
Bessemer & Lake Erie	294	430,878	23,023	464,316	65,703	140,410	8,775	150,885	9,217	374,990	89,326		12,000	77,326	118,086
Boston & Maine	2,244	2,400,875	1,062,864	3,775,127	362,287	684,990	31,330	2,114,520	103,317	3,295,990	479,137	10,180	184,721	304,796	−132,195
Buffalo & Susquehanna R. R.	265	146,018	7,359	231,754	28,449	21,225	1,188	54,154	5,728	110,804	40,938		2,200	38,738	16,111
Buffalo & Susquehanna Ry.	91	29,284	2,852	49,535	12,159	28,865	439	23,396	2,587	67,386	−17,911	5	1,700	−19,616	−4,671
Buffalo, Rochester & Pittsburgh	574	726,867	80,765	830,515	107,179	167,367	12,099	380,757	16,793	693,385	125,209	−762	29,000	95,446	−3,792
Butte, Anaconda & Pacific	46	89,317	7,233	108,968	13,253	24,012	377	63,863	2,463	104,470	4,518		2,000	2,518	−19,495
Canadian Pacific Lines in Maine	233	132,641	37,268	169,553	24,276	26,432	6,223	75,278	5,994	138,303	31,250	8	10,000	21,258	8,091
Carolina, Clinchfield & Ohio	238	185,787	12,420	203,198	32,565	23,870	12,424	36,256	2,722	84,364	118,834		14,000	104,834	16,536
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	12,706	1,161	14,438	326	96	1,063	3,090	431	5,266	9,172		500	8,672	2,924
Central New England	227	261,188	27,511	305,311	22,537	35,149	1,067	133,625	4,870	207,705	97,606	−791	10,000	87,129	−25,284
Central of Georgia	1,915	732,339	366,195	1,147,219	186,001	240,039	55,145	421,198	37,848	970,236	226,984	6,394	52,446	180,932	31,413
Central of New Jersey	669	1,747,885	382,318	2,260,927	217,621	375,861	26,779	761,227	41,700	1,363,168	897,759	−26,089	178,446	693,224	47,021
Central Vermont	411	1,004,247	71,878	1,139,262	133,539	81,438	6,930	719,522	12,640	954,068	185,194	−217	15,345	169,632	−2,922
Charleston & Western Carolina	341	116,903	29,049	153,819	28,862	30,739	3,471	69,780	4,122	137,979	25,840		5,900	20,840	14,725
Chesapeake & Ohio Lines	2,334	2,445,617	413,915	3,091,179	231,276	479,945	54,856	1,206,867	65,153	2,148,029	943,149	−3,225	127,150	813,073	68,219
Chicago & Alton	1,026	832,816	310,342	1,385,970	217,689	369,384	10,427	518,979	32,972	1,179,802	59,168	−2,471	39,000	17,697	−62,319
Chicago & Eastern Illinois	1,275	1,004,971	251,243	1,364,382	142,231	281,995	26,963	557,832	40,598	1,050,479	313,723	−5,227	45,045	263,351	75,609
Chicago & Erie	270	1,014,960	85,684	1,142,772	101,096	152,237	11,688	562,608	18,394	844,164	146,613	−1,436	30,000	−156	−1,253,578
Chicago & Northwestern	7,976	4,250,412	1,513,952	6,417,949	674,268	999,315	117,025	2,227,470	138,792	4,756,870	1,661,079	−5,781	303,000	1,352,298	1,253,578
Chicago, Burlington & Quincy	9,139	5,195,962	1,690,005	7,623,161	865,251	1,136,370	119,844	2,607,244	214,494	4,754,253	2,808,408	61,951	274,527	2,595,832	136,842
Chicago Great Western	1,946	781,462	234,534	1,104,048	147,917	175,568	49,349	497,589	33,829	849,302	254,746	−324	35,000	219,422	259,390
Chicago, Indiana & Southern	359	359,536	72,337	497,109	43,864	107,707	8,826	144,116	11,591	316,024	81,085	1,244	15,283	64,558	56,107
Chicago, Indianapolis & Louisville	617	334,274	116,938	506,083	71,870	90,159	17,624	210,050	14,611	414,351	91,729		21,224	69,993	6,186
Chicago Junction	12			151,777	10,554	13,308	1,025	83,896	3,775	112,958	38,815		1,882	36,933	8,527
Chicago, Milwaukee & Puget Sound															
Chicago, Milwaukee & St. Paul	9,592	5,346,555	1,378,314	7,283,152	614,778	1,307,171	125,245	3,055,940	107,824	5,230,958	2,052,194	−6,689	310,564	1,734,941	1,497,866
Chicago, Peoria & St. Louis	255	107,416	21,792	136,990	15,790	19,548	7,598	66,203	7,762	116,901	20,089		4,300	15,789	
Chicago, Rock Island & Gulf	427	208,618	64,925	291,662	21,870	63,607	11,018	81,339	9,665	187,519	104,143	−501	7,915	95,727	19,603
Chicago, Rock Island & Pacific	7,965	3,240,172	1,478,336	5,106,067	641,803	1,051,831	159,315	2,447,997	139,394	4,282,193	823,874	17,308	263,636	569,542	183,041
Chicago, St. Paul, Minneapolis & Omaha	1,744	813,405	377,832	1,328,498	101,265	190,537	25,267	617,966	33,147	965,197	363,301	−2,036	69,828	291,437	136,862
Chicago, Terre Haute & Southeastern	351	145,570	16,484	166,118	19,963	23,894	3,371	82,843	8,017	142,118	43,009	64	10,000	33,073	−44,027
Cincinnati, Hamilton & Dayton	1,015	534,782	125,174	759,853	102,062	160,884	19,313	394,180	21,588	698,016	61,867		34,723	27,144	−72,313
Cincinnati, New Orleans & Texas Pacific	337	715,370	173,765	937,341	77,485	213,456	24,848	275,089	19,649	606,527	325,814	−1,857	29,800	294,157	166,809
Cincinnati Northern	246	76,470	15,167	96,852	17,292	25,626	2,478	42,578	2,013	100,146	−3,294		5,500	−16,288	7,608
Cleveland, Cincinnati, Chic & St. Louis	2,014	1,901,963	606,374	2,757,999	299,518	582,878	71,661	1,246,032	59,646	2,259,744	468,255	−2,414	103,800	361,041	224,850
Colorado & Southern	1,007	596,466	93,560	743,060	73,230	169,212	10,517	309,909	22,723	514,444	214,616	−742	50,333	197,538	22,084
Colorado Midland	318	104,171	14,443	137,142	15,239	25,116	6,630	67,598	5,946	130,723	6,419	−628	8,000	−2,209	−9,077
Cumberland Valley	162	215,551	51,191	280,791	46,691	43,381	4,381	104,609	7,801	190,538	83,663	−1,212	5,702	76,749	28,596
Delaware & Hudson Co. & R. R. Dept.	1,065	1,646,646	705,396	2,403,183	161,303	320,640	23,180	1,066,296	61,270	1,675,467	924,705	2,011	49,707	872,809	568,025
Delaware, Lackawanna & Western	958	2,486,454	619,676	3,347,867	259,241	551,412	65,616	1,078,156	71,950	2,026,325	1,316,492	34,392	165,900	1,185,884	378,923
Denver & Rio Grande	2,509	1,409,097	327,752	1,906,324	158,678	295,261	41,117	693,154	61,105	1,249,435	656,889	−5,586	86,400	571,103	99,521
Denver, Northwestern & Pacific	215	58,885	12,535	75,933	13,619	16,659	1,842	35,084	6,533	73,737	2,196		1,300	896	−15,300
Detroit & Mackinac	411	49,096	24,461	80,885	9,881	14,617	2,319	37,824	3,317	67,858	12,967	−619	8,613	3,755	10,226
Detroit & Toledo Shore Line	79	122,730		126,314	8,379	7,353	1,391	35,960	2,532	55,855	70,279		4,855	65,884	21,722
Detroit, Grand Haven & Milwaukee	791	129,000	42,000	185,897	46,564	29,792	3,027	123,508	5,094	213,045	−27,158	−74	2,953	−30,215	−18,090
Detroit River Tunnel	2			116,953	2,431	2,584		9,323	33	14,372	102,582		6,000	96,582	2,024
Detroit, Toledo & Ironton	441	199,078	19,593	241,559	34,044	16,904	5,704	87,647	5,734	149,889	19,491		6,000	−25,491	−58,900
Duluth & Iron Range	372	28,376	21,805	110,221	46,056	52,120	609	67,957	10,135	176,867	−66,646	−2,347	5,623	−74,616	−7,491
Duluth, Missabe & Northern	356	68,917	76,742	181,370	49,276	67,784	2,728	66,929	11,744	197,565	−96,182	−2,805	5,384	−104,376	43,161
Duluth, South Shore & Atlantic	627	179,443	63,184	256,244	40,339	30,760	7,613	121,761	8,233	208,108	48,136	707	18,000	30,843	41,132
Elgin, Joliet & Eastern	819	1,010,663	9	1,091,445	102,454	164,344	4,980	355,941	18,896	648,615	442,830		20,333	422,497	189,100
El Paso & Southwestern Co.	968	625,673	108,077	767,683	122,360	109,210	16,409	240,313	28,849	517,141	249,941	−1,899	28,346	220,196	−39,977
Erie	1,988	3,225,623	662,271	4,266,130	361,104	837,731	94,345	1,552,290	87,867	2,938,037	1,328,093	−92,085	152,835	1,083,173	420,219
Florida East Coast	642	228,867	220,798	510,148	70,527	63,832	13,805	186,307	17,445	351,916	158,232	−1,941	15,500	170,791	79,196

† Merged with Chicago, Milwaukee & St. Paul Ry. Company, January 1, 1913. ‡This road taken out of the hands of the Receivers on January 1, 1913. No comparison shown.
Average mileage operated during previous period—7,231; 9662; 4,526; 4628; 8572; 8; 7,918; 7,074; 7,551; 1,103; 19,274; 1,342; 9,002; 4,434; 8672; 2,281; 9,570; 2,012; 1852; 2,545; 1,358; 624; 841; 1,995; 1,614. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1913—CONTINUED.

	Average mileage operated during period.	Operating revenues— Freight	Passenger	Total, misc.	Operating expenses— Maintenance Way and structures	Maintenance Of equipment.	Traffic	Transportation.	General.	Total.	Net operating revenue (or deficit)	Outside operations, net	Taxes.	Operating income (or loss)	Increase (or decr.) comp. with last year.
Lehigh Valley	454	$709,107	$119,478	$441,733	$66,053	$91,343	$5,141	$169,861	$16,968	$345,606	$96,127	$716	$9,087	$96,304	$2,751
Long Island	338	869,761	774,114	933,066	114,441	133,259	37,568	452,057	5,242	835,182	119,681	10,765	22,126	81,190	29,847
Louisiana & Arkansas	307	180,951	73,766	374,315	76,231	71,788	12,140	139,670	8,185	260,132	14,983	.....	3,336	10,747	42,229
Louisiana & Northwestern	148	129,97	119,004	430,142	60,497	81,031	16,631	199,360	15,215	367,234	62,518	13	13,641	39,390	50,578
Louisville & Nashville	347	3,901,980	1,164,080	5,167,244	776,821	754,933	36,792	2,756,049	16,160	3,723,875	1,156,869	1,638	29,977	85,334	6,994
Maine Central	1,774.00	3,472,597	942,012	4,390,482	516,911	834,570	92,958	1,706,080	102,682	3,253,160	1,137,322	10,952	232,726	1,093,594	375,494
Midland Valley	108	150,960	31,356	197,514	23,004	21,662	2,942	46,665	8,159	114,442	82,682	.....	8,967	73,175	15,526
Minneapolis & Saint Louis	1,506	870,258	222,761	1,156,142	273,821	183,962	26,515	475,750	49,665	959,653	196,489	.....	38,408	158,081	58,408
Minneapolis, St. Paul & Sault Ste. Marie	1,885	1,831,146	619,644	2,578,885	418,278	330,174	84,498	1,162,490	13,570	2,162,557	145,928	.....	37,109	108,428	—63,120
Missouri, Kansas & Texas	1,896	3,343,154	1,120,013	4,525,364	1,001,359	748,155	36,559	2,534,600	20,995	4,682,428	43,066	—1,070	16,458	25,538	78,386
Missouri Pacific	791	75,481	16,965	107,698	15,545	14,762	2,081	38,974	4,413	105,995	1,703	.....	2,122	419	12,625
Mobile & Ohio	4,762	3,852,496	1,117,626	5,226,737	671,186	1,129,070	113,983	2,130,514	119,644	4,224,808	1,103,929	—2,243	237,750	863,936	1,130,152
Monongahela	116	.....	.....	287,678	26,389	27,803	2,763	136,986	3,638	201,279	66,399	767	.....	67,166	5,000
Nevada-California-Oregon	172	134,215	26,436	266,161	32,294	45,152	2,370	80,922	6,515	167,812	98,349	—10	8,836	89,503	22,027
New Orleans Great Northern	827	677,709	127,161	893,765	70,794	95,062	22,757	315,789	25,848	544,744	349,021	.....	41,142	307,879	191,087
New Orleans Terminal	90.67	146,030	66,402	428,779	65,361	107,334	11,393	70,781	12,103	393,063	35,710	.....	26,000	65,717	33,732
New York Central Lines	1,472	3,403,396	979,265	4,879,095	506,412	685,314	80,462	1,723,723	89,711	3,285,322	1,393,770	4,310	150,000	1,439,460	541,727
New York, Chicago & St. Louis	627	344,412	63,658	456,967	52,271	74,965	1,352	59,273	4,247	192,712	53,965	.....	4,000	49,965	15,819
New York, New Haven & Hartford	1,475	3,963,537	3,304,661	8,396,614	491,190	642,589	79,628	1,201,302	72,558	2,487,167	990,447	19,854	118,500	771,093	171,407
New York, Ontario & Western	396	1,237,524	196,896	1,522,153	215,320	158,330	10,000	406,023	26,339	1,069,914	452,239	46,099	10,179	63,126	—5,696
Norfolk & Western	1,553	3,176,286	581,183	4,149,550	261,817	284,315	2,231	41,014	3,078	90,571	58,979	.....	4,500	54,479	16,574
Northern Pacific	451	1,115,464	203,800	1,465,547	206,424	172,407	6,623	62,490	6,768	119,714	28,833	.....	4,500	24,333	17,197
Northwestern Pacific	276	170,964	63,060	281,582	37,257	36,029	9,202	60,899	6,311	152,911	51,801	1,123	7,250	42,419	16,404
Oregon Short Line	4,919.95	3,843,287	1,064,530	5,317,379	965,312	977,593	112,258	1,758,657	132,612	3,886,433	1,331,146	—532	154,742	1,175,872	182,815
Oregon-Washington R. & N. Co.	1,000	611,901	93,926	811,594	97,434	126,128	14,621	337,271	6,217	581,671	8,000	.....	8,000	5,415	—14,268
Pennsylvania Lines	3,706	5,626,634	2,020,096	8,116,252	833,654	1,126,603	7,465	3,158,990	26,733	5,005,445	2,110,807	—6,259	46,236	157,412	84,103
Pere Marquette	1,817	1,996,714	644,876	2,901,353	344,216	468,920	71,954	1,284,267	51,711	2,218,748	682,237	2,762	116,900	569,404	99,800
Pittsburg & Shawmut	87	89,249	16,438	112,438	20,455	12,856	6,044	39,273	1,462	80,088	32,007	36	3,964	27,762	—13,333
Pittsburg, Shawmut & North	109.62	1,672,761	530,543	2,383,237	185,482	339,417	58,304	907,399	65,172	1,555,780	827,947	6,456	146,869	687,534	317,739
Pittsburgh & West Virginia	396	1,128,646	174,496	2,657,300	340,624	280,022	65,194	1,188,503	88,320	1,962,633	694,916	5,490	102,808	586,618	179,389
Pittsburgh, Cincinnati, Chicago & St. Louis	2,570	3,612,315	990,982	4,996,699	720,263	1,018,178	86,231	2,115,661	84,694	4,410,110	1,351,889	—3,632	190,190	1,158,067	153,427
Pittsburgh, Shawmut & Northern	113	384,206	111,277	1,054,027	111,592	194,568	38,662	390,708	33,859	769,394	283,683	—1,269	30,490	251,724	72,630
Pittsburgh & Shawmut	67	139,486	5,167	153,990	14,128	7,757	139	29,289	1,202	54,019	99,661	.....	2,200	96,461	34,674
Pittsburg, Youghiogheny & Ohio	104	59,306	99,631	360,342	72,104	70,910	16,054	172,730	12,894	349,196	11,346	—1,892	18,500	—9,046	—129,733
Quanah, Acme & Pacific	1,331	750,841	134,327	1,139,162	149,958	202,109	39,026	443,086	28,006	907,185	231,982	—1,235	25,416	205,331	23,472
Quincy, Omaha & Kansas City	165	116,398	14,126	134,950	13,434	19,607	412	34,334	4,663	71,351	63,147	.....	6,300	57,247	—92
Rutland	280	346,965	84,004	525,431	53,673	57,445	9,911	122,402	13,178	255,610	89,821	—674	11,350	77,797	18,621
St. Joseph & Grand Island	154	119,994	36,596	176,196	23,490	13,322	2,614	44,766	6,215	88,818	69,378	—63	2,650	66,665	39,782
St. Louis & San Francisco	576	1,116,778	171,561	1,446,210	215,749	78,225	17,764	329,694	17,233	657,665	25,145	.....	4,726	20,419	14,073
St. Louis Southwestern Railway	1,367	3,513,692	1,090,574	4,981,737	1,166,992	1,190,835	161,909	3,607,319	232,868	6,894,933	2,142,474	55,567	339,609	1,663,432	584,297
St. Louis-San Francisco & Texas	164.97	482,904	111,502	721,676	94,139	100,393	46,590	180,513	12,752	465,550	256,126	—222	32,000	230,818	111,490
Seaboard Air Line	3,019	9,830,456	2,051,995	5,443,498	644,977	915,785	37,145	2,519,198	197,217	4,309,404	1,134,094	—20,056	314,000	800,038	—32,592
Southern Pacific	366	604,326	75,623	789,125	80,961	134,507	9,636	244,474	15,944	541,917	166,208	4,968	16,582	153,094	67,563
Southern Railway	6,111	11,472,4	3,304,111	16,241,731	1,911,4	1,753,5	3,123	1,314,3	72,446	4,467,035	46,365	.....	8,000	38,365	12,807
Southern Railway in Mississippi	133	370,417	42,633	515,044	56,343	75,962	1,672	109,779	5,289	361,965	82,079	7,510	14,673	59,856	2,908
Spokane & Inland	1,567	1,349,206	309,883	1,823,237	377,004	270,685	54,938	1,134,243	65,993	2,354,418	1,471,351	—2,020	122,000	1,347,134	602,495
Tennessee Central	562	703,193	62,081	1,009,410	45,814	90,554	6,091	52,441	7,208	201,548	17,411	—492	2,310	60,777	12,752
Texarkana & Fort Smith	327	796,709	178,360	1,018,457	153,764	245,188	14,704	552,814	26,683	995,259	59,198	249	42,230	8,717	23,457
Texas & Pacific	1,840	3,930,756	1,163,869	5,241,149	595,838	1,176,461	107,791	2,240,601	117,715	4,347,771	1,756,875	10,124	271,833	1,428,172	237,418
Texas & Pacific Coal & Oil Co.	40.6	79,651	113,871	216,139	41,639	40,362	3,242	107,612	13,557	206,952	9,377	.....	12,579	—3,202	1,405
Texas & Pacific Terminal	10.12	1,200,008	370,930	1,649,201	188,533	235,150	30,124	476,056	43,085	979,005	670,196	—1,584	97,900	570,712	80,540
Toledo, St. Louis & Western	1,297	813,113	324,370	1,249,707	144,234	141,459	32,797	347,195	54,351	1,040,038	268,238	—6,480	96,842	165,004	5,936
Toledo, Peoria & Western	479	140,879	37,316	190,448	25,160	40,577	3,868	79,006	6,558	147,069	43,380	.....	6,325	37,055	24,715
Union Pacific	8,125	12,782,7	3,741,967	19,042,547	1,802,275	1,819,000	132,396	2,010,194	114,396	4,156,581	974,116	—4,193	237,272	736,653	246,210
Union Railroad	10.63	10,634,606	277,703	14,691,689	2,007,474	3,254,786	394,869	5,824,819	339,362	11,670,230	3,020,959	—132,114	595,919	2,342,926	755,518
Union Terminal	3.62	216,557	55,470	291,105	44,803	35,843	4,513	129,559	6,133	230,540	60,565	.....	10,400	50,165	30,558
Virginian Railway	300	1,901,297	71,975	1,435,152	71,123	128,865	10,079	64,254	46,364	1,127,623	242,519	7,425	49,793	185,301	270,506
Wabash Pittsburg Terminal	113	3,617,532	535,261	4,321,233	376,805	279,338	37,786	1,417,163	67,473	2,613,825	1,747,897	39,146	85,722	1,701,321	511,885
Western Maryland	713	1,237,910	257,137	1,715,212	177,837	193,849	31,217	257,976	15,421	1,019,299	217,246	.....	51,101	166,145	54,412
Wheeling & Lake Erie	230.24	1,443,301	131,966	1,602,154	204,858	153,835	13,301	391,094	26,598	834,301	767,953	—62	86,200	681,691	264,437
Pittsburgh, Cincinnati, Chic. & St. Louis	1,472.00	2,712,049	682,547	3,834,372	379,169	834,878	74,457	1,486,317	74,751	3,699,572	824,896	—238	136,563	687,996	79,276
Pittsburgh, Shawmut & Northern	279.0	69,389	8,390	96,143	25,478	16,716	1,313	39,423	4,135	89,443	40,698	.....	1,587	39,111	—7,302
Port Reading	21	139,992	.....	142,730	7,058	29	30	37,859	98	45,074	97,656	8,480	8,000	98,126	39,967
Richmond, Fredericksburg & Potomac	84.0	141,637	91,604	258,463	19,264	30,812	3,174	95,253	6,901	155,436	103,029	—355	722	101,952	39,189
Rutland	468	351,986	78,298	569,259	85,359	63,584	7,265	126,455	5,325	288,389	30,871	.....	14,895	15,976	—660
St. Joseph & Grand Island	319	77,543	28,439	117,180	29,776	19,499	5,355	37,433	5,844	117,407	—227	—38	6,244	—6,509	—6,778
St. Louis & San Francisco	4,742.61	3,450,478	883,878	3,871,666	369,111	447,951	79,334	1,163,826	99,440	2,358,821	1,212,995	.....	163,200	1,049,795	289,417
St. Louis, Brownsville & Mexico	518.00	136,193	79,743	231,734	34,660	26,896	4,089	124,155	8,623	198,223	33,511	.....	5,500	28,011	—16,253

Average mileage operated during previous period—[18] 586; [14] 1,775; [11] 1,450; [26] 562; [27] 473; [6] 6,034; [8] 2,333; [28] 278; [29] 7,274; [4] 1,597; [30] 353; [31] 1,264; [32] 3,770; [33] 3,395; [34] 1,915; [35] 1,230; [36] 152; [37] 2,014; [38] 404; [39] 1,762; [40] 1,926; [41] 1,260; [42] 215; [43] 1,467; [44] 83; [45] 4,732; [46] 510. — Indicates Deficits, Losses and Decreases.

STATE COMMISSIONS.

The Illinois railroad commission has suspended until May 1 a proposed advance of one cent per 100 lbs. in rates on grain from points in Illinois to Chicago, pending an investigation of the reasonableness of the advance.

The State Railroad Commission of Pennsylvania has notified the Pennsylvania Railroad and the Philadelphia & Reading that it is going to send accountants to make a thorough examination of their books with a view to determining the cost of carrying anthracite coal to Philadelphia.

The Texas railroad commission has issued an order directing all railways in the state to file a detailed statement showing expenditures for additions and betterments for each fiscal year since the commission's original valuation of their property. The statements are to be filed within 30 days.

The California railroad commission has announced that it has decided to assist the fruit growers of the state in presenting to the Interstate Commerce Commission their application for a reduction in the minimum carload weight for deciduous fruit moving from California in interstate commerce.

COURT NEWS.

After both houses of the Texas legislature had re-passed over the governor's veto, the bill to permit the Missouri, Kansas & Texas of Texas to absorb several subsidiary lines in Texas, a temporary restraining order to prevent the consolidation was issued by Judge Calhoun of the Texas district court, at Austin, Tex., at the instance of the state authorities. The petition for an injunction asserted that the proposed consolidation would be contrary to the state constitution.

Judge McCall in the United States Court for the western district of Tennessee, in a suit against the Yazoo & Mississippi Valley, sustains that clause of the hours-of-service law which authorizes the imposition of a penalty of $100 a day for each day that any railroad shall continue in default of the requirement that reports must be made every month, showing all cases of employees having been on duty for a longer period than 16 hours. The penalty in the hours-of-service law is enforced in accordance with the procedure set forth in the twentieth section of the interstate commerce law. The railroad company sought to show that the penalty in the case of the hours-of-service law should not be so rigidly imposed as in the case of failure to make an annual report; but the court says that when the language of a statute is plain and unambiguous its harshness should not be ameliorated by instructions of the court.

Decision on Hours of Service Act.

In two cases against the Minneapolis, St. Paul & Sault Ste Marie and two against the Northern Pacific, Judge Amidon, in the United States District Court, for North Dakota, Southwestern Division, holds as follows:

1. Hot boxes, loosened drawbars, etc., are matters which constantly arise and cannot be accepted as excuses for the violation of the federal hours of service law.

2. All substantial violations of the statute limiting the period of continuous employment of men engaged in railroad service must be regarded as serious—much more serious than violations of the safety appliance and the 28-hour live-stock statutes.

3. Courts must look at the subject matter of laws to ascertain whether the public welfare is seriously or only slightly involved in their violation.

4. Fatigue is as truly a physical cause of accident as are open switches and broken rails.

5. A substantial violation of the statute here involved can never justify a merely nominal fine.

PROPOSED RUSSIAN RAILROAD.—The Russian Ministry of Ways of Communication has decided to make an investigation in regard to the projected line from Saratov to Novotcherkask. This line would be 400 miles long, would traverse the grain territories of the Don Cossacks territory, and would be of great importance in connection with the future South Siberian Railway, as it would create a direct transit route to the Black Sea for the Siberian agricultural products.

Railway Officers.

Executive, Financial and Legal Officers.

Wilbur C. Fisk, vice-president and general manager of the Hudson & Manhattan, with office at New York, has been elected president to succeed William G. McAdoo, resigned. Mr. McAdoo also resigned as director.

Henry William MacKenzie, whose election as comptroller of the Seaboard Air Line, with office at Portsmouth, Va., has been announced in these columns was born on December 30, 1876, in Hampton county, S. C., and was educated in the common schools. He began railway work on May 1, 1891 with the Florida Central & Peninsular, and was a clerk in various accounting branches of that road until it was taken over by the Seaboard Air Line in July, 1900. He was then bookkeeper for the comptroller of the Seaboard Air Line until February, 1902, and then was general bookkeeper. In March, 1906, he was made assistant to comptroller of the same road, which position he held at the time of his recent election as comptroller.

Samuel C. Stickney, who has been appointed assistant to the president of the Erie, with headquarters at New York, as has been announced in these columns, was educated at the Massachusetts Institute of Technology. He began railway service in Minnesota, as a rodman on location and construction. He was then for one year—1886—locating engineer in Iowa on the Chicago, St. Paul & Kansas City, now the Chicago Great Western. In 1887 he was appointed superintendent of construction in Illinois, and from 1888 to 1890 was engineer of maintenance of way of the same road. He went to the Chicago Union Transfer Railway in 1890, as chief engineer. From 1892 to 1894, he was assistant to president of the Chicago Great Western, and from 1894 to 1909, was vice-president and general manager of the same road. He entered the service of the Erie in 1909, and now becomes assistant to president of that road as above noted.

Operating Officers.

William Lamb, trainmaster of the Illinois Central at Clinton, Ill., has been transferred to Waterloo, Ia., as trainmaster of the Waterloo terminals and Albert Lea district, succeeding John H. Rightmeyer.

G. A. Law, trainmaster of the Chicago, Burlington & Quincy at Aurora, Ill., has been appointed assistant superintendent of the Hannibal division, with headquarters at St. Louis, Mo., to succeed F. Cone, transferred.

Max Fiedler, general foreman of the Globe, Ariz., shops of the Arizona Eastern, has been appointed an assistant superintendent, Globe division, with office at Globe, succeeding D. Reid, transferred to the Phoenix division.

F. Ringer, engineer of maintenance of way of the Missouri, Kansas & Texas at Parsons, Kan., has been appointed superintendent of the McAlester district, with headquarters at McAlester, Okla., to succeed J. F. Hickey, resigned to accept other service.

E. L. Martin, J. F. Sanders and H. G. Harden, assistant superintendents of the Louisiana lines of the Southern Pacific, with headquarters at Lafayette, La., have resigned. George B. Herrington succeeds Mr. Martin, and W. S. Middlemas takes the place of Mr. Harden.

W. J. Stonehurner has been appointed general superintendent of the Alabama, Tennessee & Northern and the Tombigbee Valley, with office at York, Ala., in charge of the operating, the maintenance of way and the mechanical departments. He has served in various capacities on different lines, including the positions of superintendent of the Quincy, Omaha & Kansas City, 11 years; superintendent of the Missouri, Kansas & Texas, Northern Texas division; vice-president and general manager of the Texas City, Terminal & Transfer Company, and in the industrial department of the Missouri, Oklahoma & Gulf.

F. H. Hammill, who recently was appointed assistant general superintendent of the Chicago & North Western, with headquarters at Boone, Ia., was born January 23, 1872, at Rockford, Ill. He was educated in the public schools at Rockford, and began railway work as a telegraph operator for the Chicago & North Western. He was subsequently for fifteen years with the

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Chicago, Milwaukee & St. Paul as telegraph operator and freight brakeman, ten years as train despatcher, and two years as chief despatcher. Mr. Hammill returned to the North Western in March, 1902, as trainmaster, later was assistant superintendent, and for seven years was superintendent. He was made superintendent of the Sioux City division on January 23, 1906, one year later was transferred to the Northern Wisconsin division in a similar capacity, and the past five years was superintendent of the Iowa division, from which position he was recently promoted to assistant general superintendent, as above noted.

Traffic Officers.

W. H. L. Nelms has been appointed commercial agent of the Georgia & Florida, with office at Atlanta, Ga.

F. C. Moore, general eastern freight agent of the Chicago & Alton, has been appointed general eastern agent, with headquarters at New York City.

Edward Dowdle has been appointed traveling freight agent of the Union Pacific system, with office at St. Louis, Mo., to succeed J. F. Jutz, transferred.

L. Moore has been appointed traveling immigration agent of the Northern Pacific, with headquarters at Kansas City, Mo., to succeed H. B. Bryning, resigned.

C. R. Alvarez has been appointed commercial agent of the Georgia, Florida & Alabama, with office at Jacksonville, Fla., succeeding R. H. Dozier, resigned.

Tom O'Connell, contracting agent of the Wabash, has been appointed traveling freight agent, with office at Detroit, Mich., succeeding S. C. Lockman, promoted.

L. F. McFarland, formerly district passenger agent of the Chicago Great Western at Kansas City, Mo., has been appointed traveling passenger agent of the Southern Pacific, with office at Kansas City.

H. F. DeTurk has been appointed traveling freight agent of the Lake Erie & Western, with headquarters at San Francisco, Cal., and Arthur Corr has been made traveling freight agent, with office at New York City.

A. B. Chown has been appointed traveling passenger agent of the Grand Trunk, with office at Pittsburgh, Pa., succeeding C. E. Jenney, transferred, and the office of D. P. Drewery, traveling passenger agent at Cortland, N. Y., has been transferred to Buffalo.

The following have been appointed traveling freight agents of the Lake Erie & Western: F. C. Sheahan, Davenport, Ia.; E. J. Lewis, Minneapolis, Minn.; J. A. Sands, Kansas City, Mo., and N. D. Hoke, Philadelphia, Pa., and the position of soliciting freight agent formerly held by Mr. Lewis is abolished.

S. W. Bradford has been appointed commercial freight agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern at Monroe, La., in place of C. G. Johnson, who has been transferred to Jefferson City, Mo., as commercial agent, succeeding F. M. Curry, resigned to engage in other business.

Claude M. Harwood, traveling passenger agent of the Grand Trunk, with headquarters at Detroit, Mich., has been appointed city passenger and ticket agent at that place, succeeding George W. Watson, who has been transferred to Bay City, Mich., as passenger agent in place of F. C. Wherrett, who succeeds Mr. Harwood.

H. C. Strohm, who has been connected with the general passenger department of the Baltimore & Ohio at Chicago for several years, has been appointed traveling passenger agent of that company, with headquarters at Omaha, Neb., succeeding Edward Emery, formerly the traveling representative in that territory, promoted to general traveling agent, with headquarters at Baltimore, Md.

Engineering and Rolling Stock Officers.

W. G. Reid has been appointed general foreman of the Globe, Ariz., shops of the Arizona Eastern, succeeding Max Fiedler, promoted.

H. W. Fenno, resident engineer of the Lake Shore & Michigan Southern at Erie, Pa., has been transferred to Chicago as resident engineer.

J. C. Hill has been appointed roadmaster of the Louisiana lines of the Southern Pacific, with office at Morgan City, La., in place of J. W. Moore, resigned.

N. C. Bettenberg, locomotive foreman of the Great Northern at St. Paul, Minn., has been appointed master mechanic, with headquarters at Crookston, Minn., in place of J. W. Smith, transferred to Duluth, Minn.

Abram Lucas, general foreman, locomotive department of the Chicago, Milwaukee & St. Paul at Milwaukee, Wis., has resigned to go to the Jacobs-Shupert U. S. Firebox Company, Coatesville, Pa., with office at Chicago.

William Welland has been appointed roadmaster of the Cotter district of the St. Louis, Iron Mountain & Southern, with headquarters at Batesville, Ark., in place of R. Cantrell, transferred to Aurora, Mo., as roadmaster of the Carthage district.

G. W. Seidel, superintendent of shops of the Chicago, Rock Island & Pacific at Silvis, Ill., has been appointed superintendent of motive power of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., to succeed C. E. Gossett, deceased, whose title was general master mechanic.

Victor King Hendricks, whose appointment as assistant chief engineer of the St. Louis & San Francisco, with headquarters at Springfield, Mo., has already been announced, was born May 28, 1869. He was graduated from the Rose Polytechnic Institute in June, 1889, and began railway work the following year as rodman for the Fairhaven & Southern, with which road he remained until January, 1892, as draftsman and transitman on construction. He was then for a year assistant engineer in charge of construction of the Bellingham Bay & Eastern, and from March to October, 1893, was a draftsman at the Indiana & Lafayette Bridge Works, when he returned to railway work as assistant engineer for the Terre Haute & Indianapolis. In January, 1894, he was made engineer maintenance of way of the Logansport division of that road, and in December, 1898, was promoted to engineer maintenance of way of the Terre Haute & Logansport, which was formerly known as the Logansport division of the Terre Haute & Indianapolis. Mr. Hendricks went to the Baltimore & Ohio in June, 1902, as assistant to engineer maintenance of way, and three years later was made division engineer at Baltimore, resigning January, 1907, to become assistant engineer maintenance of way of the St. Louis & San Francisco lines. From February, 1910, to October, 1911, he was office engineer of those lines, and then he was advanced to principal assistant engineer in charge of timber preservation of the St. Louis & San Francisco and the Chicago & Eastern Illinois. He now becomes assistant chief engineer of the St. Louis & San Francisco, as above noted.

V. K. Hendricks.

L. I. Stone has been appointed assistant engineer of the London division of the Grand Trunk, with headquarters at London, Ont. H. A. Palmer has been appointed assistant engineer of the Toronto Terminal, and James Boyd has been appointed assistant engineer of the Hamilton division with headquarters at Hamilton.

R. Q. Prendergast, whose appointment as master mechanic of the Indianapolis division of the Cincinnati, Hamilton & Dayton, with headquarters at Indianapolis, Ind., has already been announced, began railway work as a machinist apprentice with the

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Baltimore & Ohio at Benwood, W. Va. After completing his apprenticeship he was made foreman at Cameron, W. Va., and subsequently was transferred to several of the large shops on the Baltimore & Ohio system, including the position of erecting shop foreman of the Mt. Clare shops. He left the Baltimore & Ohio to go to the Cumberland Valley at Chambersburg, Pa., and later became general foreman of the Delaware & Hudson at Carbondale, Pa. He resigned about five years ago to accept the position of master mechanic of the Denver & Rio Grande at Pueblo, Colo., which he held until his recent appointment as master mechanic, as noted above.

Frank Gilbert Jonah, who, on March 1, was made chief engineer of the St. Louis & San Francisco, with office at St. Louis, Mo., was born October 6, 1864, in Albert County, New Brunswick. He was educated in the high school at Moncton, N. B., and under private tuition. In May, 1882, he began railway work as a student in the chief engineer's office of the Intercolonial Railway, remaining there five years, during which time he acted in all capacities in field surveys of branch lines. The following two years he was assistant engineer in charge of government lines in Nova Scotia, and from 1889 to April, 1890, was assistant engineer of the Intercolonial Railway. On the latter date he became assistant engineer of the St. Louis Merchants' Bridge Terminal Railway, and four years later was appointed resident engineer of the St. Louis, Peoria & Northern. In December, 1899, he was made engineer maintenance of way of the Chicago & Alton, and from May, 1901, to March, 1903, he was chief engineer of the Blackwell, Enid & Southwestern. He was then for three months assistant engineer for the New Orleans Terminal Company, when he was appointed chief engineer of the St. Louis, Brownsville & Mexico, remaining in that position until October, 1904, when he was made locating engineer of the St. Louis & San Francisco. He returned to the New Orleans Terminal Company as terminal engineer in May, 1905, and on January 1, 1910, he accepted the office of engineer of construction of the St. Louis & San Francisco. He now as chief engineer assumes also the duties of chief engineer of operation.

Purchasing Officers.

E. B. Dailey, assistant mechanical engineer of the Union Pacific at Omaha, Neb., and H. B. Henry, who has been in the office of the director of maintenance and operation of the Harriman Lines at New York, have been appointed assistants to the director of purchases of the Southern Pacific Company, both with offices at New York.

Special Officers.

Marcus A. Dow has been appointed general safety agent of the New York Central Lines, with headquarters at New York, succeeding George Bradshaw, resigned, effective March 16.

OBITUARY.

C. I. Kerr, trainmaster of the Chicago, Rock Island & Pacific, with headquarters at Herington, Kan., died suddenly on March 5, at Topeka, Kan.

Arthur W. Moss, superintendent of the Schuylkill division of the Pennsylvania Railroad, died on March 12, at Reading, Pa. He was born in Philadelphia, on May 4, 1859, and began railway work as an apprentice in the Altoona shops of the Pennsylvania.

John W. Crissey, assistant engineer of construction of the Lake Shore & Michigan Southern, with headquarters at Cleveland, Ohio, died on March 7, at Chicago, of pneumonia. Until a month ago Mr. Crissey had been resident engineer of the Lake Shore at Chicago, when he went to Cleveland to take charge of track elevation work.

William E. Rogers, for nine years a member of the New York state railroad commission, and for five years its chairman, having been appointed by Governor Grover Cleveland (1884), died at his home in New York City, March 11, at the age of 68. He served in the army in the civil war and in the engineering corps afterward, and after 1872 was engaged in railroad construction. Mr. Rogers' later activities have been in the legal profession.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE INTERNATIONAL & GREAT NORTHERN is making inquiries for 10 locomotives.

THE MISSOURI PACIFIC has ordered 5 mikado locomotives from the Baldwin Locomotive Works.

THE CHICAGO, PEORIA & ST. LOUIS has ordered 10 consolidation locomotives from the American Locomotive Company.

THE MIDLAND PENNSYLVANIA has ordered 1 eight-wheel passenger locomotive from the Baldwin Locomotive Works.

THE SEABOARD AIR LINE is in the market for 25 Pacific type freight locomotives, 7 Pacific type passenger locomotives, 5 six-wheel locomotives and 1 dummy locomotive.

THE BUFFALO, ROCHESTER & PITTSBURGH is said to have ordered 12 mikado locomotives, and three switching type locomotives from the American Locomotive Company. This item has not been confirmed.

THE CITIZENS' GAS COMPANY, Indianapolis, Ind., has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 24 in.; the diameter of the driving wheels will be 44 in., and the total weight in working order will be 133,000 lbs.

THE CHICAGO, TERRE HAUTE & SOUTHEASTERN, mentioned in the *Railway Age Gazette* of February 14 as being in the market for 5 locomotives, has ordered 5 consolidation locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 25 in. x 32 in. cylinders, and in working order will weigh 244,000 lbs.

THE CHICAGO & WESTERN INDIANA, mentioned in the *Railway Age Gazette* of March 7, as being in the market for 5 switching locomotives, has ordered 5 eight-wheel switching locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 24 in. x 30 in. cylinders, 57 in. driving wheels, and in working order will weigh 212,000 lbs.

CAR BUILDING.

THE GEORGIA RAILROAD is in the market for 8 or 10 passenger cars.

THE INTERNATIONAL & GREAT NORTHERN is making inquiries for 1,000 freight cars.

THE ATLANTIC COAST LINE is in the market for 4 passenger and baggage cars, 12 coaches, and 4 mail and express cars.

THE SEABOARD AIR LINE, mentioned in the *Railway Age Gazette* of March 7, as being in the market for 1,500 freight cars, is now in the market for 1,800 freight cars. This inquiry comprises 1,000 steel underframe, 30-ton box cars, 300 all-steel 50-ton phosphate cars, 250 all-steel 50-ton hopper cars, and 250 steel underframe 40-ton flat cars.

THE PENNSYLVANIA RAILROAD, mentioned in the *Railway Age Gazette* of March 7, as being in the market for 307 passenger cars, has ordered 105 steel, suburban coaches from the Pressed Steel Car Company; 45 coaches, 25 express refrigerator cars, 25 baggage cars and 5 horse cars from the American Car & Foundry Company; and 72 steel, through coaches and 20 steel, combination passenger and baggage cars from the Standard Steel Car Company.

IRON AND STEEL.

THE BOSTON & MAINE has ordered 1,000 tons of structural material from the Pennsylvania Steel Company.

SIGNALING.

The Philadelphia & Reading has let to the Union Switch & Signal Company a contract for an interlocking plant at Palo Alto, Pa.; total cost of the work about $37,000.

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Supply Trade News.

J. H. Tweedy, Jr., has been elected a director of the Bucyrus Company.

John G. Johnson has been made a director of the Baldwin Locomotive Works, Philadelphia, Pa., succeeding E. C. Converse, resigned.

The H. W. Johns-Manville Company has purchased about 110 acres of land in the Calumet district near Chicago, adjacent to the Illinois Central, as a site for a large new plant.

Abram Lucas, general foreman of the locomotive department of the Chicago, Milwaukee & St. Paul, with office at Milwaukee, Wis., has resigned to go to the Jacobs-Shupert U. S. Fire Box Company, Coatesville, Pa., with office at Chicago.

The Raymond Concrete Pile Company, New York, has received a contract for placing 2,047 standard Raymond concrete piles for the foundation of the new grain elevator of the Chicago, Rock Island & Pacific at Kansas City, Mo.

The Isthmian Canal Commission will receive bids until March 26, on miscellaneous supplies, including electric traveling cranes, rails, angle bars, track bolts, switches, frogs, tie plates, track chisels, babbitt metal, etc. (Circular No. 764.)

The Street locomotive stoker, made by the Locomotive Stoker Company, New York, has been specified on the 40 Mallet locomotives ordered by the Norfolk & Western, and also on the 60 mikado locomotives and 10 Mallet locomotives ordered by the Baltimore & Ohio.

Burton W. Mudge & Co., Chicago, have been made agents for the Industrial Works, Bay City, Mich. This office will handle the products of the Industrial Works, including wrecking, locomotive and freight station cranes, pile drivers, transfer tables and grab buckets.

Richard F. Hawkins, of Springfield, Mass., died at his home in that city March 5, at the age of 76. Mr. Hawkins was a well known bridge builder and the proprietor of the R. F. Hawkins Iron Works. His firm was the successor of Stone & Harris, and inherited the Howe truss bridge.

The Bethlehem Steel Company, South Bethlehem, Pa., has declared a dividend of 5 per cent. on its preferred stock. This is the first dividend declared by the company since February, 1907. The dividend is payable quarterly in 1913. The last previous annual dividend on the preferred stock was 6 per cent.

The Brier Hill Steel Company, Youngstown, Ohio, is offering $5,000,000 7 per cent. cumulative preferred stock, redeemable at 105 after 1923. This company is spending about $4,000,000 in the construction of an open-hearth plant, blooming and finishing mills, and other equipment, which will add greatly to the output.

The Meeker Grip Nut Company, 1170 Broadway, New York, has just been formed to make and sell Meeker grip nuts. The officers of the company are as follows: President, Fred J. Lancaster; vice-president, Walter Schulze; and secretary and treasurer, Samuel G. Meeker. George Owens has been made manager of the sales department.

Walter H. Lienesch, formerly consulting engineer for the Illinois Traction System, has gone to the International Interlocking Rail Joint Manufacturing Company, Chicago, to take charge of the engineering department; and Burton E. Reed, formerly with the Vandalia Railroad, has been made assistant to the general manager of the same company.

The Mead-Morrison Manufacturing Company, Boston, Mass., maker of coal handling machinery and steam and electric hoists, has purchased about 10 acres of land near the tracks of the Boston & Albany at East Boston, upon which it will immediately erect a large plant. This plant will consist of a plate shop, erecting shop, power plant, pattern shop, foundry and general offices. The shops will be equipped with four 10-ton cranes and one 25-ton crane. It will be completed in about four months.

The General Electric Company, Schenectady, N. Y., has received an order for the entire rolling stock apparatus equipment which will be required for the electrification of the Melbourne suburban system of the Victorian State Railways, Australia. This order comprises 400 motor car equipments, consisting of four motors each; 800 control equipments, 400 of which are for trailer cars, and 400 compressor equipments. This is believed to be the largest single order ever placed for electric railway apparatus.

The Smith Locomotive Adjustable Hub Plate Company, of Pittsburg, Kan., will equip some mountain type locomotives which are to be built for the Missouri Pacific with its adjustable hub plate and is now conducting a test on two heavy passenger locomotives operating in the Cascade mountain territory of the Great Northern. The company's hub plate has also been installed on 15 consolidation locomotives for the Kansas City Southern now being delivered, and on 40 Mikados just being completed for the Missouri, Kansas & Texas at the Schenectady plant of the American Locomotive Company.

George M. Basford.

George M. Basford, assistant to the president of the American Locomotive Company, has resigned to accept a position as chief engineer of the railroad department of Joseph T. Ryerson & Son, Chicago. His headquarters will be at the New York office, 30 Church street, and the appointment will be effective March 15. Mr. Basford was graduated from the Massachusetts Institute of Technology in 1889. Directly afterwards he entered the Charlestown shops of the Boston & Maine, later going to the Chicago, Burlington & Quincy as a draftsman at Aurora, Ill. From there he went to Omaha, Neb., to take a position in the motive power department of the Union Pacific, and was also for some time connected with the test department of that road. Leaving the motive power department service he became signal engineer of the Chicago, Milwaukee & St. Paul, after which he was superintendent of construction of the Johnson Railway Signal Company, was for a short time with the Union Switch & Signal Company, and was signal engineer of the Hall Signal Company. In 1895 he left signal work to become mechanical department editor of the *Railway & Engineering Review*, and in 1897 was made editor of the *American Engineer & Railroad Journal*. In September, 1905, he accepted a position with the American Locomotive Company as assistant to the president, which position he now leaves to enter the service of the Ryerson company.

George M. Basford.

Mr. Basford is the father of the Railway Signal Association. Shortly after taking up editorial work in Chicago he called together a number of those interested in signaling, to consider the formation of a Railway Signaling Club, which later developed into the national association. For the first two years, 1895 and 1896, he was secretary-treasurer of the organization and a most active factor in its upbuilding.

Few men associated with the railway interests can number so many friends—real friends—as can Mr. Basford. And this he richly deserves, for he has been untiring in aiding others, either with advice or by helping them to better their condition. He has an unerring engineering instinct, which enables him to discard those things which are superficial and quickly get at the heart of a problem. It was this instinct, coupled with an extensive experience, and with his splendid character which made him such a power as an editor—for many years the *American Engineer* was informally designated as "Basford's paper," and still is by some, although it is seven and a half years since he left it. And when we recall that for a considerable part of his eight or nine years' work on that paper he had no editorial assistant, no stenographer, and that the

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office was not equipped with a telephone, we marvel at the powerful influence he was able to exert through its pages in securing a more fitting recognition of the real importance of the motive power department in the railway organization.

In the fall of 1903 Mr. Basford was in receipt of a signal honor, the like of which has never been conferred upon a man in the railway or railway supply field before or since. In a quiet way fifty-eight of the railway and railway supply men who were known to be close personal friends of Mr. Basford's joined together and presented him with a volume of personal letters expressing their appreciation of him, and accompanied by a substantial check to defray the expenses of a trip abroad. The following is taken from an informal presentation address made by W. S. Morris, who was then with the Erie Railroad: "The gentlemen around you are not only your personal friends, but they are here to represent a host of admirers, whom you can with pride claim also as friends. We are here to tender not only our admiration of the efforts God has infused within your character and ambition, but to thank you in behalf of the many who have been instructed and benefited by your industry and faithfulness to the science through which we all claim kin to one another. In all probabilities this is the first time in the history of this generation, at least, that one has been so honored by the mechanical fraternity of this country, and we assure you it is extended with every thought of true manliness and absolute worthiness on the part of him to whom these words are addressed. You may be plain, Mr. Basford, your friends feel that you have well earned some token of recognition at their hands, and we beg that you will accept this volume, which contains the sentiment, individually, of those whom the gentlemen here present have the honor to represent, and this, which is intended to give you a much needed rest in the way of an extended trip to Europe; and, also, although perhaps selfishly, we hope you may find some time to tell us of your travels and give some hints of interest which may be found on the other side."

Mr. Basford is widely known because of the impetus he gave to the development of the movement for educating and training apprentices and workmen, for he had a keen realization of the fact that the most vital problem confronting the railways is that of *men*. In 1905, after he had given several years of careful study to the situation he presented a paper before the Railway Master Mechanics' Association on "The Technical Education of Railroad Employees—The Men of the Future." The principles which he outlined in this paper attracted wide attention, not only in the railroad field but in the industrial world as well, and were taken as the foundation of such modern apprenticeship systems as the New York Central Lines and the Atchison, Topeka & Santa Fe. And it may be said at this date, almost eight years after the presentation of the paper, that apprenticeship systems on the railways have proved successful in so far as they have followed the fundamental principles laid down in Mr. Basford's paper. The preparation of this paper might well be studied by young men who are ambitious to make their efforts felt in the railway field, and it affords a marked contrast to some of the papers and reports which are often presented before railway clubs and technical associations. It was the result of years of study of conditions on the railroads in this country and a practical experience in mechanical department work. Foreign methods had been carefully looked over on his trip abroad and then the whole scheme was carefully planned and outlined. The paper was then drafted roughly and was rewritten and rewritten until every sentence was carefully rounded out and every superfluous word removed, so that the thought was clear and forceful throughout. It was then submitted for criticism to a number of leading railway officers and industrial managers, and their comments were carefully considered in its revision, although it may truthfully be said that such revision as was made was very slight indeed. And dominating it all was a broad spirit of fellowship for his fellow man, which is so characteristic of Mr. Basford. It is little wonder that it marked the real corner-stone of railway apprenticeship education in this country, and it is to be regretted that more railroads have not adopted and lived up to its spirit.

It would be hard to comment intelligently upon Mr. Basford's work as assistant to the president of the American Locomotive Company, for necessarily a large part of it was in special assignments and would be very little known outside of the officers of the company. Of one definite duty, however, which was assigned to him during the entire time of his association with that company we may speak authoritatively, and that is the matter of publicity. Many years ago when an editor Mr. Basford said that the day would come when the advertising pages of the railway technical papers would be read first, for the advertiser when he awakened to the real possibilities of advertising would have a distinct advantage over the editors, because he could display his data to so much better advantage, not being tied down to the standards of typography that the editor must observe; and to Mr. Basford belongs the honor of being the first to consistently make such use of the advertising pages as to secure the close attention of railway officers and indeed to make many of them tear out and preserve the ads. of his company, so valuable was the information presented therein. Most of our readers are familiar with this work. The campaign was carefully planned and developed, just as the editor of a paper would plan and develop his editorial policy, and was based upon supplying to railways information which they greatly needed, and presented in such a way as to make railway men read it and feel its forcefulness. This feature, which was quickly observed by other companies, is being adopted by many of them and has brought about a new era of publicity in the railway field.

During the winter of 1908-9 while the Railway Business Association was in its early stages of development an arrangement was made with the American Locomotive Company whereby Mr. Basford gave part of his time to the work of that association. That his efforts were fruitful is indicated by the following paragraph in a letter written by George A. Post, president of the association (a copy of which Mr. Post has kindly furnished us) when it became necessary for Mr. Basford to withdraw from active personal participation in the work, because of the pressing demands of his duties with the American Locomotive Company: "Whatever may be the ultimate verdict as to the usefulness and necessity for this association, there can be but one judgment of what you did in an emergent situation, when you brought to it the vigor of your push and industry, the good cheer of your persuasive personality and the impetus of your alert and fecund mentality. To work with you has been an unalloyed pleasure; to confer with you has been to draw inspiration, and to part with your services is a distinct loss which I shall constantly deplore. If, in carrying the burdens devolving upon me in this work, no other dividend of the like were mine than that afforded by the opportunity to feel that I am heart-hitched to George Basford thereby, I shall always feel that the Railway Business Association did a splendid thing for me."

Mr. Basford's hobby has always been the locomotive, and his efforts in its development were recently summed up by one of his friends as follows: "He has persistently striven to impress upon every one connected with the work, both through his paper and through his personal contact, with a possibility of improving locomotive practice by rational and progressive engineering methods, and is largely responsible for the improvement that has taken place not only in the general design of the locomotive, but also in the improvement in the construction of its various parts which has so largely increased its efficiency and economy in operation. The care which Mr. Basford took in carrying out the experiments on locomotive front ends and nozzles, which led to the completion of these experiments by the Master Mechanics' Association, is only one example of his endeavors to place the design of the locomotive on a thoroughly sound foundation. The success of these experiments was no doubt a strong factor in the adoption of the locomotive testing plant, and the knowledge we now possess as to what engines are actually doing, and what results can be obtained from them. Not only in locomotive design, but in shop practice and road work generally, Mr. Basford has energetically encouraged his friends and acquaintances, including all the important mechanical men in the country, to continually improve their results. I do not think you will make any mistake in crediting him with a large share of the development in the last fifteen years."

Possibly this sketch might well be closed with the following brief summation of his personality by another one of his friends: "He has a clear conception of mechanical and oper-

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ating needs. A way of keeping himself in the background and furnishing his numerous friends with good ideas from his generous store. Taking great pleasure in the advancement of young men and helpful to all with whom he comes in contact."

TRADE PUBLICATIONS.

MACHINE TOOLS.—The Betts Machine Company, Wilmington, Del., has published a small illustrated folder on its extra heavy, double drive, 8 ft., boring and turning mill.

SPARK ARRESTERS.—Burton W. Mudge Company, Chicago, have issued an illustrated folder describing the construction and advantages of the Mudge-Slater spark arrester.

RAILWAY MATERIAL INSPECTION.—Morgan T. Jones, Chicago, has published an interesting booklet entitled "Railway Material Inspection." Copies may be obtained on application.

WABASH.—The passenger department has issued an attractive illustrated folder entitled "Steel," describing the new all-steel passenger equipment which has been placed in service recently between Chicago and St. Louis, St. Louis and Kansas City, and Detroit and St. Louis.

AIR COMPRESSERS.—The Ingersoll Rand Company, New York, has devoted form No. 575 to its class P, E., direct connected, electric-driven, air compressers. This booklet in addition to illustrations and descriptions furnishes instructions for installing and operating these compressers, and also includes a duplicate part list.

BALL BEARINGS IN MACHINE TOOLS.—The Hess-Bright Manufacturing Company, Philadelphia, Pa., has published a handsome booklet on ball bearings in machine tools. The booklet says that the function of the Hess-Bright ball bearings is to save repairs and to maintain original accuracy and alinement of spindles, etc., quite as much as it is to save power.

ELECTRICAL EQUIPMENT FOR BUILDINGS.—The Sprague Electric Works of General Electric Company, New York, has published in bulletin No. 115, illustrations and descriptions of its electrical equipment for buildings. Several installations are illustrated, including the air compressor equipment of the Chicago & North Western passenger station at Chicago.

CULVERTS.—The Canton Culvert Company, Canton, Ohio, has devoted a very attractive booklet to its Acme Nestable corrugated metal culverts and other products. These culverts are illustrated and described in detail. A table giving the diameters of gages, thicknesses, weights and carrying capacities is included. The booklet also illustrates a number of strength tests to which these culverts have been submitted.

NEW YORK CENTRAL LINES.—The passenger department of this company has issued an unusually attractive folder on the Grand Central Terminal, New York. This bulletin contains many colored views of the terminal and illustrates also some of the chief points of interest in the city. One group of illustrations shows the various steps in the evolution of the Grand Central Terminal. The folder also gives an account of the evolution of the terminal and a description of its present advantages. A map of the city and a condensed guide to the chief points of interest are also included.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—The publication committee of this association has issued a Year Book for 1913, containing a comprehensive list of exhibitors at the annual exhibit to be held at the Coliseum and the First Regiment Armory in Chicago next week, in connection with the convention of the American Railway Engineering Association, and pointing out the value of the exhibition to railway men from an educational standpoint. Eight thousand copies of the book have been mailed to railway men, together with an invitation and tickets to attend the exhibit. The frontispiece is a large photograph of the interior of the Coliseum during the 1912 exhibit. This is followed by a list of the officers and directors of the association from 1894 up to date, an article devoted to the history and policies of the association, illustrated by photographs of different features of the exhibits at the Coliseum during recent years, and a list of the exhibitors for the 1913 exhibit.

Railway Construction.

ASHERTON & GULF.—This company has applied to the Railroad Commission of Texas for authority to issue $550,000 of bonds on 32 miles of its completed line. It is announced that as soon as these bonds are issued work on the extension west from Asherton to Del Rio via Eagle Pass, about 100 miles, will be started. (October 18, p. 774.)

ATCHISON, TOPEKA & SANTA FE.—The Dodge City & Cimarron Valley has been opened for business from Dodge City, Kan., southwest to Hugoton. (September 22, p. 599.)

An officer writes regarding the report that a branch line is to be built through the San Luis Rey valley, Cal., that the company will build a 4-mile line from Oceanside up the valley to reach a section devoted to the cultivation of sugar beets, and the line will not be further extended.

BEAUMONT & GREAT NORTHERN.—See Missouri, Kansas & Texas.

BILLINGS & CENTRAL.—According to press reports from Billings, Mont., the Billings Land & Irrigation Company has made financial arrangements to build under the name of the Billings & Central a 20-mile line to Crooked creek. Surveys are now being made, and it is understood that the construction work will be started at once. The line is eventually to be extended north to a connection with the Chicago, Milwaukee & St. Paul at Roundup.

BURRARD WESTMINSTER BOUNDARY RAILWAY & NAVIGATION COMPANY.—This company is applying to the Canadian parliament for an extension of time to build lines as follows: From the north side of False creek, Vancouver, B. C., crossing False creek by a bridge southeasterly through Vancouver, Hastings, South Vancouver, Burnaby and New Westminster to the Fraser river bridge, thence northeasterly through New Westminster and Coquitlam to Port Moody, and westerly to the proposed location of the Vancouver, Westminster & Yukon railway bridge at the second narrows of Burrard Inlet, thence westerly through Hastings back to Vancouver; from the south end of the proposed Vancouver, Westminster & Yukon bridge, northerly, crossing the bridge along Seymour creek to the northerly boundary of North Vancouver, thence easterly to the north arm of Burrard Inlet, and from North Vancouver westerly to Howe Sound; from the north end of the Fraser river bridge at New Westminster, crossing the bridge and thence southerly to the international boundary between Semiamu bay and Sumas; from the south side of False creek, through Vancouver and South Vancouver to Point Grey, returning in a southeasterly direction to the starting point; from Port Moody easterly to Dewdney trunk road through Coquitlam, Maple Ridge and Mission to the Stave river, and from the Fraser river bridge line in an easterly and northerly direction through Yale, Lillooet and Cariboo to Tete Jaune, joining the proposed Vancouver, Westminster & Yukon branch to Edmonton, Alta. A. G. Kitto, Vancouver, B. C., is solicitor for applicants.

BUTTE, ANACONDA & PACIFIC.—A new branch called the Southern Cross Line has been opened for business, from Anaconda, Mont., to Southern Cross.

CANADIAN NORTHERN.—Construction work has been commenced on the Lulu Island branch, at mile 6 below New Westminster, B. C., and about a mile farther west, there will be a trestle two miles long, crossing a muskeg. It is anticipated that this line will be completed about the end of May. The Northern Construction Company are the general contractors. About 89 per cent. of the grading between Port Mann and Kamloops, B. C., has been completed, and about 39 per cent. between Kamloops and Albreda Summit on the divide between the Upper Fraser and North Thompson rivers. The tunnel work between New Westminster and Kamloops is about 93 per cent. completed. Up to the present time, about 15,250,000 cu. yds. of material have been handled on the main line between New Westminster and Kamloops. T. H. White, Vancouver, is chief engineer in British Columbia.

CANADIAN NORTH WESTERN.—The Canadian parliament is being asked to incorporate this company to build from a point in or near Lethbridge, Alta., northeasterly to a point at or near

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Winnipeg, and from Winnipeg to a point at or near Pas, Man., passing near Dominion City, Manitou, Brandon and Grand View, and another line from Lethbridge, Alta., northeasterly through Alberta and Saskatchewan to Pas, Man., via North Battleford and Prince Albert, Sask., Brosseau, Tansey & Angers, Ottawa, are solicitors for applicants.

CENTRAL CANADA.—Incorporation has been asked for in Alberta to build from a point in township 74 or 75, range 18 or 19, west of the fifth principal meridian, to or near Peace River Landing, Alta., thence in a generally westerly direction to a point in township 81, range 4, west of the sixth principal meridian, and a branch line from a point near Peace River Landing northerly towards the Battle river, to a point in township 94, range 22, west of the fifth prineipal meridian. The capital stock of the company will be $500,000, and the headquarters will be at Edmonton, Alta.; the provisional directors include J. D. McArthur, Winnipeg, Man.; J. K. McLennan, A. C. Galbraith, S. B. Woods and J. T. J. Collison, of Edmonton.

DALLAS, CLEBURNE & SOUTHWESTERN.—See Missouri, Kansas & Texas.

DENISON, BONHAM & NEW ORLEANS.—See Missouri, Kansas & Texas.

DODGE CITY & CIMARRON VALLEY.—See Atchison, Topeka & Santa Fe.

EDMONTON, STONY PLAIN & WABAMUN.—This company, with a capital of $750,000 and headquarters at Edmonton, Alta., has asked for incorporation in Alberta to build railway lines, from Edmonton to Stony Plain, and thence westerly to Lake Wabamun. The provisional directors include A. Boileau and E. S. McQuaid, of Edmonton, and A. V. Pujebet, Paris, France.

EL PASO & SOUTHWESTERN.—The Huachuca branch of the Western division has been opened for business from Lewis Springs, Ariz., west to Fort Huachuca, 13 miles. (November 29, p. 1063.)

GRAND RAPIDS & NORTHWESTERN.—An officer writes that this company was organized in Michigan and will have terminals in the cities of Milwaukee, Wis., and Manitowoc, on the west shore of Lake Michigan, also at Ludington, Mich., and at Grand Rapids. The company proposes to operate car ferries across the lake from Ludington, Mich., to Milwaukee and Manitowoc and build a railway from Ludington southeast to Grand Rapids, about 98 miles. Valuable terminal rights and privileges in the city of Milwaukee, including ferry slips, have been secured, and the company has exclusive terminals and water front property over a mile and a half long on Ludington Harbor upon which it intends to build all necessary terminal tracks and ferry slips. It is the intention to standardize the old Mason & Oceania Railroad grade, which the company now owns. Work will be started at once to realine and widen eleven miles of this old grade and resurface seven miles of new grade. Contracts are now being let to build the line. J. N. Tittemore, president, Walter S. Syrett, vice-president in charge of construction, and T. R. Philbin, chief engineer, Chicago.

HOUSTON & BRAZOS VALLEY.—This company has amended its charter to provide for an extension from Velasco, Tex., to Bryan Heights, on the west side of the Brazos river.

LOUISIANA SOUTHERN.—This road has been extended from Pointe-a-la-Hache, La., to Bohemia, 5 miles.

MASON & OCEANIA.—See Grand Rapids & Northwestern.

MERIDIAN & MEMPHIS.—An officer writes that track laying is now under way from Meridian, Miss., northwest to Union, about 32 miles. There will be 3 steel bridges on the line varying in length from 100 to 200 ft each. J. T. Schley, president, Mobile, Ala.; L. W. Duffee, chief engineer, Meridian, Miss. (December 6, p. 1116.)

MIDLAND CONTINENTAL.—An officer is quoted as saying that work will be carried out this summer north of Jamestown, N. D., on a section of 150 miles. The road is now in operation from Edgeley north to Jamestown 50.1 miles, and the plans call for building north to Pembina, about 230 miles from Edgeley. (May 10, p. 1078.)

MISSOURI, KANSAS & TEXAS.—This company is planning to build extensions, it is said, to a number of lines that have been taken over by the M. K. & T., under the provisions of a bill that was recently passed by the legislature of Texas. The bill provides for an extension of the Texas Central northwest from Rotan, Tex., to a point in Parmer county on the Texas-New Mexico line, about 200 miles; the branch from De Leon to Cross Plains is to be extended west from the latter place to Sweetwater, 75 miles, and a branch built from Dublin, north to the coal fields of Palo Pinto county, 50 miles. An extension of the Wichita Falls & Southern is to be built from Newcastle south to Cisco, 60 miles. The Denison, Bonham & New Orleans is to be built from Bonham south to Wolfe City, 20 miles. The Dallas, Cleburne & Southwestern is to be built from Cleburne northeast to Dallas, 50 miles, and the Beaumont & Great Northern is authorized to build an extension from Weldon, northwest to Jewett, 50 miles. This extension is now under construction.

MISSOURI, OKLAHOMA & GULF.—This road has been extended from Wagoner, Okla., north to Joplin, Mo., 113.6 miles. (September 17, p. 491.)

MONTOUR RAILROAD.—An officer writes that this company is a consolidation of the Montour Railroad, the Pittsburgh & Moon Run Railroad, and the North Star & Mifflin Railroad. The line extends from Montour Junction on the Pittsburg & Lake Erie, near Coraopolis, Pa., to Mifflin yard, the terminus of the Thompsons Run branch of the Union Railroad. The road was built to connect the coal fields belonging to the Pittsburg Coal Company with the Pittsburg & Lake Erie, the Pittsburg, Cincinnati, Chicago & St. Louis, the Wabash, the Baltimore & Ohio, the West Side Belt and the Union Railroad. A contract has recently been given to John Marsch, Chicago, to build an extension of 35 miles from North Star to Mifflin yard. The company will do the track laying and the ballasting with its own forces. Contracts for all other work have been let, except for bridges and track material, which will be let in a short time. (February 28, p. 411.)

MOUNTAIN VALLEY & PLAINS.—According to press report financial arrangements have been made and construction work will be started in the near future. The company was chartered in 1909 to build from Cimarron, N. Mex., east through the Panhandle of Texas, to Guthrie, Okla., about 450 miles. The incorporators included E. C. Gray, Higgins, Tex.; D. W. Herrington, Dalhart; H. F. Wannamaker, Amistad, N. Mex., and C. L. Johnson, Arnett, Okla. J. H. Conlin, chief engineer, Dalhart, Tex.

NACOGDOCHES & SOUTHEASTERN.—An officer writes that the company has arranged to build an extension from the present terminus at Dunham, Tex., to a connection with the Angelina & Neches River, between 2½ and 3 miles. (February 21, p. 373.)

NEWTON, KANSAS & NEBRASKA.—According to press reports this company, which was organized last year, has made arrangements to build from Milton, Kan., north via Newton, and Abilene to Fairfield, Neb. T. H. McManus, president, Newton. C. M. Barnes, of Oklahoma, M. Cassidy, of Guthrie, and capitalists of Kansas City are back of the project. (November 15, p. 973.)

NIAGARA, WELLAND & LAKE ERIE (Electric).—An officer writes that the plans call for building from Welland, Ont., northeast to Niagara Falls, also from Welland south to Port Colborne, thence east following the north shore of Lake Erie to Fort Erie, opposite Buffalo, N. Y., in all about 31 miles. The company now operates about a mile and a half of track in the city of Welland and extensions will be made soon to outlying sections of the town, each one mile in length, also a line at Dainville, two miles. There will be one swing or bascule bridge to have a 50-ft. span, and a 300-ft. trestle, probably three transformer stations, and one car barn will be constructed. T. R. Cummins, Welland, is engineer.

NORFOLK, YORKTOWN & WASHINGTON.—According to press reports, plans are being made for a line on which work is to be started soon from a point in Gloucester county, Va., north to Fairfax, about 156 miles. P. T. Hoven, president, L. C. Steele, vice-president and treasurer.

OCILLA SOUTHERN.—An officer writes that at the present time the company cannot give any definite information regarding the

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report that an extension is to be built from Nashville, Ga., east about 50 miles to Waycross. It has not yet been decided whether the extension will be built or not. (February 28, p. 411.)

Oklahoma Northern.—An officer of this company, which was recently incorporated to build from Vinita, Okla., northwest to Coffeyville, Kan., about 42 miles, writes that work will be started within the next 60 days and will be carried on by the company. More than nine miles of the grade has been finished out of Vinita northwest. Arrangements have been made for the use of the Missouri, Kansas & Texas terminals at both Vinita and at Coffeyville. A. King, vice-president and general manager, 574 Brandies building, Omaha, Neb. (March 7, p. 459.)

Pecos Valley Southern.—According to press report this company is planning to build an extension from the present southern terminus south to Alpine, Tex., about 50 miles. Also to build on the north from Pecos northeast towards Tehoka.

Southern Railway.—President Finley announces that the main line is to be double tracked between Armour and Cross Keys, Ga., this section having heretofore been operated as a single track gauntlet in the double track between Atlanta and Gainesville. The grades will be reduced and much of the curvature of the present line will be eliminated. Work is to be commenced as soon as practicable and pushed to completion.

Temiskaming & Northern Ontario.—A contract for the construction of a line from Iroquois Falls on the main line to Iroquois Falls on the Abitibi river, about seven miles, has been given to Macdougall & McCluskey, Cochrane, Ont. The work is to be completed by June 1. (November 29, p. 1064.)

Texas Central.—See Missouri, Kansas & Texas.

Texas Roads.—The Interstate Development Company has been organized in Arizona to promote the construction of a railroad between either Dallas, Tex., or Fort Worth and Port Arthur. This proposed new line, it is said, will traverse a territory that is rich in agricultural and timber resources. The general offices of the railroad company will be at Lufkin, Tex. The officers of the Interstate Development Company are Dr. R. B. Bledsoe, president; W. M. Glenn, vice-president; W. R. McMullen, treasurer, and Colonel P. A. McCarthy, secretary, all of Lufkin. Arrangements are being made for financing the proposed line. The promoting company will secure the right-of-way, make necessary surveys and raise bonuses along the route.

Wichita Falls & Southern.—See Missouri, Kansas & Texas.

Williamsport, Nessle & Martinsburg.—Incorporated in West Virginia with $250,000 capital and principal office at Martinsburg. The plans call for building from Williamsport, Md., southwest to Martinsburg, W. Va., about 15 miles.

RAILWAY STRUCTURES.

Ashtabula, Ohio.—See an item in General News regarding the construction of new car shops for the Lake Shore & Michigan Southern at Ashtabula.

Bellville, Tex.—See item under Caldwell, Tex.

Caldwell, Tex.—The Gulf, Colorado & Santa Fe has let a contract to Street & Born, for the erection of passenger stations to cost over $20,000 each, at Caldwell, Cameron and Bellville, Tex., to be completed this year.

Cameron, Tex.—See item under Caldwell, Tex

Prince Rupert, B. C.—The Grand Trunk Pacific has been authorized by the Railway Commissioners of Canada to build bridges as follows: Across Porphyry creek, Prince Rupert East, B. C.; across Eagle creek, Sask.; across Boulder creek, and across Front creek, Prince Rupert East, B. C.; across Little Shuswap river, west of Winnipeg, Man.; across Telkwa river, Prince Rupert East, B. C., and across Fiddle creek, Wolf Creek West, B. C.

St. Paul, Minn.—The Chicago, Rock Island & Pacific will spend $500,000 this year, it is said, building new terminals, shops and roundhouses at St. Paul.

Railway Financial News.

Atlantic Coast Line.—This company has sold to a syndicate of New York bankers $3,500,000 unified mortgage, 4 per cent. bonds of 1909-1959. White, Weld & Company, New York, are offering these bonds at 87, using about 4.70 per cent. on the investment. Including the bonds recently sold there are now $20,144,000 of a total authorized issue of $300,000,000. The bonds are secured by a mortgage on 4,221 miles of railroad and are a first lien on 274 miles of this railroad.

Atlantic, Northern & Southern.—The sale of this road, which took place on March 1, has been set aside and a re-sale has been ordered for March 21.

Boston & Maine.—White, Weld & Company, Harris, Forbes & Company, and Kissel, Kinnicutt & Company, all of New York, have bought $7,500,000 20-year debenture 4½ per cent. bonds. These bonds are a legal investment for savings banks in Massachusetts, Maine, New Hampshire and Connecticut.

Cambria & Clearfield.—Stockholders of the Pennsylvania Railroad, at the annual meeting on March 11, voted to ratify the action of the directors in taking over the Cambria & Clearfield.

Chicago, Burlington & Quincy.—This company has sold $5,000,000 general mortgage 4 per cent. bonds.

Grand Trunk.—Joseph Ramsey, Jr., has brought a suit against the Rail & River Coal Company for an amount in the neighborhood of $500,000, which he claims is due him as commission on the sale of coal land in Belmont county, Ohio, to the Grand Trunk Development Company. The purchase of this coal land, it is understood, was negotiated for by Charles M. Hays, but final contracts were not signed before Mr. Hays' death.

Kansas City, Mexico & Orient.—The Kansas City *Journal* says that a claim of $1,045,000 held by the American Car & Foundry against the Kansas City, Mexico & Orient has been settled by the payment by the receivers of $845,000. The payment is to be made partly in cash and partly in receivers' certificates.

Keokuk & Des Moines.—A dividend of 3½ per cent. has been declared on the preferred stock, payable April 1. In 1910, 1911 and 1912 each 2½ per cent. was paid.

Lake Shore & Michigan Southern.—J. P. Morgan & Co., New York, have bought $12,000,000 one-year 4½ per cent. notes of March 15.

Louisville & Nashville.—J. P. Morgan & Co., New York, have bought $4,000,000 Louisville & Nashville unified 4 per cent. bonds and $4,500,000 Atlanta, Knoxville & Cincinnati division 4 per cent. bonds.

Missouri, Kansas & Texas.—The directors have authorized the sale of $19,000,000 2-year 5 per cent. notes to Speyer & Co., New York. The M. K. & T. has $16,000,000 2-year notes maturing May 1, and $1,500,000 1-year notes maturing July 1. The sale of the new notes will provide for refunding of these two issues.

New York State Railways.—The New York Public Service Commission, Second district, has authorized this company, which is controlled by the New York Central & Hudson River, and which operates a system of street and interurban railways in New York state, to issue $2,748,000 first consolidated 50-year mortgage bonds at 91½. The proceeds of this sale are to be used to pay off notes and maturing bonds of this and subsidiary companies.

Pennsylvania Railroad.—See Cambria & Clearfield.

Union Pacific.—No action was taken at the conference held by directors of the Union Pacific on March 11, on the dissolution plan. One of the directors is quoted as saying: "I cannot say that the plan is definitely abandoned. The situation remains unchanged. There are no arrangements for any further Union Pacific meetings this week." The underwriting syndicate by which Southern Pacific stock was to be sold to Union and Southern Pacific stockholders at par expires on Saturday.

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Railway Age Gazette

DAILY EDITION

Copyright, 1913, by the Simmons-Boardman Publishing Co.

Vol. 54. CHICAGO—MARCH 18, 1913—NEW YORK No. 11a.

PUBLISHED DAILY BY

Simmons-Boardman Publishing Co., Transportation Bldg., Chicago, Ill., on the occasion of the annual convention of the American Railway Engineering Association.

NEW YORK: 83 Fulton Street CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily Issues, North America, $1.00; foreign (excepting daily editions), $2.00.

Application made at the Post Office at Chicago, Ill., for entry as mail matter of the second class.

WE GUARANTEE, that of this issue 10,500 copies were printed; that of these 10,500 copies, 9,563 copies were mailed or delivered by messenger to regular paid subscribers; 750 copies were distributed among members and guests of The Railway Signal Association and at the Coliseum; 121 copies were mailed to advertisers; and 50 copies were set aside for office use.

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The number of Signal Association committees is increasing gradually from year to year as various subjects connected with signaling assume importance enough to warrant their study by separate committees. At the same time the reports are not decreasing much, if any, in length, and the number of meeting days in a year has probably reached its maximum under existing conditions. The result is that better use has to be made of the six available meeting days. Accordingly, this year some of the committee reports are presented for such final action at this meeting as will not require them to be submitted again until the annual convention next October. They will skip the June meeting altogether. This plan was followed to some extent last March. It is a decided improvement over the old way of letting the committees report progress at each of the stated meetings, which, in most cases has resulted only in doing over again in June a considerable part of what had already been done in March. Under the new plan about half the committees can get, at the March meeting, as much discussion as their reports need before the final presentation in October. And in June the rest of them can do the same.

The answer to the question, "Who will be who in the signal business five years hence?" is to be found in the futures of the young men. Upon them depend the future of the Railway Signal Association and the future of the signal business. It is highly gratifying, therefore, to see so many of them taking an active interest in the work of the association. There is a comparatively large number of new faces among the committee members and several among the committee chairmen. R. C. Johnson and R. B. Elsworth, both assistant signal engineers of the New York Central, E. G. Stradling, signal engineer of the Monon, and W. N. Manuel, signal supervisor of the Grand Rapids & Indiana, are the newest among the latter, and all of them are doing good work. Nobody gets paid in real money for his loyalty to a voluntary association of this kind, nor for his work on the committees, which often requires a great deal of time and a vast amount of painstaking effort. But the work itself has a double benefit. It secures greater opportunities for preference in the association, for responsibilities naturally gravitate to those who show themselves capable of carrying them. And at the same time, by attracting the attention of signalmen all over the country, it advertises individual ability in a way that even a strict interpretation of professional ethics would have no quarrel with.

Manufacturers in general, and a good many members of the Signal Association, seem to have a wrong idea as to the significance of a favorable vote on matters that are brought before the stated meetings and the annual meeting of the association. For example, there is a growing feeling that if a design or a set of specifications receives a favorable vote

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at any meeting, this vote represents the approval of the organization; and it is generally considered that whatever was thus voted upon has become the standard practice of the association. As a mater of fact the R. S. A. constitution provides that nothing can be adopted as the standard practice of that body until it has been approved by letter ballot by two-thirds of the members and representatives; and no proposition can be submitted to letter ballot until after it has been presented at an annual meeting, and ordered submitted by a majority vote of those present. In other words, the annual meeting of the association is the only one that can pass upon a standard, and even its power to do this is limited, as it can do no more than order the proposition submitted to letter ballot. The discussions at stated meetings are in the nature of considerations of the various subjects by the members as a committee of the whole, and whatever votes they may take, or whatever actions they may decide upon, amount to nothing more than an expression of the approval or disapproval of the committee of the whole on the work of the particular committee. It is a long process to get anything approved by the R. S. A.; and manufacturers who may desire to make apparatus to conform to standard specifications should refrain from making the extensive changes that are often necessary in previous designs, until they are certain that the apparatus in question has received not only the favorable votes at the meetings, but also the approval by letter ballot which alone can make it the standard and approved practice of the association. And, at that, "there's many a slip" between a favorable vote at a stated meeting and a favorable vote by letter ballot, as a number of the committees have found.

THE COMMITTEE REPORTS.

The committees that submitted reports at yesterday's meeting were the same as last year with the exception of two—those on Contracts and Automatic Block Signaling. These were not represented in the list of reports, the committee on Manual Block and the Special Committee on Methods of Recording Signal Performance having taken their places.

The reports this year were more carefully compiled and in better shape than in some previous years, principally for the reason that the new manual was available as a guide in making the specifications in practically their finished form to start with. An additional reason for the improvement is the fact that it is not intended that some of the reports shall receive any further discussion before they are submitted for final approval at the annual meeting. This is particularly true of the work of Committee V on Manual Block, which is probably the most complete of all the seven that were discussed. It goes deeply into the matter of rules, paying special attention to the elimination of hand signaling at interlocking plants and providing as a substitute the use of a caution card.

Another matter of interest covered in the revised rules of Committee V is the prevention of fires. It usually happens that interlocking stations which are built of wood are located at the most isolated points, while those that are constructed of brick or concrete stand in the midst of municipal fire fighting facilities. This makes the fire menace a serious matter. The committee would add it to the signalman's list of things to look out for and guard against.

New rules were submitted for signal supervisors, signal foremen and also for maintainers, there being five times as many for the latter to become familiar with as for either of the other two. The most difficult to obey of all the maintainers' half-hundred will undoubtedly be the rule that requires the maintainers to "know that section foremen understand that new rails should not be put in or electric connections broken without facilities to restore promptly the working order of the signals" when rails are bonded for an electric circuit. It implies not only that the maintainers must know that the section foreman knows, but also that he must see to it that the section foreman knows and likewise that he does as he knows—which is a matter of great difficulty.

The Committee on Wires and Cables submitted specifications for a class of material which is rapidly going out of style. A wire connected signal is rarely installed nowadays.

Mr. Elsworth's committee on Storage Battery and Charging Equipment presented an interesting summary of the principal facts concerning the use of Edison storage batteries for automatic signaling. This part of the report was written by G. E. Beck, signal supervisor of the Lake Shore, and is submitted merely as information, the committee's specifications having been confined to lead type stationary storage battery for automatic signaling.

THE SIGNAL ASSOCIATION.

The stated meeting of the Signal Association began at 9:30 o'clock, the appointed hour, yesterday morning. This is the first time a March meeting has been "on time" in several years. The attendance at the start was considerably better than last year, and at noon, when it had reached its height, was larger than at any previous meeting for a long time, and considerably in excess of that at some of the recent annual conventions.

The subjects taken up during the morning hours were the specifications proposed by the sub-committees of the Power Interlocking Committee. They were passed for the most part without much discussion. The principal objection advanced was that the specifications for train drops, annunciators and bells should not exclude apparatus which is now used in connection with telephone engineering practice. The general form of the specifications was such that commercial apparatus would be excluded if they were adopted, and it was the general consensus of opinion that the committee should go further into the matter and make provision for the use of this kind of apparatus in cases where signal engineers might decide that it was cheaper or better than apparatus which had to be especially made to conform to the specifications.

The second committee report was that on Manual Block. The discussion centered about the substitution of caution cards for hand signaling at interlocking plants. In order to sound out the feeling of the members on the subject, a resolution that the caution card be used in addition to hand signaling was offered, and after considerable argument for and against, was adopted by a small majority. The discussions on the manual block report were interesting, and some of the opinions expressed might have been carried further with benefit to those on both sides of the argument, had there been time.

The third report to be considered was that by Mr. Mock's committee on Standard Designs. The designs were accepted for the most part without much discussion, a few of them being referred back to the committee. The committees on Alternating Current Signaling, on Wires and Cables, and on Storage Battery and Charging Equipment "marched up the hill and then marched down again," as it were, only a few moments being given to the reports of each of them.

The last report, that of Mr. Manuel's committee on Method of Recording Signaling Performance, took up considerable time at the end of the meeting. The discussions were on the various forms presented, and they were illuminating and helpful to the committee.

Altogether, the meeting was one of the most successful that the association has had for some time, and it is to be

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congratulated, both upon the interest shown by the individual members of the committees in their assignments, and the good start they have made toward an effective disposal of the large amount of work they have assumed this year.

KEEPING TAB ON THE SIGNALS.

Mr. Manuel's committee, on Methods of Recording Signal Performance, has made a fine start, particularly in the matter of finding a standard basis for computing the efficiency of signals. There are now almost as many schemes for keeping track of what signals do as there are kinds of bootlegs—that is to say, almost as many as there are railroads. In the absence of any concerted effort to establish a uniform basis, each road has been left free to make an arbitrary selection. The committee has gathered together a good many of these arbitrary bases, and finds "considerable detail with no semblance of uniformity." It has gone ahead, nevertheless, with the effort to formulate a system that will be acceptable as a standard "medium of exchange" where the efficiency of apparatus has to be taken into account, either in the relations between different roads or between signal departments and signal companies.

One road's contract specifications already require a guarantee of 25,000 operations per failure, and another puts the figure at 18,000. The committee's basis of 15,000, while it is exceedingly conservative, may by implication, at least, fail to reflect as much credit on the signal mechanisms now available as they deserve. A higher figure might be more creditable by indicating their ability to meet a more rigorous requirement.

A standard basis of computing efficiency will give most signal departments a better means than they now have of keeping their operating forces in touch with what the signals are doing, and in addition it will establish such a common standard for recording signal performances as will enable signaling information to be disseminated to the public in a more understandable form. The interest of the public in safety matters is increasing. And it is possible that no large part of its interest in automatic stops—which are not in use—has grown up simply because it was permitted to do so as a result of the absence of any effort to arouse interest in the signal devices that are in use. These, having been tried out and found satisfactory, ought to have much more interest for the public than something which has not yet had an opportunity to prove up except in a few special situations. The fact that signals are not more interesting to the public is due as much as anything to lack of publicity. Every effort to explain signals and signaling in words of one syllable helps to make more publicity possible.

THE NEW SIGNAL MANUAL.

The first edition of 530 copies of the Signal Association Manual, which were published last year, has been entirely exhausted and there is a demand for a considerable number of extra copies. Two hundred more copies will be printed; meanwhile so much new material has been developed that it will be necessary to increase the book, which is published in loose leaf form, from 614 to 800 pages. It is estimated that the additional copies of the original manual will cost about $1200 and that the 200 new pages which will be published can be furnished to the members at about one cent a sheet.

Another revision of the manual will probably not be made within the next three years; such additions or revisions as may be made in the meantime will be referred to in the proceedings until it is found advisable to publish a new edition.

PROGRAMME OF AMERICAN RAILWAY ENGINEERING ASSOCIATION.

The following is the programme for the convention of the American Railway Engineering Association. The programme is subject to change by a two-thirds vote of the convention or by time required for consideration of reports.

Morning Sessions—9:00 a. m. to 12:30 p. m.
Afternoon Sessions—2:00 p. m. to 5:30 p. m.

Tuesday, March 18.

President's Address.
Reports of Secretary and Treasurer.
Reports of Standing and Special Committees.
XII. Rules and Organization.
X. Signals and Interlocking.
XV. Iron and Steel Structures.
V. Track.
IV. Rail.
Reception at 8:00 p. m. by Board of Direction to members and guests.

Wednesday, March 19.

XVI. Economics of Railway Location.
VII. Wooden Bridges and Trestles.
Special. Uniform General Contract Forms.
XVII. Wood Preservation.
III. Ties.
IX. Signs, Fences and Crossings.
VIII. Masonry.
Annual Dinner at 7:00 p. m.

Thursday, March 20.

XIX. Conservation of Natural Resources.
II. Ballast.
VI. Buildings.
VIII. Water Service.
XIV. Yards and Terminals.
Special. Grading of Lumber.
I. Roadway.
XVIII. Electricity.
XI. Records and Accounts.
New Business.
Election and Installation of Officers.
Adjournment.

Friday, March 21.

Visit to National Railway Appliances Exhibition in the Coliseum and Armory.

THE SPEAKERS AT THE ANNUAL A. R. E. A. DINNER.

The annual dinner of the American Railway Engineering Association will be given in the Gold room of the Congress hotel on Wednesday evening, at 7 o'clock. The speakers will be B. A. Worthington, of Chicago, president of the Chicago & Alton; George A. Post, of New York, president of the Railway Business Association; Rev. R. W. Dickie, of Montreal, Canada, and P. G. Rennick, of Peoria, Ill. Mr. Worthington will speak on Looking into the Future; Rev. Mr. Dickie on Internationalism, and Mr. Rennick on the Twentieth Century Pattern.

UNIFORM BLOCK SIGNAL LAWS HEARING.

The railway commissions of Illinois, Indiana, Wisconsin and Minnesota, by a committee of their representatives, held a final hearing on the subject of the proposed uniform block signaling laws for steam and electric railways in those states, on March 12, in the offices of the Illinois Railroad and Warehouse Commission in the Insurance Exchange, Chicago. F. G. Ewald represented the Illinois commission; D. F. Jurgensen,

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the Minnesota commission; J. N. Bidwell and E. J. Larson, the Wisconsin commission, and H. O. Garman, the Indiana commission. The signal engineers of all the roads in the four states mentioned were present; and although this hearing was to have been the last one before the recommendations were brought before the various commissions to their state legislatures, there were a number of suggestions made by the signal engineers present which it was thought advisable to take into further consideration. For that reason the hearing was not considered conclusive; and it is probable that another hearing will be held at a later date after the suggestions have been embodied in the proposed uniform rules. This matter has been under way for several years and the committee of representatives of the four commissions named have spent considerable time in investigations of, and hearings concerning, up-to-date practice in signaling and interlocking on both steam and electric railways.

RESOLUTION REGARDING THE LATE J. C. YOUNG.

At the morning session of the Railway Signal Association F. P. Patenall offered the following:

"The sad news of the sudden death of J. C. Young having reached the members of the association but a few weeks before this meeting, the following minute is offered to be spread upon the record of the meeting and a copy to be sent to his family:

"James C. Young, member and director of the Railway Signal Association and signal engineer of the Union Pacific, died on February 25, 1913. By this minute we express the feeling of loss to the association and to those connected with him in his work, which his death has occasioned, and tender to his mother and sister our profound sympthy. We hope that the memory of his upright and useful life as a gentleman and a railroad officer will be of as much comfort to his mother and sister, as it is an example to his friends and associates."

The members stood and the minute was adopted in silence.

RECEPTION AND ADDRESS BY WILLIAM McNAB THIS EVENING.

The board of direction of the American Railway Engineering Association will give a reception to the members and guests of the association in the Gold room of the Congress Hotel this evening at 8 o'clock. After the reception William McNab, principal assistant engineer of the Grand Trunk, and a past-president of the association, will deliver an address on the Panama Canal. Mr. McNab made a visit to the canal a short time before last year's convention, but has since kept closely informed regarding developments there. His address will be illustrated with stereopticon views secured from the authorities at Washington.

ANNUAL MEETING; RAILWAY APPLIANCES ASSOCIATION.

The annual meeting of the National Railway Appliances Association for the election of officers and the transaction of such other business as may come up will be held in the ballroom of the Coliseum annex on Tuesday at 11 a. m.

NEW R. S. A. BOARD MEMBERS.

W. H. Elliott, signal engineer, New York Central & Hudson River, was elected to the Board of Direction of the Railway Signal Association, at the board meeting on Sunday, March 16, to fill the unexpired term of J. C. Young, signal engineer of the Union Pacific, who died February 27, 1913.

Proceedings.

The stated meeting of the Railway Signal Association was called to order at 9:30 a. m. on Monday, March 17, in the Florentine room of the Congress Hotel, Chicago, by President B. H. Mann, signal engineer of the Missouri Pacific.

POWER INTERLOCKING.

The committee submitted specifications for annunciator bells push buttons for bells, train drops, etc., floor pushes, and fuses, asking for full discussion so that the complete reports on these subjects can be presented for final consideration at the annual convention at Nashville in October. The specifications for fuses include a diagram of dimensions for cartridge enclosed fuses.

Sub-committee "C," of which I. S. Raymer, assistant signal engineer, Pittsburgh & Lake Erie, is chairman, was instructed to prepare plans for wire ducts, terminal boxes, and manholes. The time of this sub-committee since its appointment has been given to drawing up specifications for steel and iron pipe conduit and the collection of data covering the field work for the installation of wire ducts. The specifications for steel pipe conduit and wrought iron pipe conduit were submitted at this meeting.

The committee consists of R. C. Johnson (N. Y. C. & H. R. R.), chairman; F. B. Wiegand (L. S. & M. S.), Burt Anderson (A. T. & S. F.), W. H. Arkenburgh (Union Switch & Signal Co.), M. H. Collins (H. & M.), J. R. Decker (M. C.), A. B. duBray (Frisco), B. B. Gray (P. L. W.), W. H. Harland

ROBERT C. JOHNSON,
Chairman Committee on Power Interlocking.

(N. Y. O. & W.), H. H. Harman (B. & L. E.), E. C. Hitchcock (N. Y., N. H. & H.), L. E. Kinch (P. R. R.), M. H. Loughridge (N. Y. W. & B.), J. W. MacCormack (K. C. T.), W. N. Manuel (G. R. & I.), G. A. Motry (B. & O.), H. H. Orr (C. & E. I.), F. W. Pfleging (U. P.), A. B. Pollock (P. R. R.), W. M. Post (P. R. R.), I. S. Raymer (P. & L. E.), D. W. Rossell (N. Y. C. & H. R.), T. C. Seifert (C. B. & Q.), F. G. Smith (C. & E. I.), O. R. Unger (M. P.), G. A. Ziehike (U. P.).

Discussion on Power Interlocking.

The report of the sub-committee A was read by A. B. du Bray, chairman, by paragraphs.

T. S. Stevens (A. T. & S. F.): Has due consideration been given to the advisability of using some other contact material than platinum in annunciator bells?

Mr. du Bray: We considered most of the contact materials and decided that platinum best served our purpose.

Mr. Stevens: Is it really necessary to specify that the coils of the annunciators shall be in accordance with association specifications? The association's specifications for coils, as now designed, are intended for use in instruments of far more importance than annunciator bells. The question arises as to whether we are not saddling an undue expense on the railroads by this clause in specifications. In paragraph 1-K, Binding Posts, Nuts, Washers, etc., are specified

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in accordance with Railway Signal Association drawing 1070. Has due consideration been given to the fact that this will increase the size of annunciator bells and material, and therefore possibly increase their cost unduly?

The Chairman: We decided we would get the best results by having four coils, and as long as we were going to have four coils we thought it best to live up to the balance of the relay specifications with reference to coils. With reference to paragraph K, we frequently have heavy wires on those binding posts, and we thought we would better have the standard posts.

Mr. Stevens: That will be all right as soon as we have developed a line of material which will comply with these specifications. At first it will knock out all commercial annunciator bells.

The President: We realized in the committee that, as far as we knew, there was nothing on the market that would pass these specifications, but we did not see why there was any reason it should not be made to cover the specifications.

W. N. Manuel (G. R. & I.): I suggest the diameter of the screws be mentioned, and, under "contacts," I suggest that the area of the contacts be specified, for the reason that with the bells we are using now the contacts are very frequently punctured by the short contacts. I believe the bells would give better service and would be of longer life.

A. G. Shaver (C. R. I. & P.): It seems to me that the specification on annunciator bells is too much in detail in some respects. For example, a nickel-plated gong is specified, and again pressed steel cover; the current requirement is stated in amperes for certain resistances of bells and it is arranged to allow those being put in by the purchaser. I should think it would be a good plan to specify the energy that a bell must work with, and if done in that way, then, as certain types of bells require the same amount of energy, regardless of what the resistance might be, we would not need to bother about stating the current every time we wanted to order a bell. In section 2, paragraph (h) I think is wrongly stated.

J. C. Mock (M. C.): I understand that the paragraphs in the specifications for push buttons, train drops, etc., relating to annunciator bells should be similar for each specification. Does this one permit the use of outfits such as telephone companies use, or will your specifications make the instruments so large that they will cut out all of that standard telephone equipment? Will the telephone people be able to supply it?

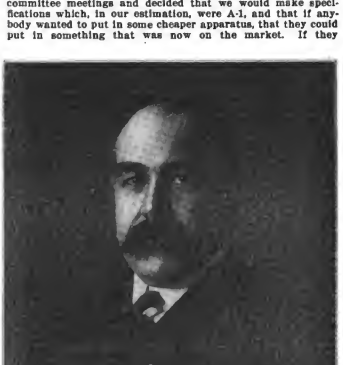
The Chairman: Not from material they have in stock at present.

Mr. Stevens: I think the question I raised and the question Mr. Mock has raised is a rather serious one, and one which this convention will have to consider seriously at the annual convention. We are practically cutting out commercial material of all kinds and specifying something which will have to be developed, without any possibility of checking the price. I doubt very much whether the material we are specifying warrants the rigid specifications we are attempting to put before the association.

Mr. Shaver: I am in sympathy with that same line of argument. It seems to me the specifications are pretty rigid and go too much in detail.

The Chairman: We considered that quite a long time in committee meetings and decided that we would make specifications which, in our estimation, were A-1, and that if anybody wanted to put in some cheaper apparatus, that they could put in something that was now on the market. If they wanted to put in a first class proposition they could specify R. S. A. specifications.

B. H. MANN, President.



F. P. PATENALL, Vice-President.

C. E. Denney (L. S. & M. S.): I believe the question would be satisfactorily covered if the specifications, after approval, are referred to the committee on standards to design a push button. The price will be lower by making it a standard article.

Mr. Mock: I would suggest that the committee be asked to draw a specification which would permit the use of any high grade equipments, such as the telephone companies now supply. The telephone companies are making very good and very compact designs. I have not the slightest notion that the standards of the committee can improve on them for the use of signal work; if you tell us that we must have a standard R. S. A. binding post and 3/8-in. air gap, you have practically settled the question of size. I think it is quite a serious matter now in all our big plants to provide the room for these appliances.

A. H. Rudd (Penn.): Could not the heading of these specifications be changed so as to show that they shall apply only to certain work; for instance, the bell is provided with a 5/8-in. air gap, and that is the same as the air gaps which

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are required to protect against lightning troubles, etc. The practice on many roads is to place these annunciator bells on a local circuit right in the cabin, and there is no chance of lightning getting at them, and in that case a cheaper bell could be used. I think the same remark applies to the specifications for annunciators and push buttons. It seems to me that if a specification could be divided so that while it does specify for the best class of material, which is to be used on certain kinds of work, where they either have circuits of high voltage or where they have circuits exposed to lightning, and this better grade of material was to be used in such cases, yet other grades of material could be used in cases where the conditions were not so exacting, and then that would give us a chance to use cheaper material on the inside and local circuits, which would serve the purpose.

Mr. Shaver: I move that the committee consider the specification with regard to revisions, such revisions as may be necessary, in view of what has come up at this meeting.

Mr. Stevens: I second the motion. I know that we will not use these specifications. We do not think the specification is provided for this type of apparatus is necessary. Mr. Mock has raised a very clear fact that all our communications with each other through the medium of the telephone are made with these identical articles which we are trying to specify here, and the telephone company has developed these things into the smallest possible articles they can get hold of, and they work. Why should we design a great big piece of apparatus, probably expensive—we cannot tell that until it is developed—to do the same work the telephone people are doing with probably a cheaper instrument, at least one of far less bulk?

L. S. Rose (C. C. & St. L.): I think the committee is right. The cost of these articles and the maintenance of them should be taken into consideration. When the telephone company wants to make a change they put in a new machine, and it has been our practice, when we have a coil burned out of a bell, to put in a new bell. If we can get a form of wound coil we can repair the bell, by putting in a new coil, and save the rest of the bell, and as far as our R. S. A. standard binding posts, nuts, etc., are concerned, we will have a lot of these parts on the railroads, with which to repair our machines, and everything will not be special. I think that the committee is on the right track.

After these specifications have been in use a little while you will find that all the supply houses will be making these patents of push buttons, annunciators, etc., without these specifications, and we will have a better chance to judge whether we are getting our material for the right price or not, where now we take some special design, and we do not know whether it is economical, because we cannot compare it with anything else. I sustain the committee.

J. Beaumont (C. G. W.): There is no compulsion as to using this material in places where possibly somewhat inferior apparatus would fill the conditions, but the work of the R. S. A. is based on the theory that we want the best material to fit certain conditions, and these conditions are taken care of by such apparatus as are developed from the work of its committees. I move, as an amendment to the original motion, that the specification be accepted by the Association.

T. S. Stevens: It is not a question of always using the best. It we can use apparatus which is being used now on the train dispatching telephone service throughout the country, surely it is good. I am arguing in favor of commercial material that is good, and the market, and that has been the process through which this association has got up all its specifications, basing it first on something that is commercial and gradually developing the thing to a higher point, if they find it necessary in the case of this commercial material.

(The president then put to vote the amendment motion, which was not carried, and the original motion to recommit the matter to the committee was then put and carried.)

Mr. Du Bray: The next is the specifications for floor pushes.

W. H. Elliott: I suggest a modification of the clause (e) I think it might be expressed more clearly as follows: "Floor push shall be mounded on the underside of the floor with operating button raised a sufficient distance above the top of the floor.

Mr. Du Bray: We will accept that.

Mr. Stevens: I move that the section, "Specifications for Floor Pushes," be accepted with the same consideration that applied to the previous paragraph.

Mr. Shaver: I ask the committee why in Section I, in paragraph (b), it should not be arranged so that there may be a normally open contact or a normally closed contact? While I am aware that in most cases a normally open contact is desirable, yet in some cases a normally closed contact is desirable. I want to call attention to paragraph (b) in Section 2, on "Testing." I find too many of us in preparing specifications are not careful about the inspection clause. A floor push is not a very expensive piece of apparatus, and I am not so sure it is going to pay us to send an inspector to look over ten floor pushes at the place of manufacture. The same applies to other apparatus of such a nature, and I believe it should be stated in such a way that we are not obligated to send someone to inspect ten or more push buttons if we do not want to do it. The expense of sending a man to make these inspections will oftentimes equal the cost of the apparatus.

The President: The committee is willing to change the word "will" to "may."

The motion was then carried.

Mr. Du Bray: The next specification which we desire to bring up is that for fuses. Before we get into this I would like to say that the drawing as shown on page 10 is not quite right. The note, "Dimensions of Above Type to Be Specified by Purchaser," applies only to the screw contact fuse and not to the ferrule contact type. The fuse covered by the National Code specifications will meet the specifications here, and there is nothing in these specifications that will make an article special for signal use. It is in accordance with the National Code; in fact, a great deal of this matter is copied directly from the Code, and the balance of it is more or less of a rearrangement of the Code specifications. In some cases we have limited the capacities to what we think is necessary in signal work and cut out all other fuses.

Mr. Stevens: I suggest an asterisk with a footnote saying at the bottom, "Specifications of the National Board of Underwriters."

Mr. Du Bray: It is the intention of the committee to make such acknowledgment.

Mr. Stevens: I move that the specifications be accepted.

Mr. Shaver: In paragraph (d), under Section 1, does the word "Link" refer to a wire fuse or a ribbon fuse?

Mr. Du Bray: It can be either one.

Mr. Shaver: In Section 1, under paragraph (e), the reading is, "The fusible wire shall be attached to the terminals in such a way as to secure a thoroughly good connection and to make it difficult for it to be replaced when melted." I imagine possibly the committee refers to the replacement of this by the maintainer, and I do not see why that restriction should be placed on it. Only recently we have discovered that a lot of the average type fuses can be refilled at a whole lot less cost than the original fuse cost, and that they are just as good.

Mr. Du Bray: That clause is taken from the Code, and it reads the same in the Code as it does here.

Mr. Shaver: I want to call attention also to the fact that only recently we have had a lot of trouble in getting fuses, due to the National Electric Code standards being changed, and if the Committee has not recently investigated the requirements of the National Code I suggest that it do so and change their specifications accordingly. It is certain they have not been well settled as to what they require.

Mr. Du Bray: That particular type of fuse known as the screw contact type seems to have no existing standard. The fuse manufacturers will make them in any way to suit the purchaser's requirements. You can get a 75-ampere fuse that is approximately 2 in. long, and you can get a 10-ampere fuse that is 5 in. long, of the same general construction, and it seemed to be the idea that the fuse was made to meet some existing condition, and several of the fuse people advised they would make the fuse in any way that it was ordered.

Earl B. Smith (N. Y. C. & H. R.): I think there should be something here with reference to the refilled fuse, as we use it with pretty good success. We do not use the asbestos filling, but the ventilated cartridge and end gap. In fact, we find the fuse does not deteriorate as much when it is refilled, we seem to get a better surface, and it does not seem to absorb the dampness, which ordinarily deteriorates the fuse.

Mr. Du Bray: We did not feel that we were putting anything in the specifications that would prevent their being refilled.

Mr. Denney: I ask if the condition of the fuse after blowing will be apparent? I have in mind the fuse of an interlocking machine that blows through the operation of the lever, and if the leverman does not find out promptly that the fuse is blown, he will probably report a failure and unnecessarily delay trains.

H. S. Balliet (N. Y. C. & H. R.): While these detectors are

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used on inclosed fuses, they are far from reliable in the signal business. I have gone through that, and there is no doubt about it, in my mind, that we ought to have an addition to what is shown in these specifications, a type of fuse suggested by Mr. Denney, so that we will know more definitely that it has blown. That is something that we should know quickly, very quickly, in congested territories.

Mr. Stevens: I move that the section of the specifications just presented by the committee be accepted, with the understanding that the committee will take into consideration the various suggestions which have been made in this discussion.

(The motion was carried.)

The report of sub-committee was then presented by I. S. Raymer, chairman.

Mr. Shaver: I raise this question with regard to pipe coating. Is it supposed the threads will be galvanized or not, or treated in any way or not? This is not brought out here, and, in some cases I know of, they are treated, and in other cases they are not treated. If the thread is not treated to prevent rust, that is the weakest part of the conduit, and it seems to me that it should receive some consideration.

Mr. Denney: I agree with Mr. Shaver, and believe that eliminates hot galvanizing. The inside coating should certainly be hot galvanized.

Mr. Patenall: Does the acid bath remove entirely all the blisters and scales on the interior of the pipe, and such being the case, would it not be rendered smooth, contrary to what Mr. Denney says?

Mr. Raymer: I believe it is the practice with the manufacturers who put on the coating to use enamel inside, whether it has been hot galvanized, sherardized or electro-galvanized. They usually put the enamel on to give a smooth inner surface for the pulling through of the wire.

Mr. Denney: The acid bath is given before the hot galvanizing, and you cannot hot galvanize and have a smooth surface. I would move that the clause 4 be revised, eliminating the words, "hot galvanized, electro-galvanized, sherardized," so as to make it read: "The interior surface of the pipe shall be enameled."

Mr. Balliett: I second that motion.

Mr. Stevens: I do not think that should carry. I am not prepared to discuss the effect of hot galvanizing on the interior of conduits, but I am confident we are using a lot of that material. I believe sherardizing is a better process, but I think you will find that the most serviceable conduit on the market, as Mr. Raymer says, is either galvanized or sherardized first, and then enameled, so whatever we do, we must remember that the enameling will not effectively protect against rust. The conduit will scale, will have pits on the surface, and the only way we can protect against that rust is either by galvanizing or sherardizing.

Mr. Denney: I disagree with Mr. Stevens. Enameling would be one of the best means of protecting the outside of the pipe, if you could put it on and keep it on while the pipe was being handled. You can properly enamel the inside and nothing happens to remove it. A great deal of conduit that is used in buildings is enameled inside, and so far as I know, it is all enameled inside. It is not enameled on the outside because it will not stand the shipping and assembling, and hot galvanizing on the inside would make an unsatisfactory surface for pulling wires through.

Mr. Raymer: I believe it is possible to hot galvanize and enamel on the interior, also to sherardize and enamel, but do not believe it is quite practical to electro-galvanize and enamel on the interior. We were agreed to let it stand as it is, but added enamel on the interior, after either of the other finishes have been put on.

C. A. Christofferson (N. P.): I suggest an addition to paragraph 3 stating that all cutting and threading must be done before the conduit is galvanized or sherardized, whichever process may be used, in order to have the thread properly covered.

Mr. Raymer: The sherardizing people, I believe, after applying their process, put the product through a paraffine bath, and then enameled the interior if desired.

F. P. Patenall: It seems to me that some tests should be applied before we finally decide this question. It is further evident that pipe properly sherardized will leave a very smooth surface; but I am doubtful, in view of practice with which I am familiar, where steel conduits have been put in without enameling, whether it is desirable to also give them a coat of enamel after sherardizing them. It seems to me that one of these operations is sufficient if we can secure what we are after.

The President: The committee agrees to look into this

T. S. STEVENS, Vice-President.

C. C. ROSENBERG, Secretary.

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matter, bearing in mind the discussion which has taken place at this meeting.

J. Beaumont: I move that the specifications be accepted. This will carry certain details to be presented at the next conventions.

C. E. Denney: I offer an amendment, that we accept the specifications as presented at this meeting and that we instruct the committee to revise the specifications and submit a further report to the June meeting. The specifications should be made more definite.

Mr. Raymer: These specifications covering the different kinds of coating embody these various processes, so that the man who draws up a requisition or a specification can cross out the one he does not want.

Mr. Balldit: I second Mr. Denney's amendment.

Mr. Mock: I have had a good deal of experience during the last two or three years in the purchase of this kind of pipe. Some of it was plain black and some other galvanized. For the committee to say what is best is a difficult as to say whether wrought or steel pipe is best under all circumstances.

The Chairman: Mr. President, the committee is not prepared to recommend any one basis of coating pipe. There are several manufacturers making different kinds and we do not care if they are any one of the manufacturers. We have not had sufficient experience to determine that one process is superior to others.

Mr. Shaver: It is a fact that this specification is made up in such a way that it is necessary to use hot galvanized, sherardized or enameled, whatever we may want. If we are getting bids on something of that kind, it is our lookout to see that we prepare our bids on sherardized, electro-galvanized and the like. I believe the committee will be glad to take this into consideration and see if any of these things can be eliminated, but in order to meet the wishes of most of the members as they have expressed themselves in the past, it seems to me they have prepared the specification all right. I think it is very difficult to tell whether one type is better than any other at this time. I do not believe the committee or any member can do it.

The President: The question is on the amended motion, unless it is withdrawn, based on the discussion, which takes into consideration the fact that the committee is willing to consider this question, but the committee do not feel in the state of the art that we can tie the specification down any tighter than it is.

C. E. Denney: I will withdraw the motion with the understanding that the committee will consider this at the annual meeting.

The motion was carried.

Specifications for wrought-iron pipe conduit material was next presented.

T. S. Stevens: In view of the discussion on the specification for steel pipe conduit, which will equally apply to this, I move their acceptance, with the idea that the committee will give consideration to the past discussion that has been had on the specifications for steel pipe conduit.

The motion was seconded.

Mr. Raymer: The specifications for wrought-iron pipe conduit are practically the same, except for the material used in the pipe and the comment that steel pipe conduit will apply to wrought iron pipe.

Mr. Denney: Have there been any tests by the committee showing whether steel or wrought iron is preferable for any particular uses?

Mr. Raymer: We use practically the same test as used in specifications for signal pipe, which are now acceptable to the Association and printed in the Manual.

Mr. Shaver: As a matter of information, I would like to know from the committee whether they have found it possible to get wrought-iron pipe conduit? Is it being furnished commercially at this time?

Mr. Raymer: Yes, sir, I believe you can obtain it.

The motion was carried.

MANUAL BLOCK.

Sub-committee "B" was assigned the preparation of, and submitted, rules for the maintenance and operation of interlocking plants and block signals. Standard code rules of the American Railway Association were accepted as the basis, but for economical reasons were not printed in the report excepting only such of them as are recommended for revision. Such additional rules as are suggested for adoption were also included. Six of the present rules for signalmen were subjected to revision, the principal point covered being the elimination of hand signaling and the substitution therefor of caution cards. Complete rules for maintenance to govern supervisors, signal foremen, and maintainers are given; 13 for the supervisors, 11 for the foremen, and 50 for the maintainers.

The committee consists of T. S. Stevens (A. T. & S. F.), chairman; L. R. Mann (M. P.), E. T. Ambach (B. & O. S. W.), Hadley Baldwin (C. C. C. & St. L.), J. Beaumont (C. G. W.), M. W. Bennett (G. C. S.), E. A. Black (L. S. & M. S.), C. Drake (C. & N. W.), J. A. Fleissner (C. M. & St. P.), M. J. Fox (C. B. & Q.), G. A. Guyer (N. Y. C. & H. R.), B. A. Hinman (N. Y. C. & H. R.), H. K. Lowry (C. R. I. & P.), G. S. Pfiasterer (N. C. & St. L.), W. N. Spangler (P. R. R.).

Discussion on Manual Block.

Mr. Rudd: I would suggest that rule 620 be changed. It says "If a signal fails to work properly its operation must be discontinued and until repaired the signal secured so as to display the normal indication." That is probably all right for an interlocking signal. A considerable mileage in this country is automatic, and, at normal, clear. I would like to suggest if there is not some way of getting these amended rules to the committee on operation of the American Railway Association, before our annual meeting.

Mr. Rose: This rule 620, I understand, is for manual block and the rule is for the signal man. Ought not that reference to train movements be cut out of here?

Mr. Beaumont: I would like to answer that by saying that the rules as submitted, both the amendment to the present rules of the A. R. A. and the proposed rules, they have reference to interlocking. These rules have no reference to manual block or automatic signals.

Mr. Rose: That is not the point. I don't care whether it is manual block signal or interlocking signal, but I think the rule governing what the train men should do ought not to be mixed in with rules for signal men.

Mr. Stevens: The Rule 629 referred to, in rule 620, specifies some definite action on the part of signal men which they have to know about, and that later the rules for the engine men and train men are handled to bring about this desired result. Practically the thing we are introducing here is the issuance of a caution card instead of the usual hand signals which have been in use up to the present time.

Mr. Rose: I do not believe it is necessary to issue a caution card to get a train by an interlocking signal in the stop position, especially if that signal is 1,000 ft. from the tower and the towerman or signalman is the block operator also. We have a means of doing that by hand signals, and the towerman is required to use a certain colored flag or lantern for his hand signal. The responsibility for passing the signal in the stop position on hand signals is up to the towerman and also to the man that accepts that signal. He is responsible if he gets off of the track and it would tie the railroad up if for every train the towerman had to go to the home signal and hand up a caution card. I do not believe it would be a bit safer.

(Sections 620, 629 and 630 was then read.)

Mr. Beaumont: Under "Proper Operating Conditions," the train movement through the interlocking plant is accomplished by the signalman setting up the route and indicating to the engineman, by means of a fixed signal, that the train may proceed. The act of forwarding the train through the interlocking, under proper operating conditions, is accomplished by the co-operation of the signalman and the engineman, subject to the check of the interlocking apparatus. The removal of the protection provided by the latter, whether by derangement of the machine or other cause, creates a condition necessitating extreme caution to insure the safety of the train movement. The proposed rule, under the principles of which a number of prominent lines are now operating, will, we believe, if adopted, have the effect of still further safeguarding traffic under such unusual conditions as follows:

First, it will cause the train to approach the interlocking signal under complete control; second, it will cause the signalman to pass over the track to a point beyond the home signal; third, as the signalman is compelled to fill out an order for the engineman to proceed, he will exercise more care in examining the route before giving such authority; fourth, it will give the engineman information as to the nature of the trouble and thus enable him to act intelligently; fifth, it will create a record of an unusual condition for the benefit of the division superintendent, and thus enable him to check such defects more closely; sixth, it will insure co-operation between the signalman and the engineman; seventh, it will prevent a repetition of accidents that have occurred in the past due to misunderstanding of hand signals or verbal orders; eighth, it will restrain

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enginemen from passing signals set at stop without written authority.

There are many other points in favor of this method of operation too numerous to mention, which, with the reason above given, seem to point to the advisability of adopting a uniform practice. It is evident that where two or more railroad companies are operating trains through a common interlocking plant, that standard practice could govern, and that such standard practice should be based upon the safest and most reliable methods. Your committee has given this matter such earnest consideration as to lead to the recommendation of the rule proposed as fully covering the conditions, at the same time establishing uniform practice, and therefore recommend its adoption.

Mr. Rose: I do not believe it will work very well on the railroad. That might do all right for an interlocking plant where the towerman had one or two trains a day and he had nothing else to do but pull the levers, but upon the road I am connected with the towerman is also the block operator, especially in the manual block territory. He has to report the passage of trains by his station; he has to obtain permission from the signalman in advance before he admits a train; he has to report the train entering the block; he has to give the clear block to the man in the rear, and we have some home signals that are 800 or 900 ft. from the interlocking cabin, and I don't believe it is necessary to go to all that machinery to get a train in an interlocking signal. With one of the causes for failure to get the interlocking signal clear are on account of some small adjustments. Sometimes the towerman cannot get it clear because he does not have the route lined up properly. In all cases the train stops at the home signal before it proceeds on the hand signal, and while we have had trains derailed there have been no serious accidents, because the trains move through the interlocking limit slowly; they do not run by home signals at 60 or 70 m. p. h. I believe a practical way to do this, just as safely as proposed, is by a scheme of hand signals with lights or flags that are different from the usual flag or lamp carried by the trainmen. At some joint interlocking plants we have two schemes, so that an engineman on one road will not be mixed where a signal is given for a train on the other road. I won't say that we have not had any trouble with it, but it amounts to one or two pairs of wheels on the ground. With Mr. Beaumont's scheme the responsibility is put on the towerman. With our scheme it is put on the engineman, if he accepts such a signal and gets into trouble without knowing that the route is all right. While that sounds very nicely, I think it would tie us up too much. It is too severe.

Mr. Stevens: All of Mr. Rose's remarks were presented before the committee for argument. The responsibility is not placed with the towerman. In the first place the rule which is now in effect with reference to trainmen is still retained in effect, and in the second place the man receiving a caution card, if he understands what the caution card means, is not relieved of anything anywhere. The argument that won the chairman over was this: It is the only way that you can tie the engineman and the towerman together; it is the only practical way that you can make sure that the engineman knows that whatever indication is given is intended for him personally and not for some other chap on the railroad. Now the argument was also presented to the committee that there would be lots of places with home signals at long distances, where the practice would be unduly restricted. I believe you will all acknowledge that these places are few and far between. The places where this rule would not be unduly restrictive are far greater in number than those where it would be unduly restrictive, and in handling subjects of this kind, previous to this discussion, many earnest thinkers have thought that it was better to have a rule even if it has to be abrogated to certain specific cases than to adopt a rule for all these specific cases which will apply to them all. Have a good rule if you can, which will take care of 75 to 80 per cent. of your cases, because then some officer of the railroad will have to be asked for permission to abrogate that rule at the places where it cannot be used. That is the position the committee takes with reference to this rule.

Mr. Rose: I do not believe in putting in a rule that will not be lived up to ninety-nine times out of one hundred. There is one thing we have to look out for and that is getting trains over the road. A good many hard-headed officers will not be willing to work under this rule. I do not believe we should put such a rule in the book. Make it a rule for the train to stop at the home signal, then you have your safety. No train is going to get up speed, run off a derail and kill a lot of people. The roads that are operating under this rule, I think, are not working a manual block system.

W. H. Elliott (N. Y. C. & H. R.): While I believe the rule is a good one, it has been our experience that it is impracticable to have it carried out, and in framing our new set of signal rules, practically the same wording that is used here was used. The use of hand signals as authority to pass fixed signals at stop is prohibited. In the discussion that took place among operating officials, assistant general managers and superintendents, it was finally agreed that it was necessary to use hand signals at certain times, as it was not practicable to get a caution card to the engineman, and for that reason we have in our set of rules a hand signal rule. We call for the issuance of the caution card under normal conditions of failure, but in certain abnormal conditions we allow the signalman to give a hand signal. This rule, if adopted, works out, according to my experience in this way, that where the signal is a great distance from the tower and on a modern plant with 18 or 20 crossovers, signals must of necessity be 900 ft. or more, in certain cases, from the tower. The signalman, instead of writing his card and taking it out to the engineman, calls for a trainman to come in, or waits for the trainman to come in, writes out the card and sends it to the engineman. What is the result? The man is trusting to luck. He may have his lock levers reversed and the route practically set out, but he does not know it. The engineman, on a dark night, cannot tell which way the switches are set, and he is going ahead without any assurance that the route is properly set and located. For that reason, while I believe such a rule is desirable, if you can enforce it, I do not believe it is practicable and that it is wise to have a hand flagging rule, carefully worded, to prescribe its use, and have that in the set of rules.

Mr. Denney: The committee has gone from one extreme to another, from all hand signals to all caution cards. There is a middle ground, and I believe we can fix that rule by inserting another paragraph, something along those lines—"for blank movements," or "at blank locations, hand signals may be used," with the idea that it will be filled in by the road. It is not a difficult or impossible thing to handle regular train movements, through movements, by caution cards, and they are the more important movements, because you are handling more equipment and the best grade of equipment; but it is possible, under certain conditions, to authorize hand signals for switching movements. I am satisfied that the proper enforcement of a caution card rule, which I am in favor of, requires a modification, not by the time card. You have no rule, if you modify it on all divisions by the time card as you see fit, but make the rule, or a part of the rule provisional so that the road may use it as they see fit. There is no weaker rule than the rule that is modified by the time card. And the committee, if it believes, that the rule will at some places have to be modified by time cards, should revise the rule.

Mr. Rose: I have heard it said that you cannot railroad by the book of rules, but the time is coming when we are going to railroad by the book of rules, and it is very close.

Mr. Mock: I am in sympathy with the rule giving the railroads some leeway, and I think that is the chairman's thought in the presentation of his argument in favor of the rule. He says the railway officials should be permitted to abrogate the rule in special cases.

A. R. Fugina (L. & N.): I do not believe it is necessary to tie up the operation of an interlocking plant in order to issue caution cards. I have handled this proposition with our operating people recently, and made a canvass of the entire situation and I find the operative people as a rule are against it on our railway. Investigations brought out that they had no cases on their railroad within a reasonable number of years on which they had had accidents due to trains coming together on account of hand signals. I believe it is by far the most general practice to operate by hand signals through the interlocking plants, and I believe where we do have accidents, it is usually due to some other weak condition on the railroad; that if the operating rules are properly observed and the men are taught to observe the rules, there will be no trouble.

Mr. Denney: I want to modify my suggestion to the extent of making the supplement to this rule refer to locations. Make it refer only to specified movements, so that the rule will be uniform over the entire line. What I say is not with the intent of discrediting caution cards for through movements or for any movements that can be governed by them, and that can be determined by the road putting the rule in effect. It is the business of this association, and its members to reduce the number of caution cards that are to be issued, and they will be reduced as maintenance is improved. While you have an important train that is making a through movement and it should go by high speed, or medium speed sig-

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nals of an interlocking plant, they should not be authorized to make a movement at a speed at which they would, if the route was not right, be led into a serious derailment; they should be given the caution card, and it should be done after the man knows the route that he is given is right. The additional time for giving the card is fully warranted in a given case.

E. D. Smith (N. Y. C.): We have been using this card a good many years under very busy traffic conditions. While our new card is not used in the form of a caution card, it is a proceed card and can be used for closing in of trains, that is with the direction of traffic. We found it a very good rule and we would have had lots of trouble if we did not have it. In fact, if you take this rule you will not have the engineer and the operator jointly responsible for the same thing. You make your operator responsible. He feels that he has that responsibility and he will look at the route. If your operating department is working with you you will have no trouble at all, because if there is anything that happens it is up to the operator and nobody else, and it is a clear cut case against him. We operate this rule and also use a card for each home signal. If he had three on this route to pass he would have to have three cards to get past them. While it does not delay us much, it is good for the maintenance end. When a man gets a card the operator has to report it and the engineer has to turn it in. Therefore we get hold of it, and if we have a failure, we can trace it. On a four track busy railroad, as in our case, with a switch out of commission, that is the time we need the card because we have the operator check the maintainer on the line, to see that the route is operated properly and to see that the man has gone where he is supposed to go. The operator in that case is responsible for the whole movement.

Mr. Stevens: We are willing to have this rule put in.

Mr. Rose: This rule might be all right on a 4 track railroad or on some great railroad that has an automatic block system from one end to another, but you are making this rule for everybody. I contend that 90 per cent. of the railroads of the country are not going to live up to that rule. If the operator hears someone blowing a whistle at the home signal he will not look at any of the switches until he gets through. He will hike right out with his ticket.

W. A. Manuel (G. R. & I.): There is not any question in the minds of any of the members but what there is need for more co-operation between the runner and the signal man, where part of the interlocking plant is out of service. In some cases that I have known of, a route has been lined up for the crossing road, and trainmen have accepted hand signals. That is certainly dangerous and it could be taken care of by the use of the caution card. Certainly there could not be any harm in saying, "Unless otherwise provided for, hand signals should not be used."

Mr. Denney: I would suggest that the committee, supplement Rule 629 and revise it to provide about as follows: "Hand signals may be used for the following hand train movements, and must be given at the track over which the movement is to be and in such a way that there can be no misunderstanding on the part of the engineman or the trainman as to the signals, or as to the train or engine for which they are given." That would make this a combination of the old rule and the new rule, and allow for flexibility to be determined by the road adopting the rule, in toto or in part.

Chas. A. Cotton (A. T. & S. F.): Is it intended that the head brakeman should do his own flagging? If he comes in on the hand signal without doing his flagging he is called in for investigation.

Mr. Elliott: I would like to suggest to the committee the substitution of the word "set" for the words "line up" in the next to the last paragraph.

Mr. Rudd: The Pennsylvania has some small lines, and some big ones, almost as big as the New York Central. We have 100 per cent. block signalling where passenger trains are run and part of it is automatic, part of it is manual block. We do not permit our men to pass the manual block system at stop position without a card. At many of the interlocking signals we have the block system. As I remember it, we require a man to get the card before he passes an interlocking signal set at stop. It is not always necessary for the signal man to fill out the blank. At some of our plants where the signals are half a mile from the cabin, the signal is located at the telephone station or the bridges and the man fills out the card, on advice of the operator. I cannot state absolutely that we require a card to pass every home signal, but as I remember that is the case. It certainly is the case where the interlocking signal is the block signal. We have found it possible to operate in that way. If you adopt a rule that you should use a caution card at all points, you will not get rid of your trouble. A fellow will not always look at his switches, but will run out with his ticket and let them go. You can bank pretty fully on a man that issues a hand signal from the cabin, that he is not going out on the route. So I do not see that it is a very great argument against the card. You certainly will not be any worse off and you may be better off. I do not think that it is the province of this association to make rules. That is the province of the American Railway Association. They are working on amended rules now. I believe the way for us to handle this under the present extraordinary circumstances, is instead of our trying to formulate a rule, to pass a resolution at this meeting, that it is the sense of our signal association that caution cards should be substituted, or ordered substituted, for hand signals, to enable an engineman to pass an interlocking signal at stop, and that we should send that resolution to the secretary of the American Railway Association.

Mr. Beaumont: The committee has simply carried out the instructions assigned to them, namely, have drawn up for your consideration rules governing operation and maintenance of interlocking plants, and block signals. I fully agree with Mr. Rudd. Insofar as the A. R. A. is concerned, such rules as they make should be based upon the best practice, should be based upon the experience of the fellow who knows what is wanted, and if you decide that this association should not make operating rules, you should also decide that this association should recommend to the men who make the rules, what they believe to be the best practice.

Mr. Rudd: I do feel that the A. R. A. should not take it in had part if we should give them the benefit of our experience and I do not believe it would handicap them seriously. I think we ought to tell them what we think. If they do not agree with us they can turn it down. If they adopt it, we will be so much ahead of the game.

Mr. Stevens: As the chairman understands it, we will consider that the operating rules are eliminated from the report. We will this afternoon present a resolution to this association simply stating that in the opinion of this stated meeting the process of getting trains by home signals, which are not working by caution cards are preferable to that of getting them by hand signals. That will be the purport of the resolution practically.

Mr. Rudd: And that if you please the purport of rules 663 and 667.

Mr. Stevens: Yes.

Mr. Shaver: If we will instruct our men and choose good men, we can have no fear that good results will be obtained in handling an interlocking plant, in case of failure or in case where a caution card or hand signalling might be necessary. I do not see that there is any particular objection to the use of a caution card by those who want to use it. At the same time hand signaling might be just as good, and perhaps it is more desirable in some situations. I do not believe that we should restrict our practices to one particular thing. I know of places where such a rule could not be used and get trains over the road.

Mr. Beaumont: To close the matter, the committee will consider the modification of the rule, so the recognized practice will be both ways. That is the only way that we can meet the feeling of the association. In other words the caution cards shall be recognized in the rules as being a method of handling the trains instead of hand signals. That is hand signals can be included in a modification, or alternative in the rule itself. If that will meet the objections raised and will dispose of the matter, we will be very glad to have it that way.

Mr. Denney: I have one further suggestion. The committee has done the work as shown in the proceedings. This afternoon they can submit some revisions, I think a motion could be put this afternoon, advising the American Railway Association of the work done to-day and ask them if they wished the work of the committee continued along the same lines or along revised lines, or if they wished the work discontinued.

A. H. Rudd: Mr. Shaver makes the statement that there are places where trains cannot be gotten over the road if the card is used. That is a pretty strong statement.

Mr. Fugina: It seems to me, if there is a demand for a rule of this kind it should come from the interlocking people. They are handling the movements over those plants. Whether we should hamper them by suggesting a rule for handling traffic over the plant is questionable. Now, if a rule can be lived up to, and is lived up to, it will be all right, but there are many rules that are not lived up to. I do not think we should consider this rule at all.

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Mr. Stevens: I move that we pass on to the rules for supervisors, with the understanding that this subject will be brought up again for discussion this afternoon.

The motion was carried.

C. J. Kelloway (A. C. L.): Rule 702. I would like to suggest that the first part of the rule read, "They shall be responsible for the safe condition and proper maintenance of signals and interlocking plants. They must make temporary repairs of such defect as may endanger or delay the movements of trains, and promptly report defective conditions to the——." I move that the last part of that paragraph be struck out, as rule 703 takes care of it.

Mr. Beaumont: I want to say that we have copied verbatim under "Supervisors" the standard rules of the A. R. E. A. We consider that these rules have been adopted by a superior association, in a way, and we thought we would better accept these instead of making modifications that better accept these instead of making modifications that might possibly improve them. A number of the members of the committee believe as Mr. Kelloway does, and in order to save time, if you are going to revise the rules, I would suggest referring the entire matter back to the committee.

C. J. Kelloway: I will include this in my motion.

J. C. Mock: I second the motion.

Mr. Stevens: The committee did not discuss the rules of the A. R. E. A. because they thought they were a senior association. The rules ought to be accepted, and afterwards, if it be the sense of this association that some of these rules can be revised, the suggestion ought to be made to the A. R. E. A., and the rules ought not to be revised here.

Mr. Beaumont: In order to bring the matter clearly before the house, I move an amendment to the original motion, namely, the adoption of the A. R. E. A. rules for supervisors of signals, as adopted by the A. R. E. A. supervisors.

The motion was seconded.

J. C. Mock: It is not intended by this motion to criticise the action of the A. R. E. A. Perhaps the same action by this committee to the Engineering Association would be entirely proper. If we see fit to suggest revisions to the Engineering Association, I think that is quite proper. These rules do come very close home, and it is very proper that this association should scan these rules, much more so than the A. R. E. A. rules, which we are operating under.

The President: Are you ready for the motion to refer these rules back to the committee for further consideration, in as much as these rules do not now meet the views of the members of this association?

The motion was carried.

Signal foremen rules were next considered.

Mr. Stevens: I don't believe that we can improve on any of these rules very materially.

Mr. Beaumont: The rules for signal foremen as presented are a copy of the A. R. E. A. I believe they fully cover conditions. The committee has been very careful in drawing up rules for maintainers which fully cover the ground. Considering those rules, the rules for signal foremen are certainly right, and I move the adoption of the report covering signal foremen.

The motion was seconded and carried.

Maintainer rules were then considered.

Mr. Fugina: Seven hundred and fifty-nine does not look like a good rule to me—"and that small parts are properly secured from theft." How about the large parts?

Mr. Beaumont: Too heavy to carry away.

Mr. Denney (Reading Section 760): I think that should read: "and should report if insufficient men are on duty."

The President: The committee accept the suggestion.

Mr. Fugina: The operating rules cover a great many of the points in Rule 761. That is the action that the signal man should take when different things occur. I wonder if the committee considered those rules in connection with these. There might be some conflict. I know that our operating rules require that in case of storm the signal man shall see what is the proper way to handle the situation. This practically puts it up to the maintainer, and the same with reference to 761.

Mr. Stevens: We maintain that, regardless of any rule issued to the signal men by the operating department, it is still a track duty of the signal foreman to know that these conditions exist.

Mr. Manuel: If a signal man is located over a vast territory, it will be impossible for him to see that a signal plant is taken care of by track men. I think that ought to be up to the track man. I do not believe the signal forces should have anything to do with it.

Mr. Beaumont: That has reference to 760.

The President: The committee have been willing to consider suggestions that have been made. Perhaps they will consider this in that way.

Mr. Smith: Why not have the maintainer cooperate with the track forces or signal forces? If our men are notified to get on the ground, we also have the maintainer men cooperate with them. I think there should be cooperation between the three men.

Mr. Stevens: The point is, where are you going to obtain your information from on a division? Where is the head of the signal forces to obtain his information from? You can not issue instructions to the section man. He is not reporting to the signal foreman or supervisor or someone else on the division in charge of signal work. What we wanted to do was to provide a way in which the supervisor would be kept in touch with the situation at the time of stalls. There are telephones and telegraph along the line, and several ways to find out what is happening at a point where a man is standing. We cannot specify those things, but we simply say that the plant is being taken care of during stalls.

J. A. Peabody (C. & N. W.): I believe this is a good rule just as it stands. The maintainers themselves must, in a heavy snow storm, take general charge, see that sufficient men are on hand or ask for them and take charge of them, and distribute them so as to get the best results.

Mr. Denney: Referring to 763, would that not be more definite as to the kind of record the committee recommends he kept? It says, "Showing failures or other unusual occurrences." That would become a log book.

Mr. Stevens: That is a very good thing to keep in mind, failure being the principal thing.

Mr. Denney: Isn't it proper to indicate what the record shall cover? I presume it is primarily intended to cover delays to trains and not an indefinite statement, "or other unusual occurrences."

Mr. Stevens: The principal thing is failures. We encourage the keeping of any other history which might be useful. We have failures first. We are specific about that and we put the other in to show the man that it will be appreciated if there is any unusual occurrence, which may be interesting at some future time, if he will make a record of it.

Mr. Denney: I think you could amplify your provision in regard to keeping a record, showing what the committee recommends.

The President: I know personally in a recent case that the facts that a towerman kept a record of a fire started in an adjoining building a few minutes before a certain train passed saved the insurance to the company. The statement was made that the train set it on fire. Shouldn't you leave it to each road to say what it shall keep? The committee will consider that.

Mr. Fugina: In 767 we have that same thing I spoke about before. We say that this must be signed by each signal man on duty. I think we should have a rule to the signal man that would conform to this.

Mr. Beck: In connection with rule 768, I should like to know what the intentions of the committee are in regard to the tests. The application of $\frac{1}{16}$ in. on the point, in the average derail connection, will allow the point to roll.

Mr. Beaumont: The committee gave that considerable thought. It is pretty hard to specify a test that will be satisfactory. We will ask for constructive criticism on that point. The committee have recommended the best rule they thought it possible to suggest.

Mr. Smith: Wouldn't $\frac{1}{16}$ in. on a hundred-pound rail cover it? We have got to lock up so tight on the rolling, it is not good maintenance, and you have several failures you would not have, because you have to pull the point very tight.

Mr. Waldron: I think with a 100-lb. rail it is practically impossible to maintain the $\frac{1}{16}$ in.

Mr. Beaumont: It is the standard test.

Mr. Rudd: It is one of the most serious propositions that we have been discussing for the past two or three years with our power operator plants. We have been making a weekly test in our terminals and we find that with a $\frac{1}{16}$ in. tester, or perhaps a $\frac{1}{8}$ in. tester, that the lock bars the locking of the dogs in the lock rods, and will shear out the bars. We have tried case hardening. We have found that our inspection test, to avoid trouble, caused more trouble than if they were not made, and we are making them less frequently now. We have not been able to find any way to prevent the rod shearing. We have not solved it yet. A $\frac{1}{8}$ in. on a power operating plant is practically impossible.

Mr. Beaumont: The rules show pretty much in detail how the various points would be maintained, but it was the thought of the committee, while lost motion is objectionable in certain ways, yet in certain pointed locks there was no

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objection to a certain amount of lost motion. Yet we found it difficult to specify how much would be allowed for this, that and the other. Consequently we considered those essential points, and made this paragraph in regard to point locks, etc.

Mr. Waldron: If this lost motion was of such a nature that it would cause an accident, would you not have the maintainer rectify it at once, refer to some place in your rules to be sure words to the effect?

Mr. Denney: The reducing of clearances should not be up to the maintainer, and this paragraph should be revised to provide that the standard clearance or the provided clearance should not be reduced.

Mr. Rose: I move that rule 774 be sent to the American Railway Engineering Association, with the request that this association would like to have that rule interpretated under the rules for section foremen, and that this committee revise the reading of the rule, so that the maintainer will report conditions of bad drainage rather than attempt to correct it.

The motion was seconded and carried.

The resolution concerning signalmen was presented at this point, as follows:

Mr. Beaumont: The committee has drawn up a resolution to be submitted, as follows: "Resolved by the stated meeting of the R. S. A., held at Chicago, March 17, that a recommendation be made to the A. R. A. that a rule be provided permitting the use of a caution card to move a train against an interlocking signal displaying stop indication, where such stop indication is brought about by an interruption in the interlocking apparatus." I move its adoption.

The President: Does the committee understand that if this resolution carries, they will eliminate from this matter as it will be presented to the convention rules 620, 629, 630, 631, 663 and 667?

Mr. Beaumont: Yes. The A. R. A. rule now provides that a hand signal shall be given, as shown in 620 and 629. All we desire in connection with that rule and with the point aimed at through this resolution is recognition of the caution card for that kind of a movement. It will not discredit the present practice of using hand signals as presented to the A. R. A.

Mr. Stevens: We are in favor of the resolution, unanimously, as to the members of the committee here present. We prefer the resolution should be submitted and adopted and that the rules as presented should be adopted.

The resolution was adopted and the report of the committee was accepted, and the committee retired.

STANDARD DESIGNS.

The committee submitted drawing 1058, for a cast-iron anchor post for use in concrete foundations; drawing 1099,

J. C. MOCK,
Chairman Committee on Standard Design.

showing the proper location of detector bars and clip bolts, the former with reference to the height of the bar above and below the rail, and the latter with reference to the distance from the bottom of the rail at which the drilling is to be done; drawing 1225, stuffing box for one-inch pipe, with full details; drawing 1226, stuffing box for wire, with details; drawing 1250, connections for a double-slip switch and movable-point frog; and drawing 1251, showing lock rod and operating connections, and giving details of the insulation of front and lock rods complete for single switches with plunger locks, for movable-point frogs with switch and lock movements, and for double-slip switches with switch and lock movements; and details of operating rods for single switches, single slip switches, and movable-point frogs.

The committee consists of J. C. Mock (M. C.), chairman; C. C. Anthony (P. R. R.), O. E. Ellis (K. C. T.), W. A. Hanert (N. Y. C. & H. R.), C. J. Kelloway (A. C. L.), F. P. Patenall (B. & O.), M. E. Smith (D. L. & W.), R. E. Trout (Frisco).

Discussion on Standard Design.

Mr. Mock: The committee has discussed and recommended certain variations from the dimensions on certain drawings. The first one is on the tang piece. We found the manufacturers were up against a rigid inspection that required 31/32 in. as the diameter of the tang ends. The inspectors did not allow any variation from that and the difficulty of manufacture required a certain leeway. Our recommendation is that the minimum diameter be 15/16 in. and maximum 63/64 in., and the nominal diameter on the drawing is 31/32 in. We ask if that is favorable. The idea is that the manufacturers will feel that they are within the specifications when they manufacture according to that variation.

The recommendation was adopted.

Mr. Mock: In cold rolled steel pins the allowable variation which we recommend for 1¼ in. crank pins is .002 in. undersize. For ⅞ in. turnjaw pins, turn to gage, not larger than ⅞ in., less one-thousandth inch, and when smaller than ⅞ in. not less than three-thousandths of an inch, and that is a variation of .002 in.

The recommendation was adopted.

Mr. Mock: In our meeting with the manufacturers of wrought iron pipe I may say that we found a necessity for a change in the specifications in regard to the tensile strength and the elastic limit. We desire to move that the specifications for the tensile strength shall be 48,000 lbs. per sq. in. for the maximum and 40,000 lbs. per sq. in. for the minimum, and that the elastic limit be 30,000 lbs. per sq. in. for the maximum and 22,000 lbs. per sq. in. for the minimum. The elongation is to be 12 per cent in the measured length of 8 in. That is for wrought iron pipe.

The recommendation was adopted.

T. S. Stevens: May we know just what results you expect to bring about by this reduction in tensile strength?

J. C. Mock: Briefly, the process of manufacturing wrought iron is through puddling furnaces; you get muck iron from the puddle and then it is reheated and given a silicon bath, and then taken out and rolled, so that the silicon is mixed in with the iron, and that forms a sort of scale on the iron. It is contended by the manufacturers, and I imagine with scientific correctness, that the scale preserves the iron against rusting. As we know, wrought iron pipe costs more than steel pipe, but it is in the long life of the wrought iron pipe that its advantage lies. The process of manufacture, however, in the case of wrought iron is that they cannot get the high tensile strength or high elastic limit that they can in the steel pipe, which is homogeneous.

I. S. Raymer (P. & L. E.): I investigated the properties of wrought iron for pipe, when I was looking up the question of conduits, and the information I got shows that the manufacturers of genuine wrought iron wish to have the maximum for tensile strength at 48,000 lbs. and the minimum at 40,000 lbs., as recommended by the committee.

Mr. Mock: The committee would like to have the association members to think about the subject of galvanizing hook bolts and see if they have now any trouble from rusting and the weakening of the parts where the hook bolt comes in contact with the pipes. The other question, which seems to be with us always, is the question of arm spacing. The committee have looked over the vote on this subject, and their analysis does not, in our opinion, justify us in assuming that we have a two-thirds majority vote in favor of 6 and 7 ft. spacing. I think the 6-ft. spacing will not be satisfactory between the top and second arms, because you will have no air gap between the second arm at clear and the top arm at stop. It is desirable to keep the bottom arm 22 ft., in our opinion, although we are not an absolute unit on that point. You can have the third arm about 9 ft. 6 in. below the second arm, and not change the kind of pole; that is, you do not have to go to three sections of pole. It will not increase the number of standards; but that is the limit. So that unless we change the poles, the ladders and all the work we have done up to this date, you should keep in mind that if we have 7 ft., which almost everybody believes is the right distance

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between the top and second arms, we should not have anything above 9 ft. 6 in. between the second and third arms. If you do that, you are getting to 6 in. section of pipe.

Mr. Shaver: Mr. Mock spoke of making the tower arm 9 ft. 6 in. below the second arm. Does that mean increasing the pole two feet more?

Mr. Mock: Yes.

Mr. Denney: I move it is the sense of this meeting that the standards should be completed on the 7-ft. and 6-ft. basis.

The motion was carried.

T. S. Stevens: I move the adoption of 1058 for presentation to the annual meeting.

The motion was carried.

Mr. Mock: Ten hundred and ninety-nine is really a specification for the angle of the bar and the spacing and location of poles in the rail where the clip must be fastened. It does carry with it an indication of the design that was adopted as standard last year for a bar, but the chief purpose is to standardize the angle and the location of bolts. Those are 5-in. centers and through the center.

Mr. Mock: Twelve hundred and twenty-five, the drawing of a stuffing box. We had some trouble in getting the equipment of the stuffing box down to a place where we could locate 2⅝-in. centers. This does it. The committee expect to follow this up with a series of water type apparatus, where you have street car work and other work of that character.

C. J. Kelloway: I have used it for about twelve years. It answers the purpose. I move that drawing 1225 be adopted as the sense of this meeting for presentation to the convention.

The motion was carried.

Mr. Mock: The next is stuffing box for wire. Wee presented this drawing last year, but we provided for two wires in a pipe. After a pretty thorough canvass of the situation, it was decided by the committee to eliminate the one showing two wires in the pipe, and it is aimed to have only one wire in the pipe. It is merely a question of elimination in this case. I move to adoption for presentation to the convention.

Mr. Beaumont: I think we should standardize this drawing because many lines prefer to use ⅛-inch pipe, and with this statement that this standard stuffing box could be used on ⅜-in. pipe with the use of a bushing. I think that would be better than adopting a ⅜-in. stuffing box, where there might be objections by lines that wanted to use ⅛-in. pipe.

The motion was carried.

J. C. Mock: The next drawing represents a double slip switch. This drawing, with the details of the lock rod, is in use, and is very satisfactory to the road using it. You will appreciate, of course, that the space between the ties is very limited, if you have to insulate between the rails, and that there are a great many limitations to the forms which you can use; they are pretty well tied down to certain forms of rods and forgings for this sort of a switch. The committee presents it for the purpose of getting the discussion and opinions of the Association for guidance.

Mr. Elliott: As near as I can see, the switch lock rods and front rods are patterned after the Pennsylvania standard. I believe they are getting good results, and that if a little time was given, or additional drawings were furnished, which would show the details of the parts, something along this line might be adopted with good results. By having the two front rods attached to points on the same side of the track, additional clearance is provided between the two inner rails, which is not had if the front rod is connected to the points of the one switch. It seems as if with this design insulation might be well provided. The only suggestion I have to make is that the throw of the switch points be made five in., the throw of the frogs four in., and that ties plates be shown on all ties.

The President: Can Mr. Elliott's point be met by any of these detailed parts? Can the throw of the switch be made 5 in. with those details?

Mr. Kelloway: There is no objection to that; in fact, I see no reason why you should move the frog points four in. and switch points five in. If the frog is safe at four in., certainly the switch is at five in.

L. S. Rose: I think you would get all you can. If you can't get five in. take four, but where you can get five in. you should take it.

J. C. Mock: This adjustment is a turnbuckle, with both right-hand threads, so that you cannot change the spread of the switch points unless you take off one of the feet. It is simply to bring it into adjustment in assembling and is not a standard turnbuckle.

L. S. Rose: I do not see any use in having anything there. The facing point lock rod, or the lock rod the plunger goes through, is adjustable, and you can work it from there. With that sort of adjustment I do not believe it is necessary to have this adjustment in the front rod. No adjustment has been provided in the end rod. All you can do is to make a kink in the switch point between the throw rod and the front rod.

W. H. Elliott: That point seemed to me a good one. It is not our practice with the ordinary single switch, and is not necessary; but in a double slip where you are crowded for room, and it is exceedingly difficult to make adjustments, it will undoubtedly help.

A. C. Rudd: We used to use 3½ in. on frogs and 4½ to 5 on switches, but we have now a standard, over the lines south and west of 5 in. on everything. With this adjustment in the operating rod, you can get a bigger throw, if you want to, because you can draw your points together. Instead of a 4-in. throw, you can get 4½ or 5, and can use the standard on the road by pulling the points closer together; I advocated not over a 4-in. throw, because it makes it easier for the leverman, if you have a 5-in. throw, you have just that much more to travel, and that much less leverage. If you make it 4-in., you gain on the leverage, and from the signalman's standpoint, you get a better operating switch with 4 in. than with 5. Four in. is plenty, and there is no need of having it five.

J. C. Mock: Why have you both right-hand threads instead of right and left?

A. C. Rudd: So that if you have to disconnect in order to adjust, the track man won't come in and open and close it; and so that the signalman is responsible for the throw.

Mr. Peabody: I believe that, both from a track and signal standpoint, the longer the throw of the switches, the better. There is a point that I think has been overlooked, and that is, the smaller the throw of the switch, the smaller the distance at the end of the switch between that and the main rail. The longer the switch point is, the smaller that distance will be, and the more shock from every wheel that passes through your switch, and the more wear on your road.

J. C. Mock: That is true. I believe you have endeavored to get a 5-in. throw on switch points. The detail at this time as far as we wish to present it to you, is largely on drawing 1251. These are drop forgings at the end and it does give a rather low lock rod. It is necessary to have the drainage, and get pretty well down on the tie with this lock rod. It might be regarded as an objection to have the rod turned edgewise, as compared with the flat rod, but the flat rod is really not practicable, in our opinion.

L. S. Rose: I am not ready to agree to that adjustment. You can vary the throw of the switch by your adjustment, by the amount of lost motion you have in that basket, without changing the distance between the two points at all. If the switch is properly constructed so that it will fit, I do not see any use of having that adjustment, and it is an element of weakness. The turnbuckles get rusty and sometimes break. After they have been used a while you have to heat them and burn the rust off to get any adjustment. They are convenient when you are first setting the switch up, but after you get it up, I do not see that it makes any difference; if the relation between the front rod and the throwing rod is properly made when the switch is installed, there is no need of that adjustment. One other thing I would like to present to the committee—we have recently built some slip switches where we staggered the points, instead of throwing the points at both ends of the slip together, we are throwing one switch at one end, with one switch at the other end. In that way we are able to effect locking between the switches and the center frogs, and prevent a train from getting in on the center frogs unless they are absolutely set; that is, the frog will have to be set properly before the switch can be thrown to make the through movement.

Mr. Kelloway: How would you adjust a No. 1 rod? Say you have a front rod that is set up for a 5-in. throw; you find a switch that has only 4½-in. throw; how would you adjust your front rod to fit the switch, if your No. 1 rod isn't adjustable?

Mr. L. S. Rose: We have an adjustment at the lug. You can take a switch of two points and move 5 in. or 4 in.; it depends how far apart your gage is at the point of the switch and in the stock rail and in the running rail.

Mr. Waldron: Mr. Rose and Mr. Peabody advocate a 5-in. throw, although it has been shown that the adjustment is so arranged that they can have a 5-in. throw if they want it. Some of us may not use switches where we would use a 4-in. throw; we must get along with less. I think it would be better to have some standard that will suit all parties. Take the layout as presented here; you can accommodate

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Mr. Rose and Mr. Peabody, and also those of us who have to use less than the 4-in. throw. Shouldn't we adopt the 4-in. throw as we have it presented here?

Mr. Denney: I would like to ask Mr. Rudd, if the adjustment is not applied to the front rod because it connects two of the switch points that are not a pair; the head rod connects the pair of switch points that are used in running the train over, while the front rod connects one point of each pair, and the distance between these points cannot be distinctly determined until the switch is set up.

Mr. Denney: I would like to ask Mr. Rudd if this layout develops any lost motion, and if so, where.

Mr. Rudd: No more than any other arrangement of interlocking. The place where the insulation is made in this rod is a matter of considerable thought. I didn't like it myself, but finally had to come to it because we found it was so good.

Mr. Waldron: We have found in slip switches, etc., that it prolongs the life of the point, and also the stock rail, by having the switch point on the curved side extended a foot to a foot and a half beyond the other point, and then have a check rail beside it. That induces a new feature of locking up the point, and while we have tried to get around it, and think we have, I wondered if the committee cared to go into that detail.

Mr. Stevens: There is more involved in the slip switch than in the single switch, and it is proper that the committee should decide this first.

Mr. Rudd: The Pennsylvania had much trouble with slip switches. We waited several years for the R. S. A. to put out a standard, and we couldn't wait any longer, and we developed this, and it is entirely satisfactory to us. It would be very nice to have another one gotten up with staggered points. Some roads won't use them in their main tracks. We use them in the yard, and it makes a saving to have one point ahead of the other, but it is not thought advisable in some cases to stagger the points on the main line. I think the association should go slowly, and if they can get the A. R. A. to adopt staggered points all the way through, and submit this in the meanwhile, we will use this until you give us something better. I think you should make a drawing of the single switch.

Mr. Denney: I move it is the sense of this meeting that in the switch ends of a double slip, each two points acting as a pair should be connected by two nonadjustable rods.

Mr. Elliott: Do you refer to the front rods?

Mr. Denney: I refer to the front and head rod on each pair; in other words, a slip will be made up of two switches, each pair of points in a switch being directly connected and not adjustable.

W. H. Elliott: I am against it. I think one of the good points about this design is that the front rods are connected to the points of the different switches, not to the same switch, because it provides additional clearance where it is very much needed, between the two inside points.

Mr. Denney's motion was lost and the original motion was carried.

ELECTRIC RAILWAY AND ALTERNATING CURRENT SIGNALING.

This committee submitted specifications and requisites of apparatus and material for alternating current automatic block signal systems on all railways except those using direct or alternating current for propulsion—in other words, on steam roads—and certain additions to existing specifications. In the data for a signal system the blanks under the sections as previously approved by letter ballot have been filled in with certain alternative specifications as required by existing practice, the quantities given in each case being representative of satisfactory systems, and being submitted as a guide for the design of systems applicable to the conditions to be met. The specifications cover the subjects of supply and distribution of power; signals of the electric motor; solenoid, electro-pneumatic and light types; control apparatus, including line circuit and track circuit relays and circuit controllers; electric locks, and switch indicators.

The committee consists of H. S. Balliet (N. Y. C. & H. R.), chairman; J. E. Saunders (A. T. & S. F.), W. P. Allen (P. R. R.), J. A. Beoddy (N. & W.), L. R. Byram (C. R. I & P.), J. D. Elder (K. C. T.), E. C. Grant (U. P.), W. W. Morrison (N. Y. C. & H. R.), C. R. Peddle (I. R. T.), W. Y. Scott (B. & M.), E. B. Smith (N. Y. C. & H. R.), F. S. Starratt (S. P.), F. E. Wass (N. Y. C. & H. R.).

Discussion on Alternating Current.

Mr. Balliet: I move that the specifications beginning on page 29 be accepted as printed. (The motion was seconded.)

Mr. Stevens: As to 76-d, I do not see why any special load is specified.

Mr. Balliet: The literature for the annual meeting will read as follows: The normal load on the signal transmission line at a point adjacent to the place of delivery shall be approximately . . . K. V. A. . . . . K. W. This load will increase to . . . K. V. A. . . . . K. W. to last one minute after interruption.

Mr. Stevens: I move an amendment to clause 440-b and all similar clauses as follows: For continuous operation at ten per cent under normal frequency without excessive heating.

Mr. Balliet: That is agreeable to the committee.

Mr. Stevens: For the sake of record, I wish to say there are one or two other clauses in which the same correction should be made.

The Chairman of Committee VIII stated to us yesterday that a new method is to be employed for stating requirements of certain instruments and those are to be tabulated instead of written out. I think clause 601 is rather hard to understand because it really means that line circuit relays shall consume not more than 10 volt amperes 7¼ watts per phase at 110 volts 25 cycles, or 25 amperes 15 watts per

H. S. BALLIET,
Chairman Committee on Electric Railway and Alternating Current Signaling.

phase 110 volts 60 cycles. It is hard to get that from that sentence, but I believe the chairman will take care of it.

Mr. Balliet: The committee developed at a more recent meeting that even the experts outside of the committee, our conferees, had difficulty in getting the points in carrying it through, when they read this literatnre, so that the committee proposes to submit at the annual meeting in tabulated form sections 440, 601 and 602, which reduces the printing to about one half a page, and makes it possible at a glance to get the thing in mind.

The previous motion was carried.

WIRES AND CABLES.

The committee submitted a set of revised specifications for galvanized steel wire for connection to mechanically operated signals, which is recommended for approval. The specifications cover the material, with reference to the form and quality of the wire, the galvanizing treatment and the properties, as to size, diameter, breaking strength, and percentage of elongation in a given length.

The committee consists of W. H. Elliott (N. Y. C. & H. R.), chairman; E. L. Adams (L. S. & M. S.), W. I. Bell (P. R. R.), W. L. Dryden (S. I. R. T.), A. B. Illmes (B. & O.), D. W. Richards (N. & W.), J. V. Young (B. & M.).

Discussions on Wires and Cables.

Mr. Elliott: I move that the recommended revised specifications for galvanized steel wire on page 39 be adopted. There are modifications in the first three paragraphs; clauses 4 to 7 inclusive remain unchanged. The revised specification reduces the weight from 380 lbs. to 370 lbs. for the No. 8 wire, and from 320 lbs. to 300 lbs. for the No. 9 wire. It also

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increases the elongation in 10 in. from 6 to 8 for the No. 8, and from 5 to 8 for the No. 9. A three mili variation from the normal diameter is also allowed as to size.

Mr. Elliott: The wording of the specification has been changed to practically conform with that adopted in other specifications, and the requirements as to variation in size,

W. H. ELLIOTT,
Chairman Committee on Wires and Cables.

difference in weight and difference in tensile strength and elongation have been adopted. The twist test has not been changed.

The motion was carried.

STORAGE BATTERY AND CHARGING EQUIPMENT.

The committee submitted as information a discussion in regard to the use of Edison storage batteries for automatic signaling. This comprised a short description of this type of storage battery with principal reference to its application to track and line circuits and methods of housing, with a table of general information. The committee also submitted specifications for lead type stationary storage batteries for automatic signaling, and a plan (drawing 1240) of a

R. B. ELLSWORTH,
Chairman Committee on Storage Batteries.

motor panel which provides for mounting charging line rheostats and motor starting apparatus.

The committee consists of R. B. Ellsworth (N. Y. C. & H. R.), chairman; H. W. Lewis (L. V.), J. G. Barteli (L. V.), G. E. Beck (L. S. & M. S.), T. N. Charles (C. N. O & T. P.), J. Fred Jacobs (C. R. R. of N. J.), T. L Johnson (D. L. & W.), A. H. McKeen (O. W. R. R. & N. C.), T. J. O'Meara (N. Y. C. & H. R.), F. A. Purdy (O. S. L.), A. H. Yocum (P. & R.).

Discussion on Storage Battery.

Mr. Ellsworth: The discussion of the design of storage battery on pages 47, 8 and 9, is printed as information. This was in answer to inquiries, and covers what may be done and is actually being done. No action is required unless there is some objection to the subject matter. The committee is making no recommendation at this time.

The specifications on page 50, items a and f with the following explanatory notes, is in a tentative form. The committee has not fully decided as to just what they want to recommend to the association and they are furnishing this information so the association may be aware of what the committee is doing, and so that we may bring out criticisms either written or verbal at this time.

Mr. Stevens: At the annual convention I asked that the Plante process be defined, and I think that is still desirable.

Mr. Ellsworth: The committee has investigated that subject considerably. In going over the matter the definition given by the Signal Dictionary seems to be supported by all the information which we could get from the various text books. That information is given on page 326.

On 51 we prepared a motor panel plan, twelve-forty, which is supplemental to the panel that has already been adopted, shown on 1,174. This panel is for the control of the motor generator which is used for the charging of the storage batteries. I will move the adoption by this meeting of panel R. S. A., plan 1,240.

Motion seconded.

Mr. Shaver: As I understand it, this is a main service switch. In a great many places they only allow us to put it at the board; it has to be put at the wire entrance. I am doubtful whether it would be well to show this, because the requirements in nearly all the cities are that it be placed right at the entrance of the wires to the building.

Mr. Ellsworth: In most cases the insurance is carried by the railroads, and the underwriters' rules are not obligatory. In many cases also the apparatus is placed on a separate building.

The motion was carried.

METHOD OF RECORDING SIGNAL PERFORMANCE.

The committee was instructed to investigate and report on the basis of methods now used on various railways in recording interruptions to traffic by signals, and in computing the efficiency of signal performance. A letter was sent to 50 railways reported by the Interstate Commerce Commission as having automatic block signals in service, in which the following information was requested:

(1) Copies of forms now in use, together with instructions issued as to the proper method of filling them out;

(2) Formula used in computing signal performance;

(3) Suggestions as to desirable alterations in or additions to the method used;

(4) Opinion as to whether or not comparative cost per mile or per signal blade should enter into the computations of comparative efficiency as between divisions, systems or railways; and

(5) Any general comments on methods now used, forms that have been presented to the association, or information that would guide the committee in best serving the association and the railways.

From the replies and report forms received sufficient information was obtained to warrant the preparation of the three signal report forms, "A," "B" and "C," which were submitted.

Form "A" is a blank, postcard size, addressed to the supervisor of signals, and intended to be filled out by the conductor or engineman and given to the operator or signalman at the first open telegraph office for telegraphic transmission to the dispatcher and subsequent mailing to the supervisor. Or it may be telephoned direct to the dispatcher by using a portable phone. It contains the information shown on all other forms except as to indicators; track being repaired; handcar in block; line wires down; lightning storm; or a signal clear which failed to go to the stop position.

Form "B" is used by the dispatcher in recording information transmitted from forms "A" and "C," and by operators and signalmen in receiving and transmitting similar information to the maintainer. The dispatcher, after receiving the maintainer's report, sends copies to the superintendent and signal supervisor.

Form "C" is intended to be filled out and given to the operator or signalmen for transmission to the dispatcher.

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Copies are mailed to the supervisor, and on some roads to the signal engineer. The maintainer also keeps a copy for his records.

The committee submitted also a brief report of the various factors involved in computing the efficiency of signal performances. Complete forms showing classifications of failures and methods for computing efficiency will be presented at the June meeting. The data received in reply to the circular letters involves such a large amount of detail which is so much in need of classification and uniformity that more time is necessary for their consideration than could be spared at this meeting. The committee proposes as a basis upon which to design forms for the classification of causes and

W. N. MANUEL,
Chairman Committee in Method of Recording Signal Performance.

for computing the efficiency of signal performances the following:

F, failures: 10.
S, total number of signals: 100.
T, trains stopped: 50.
O, total number of trains operated: 1,500.
P, total number of signal operations: 150,000.

Formulæ.

Signal operations, 150,000.
Trains stopped per failure, 5.
Signals per failure, 10.
Trains operated per failure, 150.
Signals operated per failure, 15,000
Trains operated per train stop, 30.
Signal operations per train stop, 3,000.
Maintenance efficiency, 90 per cent.
Operating efficiency, 96 per cent.

The committee consists of W. N. Manuel (G. R. & I.), chairman; J. W. Hackett (N. Y. C. & H. R.), C. A. Cotton (A. T. & S. F.), B. F. Dickinson (W. J. & S. S.), S. B. Keller (B. & O.), George J. Patton (D. L. & W.), J. B. Weigel (Frisco), L. L. Whitcomb (L. S. & M. S.).

Discussion on Methods of Recording Performance.

Mr. Manuel: This shows the results we wanted to obtain first, but on account of lack of uniformity between the various reports presented, it was impossible within the short time we had to work it up. We started in with telegraphic reports, started in to show typical forms in use to-day.

Mr. Denney: I move the adoption of Form A. (Seconded.)

Mr. Waldron: On page 41, Form A, No. 5, lightning storms. That is a peculiar way of putting it and is new to me.

Mr. Manuel: On some roads they have found it desirable for engineman to report weather conditions at the time of the failure, and that was included in the blank.

Mr. Shaver: With regard to Form A it has been our practice to use a card for the conductor to indicate stops at signals. We have asked them not to report delays due to trains in the block. I am about ready to change my mind on that. We have had considerable difficulty on account of maintainers who have been called out on supposed trouble that did not occur, and I suggest to the committee that that be shown on the record. The conductor fills out this card when the train is stopped, and he does not always learn until his train has passed through the block or is nearly through that there was a train in the block, and nine times out of ten they either have to change the card or tear it up. It does not show what the cause of the failure is.

W. J. Eck (Southern): I am unable to check the formula $\frac{E-F}{S}$ for Maintenance Efficiency. It is stated $\frac{S-F}{S}$. I think it should be $\frac{S-F}{S}$.

Mr. Manuel: That is right.

Mr. Eck: With regard to Form A, I would suggest that the paragraph appearing at the bottom of the back of the card be moved up and inserted between the lines S and U, to be followed with a heading, entitled, "Operator's Record." The note, appearing on the front of the form under the words, "Deliver immediately," should be printed on the back of the form following the line beginning "Sent by," etc. I believe the form as shown would confuse the engineman and he would attempt to fill out the part reserved for the operator.

Mr. Manuel: Under D it reads, "Signal at ——." There is a doubt in the minds of some members whether that means the geographical location of the signal or the position of the signal blade.

Mr. Rose: The same cards have been in use for a year on one road that I know of, and have generally given satisfaction. I would leave "D" out. That is intended, as I understand it, for signaling at interlocking plants, and the operator can report that matter himself without the conductor or engineer putting it in.

Mr. Denney: Not only signals at interlocking plants, but at any outlying point as a train order or any signal which has no number are covered by this line. I do not think the objection is proper.

Mr. Rose: Mr. Denney brought up a point I had not thought of, that the line might refer to a switch signal. Some roads have stop signals at outlying switches, and there would be no one there to report, and in that case it might be well to leave it in.

The President: On page 521 of the March journal is shown a form of engine man's signal report which was adopted by letter ballot as standard.

Mr. Stevens: This standard has been in force for only a few weeks and yet there is a movement on foot to change it. If we contemplate adopting any new forms with the possibility of their being carried at the annual convention, I think we ought to keep out of the manual the forms submitted in 1912, and I think a motion to that effect is in order.

Mr. Denney: I move that the forms corresponding with the forms now submitted and approved by last year's letter ballot shall not be included in the manual.

The Secretary: Can we legitimately do that?

Mr. Stevens: Not at this meeting.

Mr. Elliott: The matter is adopted as the standard of the association, but that does not mean that the executive committee or editing committee can not hold it out.

Mr. Patenall: It seems to me doubtful whether a stated meeting can reverse the action of the annual meeting.

Mr. Denney: In view of the fact that the committee which has been assigned to this subject has made a report which supersedes the form previously reported, I do not see why we should not approve it and take any necessary action to keep the previous cards out of the manual.

The President: The committee does not ask to have this approved. They would like to have it received as information.

Mr. Mock: If it is permissible, I suggest to the Board of Directors that they withhold from the manual those forms which were balloted upon and which carried. That is as far as we need to go, I think.

Mr. Denney: I move the approval by this committee of Form A.

Motion seconded and carried.

Mr. Rose: I move that the meeting approve Form B as presented by the committee.

Motion seconded and carried.

Mr. Elliott: I move the approval by this meeting of Form C.

Motion seconded and carried.

Mr. Manuel: The committee would like a discussion on the table intended to show a method for computing efficiency of signal performance.

Mr. Rose: The last paragraph says: "One road arbitrarily assumes five train stops per failure," but these reports that we have concluded to send to letter ballot show the number of trains delayed in the maintenance report, so that instead of assuming five, you will have the actual number if you take these blanks.

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Mr. Manuel: The card says, "Do not report delay due to train in block."

Mr. Rose: On the maintenance report of failure, it says, "Trains delayed," and be will report to his superior officer the number of trains delayed and you will have the actual performance and not the assumed performance. Sometimes you have only one train delay, and sometimes a good deal more, depending upon how swift be is to get around to it.

L. R. Mann (Mo. Pac.): In the maintenance efficiency, has the committee considered the matter of taking the total number of signals, the number of switches, and the number of track circuits and figuring maintenance efficiency on that basis?

Mr. Mannel: The committee went into signal indication only.

Mr. Elliott: We have gotten up on the New York Central a new blank which endeavors to cover that point. There are two records kept, one is of signal efficiency and the other is of the operated units of the interlocking plant, not included in the signal efficiency report, and while appearing on the same sheet is entirely different subject matter.

Mr. Mannel: It would be desirable to take into account track circuits, the length of track section and all of that data, if it would not complicate the forms too much. Some men like to have the record very simple, and others like to have them complicated, and there is no semblance of uniformity between the roads.

Mr. Shaver: I have been trying to think out what this formula for maintenance efficiency means. I do not see why the number of failures should be subtracted from the number of signals. Take the case of ten signals and ten failures, the percentage would figure out nothing, yet there would be a certain efficiency.

Mr. Elliott: Our practice is, to divide the number of signal operations by the number of failures, and such a record has been kept by us for the last ten years and has been very satisfactory. It has furnished, I believe, a very accurate method of comparing the operations of different sections of signals, or the signals on different divisions.

Mr. Shaver: We have certain divisions where the signaling is very much the same, and the track circuits, the number of signals, and the general design are suitable for a comparison. We have divided the number of interruptions, as we call them, into three classes, A, B and C. A are those for which the maintainers are strictly responsible. B represents those for which the track department, or some department other than the maintenance force on signals are responsible, and C interruptions are due to constructive defects in design, etc., over which the maintainer has no control. We have figured out from our records, percentages which we call, excellent fair, good and poor, and we class our performances each month on that basis, and that gives us a basis for comparison between divisions and between months on the same territory. While that will answer for ourselves, it does not necessarily answer for other railroads.

Mr. Denney: The report does not take into consideration the number of miles protected by a given number of signals, and I want to offer the thought that the efficiency of signal operation might be determined by multiplying the number of signal operations by the number of miles of track protected, divided by the number of failures, and the efficiency of train operation might be determined by multiplying the number of trains operated by the number of miles of track protected and divided by the number of train stops. This is an attempt to include the number of tracks, stations, switches, and all the other conditions which enter into the calculation. The liability of a failure increases as long sections are installed, and the number of trains stopped by signal failures varies in different territories depending upon the density of movement.

Mr. Mannel: The next subject treated by the committee is entitled "Signal Movement Defined." I might add, for information, that where counters are used, you take a chance of the signal jumping and operating the counter. The maintainer, in adjusting the signal with the counter may work it a number of times. The signals operate a good many times when they are not registering, for the reason that the yard man may throw his switch, or a number of things might happen that will not be counted when the signal is really giving protection.

Mr. Denney: I think the only satisfactory way of taking the record, is from the counter. The counter may get out of order, and not register enough, or there may be some improper operation of the counter, which will run the counter high, but if you take the record of the counter readings for a division or number of sections in the same territory, you can easily pick out the records which are not correct.

Mr. Elliott: Our practice is based on counting the number of signal movements.

Mr. Mock: I have not used the counter because I think you get the record too high, and the efficiency too high.

Mr. Manuel: The next section relates to Failures.

Mr. Elliott: I move that this committee make recommendations for decisions as to what signal failures shall be.

Motion seconded and carried.

Mr. Manuel: The next section is headed "Relative Cost." There was no discussion.

Mr. Mannel: The final section of the report is headed "Conclusion."

Mr. Fatenall: I move that the committee be instructed to continue their work in this direction.

Motion seconded and carried.

A. E. R. A. BLOCK SIGNAL COMMITTEE MEETING.

The Joint Committee on Block Signals of the American Electric Railway Engineering and Transportation and Traffic Associations will hold its second meeting of the year to-day. The morning session will be given over to an inspection of the exhibits at the Coliseum, and the afternoon session in part in conferring with representatives of the various signal companies, and in part to an executive meeting of the committee. The members are J. M. Waldron, signal engineer, Interborough Rapid Transit Company; John Leisenring, signal engineer, Illinois Traction System; Gaylord Thompson, chief engineer Ohio Electric, and C. H. Morrison, signal engineer, New York, New Haven & Hartford, of the Engineering Association; and C. D. Emmons, general manager, Chicago, South Bend & Northern Indiana Traction Company; J. J. Doyle, general manager, Washington, Baltimore & Annapolis; B. E. Morwin, general superintendent, Aurora, Elgin & Chicago; and C. F. Conn, of the Transportation and Traffic Association. The meeting will be held in the Congress Hotel.

SIGNALING CONTRACTS IN INDIANA.

The Terre Haute, Indianapolis & Eastern, the Fort Wayne & Northern Indiana and the Union Traction Company of Indiana awarded contracts last week to the General Railway Signal Company for the signaling which the Railroad Commission of that state has ordered installed by July 1, of this year. Automatic block signals of the light type, arranged for both permissive and positive block operation as conditions require on the various stretches of track to be protected, will be employed. The installation will provide for the protection of about 30 miles of track on each of the three roads.

SIGNALS ON A "SAFETY FIRST" EMBLEM.

The Southern Railway recently adopted a "safety first" emblem which uses a modern upper quadrant automatic block signal as a feature of the design. This is one of the first emblems of this kind which recognises the very important part played by the signals in securing safety on railways. One of the principal objects of the safety first campaigns has been to reduce the number of industrial accidents among employes, but as the movement extends to the broader question of safeguarding transportation in all the many phases in which the human element is employed, the importance of block signaling, and particularly of automatic block signaling, is rapidly coming to the front. The signals deserve more recognition such as the Southern Railway is giving them.

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ACTIVE MEMBERS.

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Anderson, B. T., Asst. Sig. Engr., A., T. & S. F. Ry., Topeka, Kan.
Bailliet, H. S., Past President, Engr. M. of W., Grand Central Terminal and Sig. Engr. of the Elec. Div. & Elec. Zone, N. Y. C. & H. R. R. R., New York.
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Combs, Harry, Sig. Inspr., L. S. & M. S. Ry., Cleveland, Ohio.
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Drake, Caleb, Gen. Sig. Inspr., C. & N. W. Ry., Chicago, Ill.
Du Bray, A. B., Inspr. Elec. Sigs., St. L. & S. F. R. R., Springfield, Mo.
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Eck, W. J., Elec. Engr., Southern Ry., Washington, D. C.
Elliott, W. H., Sig. Engr., N. Y. C. & H. R. R. R., Albany, N. Y.
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Hartley, L. C., Chief Engr., C. & E. I. R. R., Chicago, Ill.
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Huisizer, G. W., Sig. Engr., C. & A. Ry., Bloomington, Ill.
Kelloway, C. J., Sig. Engr., Atlantic Coast Line, Wilmington, N. C.
Killian, H. L., Asst. Supr. Sigs., L. S. & M. S. Ry., Toledo, Ohio.
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Kolb, E. W., Sig. Engr., B., R. & P. Ry., Rochester, N. Y.
Lee, Frank, Prin. Asst. Engr., Canadian Pac. Ry., Winnipeg, Manitoba, Can.
Leet, C. S., Asst. Engr., B. & L. E. R. R., Greenville, Pa.
Leisenring, John, Sig. Engr., Illinois Traction Co., Springfield, Ill.
Lomas, H. F., Asst. Sig. Engr., I. C. R. R., Chicago, Ill.
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Mann, L. R., Supr. Sigs., Mo. Pac. R. R., St. Louis Mo.
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Mullen, Joseph, Engr. M. of W. C., C. & St. L. Ry., Mattoon, Ill.
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Orr, H. H., Sig. Inspr., C. & E. I. R. R., Chicago, Ill.
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Pfiasterer, G. S., Director, Sig. Eng., N. C. & St. L. Ry., Nashville, Tenn.
Pfiaster, H. B., Gen. Sig. For., N. C. & St. L. Ry., Nashville, Tenn.
Phinney, R. M., Asst. Engr., Sig. Dept., C. & N. W. Ry., Rogers Park, Chicago, Ill.
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Ross, Robert, Gen. Sig. For., Pere Marquette Ry., Grand Rapids, Mich.
Rudd, A. H., Sig. Engr., P. R. R., Philadelphia, Pa.
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Stephens, Chas., Sig. Engr., C. & O. Ry., Richmond, Va.
Stevens, Thos. S., Vice-President, Sig. Engr., A., T. & S. F. System, Topeka, Kan.
Stewart, A. W., Supr. Sigs., Atlantic Coast Line, Charleston, S. C.
Stradling, E. G., Sig. Engr., C. I. & L. Ry., Lafayette, Ind.
Vandersluis, W. M., Sig. Engr., I. C. R. R., Chicago, Ill.
Waldron, J. M., Sig. Engr., I. R. T. Co. New York.
Weigel, J. B., Dist. Sig. Supr., St. L. & S. F. Ry., Springfield, Mo.
Wheelwright, Barton, Block Sig. Insp., Grand Trunk Ry. System, Valparaiso, Ind.
Whitcomb, Fred E., Sig. Engr., B. & A. R. R., Boston, Mass.
Williams, John F., Sig. Supr., C., C. & St. L. Ry., Springfield, O.
Willis, W. H., Sig. Engr., Erie R. R., Jersey City, N. J.
Worthing, E. E., Supr. Sigs., T. & N. O. Ry., Houston, Texas.
Zane, Wm. F., Chief Draftsman, Sig. Dept., C., B. & Q. R. R., Chicago, Ill.

JUNIOR MEMBERS.

Falk, C. L., Sig. Maint., Wabash R. R., St. Louis, Mo.
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Hartvig, C. E., Sig. For., C. R. I. & P. Ry., Englewood, Ill.
Hyatt, Thos. G., Sig. For., Wabash R. R., St. Louis, Mo.
Kellenberger, K. E., Sig. Inspr., C. & N. W. Ry., Evanston, Ill.
Stueber, A. A., Sig. For., C., B. & Q. R. R., Lincoln, Neb.
Tillett, C. H., Sig. Inspr., C. & E. I. R. R., Chicago, Ill.

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ASSOCIATE MEMBERS.

Ackerman, F. J., care of Union Switch & Signal Co., Swissvale, Pa.
Ames, Axel, Kerite Ins. Wire & Cable Co., New York, N. Y.
Backus, E. E., Sales Engr., Gen. Ry. Equipment Co., Chicago, Ill.
Baker, Ray N., Rep., Central Electric Co., Chicago, Ill.
Beck, H. M., Engr., Electric Storage Battery Co., Chicago, Ill.
Brach, Leon St. Clair, Pres., L. S. Brach Supply Co., New York, N. Y.
Brixey, Richard, Pres., Kerite Ins. Wire & Cable Co., New York, N. Y.
Brown, J. Alexander, Mgr., Pocket List R. R. Officials, New York, N. Y.
Bryant, Stanley C., Sig. Engr., Bryant Zinc Co., Chicago, Ill.
Burt, C. H., Signal Accessories Co., New York, N. Y.
Cade, J. T., Vice-Pres., Federal Signal Co., New York, N. Y.
Cameron, F. C., Corning Glass Works, Corning, N. Y.
Camp, W. M., Editor, "Railway Review," Chicago, Ill.
Cloud, K. G., Western Rep., "The Signal Engineer," Chicago, Ill.
Collins, M. W., Mgr., Maloney Oil Mfg. Co., Scranton, Pa.
Cook, W. J., Pres., Cook Railway Signal Co., Denver, Col.
Cook, W. L., United States Electric Co., Chicago, Ill.
Corey, F. B., Union Switch & Signal Co., Swissvale, Pa.
Cozzens, Chas., care of U. S. & S. Co., Chicago, Ill.
Cozzens, J. J., U. S. & S. Co., New York, N. Y.
Daves, G. W., Edison Storage Battery Co., Orange, N. J.
Dean, A., Jr., Res. Mgr., Union Switch & Signal Co., Chicago, Ill.
Distach, A. F.
Dodgson, F. L., Cons. Engr., General Railway Signal Co., Rochester, N. Y.
Doran, H. G., Western Mgr., Com. Acetylene Ry. Light & Sig. Co., Chicago, Ill.
Drury, H. A. K., Dom. Ry. Co., Ottawa, Can.
Eckert, A. P., Sales Mgr., Wire Dept., National India Rubber Co., New York, N. Y.
Edmunds, Frank W., Sales Agt., Dressel Ry. Lamp Works, New York, N. Y.
Foster, Frank M., Mfr., Switch Stands, Columbus, Ohio.
Foster, W. E., Ingalls-Shephard Forging Co., Chicago, Ill.
Ferguson, H. K., Asst. Gen. Mgr., Samuel Austin & Son Co., Cleveland, Ohio.
Gage, R. G., Railway Sig. Co., Ltd., Lachine, Que., Canada.
Gammons, R. F., 2nd, Treas., U. S. Elec. Signal Co., West Newton, Mass.
Garrity, P. A., Rep., Thos. A. Edison, Inc., Chicago, Ill.
Geer, M. F., Sales Engr., General Railway Signal Co., Rochester, N. Y.
Gifford, H. E., Jr., care of L. S. Brach Supply Co., New York City, N. Y.
Gillingham, W. J., Jr., Western Agt., Hall Signal Co., Chicago, Ill.
Graber, Geo. A., Kerite Ins. Wire & Cable Co., Chicago, Ill.
Griffith, H. Maynard, Student, Massachusetts Institute of Technology, Boston, Mass.
Griffin, H. W., Engr., Union Switch & Signal Co., New York, N. Y.
Guillaume, F. L., Pres., W. F. Bassett Mfg. Co., Utica, N. Y.
Hawley, W. P., Mgr., U. S. Light & Heating Co., New York, N. Y.
Hayes, S. W., Pres., Hayes Track Appliance Co., Richmond, Ind.
Henry, W. S., Prin. Asst. Engr., General Railway Signal Co., Rochester, N. Y.
Henze, C. D. A., Res. Mgr., Federal Signal Co., Chicago, Ill.
Hobson, J. S., Western Sales Mgr., Union Switch & Signal Co., Chicago, Ill.
Hollister, H. L., Sig. Eng., Hall Switch & Signal Co., Garwood, N. J.
Holloway, H. C., The Hall Joint Co., Chicago, Ill.
Hovey, M. H., Cons. Sig. Engr., Madison, Wis.
Hovey, W. G., Railway Sales Dept., The Okonite Co., New York, N. Y.
Howe, W. K., Chief Engr., General Railway Signal Co., Rochester, N. Y.
Howard, L. Frederic, Chief Engr., Union Switch & Signal Co., Swissvale, Pa.
Hudson, E. E., Mgr. Sales, Primary Battery Dept., Thomas A. Edison, Inc., Orange, N. J.
Jacobs, Harry M., Sig. Accessory Dept., General Electric Co., Schenectady, N. Y.
Johnson, Sidney, Gen. Sales Mgr., Union Switch & Signal Co., New York, N. Y.
Jones, Chester H., General Electric Co., Chicago, Ill.
Jones, F. H., Res. Mgr., General Railway Signal Co., San Francisco, Cal.
Kellogg, W. O., care of General Electric Co., Philadelphia, Pa.
Kinch, W. M., Sig. Engr., Gordon Primary Battery Co., New York, N. Y.
Klink, A. F., Pres., Bryant Zinc Co., Chicago, Ill.
Kyle, W. T., Duplex Metals Co., New York, N. Y.
Lane, W. H., Chief Engr., Hall Signal Co., New York, N. Y.
Lavarack, F. C., Gen. Sales Mgr., The Signal Accessories Co., New York, N. Y.
Lavarack, W. W.
Lepreau, F. J., Thos. A. Edison, Inc., Chicago, Ill.
Lorenz, J. M., Salesman, Central Electric Co., Chicago, Ill.
MacDonough, G. H., Gen. Mgr., Potter Winslow Co., Chicago, Ill.
McCready, Harold, Asst. to Elec. Engr., U. S. & S. Co., Wilkinsburg, Pa.
Martin, L. G., Engr., The Okonite Co., New York, N. Y.
Massey, Chas. F., Pres., C. F. Massey Co., Chicago, Ill.
Miller, P. W., Rep., Kerite Ins. Wire & Cable Co., New York, N. Y.
Moore, Albert, Adv. Mgr., General Railway Sig. Co., Rochester, N. Y.
Moore, Philip W., Gen. Mgr., The P. & M. Co., Chicago, Ill.
Mulleneaux, H. J., Works Mgr., Hall Sig. Co., Garwood, N. J.
Nachod, C. P., Gen. Mgr., Nachod Signal Co., Philadelphia, Pa.
Nelson, G. A., Gen. Mgr., Gordon Primary Battery Co., New York, N. Y.
Nolioth, Chas. S., F. D. Lawrence Electric Co., Cincinnati, Ohio.
Patenall, T. H., Sig. Engr., U. S. & S. Co., New York, N. Y.
Paterson, Robt. A., Eastern Mgr., C. F. Massey Co., New York, N. Y.
Peddle, W. A., Sales Dept., Hall Signal Co., New York, N. Y.
Pfaesterer, C. S., Ry. Signal & Tel. Depts., National Carbon Co., Cleveland, Ohio.
Poor, C. O., Asst. Res. Mgr., General Railway Signal Co., Chicago, Ill.
Poor, F. A., The Rail Joint Co., Chicago, Ill.
Prout, Hedley, Mgr., J. L. Morrison Co., Chicago, Ill.
Quin, J.
Reiff, G. N., Rep., Union Switch & Signal Co., Winnipeg, Man., Canada.
Renton, Jos. A., Kerite Ins. Wire & Cable Co., New York, N. Y.
Rhea, Frank, Commercial Engr., General Electric Co., Schenectady, N. Y.
Roberts, John, Sig. Accessories Dept., General Electric Co., Schenectady, N. Y.
Schoenmehl, C. B., Waterbury Battery Co., Waterbury, Conn.
Smarth, V. I., Prof., McGill University, Montreal, Que., Canada.
Sperry, H. M., Sales Mgr., General Railway Signal Co., Rochester, N. Y.
Simmen, P. J., Northey-Simmen Signal Co., Indianapolis, Ind.
Stiles, T. Geo., Manufacturer, Arlington, N. J.
Swanson, C. E., Asst. Sales Agt., Hazard Mfg. Co., Pittsburgh, Pa.
Talbert, W. W., care of Union Switch & Signal Co., Chicago, Ill.
Taylor, A. A., Fairbanks, Morse & Co., Chicago, Ill.
Thomas, L., Res. Mgr., General Railway Signal Co., Chicago, Ill.
Thompson, H. G., Prin. Asst. Engr., Federal Signal Co., Albany, N. Y.
Thompson, H. G., Mgr., R. R. Dept., Edison Storage Battery Co., Orange, N. J.
Thomson, J., Jr., General Railway Signal Co., Rochester, N. Y.
Thurber, G. P., Gen. Mgr., Gray-Thurber Train Control & Signal Co., Pittsburgh, Pa.
Underhill, J. Delmar, Salesman, The Okonite Co., New York, N. Y.
Van Hook, W. A., Asst. Engr., Ill. R. R. & Warehouse Com., Chicago, Ill.
Vogel, E. W., Sig. Eng., Railroad Supply Co., Chicago, Ill.
Wallace, H. A., Engr., Union Switch & Signal Co., New York, N. Y.
Walters, G. L., Adams & Westlake Co., Chicago, Ill.
Ware, H. C., Supt. of Constr., Federal Signal Co., Chicago, Ill.
Whall, F. R., Gen. Mgr., C. H. Whall Co., Boston, Mass.
White, F. J., Salesman, The Okonite Co., New York, N. Y.
Wiley, J. R., Mgr., Standard Underground C. Co., Chicago, Ill.
Winchell, B. L., Jr., Western Sales Mgr., Kerite Ins. Wire & Cable Co., Chicago, Ill.
Wreaks, Hugh T., Secy., Wire Inspection Bureau, New York, N. Y.
Wuerpel, M., Jr., Asst. Gen. Mgr., General Railway Signal Co., Rochester, N. Y.
Young, W. J., Kerite Insulated Wire & Cable Co., New York.

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DINNER TO APPLIANCES ASSOCIATION OFFICERS.

The officers and directors of the National Railway Appliances Association were the guests of A. P. Van Schaick, president of the association and district sales agent of the Lackawanna Steel Company, at a dinner last night at the Union League Club. Following the dinner there was an informal discussion of the association's past and future work. There were present as Mr. Van Schaick's guests: T. R. Wyles, L. R. Ashhurst, Jr., W. H. Baldwin, Philip W. Moore, C. W. Kelly, N. M. Hench, H. M. Sperry, John N. Reynolds, Bruce V. Crandall and T. W. Snow and Robert E. Belknap, past presidents. In honor of the day the table decorations were shamrocks imported direct from the "ould sod" and green flowers, and the menu was typical of the day.

VISITORS FROM FAR-AWAY PLACES.

The fact that Chicago is a good convention city, on account of its central location, is shown by the large attendance of signal engineers and signalmen from far distant points. C. R. Hodgdon, signal engineer of the Canadian Pacific; J. H. Cormick, signal engineer of the Canadian Northern; E. W. Newcomb, signal engineer of the Oregon Short Line; A. H. McKeen, signal engineer of the Oregon-Washington Railroad & Navigation Co., Fred Stuart, signal engineer of the Sunset Lines, and "Bob" Morris, signal engineer of the El Paso & Southwestern, are present from the far west and the south. Charles Kelloway, signal engineer of the Atlantic Coast Line; Chas. Stephens, from the Chesapeake & Ohio, and W. J. Eck, signal engineer of the Southern are present from the far southeast. And almost all of the New York and New England contingent are among those present.

HOW TO GET TO THE COLISEUM.

In order to make it possible for all railway men in attendance at the conventions to reach the Coliseum quickly and easily when they desire to see the exhibits, three large 16-passenger motor buses are kept in continuous operation between the Congress hotel and the Coliseum, between 10 a. m. and 10 p. m., each day up to and including Friday. These cars are for the exclusive use of the guests of the National Railway Appliance Association without charge, the drivers being instructed to honor N. R. A. A., A. R. E. A. and R. S. A. badges or passes to the Exhibition. Railway passes also are honored. The cars leave the Congress street entrance to the hotel and the main entrance to the Coliseum at intervals of about five minutes and make stops at the Blackstone hotel whenever passengers desire.

ADMISSION TO THE COLISEUM.

A new departure has been made this year in the method of admission to the National Railway Appliances exhibit at the Coliseum. In previous years complimentary tickets have been freely issued, but those not possessing these passes could purchase tickets at the door. This year no tickets are sold and a sign is placed on the entrance stating that the display is for railway men only. Complimentary tickets have been distributed more widely than before, but if any railway man has not received a ticket his pass or his American Railway Engineering Association membership badge will admit him. The aim is to exclude the general souvenir hunting public and confine the show to those directly interested, in this way enabling both the railway men and the exhibitor to gain the desired ends most effectively.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.

The National Railway Appliances Association, which has to do with the destinies of the railway supply fraternity at these annual gatherings, is one of the very few associations of its kind that enjoy the dignity of being regularly incorporated bodies. It was organized under the laws of Illinois in April, 1911, and succeeded the Road and Track Supply Association.

The chief function of the association is to organize and conduct the splendid exhibition of railway appliances that is now held at the Coliseum and First Regiment Armory every March in connection with the annual convention of the American Railway Engineering Association and the stated meeting of The Railway Signal Association.

A. P. VAN SCHAICK, President.

The officers and members of the board of directors of the National Railway Appliances Association are: President, A. P. Van Schaick, Lackawanna Steel Company, Chicago; Vice-President, T. R. Wyles, Detroit Graphite Company, Chicago; Treasurer, John N. Reynolds, Railway Age Gazette, Chicago; Secretary, Bruce V. Crandall, Chicago; Honorary Director, Robert E. Belknap, the Pennsylvania Steel Company and Maryland Steel Company, Chicago; H. M. Sperry, General Railway Signal Company, Rochester, N. Y.; Philip W. Moore, the P. & M. Company, Chicago; N. M. Hench, Carnegie Steel Company, Pittsburgh, Pa.; C. W. Kelly, Fairbanks, Morse & Company, Chicago; L. R. Ashhurst, Jr., William Wharton, Jr., & Company, Inc., Philadelphia, Pa.; and Walter H. Baldwin, the Adams & Westlake Company, Chicago. The photographs of all eleven are reproduced herewith.

T. R. WYLES, Vice-President.

President Van Schaick has been district sales agent of the Lackawanna Steel Company at Chicago for the last three years. Prior to that, and for five years, he was president of the W. K. Kenly Company, Chicago, dealers in railway supplies. His first position of importance in the railway supply industry was with the Pittsburgh Plate Glass Company. He was identified with the sales department of

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C. W. KELLY.

L. R. ASHHURST, JR.

W. H. BALDWIN.

H. M. SPERRY.

ROBERT ERNEST BELKNAP.

N. M. HENCH.

BRUCE V. CRANDALL,
Secretary.

P. W. MOORE.

JOHN N. REYNOLDS,
Treasurer.

OFFICERS AND DIRECTORS OF THE NATIONAL RAILWAY APPLIANCES ASSOCIATION.

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that concern in Chicago for four years before going with the W. K. Kenly Company.

T. R. Wyles, vice-president, is a director and second vice-president of the Detroit Graphite Company, with office in Chicago. He is a Canadian by birth, and was just 41 years old on January 14 last. After leaving school, and until 1891, he worked in various capacities in Richmond, Va., and St. Louis, Mo. From 1891 to 1896 he was a stenographer in the purchasing department of the American Refrigerator Transit Company at St. Louis, and during the latter year was transferred to Chicago as contracting freight agent of the company. He resigned in 1897 to become agent for the Detroit Graphite Company and was made second vice-president in 1907.

THE EXHIBIT.

The four previous exhibitions of railway appliances given by the National Railway Appliances Association have set such a high standard of excellence that it would be difficult to commend the fifth annual exhibition now in progress at the Coliseum and the First Regiment Armory more highly than to say that it equals any of the four that preceded it. There is probably no basis of comparison which would be unfavorable to the 1913 "show" and in some ways it is declared by the exhibitors and railway men in attendance to establish a new record.

The floor area occupied is the same as last year, including the main floor of the Coliseum, the Coliseum Annex and the First Regiment Armory. The number of companies exhibiting is also practically the same as last year. The success of any exhibition of this kind, however, depends more on the character of the individual exhibits than on the aggregate space occupied or the total number of companies represented; for the visitors in increasingly large proportions are the men who buy and use the materials exhibited. Such men feel that the time spent in examining the devices shown is profitable to the extent that they receive new ideas or are set thinking along new lines. Realizing the "show me" attitude of the men in attendance, practically all of the companies prepare educational exhibits. Reception booths with beautiful decorations and comfortable chairs are even less in evidence than in former years and full-size samples, operating models, stereopticon exhibits or collections of photographs are present in nearly every booth. The plan of locating most of the large track work exhibits in the Armory which was successfully adopted last year has been followed in the assignment of space this year with the result that both the companies going to the Armory and those remaining in the Coliseum are benefited.

As has always been the case, the signal supply companies occupy much space, while not many important new developments in signal mechanism and interlocking machines are shown, a good deal of attention is being paid to the accessory devices, and exhibits of all the necessary mechanisms for complete signal installations are shown.

Water service men should find much of interest, for tanks, water softeners, stand pipes, and oil engines for pumping service are prominently displayed. While the oil engines are a comparatively new development, there are four types on exhibit. Practically every motor car manufactured for railway use is shown, including both the complete cars of special designs for various purposes and band cars equipped with a gasoline engine. Bridge and building department officers are interested by the exhibits of paint, roofing, and insulating materials, doors and hangers. The office engineer and designer are appealed to by the makers of rules, calculators, draughting and blue printing supplies, while the field engineers find instruments, tape and other necessary field equipment. Two exhibits include steel bunks of improved design which should be appreciated by men who are finding it advisable to give laborers better accommodations in order to hold them.

As usual, several full-size switch layouts are shown, while steel and concrete ties in a variety of designs, tie plates, rail anchors, screw spikes, rail joints, switch stands, derails and other devices are present in abundance.

In general appearance, the first glance over the Coliseum or Armory shows little change from last year's exhibition. For the third time, flags and bunting are used exclusively this year for roof decoration in the Coliseum, while the memory of St. Patrick is honored by the green in the ceiling decorations of the Armory. The central feature of the Coliseum is a pagoda of ornamental design covering four drinking fountains, which are both convenient and sanitary. Music is provided during the afternoon and evening by the Ellis Brooks band.

The opening of the exhibits was announced for Saturday morning and while the crowd on Saturday was not large, all exhibits were in place by noon of that day, so that the visitors on Monday were not annoyed by the trucking of machinery into the booths and the preliminary setting up of which precedes any working exhibit. The crowd Monday was always there and by posting a sign at the main entrance "No admission to the public; for railway men only," and by refusing to sell tickets, the officers of the association assured the exhibitors the presence of the class of visitors that they most want to see.

THEY WILL BE ELECTED.

The Nominating Committee of the Railway Signal Association held a meeting at the Congress hotel last night. The names of the nominees for the various offices is a profound secret. But it is known that, whoever they are, they will be elected, as usual. A. R. Fugina, signal engineer of the Louisville & Nashville; H. S. Balliet, assistant manager of the Grand Central Terminal, New York; G. W. Hulsiser, signal engineer of the Chicago & Alton, and Bert Howland, of the Missouri Pacific, were the members of the committee present.

WIRELESS EXPERIMENTS ON THE LACKAWANNA.

The Delaware, Lackawanna & Western is planning the installation of wireless telegraph apparatus at the stations in Scranton, Pa., and Binghampton, N. Y., with a view to testing the feasibility of the wireless telegraph for train dispatching purposes, and for communication between moving trains and stations. The Union Pacific has been experimenting in this direction for some time, but as yet has come to no definite conclusions on the subject.

A WESTERN SIGNALMAN GOES TO AN EASTERN ROAD.

J. E. Saunders, assistant signal engineer, Atchison, Topeka & Santa Fe, has resigned to become office engineer in the signal department of the Delaware, Lackawanna & Western, with headquarters at Hoboken, N. J. He assumes the duties of his new position on March 18, and reports to M. E. Smith, signal engineer of the Lackawanna.

C. A. MORSE GOES TO ROCK ISLAND.

Charles A. Morse, chief engineer of the Atchison, Topeka & Santa Fe system, at Topeka, Kan., has resigned that position to become chief engineer of the Rock Island Lines, with office at Chicago, effective on April 1. He succeeds J. B. Berry, who will remain in the service of the Rock Island

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in a special and consulting capacity. Mr. Morse will be tendered a complimentary dinner by officials of the Santa Fe at Topeka on Saturday. A committee consisting of C. F. W. Felt, chief engineer of the A. T. & S. F. railway, R. J. Parker, general superintendent, and E. L. Copeland, secretary and treasurer, is in charge of the arrangements. Mr. Morse has been chief engineer of the system since November, 1909, and was previously chief engineer of the lines east of Albuquerque. He has been with the Santa Fe since January, 1886.

TWO A. R. E. A. SUB-COMMITTEE MEETINGS.

The sub-committee on poles, of the power distribution committee of the American Electric Railway Engineering Association, will hold a meeting on Wednesday, March 19, at the offices of Ralph H. Rice, assistant engineer for the Board of Supervising Engineers, in the Borland Block, La Salle and Monroe streets, Chicago. The sub-committee on rubber insulated cable, of the same committee, will hold a meeting at the same place on Thursday, March 20. Mr. Rice and Gaylord Thompson, chief engineer of the Ohio Electric Railway, are members of both sub-committees, and Mr. Thompson is also a member of the A. E. R. A. Joint Committee on Block Signals.

ART AT THE COLISEUM.

Something happened to the wall back of an exhibit at the north end of the Coliseum. It looked like a radiator had leaked upstairs. Various ways of improving the appearance of the space were suggested. One man wanted to put a frame around it and give it a name, claiming that it was a perfect facsimile of the famous Futurist-Impressionistic picture, entitled "Harvesting the Tie-Treating Plants." Finally the trouble was settled by getting a real painting, in oil, to fit the space. The painting is worth seeing. It is at the north end, just left of the middle of the wall.

SECOND-CLASS APPLICATION FOR R. S. A.

The Railway Signal Association has made application for entry at the post-office at Bethlehem, Pa., under the second-class privilege for its publications. This, if it is secured, will cut the postage bill down to one-eighth of what it is at present. It is a good move, and Secretary C. C. Rosenberg is urging the members to support it by paying their dues while they are here this week. Uncle Sam requires the dues to be paid in advance in order to obtain the second-class privilege.

ILLINOIS CENTRAL MEN AT THE COLISEUM.

Arrangements have been made by the Illinois Central for all roadmasters, supervisors and water service men, who can get away from their duties, to spend at least one day at the Coliseum. This includes all men on the system as far south as New Orleans and as far west as Omaha.

CHICAGO ENGINEERS' CLUB INVITATION.

The Chicago Engineers' Club extends to all visiting members of the A. R. E. A. the courtesies of the club which is located at 314 Federal street.

JOINT COMMITTEE MEETING.

Committee 1, of the Railway Signal Association, and Committee 10, of the American Railway Engineering Association, will hold a joint meeting at 6:15 Tuesday evening, in Club Room 6, at the Congress Hotel. The membership of these committees is practically identical. Committee 10 will submit this morning the same report on uniform signaling practice that was presented to the Railway Signal Association last fall, and was adopted by letter ballot of that organization by a vote of 746 to 10.

PRESIDENT'S DINNER.

An informal dinner was given to the officers, directors and committee on Arrangements of the A. R. E. A., by the president, Chas. S. Churchill, in the English room of the Congress hotel.

THE STRAUSS DIRECT LIFT BRIDGE.

The vertical lift bridge is particularly adapted to long spans, with a relatively small lift. It has long been used in a small way, but during recent years, has been adopted for a number of larger structures. To do away not only with the operating cables and cable-driven locks, but also with the counterweight cables, which have been generally adopted in other designs of vertical lift bridges, the Strauss Bascule Bridge Co., Chicago, has developed a vertical lift bridge which substitutes for the counterweight cables a series of counterbalanced levers, and for the operating cables a rack and pinion drive. This design is of the same general type as the modern bascule bridge, and possesses essentially the same characteristics. The Strauss Co. does not urge the new design as a substitute for the bascule, but believes that the direct lift type has special advantages under certain conditions and will be capable of a wide application. Although it was put on the market only one year ago, three large railway bridges are already under construction, which will have movable spans of this type, one other is under contract and still others are proposed and awaiting final decision.

The Arkansas river bridge, near Pine Bluff, Ark., is to be used by the St. Louis Southwestern and an electric road, and carries, in addition, two roadways and two sidewalks. The movable span has a length of 245 ft. and a weight of 500 tons, the height of lift being 50 ft. This bridge is designed to open in one minute, the lifting apparatus being interchangeable to any span. The Chicago, Burlington & Quincy bridge over the Illinois river at La Salle, Ill., is a single track span 150 ft. long, with a height of lift of 32 ft. In this case an old span will be converted into a lift bridge without interruption to traffic. The Fraser River bridge at Fort George, B. C., for the Grand Trunk Pacific, is a single track span, 105 ft. 6 in. long, carrying, in addition to the railroad, two 12 ft. highways. This bridge has a lift of 40 ft. The Northern Pacific bridge over the Steilacoom Creek Waterway in Washington, which is under contract, is a double track span 96 ft. long, with a lift of 43 ft. In this design the towers are connected above the clearance line by a cross channel strut.

One of the claims in the patent covering the new Strauss design describes it as one "comprising a vertical movable span, fixed supports at each end of said span, a plurality of pivoted levers at each end carried by said fixed supports and connected with said span so as to move it vertically when the levers are moved." This broad claim covers practically any construction of a lift bridge employing rigid arms or links in place of cables or chains. This allows various types to be designed, and the possibilities of meeting special conditions are evident. Among these types are included a single tower design in which the entire operation is effected from one end, as in a single leaf bascule; an underneath counterweight design in which all the operating parts are beneath the roadway corresponding to a deck bascule, and the suspension lift design in which the lifting trusses form part of a suspension system which carries the live load. This latter bridge is not only economical, but is well adapted for long span structures of esthetic design.

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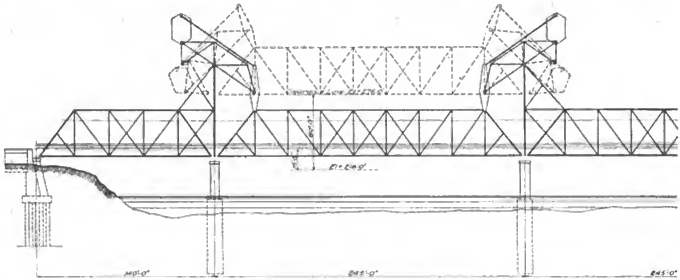
The moving truss of the Strauss vertical lift bridge is a simple span with stiff chords, having a lifting mechanism at each end mounted on braced tower posts between which the span moves as it is lifted. The lifting mechanism is the usual parallel link mechanism of the Strauss bascule, with the addition of a hanger connecting this mechanism to the

Since the hangers support the movable span at points between the ends of the span, the span length for dead loads is reduced. This also permits the erection of the span in the open position without the use of falsework, as the hanger points can be used as points of support from which the two halves of the span can be erected as cantilevers. If an old



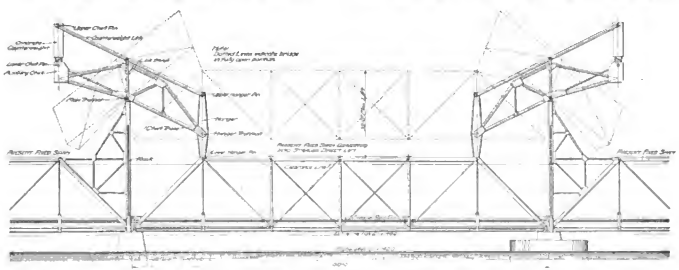
Elevation of Arkansas River Vertical Lift Span.

span. The details of frame, links and trusses are exactly the same as those used in the Strauss heel trunnion bascule type. The center of gravity of the counterweight at each end of the span moves in a vertical line, thus exerting a constant moment and maintaining the span in exact balance in all positions. There are no unbalanced horizontal forces. A secondary fixed counterweight on the lifting frame brings the center of gravity of this frame into coincidence with its fulcrum, so that there is no unbalanced moment.

The operating mechanism comprises a rack on each tower

span is in existence at the site, it may be retained in service, while the new span is being completed above it. The other methods of erecting movable spans as on falsework or by floating are, of course, applicable to this design, but when it is necessary to erect it in the open position, the fact that this can be done without the use of expensive steel falsework is an evident advantage. It is also possible to erect each tower and each half of the moving span individually and connect them together subsequently.

The equilibrium of the moving parts of the bridge is



Elevation of Strauss Direct Lift Bridge for C., B. & Q.

post with corresponding pinions on the span, the motors and gearing also being located on the span and connected through an equalizing shaft, so that the four corners of the span move together at all times. The operator's cabin may be located either on the span or on the fixed portion. The end lock used in the single leaf bascule bridges is applied to each end of the vertical lift span, and is controlled from the operator's cabin.

demonstrated in the line drawing shown herewith. The conditions for perfect balancing are: First, that the moment of all the weights about the fulcrum O must equal zero for all positions of the bridge, and, second, that the moment of the main counterweight and one-half the link at s about the point P must be equal and opposite to the moment of one-half the span, the hanger and one-half the link at r about the point Q. To demonstrate the equilibrium, let W equal the weight of

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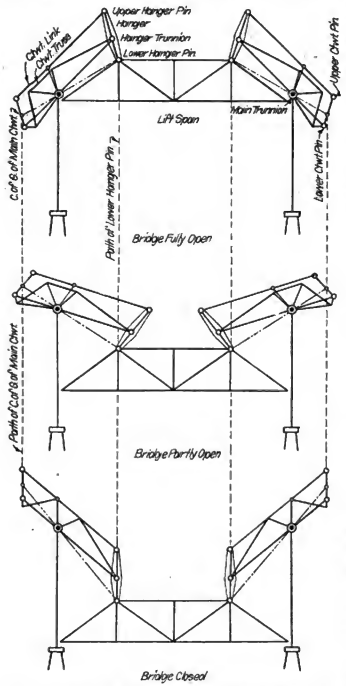
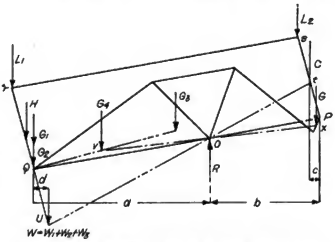
one-half the lift span, H the weight of the hanger, and L the weight of the link. It is assumed that the weight W is divided into three portions, the first W_a of such a magnitude that when combined with L_1, one-half of the weight L which acts at the point r, the resultant of W_a and L_1 or G_1 will be applied at the point Q. The second portion W_b of the weight W, is of such magnitude that when combined with the weight H, the resultant of W_b and H or G_2 will also be



Three Positions of Strauss Vertical Lift Bridge Illustrating Movement of the Parts.

applied at the point Q. The third portion W_c of the weight W, is assumed as acting at the point U, which is the connection of the hanger to the moving span. The forces W, L_1, and H are then considered as being replaced by an equivalent system of forces composed of W_1 at U and $G_1 = L_1 + W_a$ and $G_2 = H + W_b$ acting at Q. If G_s is the weight of the counterweight truss, the resultant of G_1, G_2, and G_3 will be a force G_4, equal to the sum of the other three and applied at their center of gravity, v. The auxiliary counterweight G is applied at a point x on the line vO extended, its weight being such that its moment about the point O balances the moment of G_4 about that point. The main counterweight C_1 is applied at such a point and is of such magnitude that when combined with L_2 the resultant C of C_1 and L_2 is applied at the point t on the line UO extended, the moment of this force about the point O being equal to the moment of W, about the same point. From similar triangles, $\frac{c}{d} = \frac{b}{a}$, and from the fact that the moment of C about the point O is equal to the moment of W_1 about that point, it can be shown that $\frac{W_1}{C} = \frac{c}{d}$ also equals $\frac{c}{d}$. From this equation $W_1 \times d = C \times c$. Since G_1 and G_2 are applied at the point Q and have no moment about it, the condition of equilibrium between the moments of W, H and L_1 about Q, and of C_1 and L_2 about p, is realized. Since the moment of all the forces about O has been made equal to zero, both conditions of equilibrium are therefore realized. The system of forces is made up entirely of vertical forces, so that the main trunnion reaction R is ver-



Demonstration of Equilibrium of Strauss Vertical Lift Bridge.

tical. The hanger is capable of resisting bending, so that it can receive a vertical pin reaction at U and equilibrium can exist without a horizontal component of this pin reaction.

The principal advantages claimed by the designers for the Strauss type of direct lift bridge are as follows: The fixed trunnions and parallel link counterweight are of the same design as in the Strauss bascule. The bridge is free from binding and power loss, due to long sliding guidings. All four corners of the span move absolutely level. The design eliminates all cables, chains and equalizing devices. The points of wear and those requiring inspection are few and easily accessible. The operating parts are completely enclosed and protected from the weather and other extraneous influences. The operating machinery is direct acting, safe and dependable. Both the counterweights and lift span are integral parts of the structure and cannot break loose from their supports. All parts of the structure have the same length of life, eliminating such items of cost as cable renewals, while the annual cost of cable lubrication, maintenance and inspection is eliminated. The entire moving structure is balanced in all positions, resulting in a low power consumption. The supports of the lifting span at points between its ends reduce the dead load stresses and allow erection in the open position without falsework.

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CONTINUOUS RAIL CROSSING.

The continuous rail crossing designed by the Alexander Crossing Co., Clinton, Ill., has been installed at two places, one of the crossings having been in service three years and eight months and the other one year and two months. In both cases it is stated that the operation of the crossing has given no trouble, the maintenance cost has been very much decreased and the shock to equipment passing over the crossing has been shown by tests to be much less than that occasioned by the crossing of the ordinary type.

The crossing is of very rigid construction, the foundation consisting of a solid slab of reinforced concrete 18 in. thick extending down 2 ft. 7½ in. below the base of rail under the entire crossing. This slab of concrete is covered with two layers of 3-in. oak timbers, over which a ½ in. steel plate, the exact size of the foundation, is laid. Under each rail intersection is placed a base casting having a total depth of 7 in., which incloses two layers of oak timbers. The ends of the main track rails and the intermediate or connecting rails are carried directly on these base castings. A number of bolts are embedded in the concrete foundation to hold the base plate and the castings firmly in place.

The continuous rail is secured by the use of crossing frogs consisting of 10-in. sections of rail designed to swing so as to come in line with either of the main track rails. This revolving section is made of manganese steel and has a total height of 11 7/16 in., the portion below the head section being shaped to form a pinion, the hub of which has a bearing on the base casting. This pinion is provided with a cut spur gear to mesh with a spur rack which is operated by a pipe line from the interlocking tower. A bolt lock is provided to hold the revolving section firmly in place in line with either main track rail, these locks being also operated by pipe lines from the interlocking tower.

In addition to the revolving rails at each rail intersection, there are four intermediate sections of standard T rail to complete the crossing. These are held firmly in position on the

Revolving Portion of Alexander Crossing Frog, Showing Holes for Bolt Locking.

base castings by specially constructed angle bars of a very heavy section, the bolts which hold these bars being embedded in the concrete foundation. The full length main track rails can be carried up to the crossing, the end of each rail being supported on the base casting and firmly held by angle bars and bolts in the same manner as the intermediate rails. The main track rails are so rigidly attached to the base casting that expansion of the rail will not close the joint between the main track rail and the swinging rail, which would prevent the operation of the latter.

The first crossing of this type was installed at Thayer, Ill., at the crossing of the tracks of the Illinois Traction System and the Thayer Junction Railway, July 3, 1909. At the end of 19 months' service the cost of maintenance was reported by the companies using the crossing as less than $10. The Illinois Traction System operates 40 or more electric cars over this crossing daily and the Thayer Junction, three or four trains daily. The second crossing was installed at

Alexander Continuous Rail Crossing at Champaign, Ill.

Champaign, Ill., in the northbound main track of the Illinois Central at the crossing with the Cleveland, Cincinnati, Chicago & St. Louis. At this point there is a heavy traffic on both roads and all trains maintain a fair speed. There has been no delay to traffic on account of the operation of the crossing, even during the severe snow and sleet storms during the past two winters. About two months after the installation of this latter crossing, a test was conducted by the railway department of the University of Illinois, using the University test car to determine the comparative vibration caused by passing over the Alexander crossing in comparison with a crossing of standard type. These tests made it clear that there is very much less vibration and shock on the Alexander crossing. It is stated that the cost of maintenance for this crossing since its installation has been only 10 cents.

QUICK WEIGHING ATTACHMENTS.

BY F. E. KAEPPEL.

Several devices designed especially for the quick weighing of freight in local freight houses have been put on the market within the past few years. They are especially intended to eliminate the delays now incident to heavy weighing. When one stops to consider that weighing is so essential to the revenue of railways it is remarkable that these developments have been delayed as long as they have. The manipulation of a scale beam by hand, the placing of the loose weights on the hanging poise, and other operations, cause a considerable loss of time and also give opportunity for errors.

These recent devices, commonly known as quick-weighing indicators, aim to relieve these conditions, and while they undoubtedly have not reached their final stage of development, they nevertheless possess enough merit to justify their installation in many large freight houses already. These machines are really attachments to the scales, and perform no work other than to indicate the weight on the scale levers, which was formerly accomplished by the scale beam itself. The advantages are apparent. In the first place, compare the delay in the old method of weighing in obtaining the balance and handling the weights as against the instantaneous action of the indicator. It has been estimated that the elimination of this delay alone may result in a saving of from 20 to 25 per cent in labor. However, the most important feature of the quick-weighing device is not the saving in time, but the increased accuracy. There has grown up a

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system on many railways of accepting the shippers' weights on freight wherever stenciled without reweighing it, as the time consumed in reweighing does not justify the expense. With the quick-weighing indicator, however, the roads are now reweighing all freight received regardless of the shippers' weights and the size of packages. With an indicator properly working, it is practically impossible to obtain any except the correct weights, and the only way for an operator to make a mistake is to enter the figures incorrectly.

One interesting feature of these machines is the fact that results are obtained without the use of springs, and there is practically no oscillating on the part of the indicator. The capacity of these devices varies from 1,000 to 2,000 lb. on the dial, with an auxiliary beam to provide for the overweight to the full capacity of the scale. However, these auxiliary beams are seldom used in freight houses, where 90 per cent of the freight handled weighs less than 1,000 lb.

Five or six manufacturers have operating devices on the market, the general construction of which varies widely, but the method of obtaining the results of which are practically identical. Some of these machines are connected directly to the shackle of the scale levers, entirely eliminating the former beam equipment. Others are attached to the steel-yard rod, so that if the indicator is out of commission at any time, weighing can be continued on the beam as formerly. Among the present quick-weighing indicators are the Kron, Springfield, Streeter-Ammet, McFarlane, Fairbanks and Howe, all of which have been thoroughly tried out in this service.

Quick Weighing Indicator on a Freight House Platform Scale.

AN INTERESTING AND UNUSUAL ACCIDENT.

A short time ago a passenger train consisting of an engine, baggage car, mail car and two sleepers was derailed on a western road, and a 100-ton wrecker was sent out to clear the track. After working two or three hours an opposing passenger train appeared, and the wrecking outfit, consisting of an engine, convoy and wrecker, was ordered to a nearby passing track to let this train by. To reach this siding it was necessary for the wrecker to pass a through truss span. Owing to oversight on the part of the engineer, the boom of the wrecker was left up, and while running about 10 miles per hour this boom caught in the end of the bridge, pulling out the end portal and cross-bracing and lifting the span off the bridge seat after the engine and convoy had passed safely. The span dropped about 25 ft. into the creek below, carrying the wrecking outfit with it. Although six persons were on the wrecker, no one was injured.

This accident happened about 10 o'clock in the morning. The crew immediately started pulling the bridge apart and putting in a temporary track up the dump. With the assistance of two engines and a deadman, through which a line from the auxiliary boist was attached, the wrecker was pulled up a 25 per cent. grade to the main track, and at 5 o'clock in the evening was again at work on the derailed engine of the passenger train. During all this time, even while the wrecker was in the stream, fire had been maintained under the boilers, and after it had been gotten back onto the main line, a careful examination showed that less than $5 worth of damage had been done to it.

Wrecked Bridge Before Pulling Wrecker Up Inclined Track.

This wrecker was made by the Industrial Works, Bay City, Mich.

HANDLAN'S RADIUS LENS SIGNAL LAMPS.

The Handlan radius lenses used in the signal lamps illustrated herewith were designed to impart the same amount of reflected light to observers viewing them from any position within the arc covered. The switch lamp is especially efficient for locations on curves. The spread of light not only covers an arc of 79 deg., but also radiates above and below the center line of the lens, thereby displaying clear indications on grades, and from stands located on tangent track in which the lamp has drooped over or is otherwise out of focus. These lamps are furnished with any combination of colors, can be constructed to hold either forks or staff, and are optionally equipped with either one-day or long-time burners.

Engine, Tail and Switch Lamps with Handlan Radius Lenses.

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The engine lamps are equipped with green and white lenses, having an arc of 130 deg., the combined arc of a pair of these lamps upon a locomotive exceeding 225 deg. By this method employees are given the same uniform intensity of light regardless of their location. These lamps are adapted to be used on either side or front, and have an interior steel blind to obscure the lens not in use, which eliminates all expensive, intricate interior parts and colored glasses.

The tail end marker was designed to afford equal protection to rear ends of trains, both on tangent track and curves. These lamps are supplied with ruby radius lenses, covering an arc of 80 deg., and three standard 5-in. diameter lenses of any colors. They are equipped with one-day burners.

The engine lamp has been adopted as standard on the Frisco Lines, the Missouri, Kansas & Texas, the Mobile & Ohio and the Denver & Rio Grande, besides being tested at present on 24 other lines. The switch lamp is undergoing test on various lines, while some railways have purchased them in considerable quantities for use on curves. Sample lots of the tail lamps have been purchased by several lines for test. All of these lamps are equipped with Handlan's top draft ventilation, and are made by the Handlan-Buck Manufacturing Co., St. Louis, Mo.

A NEW FLEXIBLE HOSE.

Users of hose or flexible connectors for steam and pneumatic service would welcome a high pressure hose that would not kink, flatten, puncture or collapse at inopportune moments. A new coupling known as the J-M Flexible Metallic Combination Hose is said by the manufacturers to fulfill these conditions. This connector consists of durable rubber hose, protected against outward injury by a stout metal armor. The armor is made in the form of a ribbon, with crimped edges, forming, when wound, a continuous, interlocking flexible spiral, which is said to be practically pressure-tight in itself, without the inner tube. As the interlocking construction of the spiral restricts the curvature, sharp bends are impossible. Consequently the inner tube cannot kink or flatten, and is always open to its full diameter, permitting an unrestricted flow of steam, gas or liquid.

Owing to its unusual strength, the armor is practically proof against damage from the outside. Service tests show that it will resist a crushing strain of 300 to 800 lbs. to each four turns of the spiral, depending on the size of the hose, while it is capable of withstanding the highest internal working pressures. It is claimed that this hose cannot be put out of service unless both the outer armor and inner tube are punctured at the same time. In case the armor is dented or jammed, it will still serve as an efficient protection to the inner tube, and can be restored to its original condition. The substantial construction of the armor permits the use of a much lighter inner tube than is ordinarily used. This means a decided saving when it becomes necessary to renew the rubber hose. The inner tube is never subjected to any pulling strain, as the armor is stretched to its maximum length before the former is inserted. All the working strain comes on the armor, which is tested to resist an end pull or thrust of 1,000 to 2,000 lb.

Another advantage of the new hose is that its exterior surface, unlike ordinary single types of hose, does not become excessively hot when used for steam service, drills, or blowing out boilers, and can therefore be more conveniently handled. There are no rough edges in the metal armor of J-M Combination hose to cut or chafe the inner tube—no cracks or spaces between the spirals to permit the tube to work out or blow through, and, as the exterior is smoothly finished, it cannot cut or scratch the hands.

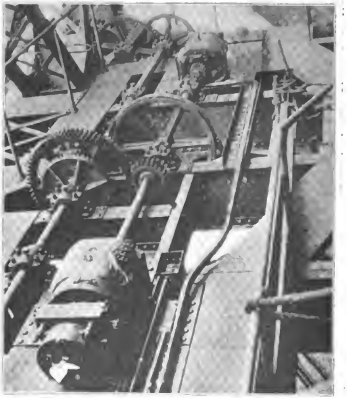
Specially designed couplings of malleable iron or brass are furnished with each length of hose. These couplings are virtually a union of three pieces: An outer sleeve into which the metal armor is threaded and riveted fast, the internal nipple, tapered on one end to fit tightly inside the inner tube, and the lock or binding nut, which serves to wedge the internal nipple well into the inner tube and hold it tightly against the inner walls of the outside sleeve. The outer end of the internal nipple can be furnished in male or female type, threaded to meet any standard requirement.

J-M Combination hose can be furnished in any length, any inside diameter up to 12 in., of any metal, and for all working pressures. It is also made with an inside pressure-tight metallic lining, as well as outside metal armor, for suction service, oils, etc. For boiler wash-out, round-house work and other places where steel would corrode, copper armor should always be used.

The H. W. Johns-Manville Co., New York, have published an interesting circular on this new coupling, which they will forward on request to anyone interested.

TWO MOTOR-OPERATED RAILROAD LIFT BRIDGES.

Practically all the railroad lift or draw bridges erected in the last few years, where electric current is available, are motor operated. Experience has proved that motors are fully as reliable as any other form of drive, and they are



Motors Applied to Bronx River Bridge.

more economical, as there is no maintenance expense when the bridge is not being operated. The control of motors is also simpler than that of any other form of drive, and many protective devices can be installed.

Two interesting installations of motor-operated railroad bridges are those that carry the six tracks of the Harlem river branch of the New York, New Haven & Hartford over the Bronx and the Hutchinson rivers and over which approximately two hundred trains pass daily. Each bridge is made up of three leaves, each leaf carrying two of the six tracks. The Bronx river bridge is near the Westchester avenue station, and the Hutchinson river bridge is between

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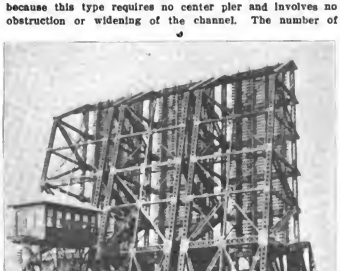
Baychester and Bartow stations. Both are the Scherzer type rolling lift bridges.

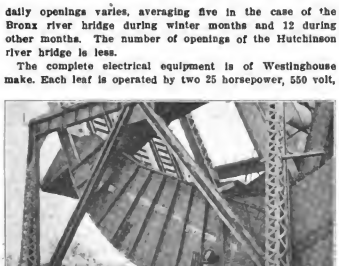
Since the channels spanned by these bridges are only about 100 ft. wide, the rolling lift construction was adopted, because this type requires no center pier and involves no obstruction or widening of the channel. The number of



Six-Track Scherzer Rolling Lift Bridge Across Bronx River.

daily openings varies, averaging five in the case of the Bronx river bridge during winter months and 12 during other months. The number of openings of the Hutchinson river bridge is less.

The complete electrical equipment is of Westinghouse make. Each leaf is operated by two 25 horsepower, 550 volt,



Method of Conveying Conductors to Moving Parts.

direct current motors, mounted on the moving leaf and geared to pinions which project from the side and mesh with racks on the stationary part of the bridge. Under ordinary circumstances the two motors on each leaf are operated together as one unit, but either can be controlled separately, and either has sufficient capacity to move its leaf, although, of course, more slowly than if the two motors were working together. Both motors are provided with electric brakes, and each leaf has a separate emergency brake.

The motors, brakes and other apparatus on the bridge itself are weatherproof, and designed for successful operation through an angle of 90 deg., through which angle the bridge moves vertically. The conduit carrying the current to the moving part of the bridge can be seen near the lower left-hand side of one of the photographs, passing to the under side of the roll-way, and, when the bridge is open, as shown, lying along a trench to the point where the conduit is carried up into the bridge itself. As the bridge swings down, the point where the cables enter the leaf moves upward, and the slack cable rises out of the trench.

The bridge is controlled from a tower. To open the bridge the signals are first set against trains, de-rails are opened, and bridge rail lock mechanisms are released. The controllers are then operated, and the upward movement of the bridge begins. At four points in its travel, signal lamps are lighted and bells are rung. If the power is not shut off when the leaves are at the proper height, a circuit breaker is tripped automatically. When the bridge is open, the navigation lights on the river change from red to green. The leaves are arranged in case of emergency to be manually operated by means of an endless chain over a wheel on the counter shaft. Considerable time is required for this, and it has never been necessary since either of the bridges were put into service.

THREE POSITION MOTOR RELAY.

The illustration herewith shows the new three-position direct current motor relay which has been designed by the General Railway Signal Company for use in wireless control automatic block signaling. The pickup, drop-away, contact pressure, and opening are the same as the G. R. S. model 9 tractive type.

New Three-Position Direct Current Motor Relay for Wireless Signal Control.

For use in cut sections the track control is broken through one set of contacts only instead of through the neutral and polar contacts as when polarized relays are used. This means that the sections can be employed to as great a length as is possible with the ordinary neutral relays. Furthermore, this relay is much less subject to the influence of large flashes of current or lightning than any other form of polarized relay.

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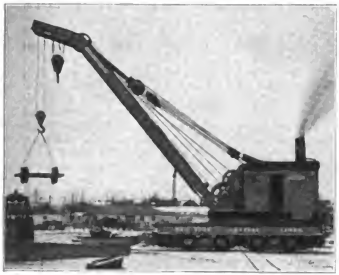
A LARGE RAILWAY STYLE WATER TOWER.

What is believed to be the largest steel tank on a short steel tower of a style commonly used by railways is being completed at Lakewood, O., a suburban city, close to Cleveland. It has a capacity of 560,000 gal. and height to bottom of tank of about 18 ft. The total height is 70 ft. and the diameter 46 ft. The bottom of the tank is constructed of compound curve, the largest radius of curvature being about 24 ft. The twelve columns are each supported by a pier 10 ft. square at base and 6 ft. high. No roof is used on this tank. The two balconies are for ornamentation and also for convenience in inspection. The initial cost of tanks of the size illustrated approximates five cents per gallon.

This structure illustrates the tendency of engineers to abandon the steel stand pipe having a flat bottom resting on a masonry pier. A large portion of the cost of flat bottom stand pipes is included in the extra masonry required to support them. The water in the lower portion is usually not available for service and failures due to rusting out of metal sometimes occur. The structure shown was designed and built by the Des Moines Bridge & Iron Co., Pittsburgh, Pa.

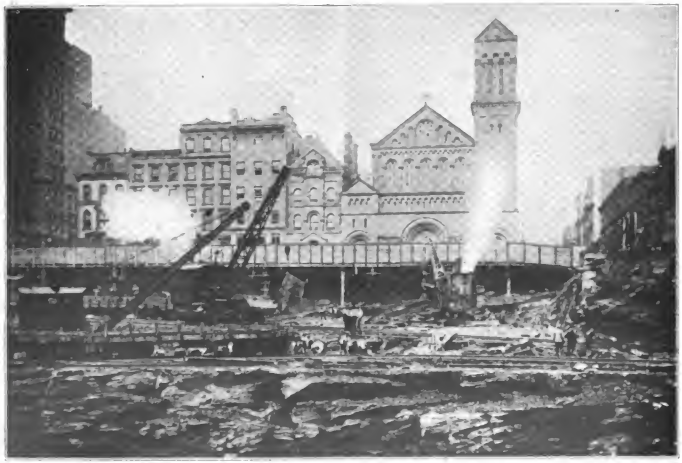


New Wrecking Crane for New York Central Lines.

LOCOMOTIVE CRANES IN THE CONSTRUCTION OF THE GRAND CENTRAL TERMINAL.

A large portion of the rock from the excavation for the new Grand Central Terminal, New York, was handled by seven cranes built by the Browning Engineering Co., Cleveland, O. These machines had been in constant use since the terminal work began, eight or nine years ago, and after the completion of the work will be sent to various yards for handling coal, cinders, etc. Some of the cranes are of 10 tons and some of 15 tons capacity, being equipped with booms of variable lengths. They were used to handle the rock after blasting, in most cases loading it onto flat cars.

These machines were particularly adapted to the handling of this rock, since in many cases the pieces resulting from the blasting were too large to be handled by a steam shovel dipper and the use of the cranes allowed these large rocks to be handled without further breaking. The cranes were also used to handle concrete into the forms and the cement, sand and stone around the mixing plants; also cinders, ties, rails and other heavy material throughout the course of the work. In the construction of the buildings, they were used to set the columns and girders and were frequently used for switching cars on the temporary tracks.



Browning Cranes Handling Rock Excavation for the New Grand Central Station, New York.

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At the Coliseum

LIST OF EXHIBITORS.

The following is a complete list of all exhibits, in place or being installed, in the Coliseum and the First Regiment Armory. Spaces numbered from 1 to 212, inclusive, are in the Coliseum, and, unless otherwise indicated, the space numbers in the list are in the Coliseum. Exhibits in the Armory are so indicated:

Adams & Westlake Company, Chicago, Ill.—Signal lamps, railway hand lanterns, folding lavatories, car lighting fixtures, car baggage rack and car window devices. Represented by W. H. Baldwin, G. L. Walters, A. S. Anderson, C. B. Carson, W. J. Pierson, H. G. Turney, J. T. Ross, T. A. Galt. Spaces 83, 84, 102 and 103.

Ajax Forge Company, Chicago, Ill.—Manganese steel one-piece guard rail, Manganese frogs, guard rail clamps, adjustable switch rods and rail braces. Represented by F. B. Bradley, H. G. Elfborg and H. C. Hutchins. Spaces 230, 235, 236, Armory.

American Guard Rail Fastener Company, Philadelphia, Pa.—Vaughan automatic rail anchors, Vaughan guard rail clamps, anchor guard rail clamps, tie plate guard rail fasteners. Represented by David F. Vaughan and Charles Z. Vaughan. Space 119.

American Hoist & Derrick Company, Chicago, Ill.—American railroad ditcher. Represented by Frank J. Johnson, William L. Manson and C. C. Austin. Space 47.

American Lock Nut Company, Chicago, Ill.—Absolute lock nut. Represented by F. M. Bobo, B. A. Radcliffe, W. W. Smith, W. J. Hamlin, E. J. Murdock. Space 162.

American Rail Joint Company, Toronto, Canada.—Reinforced angle bars and rail joints. Represented by T. D. Bedoe. Space 148.

American Steel & Wire Company, Chicago, Ill.—Right-of-way fencing, galvanized steel fence posts, steel farm crossing gates, signal wire, switch ropes, telegraph and telephone wires, insulated wires and cables. Represented by J. W. Collins, B. H. Ryder, L. P. Shanahan, C. J. Boon, M. E. Evans, F. J. Conkling, J. W. Meaker, H. A. Parks and C. H. Knight. Spaces 261, 262, 267, 268, Armory.

American Vulcanized Fibre Company, Wilmington, Del.—Rail joint insulation, fibre plate, end posts, bushings, steel ties, shims and other fibre products. Represented by John Barron, C. C. Bell and J. H. Burn. Space 117.

Asphalt Ready Roofing Company, New York, N. Y.—Roofing materials, Hudson asphalt shingles, Protection brand roofing. Represented by H. H. Huested and W. A. Hemenway. Space 167.

Associated Manufacturers' Company, Waterloo, Ia.—Jerry boy section motor car, gasoline engines, magnetos. Represented by A. H. Ambrose and Alfred Grove. Space 161.

Atlas Preservative Company of America, New York, N. Y.—Descriptive matter of Atlas products, particularly Atlas "A" weed killer and track preservatives. Represented by R. N. Chipman and Jacob Kramer. Space 169.

American Valve & Meter Company, Cincinnati, O.—Poage automatic water columns and tank fixtures, Fenner drop spout, Anderson economy switch stands, interlocking switch stands and safety switch locks. Represented by J. T. McGarry and F. C. Anderson. Spaces 130, 131 and 132.

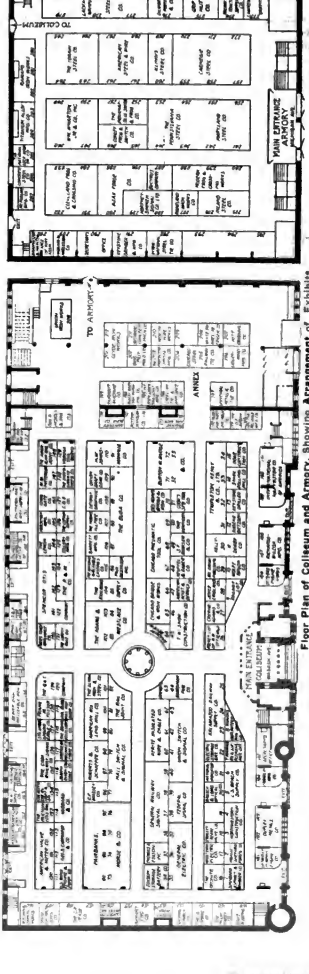
Barrett Manufacturing Company, Chicago, Ill.—Bridge waterproofing, Barrett specification roofs, Barrett Tarrok subfloors, Hydronon, the dampproofing paint, waterproofing for buildings. Represented by H. B. Nichols, W. S. Babcock, Henry Olmsted, Jr., B. B. Breder and J. J. Ross. Space 106.

Beaver Dam Malleable Iron Company, Beaver Dam, Wis.—Tie plates and rail braces. Represented by D. P. Lamoreux, Lawrence Fitch and Frank Bell. Spaces 165 and 166.

Bausch & Lomb Optical Company, Rochester, N. Y.—Engineers' and surveyors' instruments. Represented by W. Louis Johnson, Chas. A. Bengston and Harold D. Skelton. Space 20.

Blessing Louis, Jackson, Mich.—Reinforced concrete railway tie, "Safite" rail fasteners and noiseless rail joint. Represented by Louis Blessing and Fred M. Hall. Space 149.

Blocki-Brennan Refining Company, Chicago, Ill.—Carboxide Elastic Metal Preserver. To protect steel and iron structures against weather conditions, sulphur and acid fumes. Represented by Jas. C. Cleary, Glenn E. Plumb, W. F.



Floor Plan of Coliseum and Armory, Showing Arrangement of Exhibits.

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Brennan, Gordon E. Douglas and Rudolph Braocker. Space 194.

S. F. Bowser & Company, Inc., Fort Wayne, Ind.—Oil storage systems, self-measuring and power-driven pumps, oil tanks large and small, gasolene storage, self-registering pipe line measures, oil filtering and circulating systems. Represented by J. L. Handy, W. T. Simpson and E. H. Briggs. Space 49.

L. S. Brach Supply Company, New York, N. Y.—Lightning arresters, insulating compounds, handy die stocks, railway crossing signals, Brach handy pipe vise, Brach hydrogrounds, Brach vacuum arrester testing sets, Brach lightning arrester cabinets, Brach iron arrester cases, Brach volt meters, solderall kettles, solderall torches and Brach duplex shunts. Represented by L. S. Brach, A. G. Brach and H. E. Gifford, Jr. Spaces 5 and 6.

Bryant Zinc Company, Chicago, Ill.—Crossing signals, relays, channel pins, annunciators, Waterbury batteries, and Orangeburg fibre conduit. Represented by Stanley C. Bryant, J. P. Costigan, E. M. Deems, J. W. Cremerius, A. F. Klink and H. F. Worden. Spaces 154 and 155.

Buda Company, Chicago, Ill.—Motor cars, track drills, bumping posts, jacks, switch stands, car replacers, electric storage battery, shop truck, electric crossing gate, automobile engines, etc. Represented by H. C. Beebe, W. C. Dyer, H. S. Evans, R. B. Fisher, J. J. Gard, J. T. Harahan, Jr., L. Hamill, Wm. P. Hunt, Jr., E. Johnson, W. Krause, G. J. Slibeck, M. E. Towner, T. H. Wheeler. Spaces 87, 88, 89 and 90.

Bucyrus Company, South Milwaukee, Wis.—Pictures of locomotive piledrivers, steam shovels, drag line excavators, wrecking cranes and unloading plows. Represented by P. E. Dutcher. Space 237, Armory.

Buyers' Index Company, Chicago, Ill.—Publication "Railway Supply Index-Catalogue." Represented by Lloyd Simonson, Norman F. Rehm, Alex Smith, C. W. Cozzens, D. J. Beaton and F. B. Cozzens. Space 155.

Philip Carey Company, Cincinatti, O.—Carey Flexible cement roofing, celiboard, Deco veneer, waterproofing materials, etc. Represented by Allan Wallace, J. E. Fitzpatrick, N. S. Keasbey, E. P. Tingley and P. A. Johnston. Space 150.

Carnegie Steel Company, Pittsburgh, Pa.—Full set steel switch ties, United States steel sheet piling, steel wheels, gear blanks, axles, Duquesne rail joints, hot and cold worked splice bars, automatic stereopticon showing views of steel tie track and steel piling installations. Represented by N. M. Hench, L. C. Lustenberger, Robert Coe, C. F. W. Rys, John McLeod, John S. Unger, Edwin S. Mills, C. B. Friday, G. W. Landrus, G. E. Dix, H. van Zandt, C. E. Dinkey, J. W. Dix and H. D. Williams. Illinois Steel Company representatives: W. H. C. Carhart, George Baker, D. T. Buffington, H. L. Baker, D. E. Sawyer, H. C. Griswold, J. P. Walker, C. E. Haywood, W. J. Totten, T. W. O'Brien, J. B. Arnold, B. E. Hamilton and P. Carhart. Spaces 257, 258, 259, 260, 271 and 272 Armory.

George B. Carpenter & Company, Chicago, Ill.—Railway supplies. Represented by H. W. d'Evers and H. S. Hanson. Spaces 112 and 113.

Chicago Bridge & Iron Works, Chicago, Ill.—Steel towers and tanks. Represented by George T. Horton, Horace B. Horton, Robert H. Murray, Merle J. Trees, Elwood G. Ladd, Charles S. Pillsbury, Clinton M. Ladd, Kenneth I. Small and H. B. Murphy. Spaces 65 and 66.

Cleveland Frog and Crossing Company, Cleveland, O.—Frogs, switches, switch stands and rolled manganese rail crossings. Represented by George Stanton, L. G. Parker, W. S. Moore, George Arnold, Jr., and G. A. Peabody. Spaces 231, 232, 233 and 234.

Clyde Iron Works, Duluth, Minn.—One 8¼ in. by 10 in. double cylinder, double drum erectors' hoist with four independent winch heads; one 7 in. by 10 in. double cylinder, double drum contractors' hoist complete with bull wheel swinging gear, and various sizes of blocks and sheaves. Represented by A. E. Holcomb and G. P. Miller. Spaces 201 and 212.

Chicago Pneumatic Tool Company, Chicago, Ill.—Rockford railway motor cars, pneumatic and electric tools, rail bonding outfits, etc. Represented by C. E. Walker, J. C. Campbell, P. F. Flavin, M. O'Connor, W. F. Delaney and J. W. McCabe. Spaces 67, 68 and 69.

Chicago Steel Railway Tie Co., Chicago, Ill.—Steel and concrete railway ties. Represented by Walter R. Carmody, T. P. Ingleshy and John Hemmingway. Spaces 204 and 205.

Commercial Acetylene Railway Light & Signal Company, New York, N. Y.—Flashing signals, commercial acetylene headlights, acetylene signal lighting. A. G. A.-Dalen signal devices, Oxy-Acetylene welding. Represented by C. E. Lee, H. G. Doran, E. T. Sawyer and F. A. Barbey. Space 134.

Concrete Steel Company, Chicago, Ill.—Reinforcing bars, safety tread and bar bending machines. Represented by Fred C. Harper, John G. Ralston and T. M. Davidson. Space 286 Armory.

Conley Frog & Switch Company, Memphis, Tenn.—Three designs of Conley frogs. Represented by J. E. Conley, F. W. Lange and J. W. Buzick. Spaces 245 and 246 Armory.

Cook Railway Signal Company, Denver, Colo.—Automatic block signals, automatic crossing gates and "Revivo" dry storage batteries. Represented by W. J. Cook, George R. Simmons, M. W. Breuer and N. Fallek.

Cook's Standard Tool Co., Kalamazoo, Mich.—Track drills, bonding drill, track tool grinders, chucks, drill bits, track jacks, car jacks and cattle guards. Represented by Eugene Cook, Walter Reynolds and E. B. Cook. Space 51.

Crerar, Adams & Company, Chicago, Ill.—Calumet heavy duty track drills, Eureka bonding drill, Hercules steel trucks, Calumet expanders, Shelby seamless steel tubing. Represented by Russell Wallace, W. J. Clock, C. J. O. Swift, W. H. Dangle, J. A. Martin, G. D. Bassett and T. W. Barrett. Space 27.

The Curtain Supply Company, Chicago-New York.—Ring 88 curtain fixture, Rex all-metal curtain rollers, Rex steel sash balance, vestibule curtains, including Rex release handle, Rex steel vestibule roller, No. 6 roller, vest hook, Rex vestibule curtain opening shield and C. S. C. O. diaphragms and fireproof hoods. Represented by W. H. Forsyth, S. W. Midgley, F. M. Egolf and Randolph Reynolds. Space 126.

D. & A. Post Mold Company, Three Rivers, Mich.—D. & A. cement fence machines, special molds for line, anchor and brace posts, D. & A. post manufactured by Pennsylvania Railroad Company, post reinforcements and fence fasteners. Represented by G. H. Dougherty, L. R. Dougherty, O. Dougherty and L. A. Dougherty. Space 168.

David Lupton's Sons Company, Philadelphia, Pa.—Steel sash and window operating device. Represented by C. P. Pond, R. A. Sanborn and G. J. Wagner. Space 159.

Des Moines Bridge & Iron Company, Pittsburgh, Pa.—Steel water towers, steel coaling stations, steel standpipes and novelty beam and tank calculator. Represented by W. W. Hendrix and A. C. Pearsall. Space 70.

Detroit Graphite Company, Detroit, Mich.—Paints for railroad service. Represented by T. R. Wyles, L. D. Mitchell, B. O. F. Randolph, A. H. Kuerst, E. Booth, J. J. Hogan and C. C. Potter. Space 108.

Eugene Dietzgen Company, Chicago, Ill.—A complete line of improved railroad transits and levels. Represented by C. E. Cole and G. C. Moore. Space 12.

Paul Dickinson, Inc., Chicago, Ill.—Smokejacks, Aeolus ventilators and cast iron chimneys. Represented by A. J. Filkins, J. A. Meaden, George M. Kenyon, Wm. H. Dayton, F. C. Webb and G. H. Vrooman. Space 86.

Dilworth, Porter & Company, Ltd., Pittsburgh, Pa.—Railroad spikes and tie plates. Represented by W. H. Schleiter and Joseph Dilworth. Space 276 Armory.

Joseph Dixon Crucible Company, Jersey City, N. J.—Dixon's silica graphite paint and graphite productions. Represented by H. W. Chase, R. R. Belville and F. B. Gibbs, Jr. Space 115.

Drouve Company, G. The, Bridgeport, Conn.—Skylights and window operating device. Space 151.

Duplex Metals Company, Chester, Pa.—Copper clad wire and accessories. Represented by C. B. Semple, W. T. Kyle, L. M. Gordon, R. C. McCall, Elgin Braine and B. F. Cameron. Spaces 182 and 183.

E. D. E. Company, Chicago, Ill.—Flaxlinum insulation for refrigerator cars, ice houses and fireproof Flaxlinum insulation for steel passenger cars. Represented by Frank M. Gilmore and Frank J. Burns. Space 127.

Eastern Granits Roofing Company, New York, N. Y.—Granite roofing, Evertite roofing, Tilsbest roofing and Paimoid roofing. Represented by H. Henning, A. E. Roever and W. F. Sachs. Space 128.

Edison Storage Battery Company, Orange, N. J.—Storage batteries for railway signals, car lighting, telegraph and telephones. Represented by H. G. Thompson and George W. Dawes. Space 54.

Edison, Thos. A., Inc., Orange, N. J.—Primary batteries. Model working exhibit, showing B. S. C. O. gravity and storage batteries working on track circuits. Represented

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by E. E. Hudson, F. J. Lepreau, P. A. Garrity and E. McGall. Space 55.

Electric Storage Battery Company, Chicago, Ill.—"Chloride," "Tudor," "Exide," "Hycap" and "Ironclad-Exide" batteries to be used in car lighting, telephone, telegraph and signal operation; storage battery locomotives, central station batteries, commercial industrial trucks and operation of drawbridges. Represented by G. H. Atkin, T. Milton, H. N. Beck, R. J. Baird, T. A. Cressey and P. G. Downton. Space 22.

Elyria Iron & Steel Company and the Hart Steel Company, Elyria, O.—Tie plates and compromise rail joints. Represented by Guilford S. Wood, A. W. DeRocher, W. T. Bents and J. H. Allen. Space 101.

Fairmont Machine Company, Fairmont, Minn.—Motor cars, bridge building, 4-speed cars, section and inspection car. Represented by F. E. Wade and H. E. Woolery. Space 193.

Federal Signal Company, Albany, N. Y.—Federal electric interlocking, Federal electromechanical interlocking machine, Federal switch guard, Federal top post signal mechanism, 3-position solenoid dwarf signal, Mercury time release, hand time release, track model, battery charging switch, switch box, etc. Represented by A. H. Renshaw, J. T. Cade, C. Hunt, H. G. Thompson, J. J. Hubbard, H. C. Ware, H. P. Ober, John Kelly, W. H. Richard and A. C. Dunne. Spaces 38 and 39.

Franklin Manufacturing Company, Franklin, Pa.—Franklin asbestos lumber smoke jacks, asbestos train pipe covering, "Franklin" 85 per cent magnesia sectional boiler lagging, and cotton and wool waste. Represented by E. R. Rayburn, L. B. Melville, R. J. Evans and H. S. Hayden. Space 184.

The Frictionless Rail, Boston, Mass.—Rail for track curves. Represented by F. A. Barbey, J. W. Mnnama, S. W. Simonds, G. H. Bryant and T. F. Dwyer, Jr. Space 133.

Fairbanks, Morse & Company, Chicago, Ill.—Motor cars, combined oil engine and pump, 9 HP oil engine directconnected to 5½ Kw generator, steam pump, cattle guards, scales, standpipe, boiling outfit, chain hoists, double-acting deep well cylinder, electric motor, jacks—ratchet, hydraulic and ball bearing, Eclipse engine and trench pump. Represented by S. F. Forbes, A. A. Taylor, E. M. Fisher, L. H. Matthews, D. J. Higgins, F. C. Condit, C. L. Jones, F. H. Douglas, Geo. A. Akers, C. T. Fugitt, K. B. Brown, W. W. Adams, A. M. Fenwick, D. K. Lee, F. V. Roy, E. E. Pendray, L. Norvell and H. E. Vergosen. Spaces 92, 93, 94, 95, 73, 74, 75 and 76.

General Electric Company, Schenectady, N. Y.—Electrical equipment for steam railways and railway supplies. Represented by H. L. Monroe, W. J. Clark, A. W. Jones, F. Rhea, W. O. Kellogg, W. H. Coleman, J. Roberts, H. M. Jacobs, G. F. Gray, L. W. Shugg, A. P. Jenks, L. A. Crawford, C. H. Jones, B. F. Bilsland and H. K. Ferguson. Spaces 35, 36 and 37.

General Railway Signal Company, Rochester, N. Y.—Power signaling, consisting of electric interlocking using dynamic indication, alternating current block signals, A. P. Block system, Selective signal system for telephone train despatching, model 4 switch machine, 110-volt model A signals, direct-connected and base of mast types, model 2A dwarf signal, light signals, direct and alternating current, model 2A block signals, signal transformers, alternating and direct current relays and indicators, model 5 form A switch box, 3-position relays and signal accessories. Represented by W. W. Saimon, G. D. Morgan, M. Wuerpel, H. M. Sperry, F. W. Moffett, M. F. Geer, S. N. Wight, A. G. Moore, M. R. Brinsy, L. Thomas, C. O. Poor, F. H. Jones, W. K. Howe, F. L. Dodgson, W. S. Henry, J. H. Campbell, S. M. Day, O. A. Ross, L. B. Somerby, A. Thomson, L. E. Dodge and H. C. Frey. Spaces 56, 57, 58 and 59.

Gordon Primary Battery Company, New York, N. Y.—Gordon primary battery. Represented by O. S. Flath, G. A. Nelson and W. M. Kinch. Space 156.

Griffith, Lawrence, Yonkers, N. Y.—The Griffith shoulder tie plate insulated rail joint. Represented by Lawrence Griffith. Space 273, Armory.

Grip Nut Company, Chicago, Ill.—Grip lock nuts, grip holding nuts, monogram bolt fastener and the D. P. journal box dust guard. Represented by W. E. Sharp, Blake Hooper, E. V. Lea and C. Beaumont. Space 275, Armory.

Hall Switch & Signal Company, New York, N. Y.—Automatic signals, relays, switch boxes, electric interlocking machines, switch machine and auxiliary appliances used in signal work. Represented by W. H. Lane, W. J. Gaillingham, Jr., H. J. Mullineaux, H. B. Taylor, H. L. Hollister, R. Connell, O. B. Frink and C. R. Sloan. Spaces 77, 78, 79 and 80.

Hayes Track Appliance Company, Richmond, Ind.—Hayes derails, models A, CX, E and H, with operating and target stands. Represented by S. W. Hayes, W. Harding Davis, J. E. Ruby, E. W. Brown, E. C. Knapp, J. McCulloch, Jr., Wellington B. Lee, Arthur Gemunder and F. C. Stowell. Space 140.

Hitt Crossing Company, Champaign, Ill.—Space 207.

Hobart-Allfree Company, Chicago, Ill.—Smyth and Freeland derailers, Newton car replacers, one-eighth-size model of piston valve cylinders. Represented by B. F. Hobart, E. H. Allfree, F. R. Cooper and W. H. England. Space 107.

Hoeschen Manufacturing Company, Omaha, Neb.—Mechanical highway crossing bells. Represented by H. Hoeschen, H. P. Ryner, A. H. Snedeker, R. A. Fry and George H. Fisher. Space 145.

Hubbard & Company, Pittsburgh, Pa.—Railroad track tools, shovels, spades and scoops, Pierce specialties, pole line material and washers. Represented by R. L. Mason and O. W. Youngquist. Spaces 114 and 115.

Haggard & Marcusson Company, Chicago, Ill.—Tiger steel bunks. Represented by Henry H. Marcusson. Space 289, Armory.

Indianapolis Switch & Frog Company, Springfield, O.—RNR solid manganese frog, "Indianapolis" manganese crossing, RNR frog crossing, "Indianapolis" portable electric welder, electric welded joints, reclaimed manganese frog and manganese plated rail frog. Represented by E. C. Price, J. A. Foulks, W. H. Thomas and J. C. Jameson. Spaces 251 and 252 Armory.

Ingalls-Shepard Forging Company, Harvey, Ill.—Represented by W. E. Foster. Space 2.

Inland Steel Company, Chicago, Ill.—Open hearth steel products, tie plates, railway track bolts and track spikes, rivets, Vismera rust and corrosion-resisting iron sheets and products, concrete reinforcing bars, rail carbon, plain and hot twisted, medium open hearth steel, plain and cold twisted, steel barrels and steel fence posts. Represented by H. L. Hart, R. C. Coombs and A. C. Roeth. Spaces 225 and 226 Armory.

International Harvester Company of America, Chicago, Ill.—Oil engines and tractors for railroad construction work. Represented by A. F. Young and C. C. Mangrum. Spaces 189, 190 and 191.

International Interlocking Rail Joint Manufacturing Company, Chicago, Ill.—Interlocking rail joint (Barnhill joint). Represented by J. McWeeny, W. H. Llenesch and B. E. Reed. Space 195.

International Steel Tie Company, Cleveland, O.—Steel railway ties and steel crossing ties. Represented by Wm. P. Day, J. J. O'Donnell, L. C. Shank, George Harpham and W. C. Mahon. Space 292 Armory.

Iowa Gate Company, Cedar Falls, Ia.—Right of way and stock yard gates (metal). Represented by Jack Hyland, Jos. B. Clay and John H. Meyer. Space 146.

W. F. Jordan Company, Chicago, Ill.—Jordon spreader. Represented by M. J. Woodhull and F. C. Rutan. Space 179.

Johns-Manville Company, H. W., New York, N. Y.—Asbestos smoke jacks, shingles, roofings, passenger and freight car insulation, pipe coverings, boiler lagging, cork insulation, cork tile, waterproofing materials, mastic flooring, packings, sectional conduits, fibre conduits, electrical materials. Represented by J. E. Mcek, J. C. Youngiove, B. J. Feeney, E. T. Wade, L. L. Cohen, Geo. Christenson, Chas. Craig, F. W. Dey, M. H. Farnsworth, C. D. Folsom, C. W. Gearhart, R. A. Hamaker, L. E. Hassman, W. J. Hennessey, F. J. Horne, P. C. Jacobs, D. L. Jennings, W. H. Lawrence, H. L. Leach, H. T. Morris, C. E. Murphy, H. M. Newell, H. G. Newman, G. A. Nicol, H. B. Sewell, J. H. Trent and H. A. Waldon. Spaces 91 and 110.

Joyce Cridland Company, Dayton, O.—Lifting jacks. Represented by Chas. D. Derby, Geo. W. Llewellyn and Frank I. Joyce. Space 28.

Kalamazoo Railway Supply Company, Kalamszoo, Mich.—A general line of track and railway supplies including motor cars, track drills, light velocipedes, etc. Represented by John McKinnon, D. A. Stewart, C. A. Wallace, W. N. Sidnam, E. R. Martin, H. N. Whipple, E. Hicks and W. Winterle. Spaces 23, 24 and 25.

Kelly-Derby Company, Chicago, Ill.—Pumps, engines, motors, well cylinders, rubber, wire cloth and crucibles. Represented by C. W. Kelly, R. E. Derby, W. L. Berchoffer, S. D. Baldwin, Robert McGowan and J. E. Bond. Spaces 11 and 30.

Kennicott Company, Chicago, Ill.—Working models of water softener and filter. Represented by Cass L. Kenni-

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cott, E. J. Flemming, W. D. Hawkins, F. S. Dunham, T. G. Winden, Jr., and Wm. N. Jewell. Space 50.

Kerite Insulated Wire & Cable Company, New York, N. Y.—Kerite insulated wires and cables. Represented by R. D. Brixey, Axel Ames, P. W. Miller, J. W. Young, Joseph A. Renton, B. L. Winchell, Jr., and G. A. Graber. Spaces 60, 61 and 62.

Kauffel & Esser Company of New York, Chicago, Ill.—Drawing materials, measuring tapes, surveying instruments, etc. Represented by Rudolf Link, James J. Carlisle, H. B. Hunter, Edw. C. Harris, J. C. Hess and Carl W. Strassburger. Space.

Keystone Driller Company, Beaver Falls, Pa.—Downie deep well pumps and well drilling machinery. Represented by E. O. Eyer and G. H. Conyne. Space 13.

Keystone Grinder & Manufacturing Company, Pittsburgh, Pa.—Portable automatic tool-grinding machines. Represented by Wm. L. Munk, G. H. Hommel and S. S. Newman. Space 291, Armory.

Lackawanna Steel Company, Buffalo, N. Y.—Rails, structural material, cabbneta of rolled sections, illuminated views of mills, shops, mines, etc, rail joint splices, book shoulder tie plates, rail joint plates and Lackawanna steel sheet piling. Represented by C. R. Robinson, E. Armstrong, A. P. Van Schaick, C. H. Hobbs, J. L. Hench, F. E. Abbott and A. H. Weston. Spaces 277, 278 and 279 Armory.

Lehon Company, The, Chicago, Ill.—Waterproof canvas, roofing, insulating papers, sill covers, saturated burlap Represented by Tom Lehon and D. B. Wright. Space 144.

Ludgerwood Manufacturing Company, Chicago, Ill.—Hoisting engines and boilers. Represented by F. B. Knight, G. N. Crawford, W. G. Wilmont, E. C. Reeder and W. R. Elden. Space 206.

Lorain Steel Company, Johnstown, Pa.—Track material, frog crossings, switches of both rolled and cast manganese, switch stands, rail braces and guard rail clamps. Represented by A. S. Littlefield, S. P. McGough, H. H. McDonald, Arthur S. Littlefield, Charles G. Donnell, Carroll Burton, George W. Reese, Wm. Lynam, J. E. Decker, W. W. Kingston and A. L. Verner. Spaces 263, 264, 265 and 266 Armory.

Luitweiler Pumping Engine Company, Rochester, N. Y.—Non-pulsating deep well pump, triplex pump.—Represented by R. J. Bamerslean. Space 181.

Lufkin Rule Company, Saginaw, Mich.—Measuring tapes and rules of every description. Represented by S. B. McGee and F. G. Brown. Space 121.

M. W. Supply Company, Philadelphia, Pa.—Vaughan rail anchors. Represented by David L. Vaughan. Space 163.

McGraw Publishing Company, New York, N. Y.—Copies of the Electric Railway Journal, Engineering Record, Electrical World, Metallurgical and Chemical Engineer, Electric Railway and Lighting Gazette, and other special publications. Represented by Hugh M. Wilson, L. E. Gould, E. J. Hunt, Sam Hobson, S. T. Henry, W. E. Kelly, E. M. Haas, W. W. DeBerard, F. Nicholas, E. J. Mehren, C. W. Stark, H. L. Fischacher, E. B. Cooke, Henry Barnes and Lyon Gardiner. Space 89.

Burton W. Mudge & Company, Chicago, Ill.—Motor cars for inspection, section and spike driving service; right of way gates. Represented by Burton W. Mudge, Thomas H. Garland, Robert D. Shutz, A. R. Dyer, Robert M. Smith, Blake C. Howard, George W. Bender, Ira W. Winchell, S. S. Lawson, Clive Hastings, H. L. Goodwin, Lathrop Ressegule, Fred S. Wilcoxen, Royal D. Hawley and A. P. Grenier. Spaces 52, 53, 71 and 72.

C. F. Massey Company, Chicago, Ill.—Reinforced concrete railway supplies such as culvert pipe, battery wells, signal posts, telephone booths, etc. Represented by C. F. Massey, A. Christ, Jr., O. J. West, Chas. Gilman, R. A. Peterson, E. M. Hathaway, T. W. Scott and H. W. Wilder.

Morden Frog & Crossing Works, Chicago, Ill.—Solid and built-up manganese frogs, manganese crossing, manganese switch points, Unity, Security and G. L. M. switch stands, guard rails, guard rail clamps, compromise joints, rail braces, etc. Represented by Irving P. Harts, Arthur C. Smith, Harry M. Macke, William J. Morden, W. Homer Hartz and B. T. Gibbs. Spaces 238, 239 and 240 Armory.

National Carbon Company, Cleveland, O.—Columbia track batteries types 71 and 73, Columbia dry batteries, Columbia multiple batteries, Columbia blue label flashlight batteries and flash lights. Represented by M. H. Moffett, Chas. S. Pfaisterer, W. O'Connor and L. W. Fisher. Space 152.

National Concrete Machinery Company, Madison, Wis.—National Concrete fence posts. Represented by Victor E. Rogers and W. L. Casady. Space 221.

National Corrugated Culvert Company, Middletown, O.—Corrugated culverts and flumes. Represented by G. F. Ahlbrandt and Paul T. Defrees. Spaces 99 and 100.

National Electric Specialty Company, Toledo, O.—"Vac-M" (Vacuum) lightning arresters, Signal types No. 1 and No. 2 for automatic block signal work and police and fire alarm telegraph. Giant type for telephone and train dispatching; high tension transmission telephone lines, and toll lines. Telephone exchange type for ordinary subscribers' stations and local lines. Also Paragon ground cones. Represented by F. S. Chapman, V. A. Chapman, J. T. Greene, C. F. Wall and P. H. Chapman. Space 164.

National Indicator Company, Long Island City, N. Y.—Train indicators, station indicators, train departure bulletins, gate signs. Represented by J. Hutchinson and T. M. Wilders. Space 21.

National Lock Washer Company, Newark, N. J.—Nut-locks and testing appliances. Represented by John B. Seymour, Alvin T. Thompson, Chas. P. Williams and A. H. Handlan, Jr. Space 285 Armory.

National Malleable Castings Company, Cleveland, O.—Tie plates, rail braces, anti-rail creepers and bridge washers. Represented by C. L. Johnston, Chas. H. McCrea, J. J. Byers, H. J. Hiatt, L. W. De Witt and T. W. Ashton. Space 105.

George P. Nichols & Bro., Chicago, Ill.—Electrical turntable tractor. Represented by George P. Nichols, Samuel F. Nichols, R. M. Gustonand and Henry Price. Space 173.

Northey-Simmen Signal Company, Ltd, Indianapolis, Ind.—Apparatus for automatically drawing a graphic train chart in dispatcher's office; cab signal apparatus. Represented by F. Erichsen Brown, P. J. Simmen, C. E. Chatfield and Ed Moore. Spaces 229, 229, Armory.

Ogle Construction Company, Chicago, Ill.—Model coaling station and hoisting machine. Represented by R. A. Ogle, C. F. Bledsoe, E. G. Wendel and Otto Albertz. Space 15.

Ohio Post Mold Company, Toledo, O.—Molds for cement fence posts. Represented by Asa M. Smith and E. S. Smith. Space 202.

Okonite Company, The, New York City, N. Y.—Okonite wires and cables of all kinds, Okonite and Manson tapes, Candee pot heads. Represented by Lewis G. Martin, J. D. Underhill, W. G. Hovey, J. M. Lorenz, R. H. Baker and H. Cox. Space 16.

O'Malley-Beare Valve Company, Chicago, Ill.—Multiplate valves. Represented by Edward O'Malley, Thomas O'Malley and H. A. Crews. Space 18.

Spencer Otis Company, Chicago, Ill.—Economy steel tie plates, Kron automatic springless scales. Represented by H. H. Hart, W. I. De Remer, T. W. Blatchford, Hunter Michaels and Oliver Oleson. Spaces 122, 141, 142, 143.

Otto Gas Engine Works, Chicago, Ill.—Otto kerosene engine. Represented by W. Y. Shaw and D. S. Faulkner. Space 186.

The P. & M. Company, Chicago, Ill.—The P. & M. rail anticreeper, bond wire protector, Crane guard rail retainer and the Smith tie reserver. Represented by Alfred W. Moore, L. W. Kent, Alvar R. Sutter, Geo. E. Johnson, David T. Hallberg, John Ritchie, R. Harris, J. Edgar Johnson, Royal D. Hawley, Robert J. Mercur and Fred. A. Preston. Spaces 123 and 124.

W. H. Patterson Company, Pittsburgh, Pa.—High grade, hand made tackle blocks. Represented by W. W. Patterson, Jr. Space 147.

C. F. Pease Company, Chicago, Ill.—Automatic blue printing and direct blue line printing machines, paper coating machines, motor driven cutting tables, etc. Represented by C. F. Pease, P. M. Morgan, T. K. Murney, E. R. Thompson and L. M. Campbell. Spaces 157 and 158.

Pennsylvania Steel Company, Philadelphia, Pa.—No. 30 Manard anvil face frog dies, 160 32°; No. 20 Manard anvil face frog; No. 18 Manard anvil face frog; No. 16 Manard anvil face frog; No. 10 solid Manard frog; No. 10 spring rail frog with rolled Manard stiff rail; 30-ft switch complete having rolling Manard switch points; No. 10 Manard spring rail frog main line switch stands, low Steelton positive switch stand; low New Century switch stand with detector attachment; intermediate New Century switch stand with semaphore attachment; intermediate New Century switch stand; drop tests of joints, using iron, steel and Mayari steel bolts; drop tests of open hearth steel. Represented by G. S. Vickery, G. W. Parsons, C. A. Alden, C. A. Langdon, W. H. Allen, F. H. Ogden, W. H. Philler, W. M. Henderson, John C. Jay, Jr., C. S. Clark, R. E. Belknap, R. W. Gillespie, R. W. Reed, N. E. Safsich, J. G. Miller and R. C. Hoffman, Jr. Spaces 241, 242, 243, 244, 253, 254, 255 and 256 Armory.

Pocket List of Railroad Officials, New York, N. Y.—Pocket List of Railroad Officials. Represented by J. Alexander Brown, Chas. L. Dinsmore and Harold A. Brown. Space 26.

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Positive Rail Anchor Company, Louisville, Ky., and Marion, Ind.—Rail anchors. Represented by W. M. Mitchell, John C. Haswell and R. H. Johnson. Space 177.

Potter Winslow Company, Chicago, Ill.—Railway supplies in concrete. Represented by G. H. Macdonaugh and A. C. Hudelburg. Spaces 175 and 176.

Protective Signal Manufacturing Company, The, Denver, Colo.—A railroad highway crossing signal, annunciator for tower service; telephone selector. Represented by W. C. Neahr and D. B. Turner. Space 203.

Q. & C. Company, The, New York, N. Y.—Bonzano rail joints, Vaughan rail anchors, Bonzano rolled steel compromise joints, guard rail clamps, insulated rail joints, Samson rail benders. Represented by C. F. Quincy, F. F. Kister, T. B. Bowman, J. A. Wescott, E. M. Smith, H. A. Hawes, C. D. Walworth, J. A. Bodkin, A. R. Horn, W. A. Duckworth, J. J. Quinn and A. E. Stokes. Spaces 120 and 139.

Rail Joint Company, The, New York, N. Y.—Continuous Weber and Wolhaupter rail joints. Represented by L. F. Braine, Percy Holbrook, Benj. Wolhaupter, W. E. Clark, U. C. Armstrong, Fred L. Poor, H. C. Holloway, Geo. C. Isbester, Sumner Collins, E. L. Van Dressar, E. A. Condit, Jr., W. A. Chapman, J. G. Miller, R. W. Smith, W. S. Boyce, C. B. Griffin, Frank M. Hill and Chas. Jenkinson. Spaces 81 and 82.

Railroad Supply Company, Chicago, Ill.—Tie plates, derailers, high crossing alarms, electric signals and signal supplies. Represented by M. J. Comerford, R. D. Hawley, P. F. Hawley, F. C. Webb, H. M. Buck, Geo. M. Kenyon, A. H. Smith, E. H. Bell and E. W. Vogel. Spaces 85 and 104.

Railway and Engineering Review, Chicago, Ill.—The Railway and Engineering Review, a weekly magazine devoted to railway and engineering subjects. Represented by Willard A. Smith, Harold A. Smith, R. S. Richardson, C. L. Bates, A. E. Cherrifield, W. M. Camp and Robert R. Greig. Space 64.

Railway List Company, Chicago, Ill.—Railway publications. Represented by W. E. Magraw, C. S. Myers, L. F. Wilson, K. L. Van Auken, J. M. Crowe, Dalton Risley and W. R. Toppan. Space 9.

Railway & Traction Supply Company, Chicago, Ill.—Hercules steel bumping posts, Wyoming track sander, Wyoming vestibule curtain release. Represented by W. S. Barbee and E. C. Holmes. Space 274, Armory.

Ramapo Iron Works, Hillburn, N. Y.—Switch stands, switches, frogs, guard rail clamps, special switch slide plates, etc. Represented by J. Edgar Davidson, Wellington B. Lee, Arthur Gemunder, James B. Strong and W. C. Kidd. Spaces 280, 281 and 283 Armory.

Reliance Manufacturing Company, Massillon, O.—Nut locks. Represented by Howard J. McGinn, A. W. Carpenter and Frank C. McLain. Space 180.

The Remington Oil Engine Co., New York City, N. Y.—Tenderoserpower kerosene oil engine and duplicate parts. Represented by Frank W. Chaffee and A. L. Abbott. Space 173.

Rhineland Machine Works Company, New York, N. Y.—Rail bearings. Represented by D. D. Davis and Elmer Hendrickson. Space 227 Armory.

Richards-Wilcox Mfg. Company, Aurora, Ill.—Railroad door hangers, parallel door hardware, Underwriters' fire door hardware and grindstones. Represented by E. J. G. Phillips, W. D. Jameson, A. J. Eggleston. Spaces 187 and 188.

Roadmasters' & Maintenance of Way Association, Sterling, Ill.—Booth for the reception of visiting roadmasters and supervisors. Represented by L. C. Ryan, W. A. Kannally, Harry Clark and A. M. Clough. Space 288 Armory.

Roberts & Schaefer Company, Chicago, Ill.—Photographs of Holmen reinforced concrete and frame constructed locomotive coaling stations. Represented by Clyde P. Ross, W. B. Ouard, E. E. Barrett and J. S. Shannon. Spaces 97 and 98.

Sanitary Bunk Company, Indianapolis, Ind.—A sanitary double deck steel spring bunk. Represented by L. H. Mummert. Space 174.

Sellers Manufacturing Company, Chicago, Ill.—Sellers anchor bottom wrought iron tie plates and Sellers wrought iron angle bars. Represented by J. M. Sellers, R. A. Van Houten and G. M. Hogan. Space 125.

Signal Accessories Company, New York, N. Y.—Signal material. Represented by F. C. Lavarack and C. H. Burt. Space 118.

Simmons-Boardman Publishing Company, New York, N. Y. and Chicago, Ill.—The Railway Age Gazette, Maintenance of Way Daily, The Signal Engineer and American Engineer. Represented by Edward A. Simmons, Samuel O. Dunn, Lucius B. Sherman, Henry Lee, Roy V. Wright, John N. Reynolds, Frank S. Dinsmore, H. H. Marah, Arthur E. Hooven, E. T. Howson, R. E. Thayer, A. D. Cloud, H. H. Simmons, Harold F. Lane, F. H. Thompson, C. W. Garrison, Kenneth G. Cloud, Harold D. Horton, L. G. Dennison and T. E. Crossman. Spaces 44 and 63.

Snow Construction Company, T. W., Chicago, Ill.—Screw spike car, Snow oil crane, Snow bucket type coal chutes and Snow water crane, Johnson water tank lug, Dupree water tank lug, Hess ardentan well cylinder, Crescent oil engine. Represented by T. W. Snow, R. E. Gurley, M. D. Miller and R. A. Blake. Spaces 45 and 46.

Southern Railway Supply Company, St. Louis, Mo.—Saunders corrugated car stopper. Represented by W. D. Achuff. Spaces 170 and 171.

Standard Asphalt & Rubber Company, Chicago, Ill.—"Sarco" No. 6 waterproofing and other "Sarco" asphalts for various purposes, including practical illustrations of methods of application, etc. Represented by Norman Malcolm, C. V. Eades, R. E. Kartrock, J. M. Woodruff, G. Schomburg, W. A. Hewey, H. J. Smith and T. P. Stypayneki. Space 1.

Standard Underground Cable Company, Pittsburgh, Pa.—Railway signal wire in all forms. All copper and Colonial copper clad, both bare and insulated; underground cable and cable terminals. Represented by J. R. Wiley, H. P. Kimball, A. A. Anderson, W. M. Rogers, Russell E. Green, J. L. Lyon and Elbert F. Norton. Space 137.

Stark Rolling Mill Company, The, Canton, O.—Flat sheets, roofing, culverts and drains made of anti-corrosive Toncan metal. Represented by A. T. Enlow, J. T. Hay and D. B. Coey. Space 14.

Steel Railway Tie and Appliance Company, Denver, Colo. —Shane steel railway tie and safety fastener. Represented by George H. Shane, Robert E. Foresman, George F. Kiser, A. H. Williams and Bert F. Kiser. Space 196.

Templeton, Kenly & Company, Ltd., Chicago, Ill.—Simplex car and track jacks. Represented by Alfred E. Barron, Arthur C. Lewis, Charles A. Crane, Jr., Lionel B. Morton, Harry M. Hood and Walter B. Templeton. Spaces 31, 32, 33 and 34.

Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.—Samples of Titanium products. Represented by H. H. Cook, Charles Vickers and J. M. Sherrerd. Spaces 283 and 284 Armory.

Toledo Pipe Threading Machine Company, Toledo, O.—Pipe threading and cutting tools. Represented by W. W. Vosper, S. S. Thornberry and R. H. Irwin. Space 178.

Union Draft Gear Company, Chicago, Ill.—Draft gear. Represented by J. R. Cardwell, L. I. Canfield, J. W. Hathaway, W. L. Krauser and J. B. Hamilton. Space 199.

Union Iron Works, Hoboken, N. J.—Pile hammers and derrick excavators. Represented by M. S halscha and W. G. Schalscha. Space 200.

Union Switch & Signal Company, Pittsburgh, Pa.—Mechanical, electro-mechanical, electric and electro-pneumatic interlockings, automatic block signals (A. C. and D. C.), Keystone insulated joints and other signal accessories. Represented by S. G. Johnson, G. A. Blackmore, W. H. Cadwallader, J. S. Hobson, L. F. Howard, J. P. Coleman, H. W. Griffin, H. A. Wallace, T. H. Patenall, J. W. White, J. J. Cozzens, W. W. Talbert, Aaron Dean, M. D. Hanlon, W. E. Corey, H. McCready, A. C. Livermore, E. R. Coe, W. P. Newhart. Spaces 40, 41, 42 and 43.

Universal Metallic Tie Company, Salt Lake City, Utah.—Metal railroad crossties. Represented by Burton S. Rupp. Space 197.

Verona Tool Works, Pittsburgh, Pa.—Track tools and nut locks. Represented by W. H. Remmel, Henry Fischer, E. Woodings, Rex Gray and James C. Barr. Space 129.

Western Electric Company, Chicago, Ill.—Railroad telephone, selectors, arc lamps. Represented by E. W. Hamlin, J. O. Kich and G. H. Porter. Space 17.

Wm. Wharton, Jr. & Company, Inc., Philadelphia, Pa.—Manganese steel frogs and crossings, split switches, switch stands, guard rail clamps, enlarged photographs, models, etc. Represented by Victor Angerer, L. R. Ashhurst, Jr., A. E. Borie, George R. Lyman, R. C. McCloy, H. F. McDermott, W. McLain, J. C. Robinson, W. S. Stothoff and L. W. Jones. Spaces 247, 248, 249 and 250 Armory.

White Enamel Refrigerator Company, St. Paul, Minn.—Full sized section of refrigerator car showing Bohn patented all steel collapsible bulkheads, hatch ventilators and plugs. Represented by A. D. Thomsen. Space 208.

Winans Improved Patented Rail Joint Company, Portland, Ore.—Rail joints. Represented by A. Winans. Space 8.

U. S. Wind Engine & Pump Co., Batavia, Ill.—Water col-

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umns, water tanks, steel frames for water tanks, switch stands, semaphores, pumps and pumping machinery. Represented by L. E. Wolcott, C. E. Ward and J. P. Prindle. Space 111.

Wolfe Brush Company, Pittsburgh, Pa.—Railroad paint brushes, railroad brooms and railroad cleaning brushes. Represented by C. N. Struble, W. T. Hogan and W. G. Lange. Space 10.

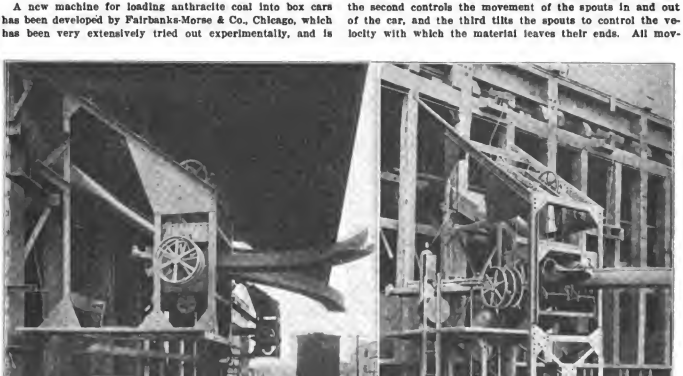
Worth Wire Works, Kokomo, Ind.—Cinch fence stays for right-of-way fences. Represented by O. H. Buck, Timothy Harrison, Forest Craig, H. D. Buck and H. L. Green. Space 210.

Wyoming Shovel Works, Wyoming, Pa.—Track shovels and locomotive scoops. Represented by G. E. Geer. Space 160.

A NEW BOX CAR LOADER.

A new machine for loading anthracite coal into box cars has been developed by Fairbanks-Morse & Co., Chicago, which has been very extensively tried out experimentally, and is now in service at three points. The machine could probably also be adapted to the loading of bituminous coal, coke or similar substances, although as yet no installations for these purposes have been made. The supporting carriage is designed to travel either on its own rails or to be suspended from the structure of the bin it serves. The carriage is of steel with an operating platform suspended on one side at a height which allows the operating levers to be readily handled. The essential feature of the loader is the use of two horizontally curved spouts which receive the coal from two discharge pipes leading from the lip screens of the loading pocket and discharge it in the car, the point of discharge being governed by the distance which the spouts are pushed into the car. These chutes are bronze-lined to reduce the friction, and it has been found that the coal acquires a sufficient velocity in the down spouts to carry it to the ends of the horizontal chutes.

The chutes are supported on a carriage which is capable of vertical movement within the supporting carriage, allowing the chutes to be regulated for the various heights of box cars in use. After this height is adjusted to suit the door of the car, the spouts are extended into the door until their ends are about 25 ft. apart, and as the loading proceeds the spouts are withdrawn, keeping their ends just clear of the pile. The loader may be operated entirely by hand or entirely by electric motor, or by a combination of hand and electric power. The machine shown in the accompanying photograph is propelled from one discharge chute to another by an electric motor and the movement of the chutes is accomplished by hand through the operation of three wheels, shown in the foreground. One of these wheels raises and lowers the chutes to suit the height of the car doors, the second controls the movement of the spouts in and out of the car, and the third tilts the spouts to control the velocity with which the material leaves their ends. All moving parts are carefully counterbalanced so that very little power is required to adjust them, one man being able to handle the whole machine readily. So far as is known, the capacity of the machine is limited only by the capacity of the lip screens which deliver the material from the storage pockets. The ordinary loading rate with this loader is six to eight minutes for a 40-ton car.



New Box Car Loader with Two Types of Carriage.

EXCURSIONS FOR FRIDAY.

While Friday is reserved by the Association for visiting the Exhibition at the Coliseum and Armory, it is probable that some members will find ample time to see the exhibits before Friday and would like to see some points of local interest about the city on that day. If such members will communicate their desire to the arrangements committee, of which F. R. Coates is chairman, parties can be arranged.

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Railway Age Gazette

DAILY EDITION

Copyright, 1913, by the Simmons-Boardman Publishing Co.

Vol. 54. CHICAGO—MARCH 19, 1913—NEW YORK No. 11b.

PUBLISHED DAILY BY

Simmons-Boardman Publishing Co., Transportation Bldg., Chicago, Ill., on the occasion of the annual convention of the American Railway Engineering Association.

NEW YORK: 83 Fulton Street CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico.....$5.00
Canada.....6.00
Foreign Countries (excepting daily editions).....8.00
Single Copies.....15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign (excepting daily editions), $2.00.

Application made at the Post Office at Chicago, Ill., for entry as mail matter of the second class.

WE GUARANTEE, that of this issue 10,850 copies were printed; that of these 10,850 copies, 9,869 copies were mailed or delivered by messenger to regular paid subscribers; 500 copies were distributed among members and guests of The Railway Signal Association and at the Coliseum; 131 copies were mailed to advertisers; and 50 copies were set aside for office use.

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The attendance at both the morning and afternoon sessions of the association yesterday should be a source of much gratification to the officers and to the membership at large. Even though the morning session began at 9 o'clock, there has been no preceding opening session in the history of the association when so many members were in attendance, and at many times throughout the day many men were standing after all chairs were filled. The large attendance and the interest in the discussions forecast that the fourteenth annual convention will surpass all previous records for interest and value of the work done. The registration yesterday was 315, which is the largest for an opening day in the history of the association.

In marked contrast with its presentation last year, the report of Committee 10 on the Uniform System of Signaling, which has been under discussion for so many years, was unanimously adopted without discussion. This is the same report that met with such a favorable reception from the Signal Association last fall, and was referred to letter ballot at the Quebec meeting by unanimous vote, and also without discussion, and was passed by a vote of 574 to 10. The adoption of this report by both associations will now enable it to be referred to the American Railway Association, probably just in time to be taken into consideration in the revision of the standard code which that organization now has under way. The reports from Committee 10 on the other two subjects were offered merely as information. The one dealing with effects of treated ties on track circuits was interesting, the information having been taken from the experience of a large number of roads, all of which seem to have had such varied results that at this time there is not much upon which to base definite conclusions, although the committee did very well in this respect.

The suggestion made by Mr. Loree at the annual dinner of the American Railway Engineering Association one year ago that in view of the large proportion of the expenditures of the maintenance of way department devoted to labor, the association give more attention to the economics of labor, has borne its first fruit this year. Acting upon this suggestion the board of direction assigned this subject to three committees last spring. The first report embodying definite recommendations is that of the Track Committee, which made three recommendations regarding desirable agencies to obtain a better class of section foremen. Before starting upon this work the committee made an outline of the most essential subjects to be considered, this outline including subjects enough for several years' study. Judging from the very general response to the request for information by the sub-committee having the matter in charge and by the interest shown in the convention yesterday, the members and railway executives in general agree upon the importance of this subject. The fact that the cost of labor in the maintenance department is increasing indicates that the situation is becoming worse. It is frequently the case in associations of this kind for a desire to be shown to avoid reference to labor conditions, especially where any recommendations involve the question of an increase in wages. If an increase in wages is essential to the maintenance or increase of efficiency, it is just as much within the province of an association to recommend it as it is to make a recommendation regarding the selection of material. The subject of economics of labor has been neglected so long and is now such a pressing one that the association is to be congratulated for taking it up even at this late date, and it is to be hoped that the committees will be encouraged to go deeply into the subject and make definite recommendations, even though they may perhaps involve increases in wages or rearrangements of forces

Some of the rules for the organization and guidance of inspectors in the mill, shop and field, presented by the committee on Iron and Steel Structures, seem to be rather a general discussion of the subject of inspection than a series of definite rules for the guidance of an inspector familiar with his work. Many of the qualifications of an inspector outlined in the preamble would be equally desirable in any other line of business. While this information might be valuable to a man unfamiliar with the subject, it is hardly to be expected that such a man will be employed as an inspector without previous mill experience. In one place it is stated that the inspector should "study the operations of the plant and become familiar with the various processes of manufacture." To be qualified as an inspector, a man should have this knowledge of the processes of manufacture before being appointed. Some of the requirements in the rules seem to belong more properly in the specifications furnished to the inspector than in the rules outlined

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for his guidance. The minority report calls attention to some of the defects in the present system of inspection which are common knowledge. May not many of these defects be due chiefly to the effects of severe competition? When a railway or other concern lets contracts for the inspection of material upon the basis of competitive bids, the service is pretty sure to deteriorate as the price of the work is reduced. Inspection in many ways is not now as efficient as a few years ago; but the same price is not being paid as in former years. The establishment of a railway inspection bureau by the railways themselves would not necessarily reduce the actual cost of inspection; and if the standard of inspection is to be raised the cost probably will also be increased no matter who does it. The objection that the present inspectors do not gain the advantage of personal contact with the heads of private bureaus is true only to the extent that the inspectors now come in contact with the department head devoting his entire time to one specialty instead of with the general heads.

In commenting upon the amount of study which railway men, and particularly the members of the rail committee, are giving to the rail situation, a prominent student of this subject said a few days ago that nearly all the attention is being given to the manufacture of the rails, which is under the control of the steel makers, and comparatively little organized attention is being paid to the protection of the rails in service, which is under the control of the railways themselves. There appears to be some foundation for this statement. The need for improvement in the manufacture of rails is one of the most pressing affecting railways at the present time. We do not desire to minimize in the least the necessity for the work to get better rails which has been done, or the value of the improvements which have resulted from this work. But, as we have stated before, it does not appear entirely reasonable for the railways to have to provide the funds or the investigators to teach the steel makers how to manufacture their product. Nor is it to be supposed that all the facts brought out in these investigations are new to the manufacturers who have devoted their entire attention to the making of rails for many years. There is no question that the quality of the steel going into the rails leaves much to be desired; but the same is true with regard to the quality of the roadbed and equipment. It is to the defects of the latter, the remedies for which are directly under the control of the railways, that it would seem advisable for the association to devote more attention. It is not commercially practicable to produce rails every one of which will be absolutely perfect, or to maintain the track or equipment in such condition that no broken rails will result. While it is true that almost without exception the rails which give rise to serious wrecks and loss of life and property, are seriously defective, many sound rails were broken last winter because of the unusual climatic conditions and defective equipment and roadbed. Even granting that little danger is due to broken rails of this class, there is some danger, and the financial loss due to the destruction of a large number of rails by a flat wheel is material. It would seem that some concerted study, perhaps by a joint committee of the railway mechanical and engineering associations, should be made of the effects of defective equipment in various degrees of development on the rail under different conditions of roadbed support, temperature, etc. There is also a need of definite information regarding the service which a rail has to withstand in view of the recent statements that the rail is being overloaded. The stresses actually present in the rail, the influences of varying standards of roadbed support, high speeds, heavy wheel loads, low temperatures, etc., are important. In other words, while continuing to devote a large amount of attention to the study of the manufacture of steel rails it would also appear desirable to devote some attention to the improvement of service conditions, the remedies for which lie directly in the hands of railway officers.

STUDYING THE SCIENCE OF ORGANIZATION.

President Churchill, in his address at the opening of the Engineering Association convention yesterday, dwelt forcibly on the need for more scientific study and handling of engineering and maintenance of way problems, especially that of labor. In the discussion of one of the reports on Rules and Organization, Edwin F. Wendt quoted from the last report of the Block Signal and Train Board the board's statement that "on the large majority of American railroads excellence of administration is nullified by faulty organization, magnification of individual function to the detriment of team work, and by an almost entire absence of a definite system of broad training of subordinates for higher duties." Commenting on the foregoing, Mr. Wendt expressed the opinion that "the study of the principles which underlie organization would be a proper work for this association. I think." Mr. Wendt added, "that this committee should study what is called the 'science of organization.'"

The Block Signal Board, in the sentence quoted by Mr. Wendt, diagnosed the cause of some of the greatest shortcomings of railway operation in this country, and President Churchill and Mr. Wendt suggested the remedy for those shortcomings. Doubtless, Mr. Wendt meant the study he suggested to relate more especially to the improvements in organization needed to increase the efficiency of the engineering and maintenance of way departments; but the same remedy could be beneficially applied to all departments.

There are really two kinds of engineering—the engineering of materials and the engineering of men. The engineering of men includes the best practicable selection, training and supervision of all officers and employes from the top to the bottom; and from a purely financial standpoint it is a more important branch of railway engineering than the engineering of materials. There is plenty of discussion of the proper form of railway organization; but it really is more important to have an organization worked the best way it can be than it is to give it the best practicable form. It is not so important, after all, to whom the roadmaster reports as it is that whomever the roadmasters report to shall select and train them and supervise their work with the greatest practicable care, consideration, intelligence and thoroughness. There is plenty of "rawhiding" in the railway business, but there often is not enough done to get and develop the kind of subordinate officers and employes who will not have to be "rawhided."

The political history of the world shows that democracy is a better form of government than monarchy; but it also shows that some peoples have been very well-governed under monarchy and others very ill-governed under democracy. The same principle applies to industrial organization. The functioning of an organization is even more important than its structure, and study of the "science of organization" as applied to the railways must, if it is to be useful, get below the surface and find out why in many cases organizations of widely different forms fail equally to satisfactorily perform their function. We believe that such a study will show that one main trouble with railway operation in the United States is that the present organizations, whatever their form, usually do not make provision for adequate supervision, including under this head selection, training and direction of subordinate officers and employment of a sufficient number of such officers.

It is a circumstance fortunate and inspiring hope that two men so prominent in the association as the president and

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Mr. Wendt have both directed the thoughts of the members along this channel.

PRESIDENT'S RECEPTION AND MR. McNAB'S ADDRESS.

The president and board of direction of the American Railway Engineering Association tendered a reception to the members, ladies and guests in the Gold room of the Congress hotel last night. Although this is the first year that a reception of this kind has been held, the attendance was gratifying to the committee in charge, particularly on account of the number of ladies who were present. It is expected that it may become an annual feature which will be as popular as the banquet and that the ladies may be induced to come to the annual meeting in increasingly large numbers.

President Churchill and the members of the board of direction began receiving the guests about 8 o'clock and as the crowd gathered, they were entertained by vocal and instrumental music. Kloer's orchestra, which has been furnishing music for the banquet for several years, was present, and Sybil Sammis McDermaid, a soprano of note in Chicago musical circles, sang a number of selections, among which was one Scotch air, rendered by request in honor of the speaker of the evening. A baritone solo, with orchestra accompaniment, was also a feature of this part of the entertainment.

The talk on the Panama Canal by William McNab, principal assistant engineer of the Grand Trunk, and past-president of the association, was presented in his usual happy style and was much appreciated. It was illustrated by a number of excellent stereopticon slides, through the courtesy of the government officials in Washington. Mr. McNab is familiar with conditions on the Isthmus as a result of his visits there, and having recently returned from a trip to the canal was able to give recent and authoritative facts concerning the work. His address was full of information of peculiar interest to engineers, although it was presented in such a manner as to hold the interested attention of all the ladies present.

By way of opening his discussion, he expressly disavowed any intention to mention politics, treaties or commerce, preferring to confine himself closely to the engineering features of the work. In his introductory remarks concerning the history of the project, he paid a high tribute to John F. Wallace and John F. Stevens, former chief engineers in charge of the construction, who did much to make possible the successful prosecution of the work under later administrations. Mr. Wallace was the first president of the association and is well known to many of the present members. Mr. McNab gave due credit to the administration of sanitary regulations on the Canal Zone, quoting several verses of the "Song of the Prickly Heat" to show how important these preliminary measures were to make that tropical region safe for the Americans who have gone there to work.

The construction features were divided into three heads, the excavation of Culebra cut, the building of the locks, and the construction of Gatun dam.

The pictures of the big cut made clear the importance of the 400 miles of railway for work trains which were required to remove the excavated material. Recent photographs of the locks served to give an impression of the magnitude of these structures and the work of building the dam which will impound the waters of the Chagres river to form an immense lake was well illustrated by a number of other views.

Mr. McNab, in closing his remarks, advised those who contemplate making a trip to the Canal Zone to go before the water is turned in, as the interesting features will practically all be covered up after that time, and visitors will find, instead of a great engineering project, only a tropical lake with abundant vegetation. He suggested, however, that if any of the members present were so delayed in reaching Panama as to miss the interesting sights there, they can return home by a new transcontinental route, which will be completed in the not very distant future, along which will be found scenery as interesting as any on this continent. By way of proof of this assertion, he had thrown on the screen a number of beautifully colored views of the Canadian Rockies along the new Pacific coast extension of the Grand Trunk. These views had never before been shown and were very much appreciated.

TO-DAY'S PROGRAMME.

XVI.	Economics of Railway Location	Bulletin 153
VII.	Wooden Bridges and Trestles	Bulletin 153
Special.	Uniform General Contract Forms	Bulletin 153
XVII.	Wood Preservation	Bulletin 153
III.	Ties	Bulletin 153
IX.	Signs, Fences and Crossings	Bulletin 153
VIII.	Masonry	Bulletin 153
	Annual Dinner at 7:00 P. M.	

ANNUAL MEETING RAILWAY APPLIANCES ASSOCIATION.

At the annual meeting of the National Railway Appliances Association, held Tuesday morning at the Coliseum, there was a larger attendance than usual. President A. P. Van Schaick presided. In his annual report Mr. Van Schaick called attention to the noticeable increase in interest in the exhibits each year on the part of the railway men. He stated that next year the association might be compelled to also lease the new Wilson building, near the Coliseum, in order to provide additional exhibit space to meet the constantly increasing demand.

T. W. Snow, chairman of the nominating committee, reported the following selections for officers of the Association for the coming year:

President, T. R. Wyles, Detroit Graphite Co., Chicago.

Vice-President, N. M. Hench, Carnegie Steel Co., Pittsburgh.

Treasurer, John N. Reynolds, Railway Age Gazette, Chicago.

New members of the board of directors, for three years, J. Alexander Brown, Pocket List of Railroad Officials, New York, and E. H. Bell, Railroad Supply Co., Chicago; for one year, E. E. Hudson, Thomas Edison, Inc., Orange, New Jersey.

Treasurer Reynolds reported that at the end of the fiscal year, April 30, 1912, the Association's assets amounted to $13,225.37, with no liabilities.

1,574 INVENTORS WANT MR. MELLEN'S $10,000.

The $10,000 reward for a successful automatic train stop offered by President Mellen of the New York, New Haven & Hartford a short time ago brought replies from 1,574 inventors. Each applicant was sent a printed list of the conditions which the devices are required to meet. Over 500 replies were received to this circular, and of those who took this second step in the matter, over 95 per cent failed to comply with the very first condition, let alone the other 17.

Altogether there were 1,480 holders of patents among those who sought the reward. They were from all walks and conditions of life and from all grades of intelligence, experience and education—and all grades of a lack of it. Out of the whole number, two devices have been selected for testing, and experimental installations will be made in the near future.

Four replies came from inmates of insane asylums; four

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from men serving time in states' prisons; one from a monastery, and one from a man who said he had received a revelation from Heaven in which it was explained to him that anything he took up would be successful. The last-named desired to get a trial of a friend's device, and assured the New Haven that if the said friend secured the $10,000 he only expected $1,000 as commission for the use of his revelation.

Replies came from Panama, Porto Rico, Jamaica, Belgium, France, Ireland, Hawaiian Islands, England, Scotland, Wales, Germany and Denmark, and several other countries.

One inventor's scheme would, in his words, "constitute no source of danger to the passengers, but would probably kill the engineer and fireman. "However," he continued, "since it is to be used on the New Haven, it won't make any difference." Another scheme provided a heavy spring equipped with a hook, which would rise in the center of the track as soon as the train passed. Any following train trying to enter the occupied block would be stopped by the hook firmly grasping the nearest axle and holding the train.

The letter setting forth the 18 conditions to be complied with was answered by one man as follows: "I accept your offer of the $10,000. Please send a check." Another inventor said, "Send me the $10,000, and pay me a retainer's fee and expenses, and I will come down and design you an automatic stop."

The time for filing applications expires on July 1, 1913, and no devices received after that date will be given consideration in connection with the $10,000 reward.

NORFOLK & WESTERN LETS CONTRACTS FOR DOUBLE TRACKING.

The Norfolk & Western has let contracts for double tracking 61 miles of line on its eastern section and for the masonry work on a new double track bridge, to replace the high bridge over the Appomattox river.

BALTIMORE & OHIO ANNUAL DINNER.

The officers of the Baltimore & Ohio in attendance upon the convention will have their annual dinner this noon. This road has maintained a very creditable record for a number of years as regards the large number of men attending the convention, and their dinner in connection with the convention has been an annual event for some years.

CONFERENCE REGARDING DENVER UNION STATION.

A conference of officers of the railways entering Denver, Colo., regarding the matter of the construction of a new union station at that city was held in Chicago yesterday. Among those attending the conference were D. Miller, president of the Burlington; H. U. Mudge, president of the Rock Island Lines; A. L. Mohler, president of the Union Pacific; A. D. Parker, vice-president of the Colorado & Southern; W. B. Storey, Jr., vice-president of the Santa Fe, and E. L. Brown, vice-president of the Denver & Rio Grande.

W. S. DAWLEY TO RETURN TO UNITED STATES.

F. W. Hawks, formerly assistant chief engineer of the Unnan-Fur-Szech-Uan Railway, in Unnan-Fur province, in Southern China, is attending the convention.

Mr. Hawks reports that W. S. Dawley, who is now chief engineer of the Unnan-Fur-Szech-Uan Railway, and who formerly was chief engineer of the Chicago & Eastern Illinois, expects to return to the United States next summer, leaving China in June.

Mr. Dawley, it will be recalled, was treasurer of the Engineering Association for several years. Prior to going to China he was with the Evansville & Terre Haute and before that with the Virginian Railway.

REFERRED TO ARRANGEMENTS COMMITTEE.

One of the incidents which occasionally relieve the strain of a serious discussion was precipitated by C. E. Lindsay, division engineer of the New York Central & Hudson River, during the discussion on the Iron and Steel Structures report. Paragraph 34 of the "Instructions for the Inspection of the Fabrication of Steel Bridges" read, "Have important members so loaded as to be headed in the right direction upon arrival at the site of the work." Mr. Lindsay suggested after the reading of this paragraph that it be referred to the Committee on Arrangements.

NEW FIRM OF CONSULTING ENGINEERS.

C. P. Howard, locating engineer of the Canadian Pacific, and S. S. Roberts, division engineer of construction, Illinois Central, have organized a new firm of civil and consulting engineers, to be known as Howard & Roberts. Both men have had extensive experience in railroad location and construction and expect to specialize in railway surveys, locations, re-surveys, grade revision and terminal developments. The company has offices at room 1662, Transportation building, Chicago.

MEMBERSHIP OF AMERICAN RAILWAY ENGINEERING ASSOCIATION.

The secretary's report showed that the total membership of the association on December 31, 1912, was 1,066, as compared with 1,004 on December 31, 1911. During 1912 there were 5 deaths of members, 12 withdrawals and 23 were dropped for non-payment of dues, while there were 102 additions.

The following table shows the geographical distribution of the membership:

United States	925	Peru	2
Dominion of Canada	91	Philippine Islands	2
Japan	8	Australia	1
China	7	Bolivia	1
Mexico	6	Brazil	1
Cuba	5	Korea	1
Central America	4	Panama	1
New Zealand	4	Porto Rico	1
Argentine Republic	2	Russia	1
Great Britain	2	Uruguay	1
Total			1,066

NEW WORK FOR THE QUEEN & CRESCENT.

Announcement has been made that the Cincinnati, New Orleans & Texas Pacific will build eight new tracks and rearrange its present tracks in the McLean avenue yard at Cincinnati.

B. M. McDade, manager railroad department Detroit White Lead Works, Detroit, Mich., which is attending the convention, announces the appointment of William B. Wise as manager Eastern district at New York.

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Proceedings.

The first session of the fourteenth annual convention of the American Railway Engineering Association was called to order at 9:30 a. m. on Tuesday, March 18, in the Florentine room of the Congress Hotel, by the president, Chas. S. Churchill, chief engineer, Norfolk & Western, Roanoke, Va.

The minutes of the last convention were approved as printed.

PRESIDENT'S ADDRESS.

At the last annual convention our membership aggregated 1,004. During the past year there has been an increase of 62, making a total of 1,066. The number of printed pages issued during the year was as follows:

In Bulletins	1,542 pages	
In Proceedings	1,364 pages	
In Manual	136	
Program, and	56	
Miscellaneous	128	320 pages
Total		3,226 pages

The aggregate to date by this Association is therefore 30,366 pages

The Association was invited to be represented at the Fourth National Conservation Congress held at Indianapolis in September, 1912. Messrs. McNab, Atwood, Ferriday, Fink and Young were appointed as delegates to attend that congress.

With the completion of another year in the existence of the American Railway Engineering Association, it is well to review its accomplishments and to point out the work before it.

Its first notable accomplishment has been:

The standardization of materials, designs, specifications and records used in the construction and maintenance of the various parts of a railroad. Progress has been made in the specifications governing the making of such complex materials (so largely used by railroads) as concrete and steel.

While the first of these items relates almost wholly to materials, the proper use of these materials is largely dependent upon labor, skillfully and economically directed; and the second item—namely, the manufacture of such materials as concrete and steel, is very greatly dependent upon the quality of the labor and upon the honest and thorough use of it.

This Association has had before its committees instances of the short life of concrete, due more often to faulty or dis-

CHARLES S. CHURCHILL, President.

EDWIN F. WENDT, First Vice-President.

The various methods reported upon at the last convention for increasing revenues, especially those procurable by economies, have been carried out with the result that on January 1, 1913, our cash on hand was $3,183.11 in excess of what it was on January 1, 1912. The secretary estimates that the proceedings of this convention will be issued about May 1. The credit for this belongs to your secretary, your committee on publication and to your editor, Prof. W. D. Pence.

The American Railway Association has made the following appropriations on account of the investigations of the rail committee: In 1910—$5,000; in 1911—$6,000; in 1912—$10,000, making a total of $21,000, and in November, 1912, a further appropriation of $10,000 was made for the work of 1913, bringing the total up to $31,000. Against this appropriation there had been expended up to November, 1912, $21,011.41.

honest labor used, than to the materials themselves composing it; yet so far, more concern has been given by this Association to the materials than to the labor. The discovery of voids in concrete, or of portions where adhesion is lacking, or again of the misuse or damage by laborers of reinforcing materials, has resulted in the gradual increase in the amount of skilled labor and of supervision employed; because, after all, a mass of concrete is only as strong as its weakest part.

The manufacture of steel likewise demands employment of skilled labor in every step of the process. The time was when certain ores of generally known quality when handled and reduced to steel by a method in general practice was all that was necessary; and the product received its name and often its rate value from the record of the individual manufacturers. That time is gone. Labor used instead of

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being small in numbers is both large and changeable; so, skillful labor and the efficient use of it, as well as of the extensive mechanisms under its control, is the only surety for a steel that will be uniform in good quality. The rail committee of this Association has brought out this point very forcibly to railroad people and to the manufacturers of rail, as well as to the public.

It has been found that it is those mills which have sought for scientific care on the part of their men, and which have discharged others for carelessness, or for a misguided loyalty to their employer in their effort to produce quantity at the risk of slighting quality, that are to-day producing rails of the more uniform grade. It is by this method of extreme watchfulness that further improvement will be obtained.

The rail committee has shown so far:

First.—That while rail failures in the past have had as many explanations as there were manufacturers, with no means of proving or disproving any of them, now we know the general causes, and the remedies are being worked upon.

Second.—Many negative results of the investigations prove that good or bad mill work produces good or bad rails, and in many cases overcome the advantages or disadvantages of any particular rail section.

Third.—That the amount of discard from the top of ingots does not set a gage on either the high standard of the rail produced, or on the number of rail failures; but rather indicates the relative skill of some mills in controlling the chemical content, casting ingots and rolling rails.

Fourth.—That some mills continuously produce better or more uniform material than others; and that this uniformity is largely the result of greater care and skill at the mills, which has been considerably developed by the publications of this Association.

Fifth.—And now we are finding that the use of thick base rails of the A. R. A.—"B" type is reducing base failures to an insignificant number; and also that care in handling and using rails is productive of both longevity and safety. In fact, that careful labor should follow the treatment of rails until they are removed from main tracks.

To explain one type of watchful labor in detail: About two years ago a broken wheel nicked the rails of over a mile of track on an important road. The nicked rails began to break under following trains before their replacement could be completed. It seems important, therefore, that track supervisors should promptly remove rails nicked by broken wheels whenever discovered in main tracks.

It is proper here to place on record the fact that James E. Howard, of the United States Bureau of Standards, has personally complimented the work of this Association on the subject of rails, and it seems well also to call your attention to a recent report of the National Association of Railway Commissioners, by its special committee, to whom was assigned the question of equipment and rails. In this report many quotations are included from the Proceedings of the American Railway Engineering Association, and the following statement is made:

"The best general information obtainable on the subject for the country as a whole will be found in the reports of the rail committee of the American Railway Engineering Association. The care which has been used in obtaining statistics of rail failures by this committee, in analyzing these figures, and in fearlessly reporting its conclusions, justifies high praise."

This problem is a complex and difficult one, but its solution is approaching; and very fortunate will be that mill, or group of mills, that first proves that it is delivering tougher and more uniform rails than are now produced.

This Association should keep up to date in labor-saving machinery and devices, and should discover and compile records of the best practice in handling labor with and without their use. It should also refer to its quality and the economical seasons for its employment, as well as to its best supervision in all branches of railroad construction, maintenance and operation.

One of the best ways for securing efficient results from labor is to freely recognize any improvement that its intelligent use produces. An employer that always points out the fault only, without commending the gain, soon discourages even the most skilled of artisans. Humanity in general needs incentive and encouragement in addition to wages.

We, in America, have made great strides in methods of getting work done; but we cannot afford to overlook the song of the leader of the boat crew on the Mediterranean who keeps the men at vigorous stroke by his frequent exclamation "Glory to Allah." These are both examples of good "team work."

Some railroads adopt a prize system in one or more branches of service. There is no single department that will answer more readily to this system than the labor employed upon the maintenance of track. The Pennsylvania, for example, has a special committee of maintenance of way officers to look after the award of premiums for the maintenance of track and roadbed, which award is finally made after an annual inspection of the road by a large number of its operating officers.

The road with which I am connected has used this plan in a modified form for a long period. Its annual inspection awards upon 2,000 miles of railroad last year cost for prizes less than $1,500. This, however, was not a track inspection by officials, but one of roadmasters and track foremen taken from one district to inspect quite another. Not only have these awards been just, but each individual has learned many of the good points found on the other district. Such an inspection is a method of indirect but very effective instruction.

There is an economic cost for putting a new tie in place in the track of every district of a railroad, likewise a corresponding one for putting bridge timbers or steel in place, for laying stone masonry, or depositing concrete. The distribution among the districts of each railroad of the costs secured each month is a great incentive itself in track and other classes of maintenance labor, as also in other departments of railroad service.

If we, for a moment, turn back a dozen years and see how little standardization there existed on railroads as a whole, and how little general information was distributed; and compare that with the mass of valuable information in our Manual and Proceedings, we may realize that there must be likewise a large amount of data as to labor and mechanical appliances for cheapening the use and handling of materials that may be compiled in the same manner. This is of special importance as the unit cost of labor is increasing very rapidly.

The changes in ideas and methods in this branch of economy will be frequent and often great from year to year. Committees can never expect, therefore, to complete this subject. They will, when fully organized in collecting this kind of data, have some new economies to report each year in every branch of the service. The study of this line of economies often leads to what at first thought appears to be bold undertakings.

As examples to be mentioned because of personal knowledge of the details:

The Norfolk & Western has just successfully swung, under the method of cantilever erection, the central and last span, 520 ft. long, being one of a total of five double tracked spans of bridge forming its crossing of the Ohio River. These spans were built around the old spans and rest on the original masonry. The original spans carried the dense traffic until they were replaced. The consideration that led to this novel construction were economy in time and labor combined with the least delays to railroad traffic and none to river traffic.

Another study on similar lines of economy of labor and efficiency mostly, which has been under progress in the engineering department of the same road since 1905, has just culminated in the undertaking of electrification of 37 miles of that portion of its line having the steepest grades and densest business in the heart of the Pocahontas coal field, purely for handling freight traffic most economically.

We should always bear in mind that any saving in cost of labor applying materials is a net income to a railroad, that the same as is the saving in overtime charges in handling trains gained either through improvements in grades or in motive power, or through efficient block signals.

In traveling about over various railroad lines, I have observed forces of men employed thereon that do not seem to differ much in number; but there was noticed at the same time a difference in the appearance of the railroads, even to the extent of a large percentage. Close investigations of both the labor employed and the business handled in many cases reveal the fact that for the corresponding amount of traffic the best appearing railroad accomplished its maintenance work at the lower cost. The explanation is simply that it is just as easy and no more expensive to work to a definite line or plan than to a random one; and if this method is followed uniformly on every district of a railroad, any given standard can be acquired without cost.

One of the leading officials of a great concern was heard some time ago to say: "We have let one-fourth of our men go; the other three-fourths have since gotten busy, and we are securing great results." While this did not speak well for the past of that concern, it also proved the fact that there was a large number of unproductive employes, who, if they

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had been always well directed, would have added greatly to the stability and value of that property.

A number of years ago we had occasion to have railroad ties condemned as first class because they were of variable lengths and presented a bad appearance in track. Many have been satisfied to condemn only when too short. But I submit it is just as easy to have them cut by the makers practically to the right length.

These illustrations show how we can make our permanent way and track in a period of years things of strength, safety and beauty through uniformity acquired without cost except in the time of skillful directors and in the abundance of standard plans and constructive forms economically followed.

Gentlemen, this is part of our work. We are directors of the economical and efficient expenditure of money. We should hesitate to ask for more till we have shown that we are using that in hand to the best advantage, or until we can prove that we can secure a fair percentage of earning from the additional amount requested. The American Railway Engineering Association can aid in the development of skill in labor efficiency just as it has developed and must continue to improve the standards of materials and specifications.

GEORGE H. BREMNER, Treasurer.

E. H. FRITCH, Secretary.

Reports of Secretary and Treasurer.

Balance on hand December 31, 1911		$ 7,562.15
Consisting of:		
Six railway bonds	$ 5,206.06	
Cash in bank	2,356.09	
Total		$ 7,562.15
Receipts during the year 1912:		
From members		$13,363.25
From others—sales of publications, advertising, etc.		6,111.19
From Am. Ry Assn., Rail Com. fund..		7,961.81
From interest on bank balance		123.66
From interest on investments		280.00
Total receipts in 1912		$27,839.91

Summary.

Receipts during 1912		$27,839.91
Expenditures:		
Dec. 1911 vouchers, paid Jan. 4, 1912	1,047.68	
Vouchers for 1912	$23,609.12	24,656.80
Excess of receipts over expenditures		3,183.11
		3,183.11
Assets December 31, 1912		10,745.26
Consisting of:		
Six railway bonds	$ 5,206.06	
Cash in bank	5,539.20	
Total		$10,745.26

RULES AND ORGANIZATION.

Last year's report consisted in the presentation of a number of rules regarding the government of employes and the conduct of work of the maintenance of way department.

The subjects assigned the committee for this year were to continue the work of last year, including: the compilation of rules for the government of maintenance of way employes, and the formulation of rules in the nature of specifications or instructions regarding the conduct of work, making use of the recommendations of the various committees dealing with these subjects and of the best practice of railway companies as embodied in their books of rules.

In accordance with the first instruction, the committee recommends that revisions and additions be made in the General Rules for the Government of Employes of the Maintenance of Way Department heretofore adopted by the Association, as follows:

Revise rule No. 8 under "Track Supervisors," "Track Foremen," "Supervisors of Structures," "Bridge and Building Foremen," "Signal Supervisors" and "Signal Foremen" to read as follows:

(8) They shall conform to the prescribed standards, plans

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and specifications in the execution of the work under their charge.

Insert under "Track Foremen" a rule to be No. 17 and reading as follows:

They must keep all interlocking pipe lines and trunking free from grass and weeds and all switches, frogs and movable parts of interlocking plants free from snow, ice and other obstructions.

Under "Track Foremen," change rule No. 17 to be No. 18.

Insert a rule under "Track Supervisors" to be No. 17 and under "Track Foremen" to be No. 19 to read as follows:

Any action proposed by county, township, municipal or other authority, which will in any way affect the company, shall be reported immediately to the.....

Insert under General Notice rules to be No. 12 and No. 13 and reading as follows:

(12) The use of intoxicants by employes while on duty is prohibited. Their use, or the frequenting of places where they are sold, is sufficient cause for dismissal.

(13) Employes subject to emergency call shall notify their immediate superior officer and the division superintendent of any change in address, whether temporary or permanent.

In accordance with the second instruction, the committee recommends that the following rules be added to the "Instructions" which were presented and adopted by the Association at its convention of last year. In preparing these rules the specifications have been taken wherever possible from the approved recommendations of the other committees of

J. O. OSGOOD,
Chairman Committee on Rules and Organization.

the Association, the wording only being changed, where necessary, to conform to that of the other rules.

Tie-Plates.

27. Tie-plates must be used wherever ties wear out faster than they fail by ordinary decay. They must be put on so as to get a full and level bearing on the tie and against the rail.

Gaging.

28. Perfect gage is one of the essential features of good track; gage kinks are as detrimental as low joints.

29. The standard gage is 4 ft. 8½ in. Curves 8 deg. and under should be standard gage. Gage should be widened ¼ in. for each 2 deg. or fraction thereof, over 8 to a maximum of 4 ft. 9¼ in. for tracks of standard gage. Gage, including widening due to wear, should never exceed 4 ft. 9½ in.

30. The installation of frogs upon the inside of curves is to be avoided wherever practicable; where this is unavoidable the gage of the track at the frog should be standard.

Curve Easement.

31. On all curves the amount of super-elevation to be given to the outer rail and the proper easement to be provided at the ends shall conform to the standards for "Track" as prescribed by the American Railway Engineering Association and published in the manual, edition of 1911.

Switches.

32. Switches must be placed in accordance with the standard plans and as located by the engineer.

33. Switches and frogs must be kept well lined and in good order. Particular care must be taken to maintain good surface at switches.

34. Switches must be inspected frequently to see that they are in working order and that all nuts, bolts and other fastenings are in place and properly tightened. Broken or damaged parts must be renewed promptly.

35. Switch points must fit closely and accurately to the stock rail, which must be bent to suit the angle of the switch. The bend in the stock rail shall be at such distance ahead of the switch point as will make the gage line continuous.

36. Lead rails in all turnouts must be curved with a rail bender before being laid.

37. All main track switches leading to sidings or branch lines should be protected by switch connected derails.

Switch Ties.

38. Switch ties must be used for all permanent turnouts, crossovers and railroad crossings and placed as shown on the standard plans.

Guard Rails.

39. Frogs must be protected by guard rails, constructed and placed in accordance with standard plans. The tops of the guard rails must be level with the tops of the main rails and must be securely held in place.

40. Guard rails must be so placed that the distance from the gage side of the head of the frog wing rail to the flangeway side of the guard rail shall be exactly 4 ft. 6⅝ in., and great care must be taken to preserve this distance.

Track Posts and Signs.

41. All signal posts, whistle posts, mile posts, signal targets, bridge and other standard signs must be kept plumb and in good condition.

42. Whistle posts must be placed so as not to be obscured by fences or other signs.

Care of Track Tools.

43. Tools must not be left standing within 6 ft. of the nearest rail of the track on which a train is approaching.

Road Crossings.

44. Road and street crossings must be constructed as shown on the standard plans and kept in good order.

45. Particular care must be taken to remove as far as practicable all obstacles which obstruct the view of crossing signs and approaching trains.

46. Flangeways must be kept clear of rubbish, snow, ice and other obstructions; defective crossing planks must be repaired promptly.

Platforms.

47. Station platforms must be kept clean, free from rubbish, snow and ice, and in good order.

48. Defective platforms must be promptly repaired or reported.

Fences and Cattle-Guards.

49. Fences and gates along the right-of-way shall be kept in repair and all gates kept closed when they are not in actual use.

50. Cattle-guards must be kept in repair and at all times free from dirt, rubbish and other obstructions.

Track Jacks.

51. Track jacks must not be used between the rails of main tracks, except in unavoidable cases; the track must then be properly protected as in the case of other obstructions.

RULES GOVERNING THE USE OF STOP AND CAUTIONARY SIGNALS FOR THE PROTECTION OF UNSAFE AND OBSTRUCTED TRACK.

Flagging.

52. In case of impassable track, flagging is the first duty, and repairs must wait, if necessary, until signals have been placed.

Flagging Before Obstructing Track.

53. The track must never be obstructed without first displaying stop signals not less than 20 telegraph poles in each direction from the point of obstruction. Stop signals must be in the hands of reliable men. Flagmen must stop all trains and explain to the engineman the nature of the obstruction and its exact location.

Slow Orders.

54. When the track is not in condition for the passage of trains at the usual rate of speed, and this condition will

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Convention of the American Railway Engineering Association in Session.

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continue over night or for the greater portion of a day, notice must be given immediately to the..... In such notices the place of danger, its nature, and the speed at which trains may pass must be stated.

In addition to sending this notice, slow (color) signals must be displayed. When repairs have been made the person making them must at once notify the..... that the slow order may be recalled.

Signals to Be Used.

55. The color, hand, flag, lamp and engine steam whistle signals, and the train markers prescribed by and published in the standard code of American Railway Association shall be used. It is suggested that copies of the description and rules for the use of these signals, including diagrams, be inserted in books of rules governing maintenance of way employes.

Time for Obstructing Track.

56. All work which will obstruct the track must be done at such times as will interfere as little as practicable with the passage of trains.

Obstructing Track in Storm or Fog.

57. Except in case of emergency, no work that will obstruct the track shall be done during fogs or storms.

Signals in Obscure Weather.

58. In obscure weather, or on heavy grades or curves, extraordinary care must be taken to make sure that the stop signals are out a sufficient distance in both directions to insure full protection.

Proper Maintenance of Signals.

59. While working under the protection of signals, great care shall be taken that the signals are intact and in their proper location and position. Disregard of signals shall be promptly reported to the .....

Signals for Double Track.

60. In using signals on double track, each track must be considered as a single track railroad upon which trains are likely to be run in either direction at any time.

RULES GOVERNING THE USE OF HAND, PUSH, MOTOR AND VELOCIPEDE CARS.

61. Care must be exercised by foremen and other employes in the use of hand, push, motor and velocipede cars. In order to avoid accident, they must protect themselves with the proper signals, when the view is obstructed. On moving hand cars at least one man must face the rear to look out for approaching trains.

62. Such cars must be protected from the weather and when not in use must be locked.

63. Cars must never be used or left on the main tracks or sidings unprotected. Loaded hand or push cars on the track are obstructions and must be protected by the proper signals.

64. They must not be attached to trains. When following trains, or other moving cars, they must not run closer than ten rail lengths.

65. They must be kept in good order and inspected frequently for loose bolts or other defects.

66. Switches must not be thrown for such cars, unless loaded, and then only under the supervision of the foreman.

NEXT YEAR'S WORK.

For next year's work the committee recommends that it be instructed to review the rules and instructions heretofore adopted by the Association and to recommend such changes and additions thereto as may seem desirable.

Jos. O. Osgood (C. R. R. of N. S.), chairman; G. D. Brooke (B. & O.), vice-chairman; F. D. Anthony (D. & H.), J. B. Carothers (B. & O.), S. E. Coombs (N. Y. C. & H. R.), J. B. Dickson (Erie), C. Dougherty (C. N. O. & T. P.), W. T. Eaton (St. L. S. W.), J. A. Gordon (P. M.), K. H. Hanger (C. R. I. & P.), B. Herman (Southern), Jos. Mullen (C. C. C. & St. L.), E. T. Reisler (L. V.), A. F. Stewart (C. N.), Committee.

Discussion on Rules and Organization.

In the absence of the chairman, Mr. Osgood, the report was presented by Mr. Brooke.

L. C. Fritch (C. G. W.): I would suggest that the "State" be included in the new Rule 18. It covers every sub-division except the state. Very often employes to whom this is directed have information in regard to any state action taken.

The President: The committee would accept that modification, to insert the word state before county.

After considerable discussion it was voted that Rule 27 be changed to read as follows: "When tie-plates are used they shall be applied so as to secure a full bearing upon the tie and for the rail."

L. S. Rose (Big Four): I move that the second half of Rule 28 referring to "gage kinks are as detrimental as low joints" be cut out. It depends on what a gage kink is. I do not believe you can prove that a gage kink is more detrimental than a low joint. (The motion was carried.)

Albert Swartz (Toledo Rys.): We might say, "Perfect gage is on of the essential features of good track and must be maintained."

The President: The committee is willing to accept the suggestion of Mr. Swartz.

Rule 30.

H. R. Safford (Grand Trunk): Is Rule 30 a proper rule to put under instructions to the section foremen on the theory that the location of the switch is a matter which is not left to the judgment of the section foreman. It is always prescribed by the higher officer, generally the engineer in charge of maintenance on the division.

T. S. Stevens (Santa Fe): I believe that if the standard prescribed by the committee is good the widest publicity we can give to it is desirable, and it is just as well to have the section foreman know what the standard is, as the division engineer, with the idea that perhaps some time or other the section foreman may be able to check up the division engineer, in some probable error he has been led into by mistake.

The rule was adopted as read.

The last two lines of Rule 31 after the word "standards" was omitted and the rule was changed to read "On all curves the amount of super-elevation to be given to the outer rail and the proper easement to be provided at the ends shall conform to the standards," and a notation in parenthesis will refer to the standards of the Association.

J. A. Atwood (P. & L. E.): I move the adoption of Rule 34 in the form submitted by the committee, the only changes being the addition of the words "and frogs" at the heading of the rule. (The motion was adopted.)

S. S. Roberts (I. C.): Rule 35 as it stands is rather indefinite, and inasmuch as most roads have a specific distance ahead of the switch point for bending a stock rail and as this committee has recommended a certain distance ahead of the stock rail, I move the rule should read "switch points must fit closely and accurately to the stock rail, and the stock rail must be bent in accordance with the standards." Then in parenthesis refer to the recommendations of the track committee of this association. (The motion was carried.)

Rules 36 and 37 were voted to be stricken out.

A. Swartz (Toledo Ry.): Referring to Rule 38, I do not believe it is good practice to use switch ties on railroad crossings. We generally use a heavier timber than switch ties.

G. W. Bremner (C. B. & Q.): I think this ought to refer to the standards of the track committee also.

The President: The committee will accept that and put a note, referring again to the standard practice of this association.

Section 40.

Mr. Brooke: The committee has a communication from Mr. A. M. Shurtleff, suggesting Section 40 should read as follows:

"Guard rails must be so placed that the gage distance from the frog point to the flangeway side of the guard rail shall be at least 4 ft. 6¾ in., and the distance between the flangeway sides of the wing rail and guard rail shall not exceed 4 ft. 5 in."

(The committee accepted this amended reading and it was adopted.)

C. E. Lindsay (N. Y. C. & H. R.): I think that Section 42 should read—"All signal posts, whistle posts, etc., must be placed so that they will not be obscured."

The President: The committee accepts the change to Section 42.

Mr. Lindsay: I think that Section 43 should read. "Tools should not be left where they are liable to be struck by trains." (This was adopted by a rising vote.)

John R. Leighty (No. Pac.): I would suggest that we add to Rule 49 as it stands, that a report be made to the proper officer, of all gates which are habitually left open. (The motion was seconded and carried.)

Mr. Lindsay: The latter part of Section 51 is rather indefinite. I would like to substitute for it the words, "and then only under flag protection as per Rule 53." so

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that the rule would read, "Track jacks must not be used between the rails of main tracks, except in unavoidable cases; and then only under flag protection, as per Rule 53." (The motion seconded and was accepted by the committee.)

It was voted that Rule 53 read as follows: "The track must never be obstructed without first displaying stop signals in general accord with Rule 99 of the American Railway Association. Stop signals must be in the hands of reliable men. Flag men must stop all trains, and explain to the engine man, the nature of the obstruction, and its exact location."

In Section 57 the words "In case of" were changed to read, "except emergency."

The following is to be added to Section 58: "Displayed at a proper distance."

Mr. Lindsay: In Section 60 I would like to substitute for "signals on double track"—"signals for multiple track," because we have 4 and 6 track-railroads, and I believe the rule would be better if it said, "Each main track shall be considered as a single track railroad upon which trains are likely to be run in either direction at any time, and signals must be displayed accordingly."

The following was inserted in Rule 63, after the word "sidings": "street or public crossings."

Mr. Lindsay: I would like to confine Rule 66 to main track switches, because in yards it is common practice and always will be, to operate the switch by the man in charge of the car, without the foreman being there. (The committee accepted this change.)

Hunter McDonald (N. C. & St. L.): There is an inconsistency between that and 29. It says, "Perfect gage is one of the essential feautres of good track." I do not know of any road that maintains perfect gage. In Section 29, the words in the last part are as follows: "Gage including widening due to wear" if you are going to admit widening due to wear, which we will necessarily have to do, we cannot have perfect gage, and I move therefore that Section 28 be amended to read: "Uniform gage is essential to good track and must be maintained." (The motion was seconded and carried.)

A. G. Shaver (C. R. I. & P.): I want to call attention to one thing that I believe is lacking in the rules for constructing track, and that is the automatic block signal. In some of the territory of some of the roads, they require the section foreman to assure himself that the signal is at "stop" while the change is being made. It would be a good plan to include something of that kind in connection with these rules.

The President: The committee will take that into consideration.

The rules were then adopted as amended, in their entirety.

Edwin F. Wendt (P. & L. E.): Before this committee is dismissed I wish to make a suggestion in connection with the work of next year. Much work has been done in connection with the question of rules, but very little attention has been given to the subject of organization. In reading the final report of the Block Signal and Train Control Board of the United States Government, I was struck with the following statement, "As regards methods, it may be said that on the large majority of American railroads excellence of administration is nullified by faulty organization, magnification of individual function to the detriment of team work, and by an almost entire absence of a definite system of broad training of subordinates for higher duties." It seems to me that our committees might well study the science of organization. Considerable literature has been developed in recent years respecting this question. The study of principles which underlie organization, would be a proper work for this association. I do not refer to those features of organization which give rise to so much discussion. Reference is made to the principles which underlie organization, and I think that this committee should study what is called, "the science of organization."

The President: We will take that up in the committee of the Directory, in assigning subject for the coming year.

Mr. Lindsay: I would like to ask that the committee be asked to prepare and submit to the Association next year, a rule for display of caution signals.

The President: The committee will take that into consideration as part of their instructions for next year.

SIGNALS AND INTERLOCKING.

On Subject No. 1, "Continue investigation of outline description of a comprehensive and uniform signal system, suitable for general adoption, conferring with proper committee of the American Railway Association," the committee submits the following report:

As a result of several years' study, the committee, in 1907, arrived at the conclusion that the basis of a uniform system of signals should be the control of the train. During the succeeding two years the committee ,after exhaustive study and investigation of the subject, was unable to agree,

First—As to the number of indications that should be given by fixed signals;
Second—As to the wording of the indications;
Third—As to the aspects or forms of the signals that should be used to represent the several indications.

In 1910, the American Railway Engineering Association requested the American Railway Association to bring the matter to the attention of its committee on Transportation for decision. The committee on Transportation heard arguments at a meeting in June of that year and reported as follows:

"MEMORANDUM OF THE ESSENTIALS OF SIGNALING.

"*Incorporated in the Report of the Committee on Transportation of the American Railway Association, May,* 1911.

"The reports of various committees of the Railway Signal Association and of the American Railway Engineering Asso-

A. H. RUDD,
Chairman Committee on Signals and Interlocking.

ciation on the subject of signaling have been submitted to this committee, with the request that the essentials of signaling be outlined or defined for the future guidance of their committees.

"The subject has been carefully analyzed and considered. There are three signals that are essential in operation and therefore fundamental, viz.:

(1) Stop.
(2) Proceed with caution.
(3) Proceed.

"The fundamental, 'proceed with caution,' may be used with the same aspect to govern any cautionary movement; for example, when:

(a) Next signal is 'stop.'
(b) Next signal is 'proceed at low speed.'
(c) Next signal is 'proceed at medium speed.'
(d) A train is in the block.
(e) There may be an obstruction ahead.

"There are two additional indications which may be used where movements are to be made at a restricted speed, viz.:

(4) Proceed at low speed.
(5) Proceed at medium speed.

"Where automatic block system rules are in effect, a

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special mark of some distinctive character should be applied at the stop signal.

"The committee therefore recommends:

"Signal Fundamentals.

(1) Stop.
(2) Proceed with caution.
(3) Proceed.

Supplementary Indications to Be Used Where Required.

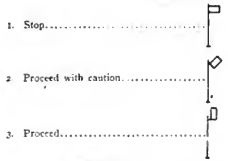
(4) Proceed at low speed.
(5) Proceed at medium speed.

"Stop signals operated under automatic block system rules should be designated by some distinctive mark to be determined by each road in accordance with local requirements."

RECOMMENDATIONS.

The committee submits for approval the following two schemes of signaling in conformity with the recommendations of the committee on Transportation.

Scheme No. 1.
FUNDAMENTALS.

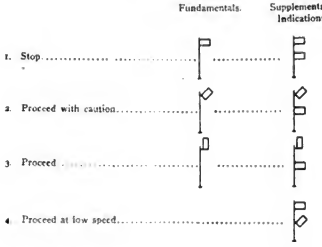


Scheme No. 1.

As means of designating stop signal operated under automatic block system rules, the following are suggested (for all three schemes):

1. The use of a number plate; or
2. The use of a red marker light below and to the left of the active light; or
3. The use of a pointed blade, the blades of other signals giving the stop indication having square ends; or
4. A combination of these distinguishing features.

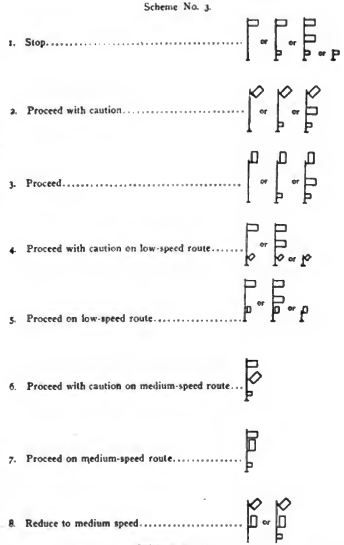
Scheme No. 2.



Scheme No. 2.

Having in view the practice of indicating diverging routes by several arms on the same mast, the committee submits for approval the following to establish uniformity in this practice:

Scheme No. 3.



Scheme No. 3.

The above three schemes are submitted, after an earnest effort to carry out the instructions to "outline description of a comprehensive and uniform signal system, suitable for general adoption," with the idea that each scheme is complete in itself.

CONCLUSION.

That the signal indications and aspects and the means of designating stop signals operated under automatic block system rules, presented above, be adopted, published in the manual and referred to the American Railway Association as information.

EFFECT OF TREATED TIES ON TRACK CIRCUITS.

On Subject No. 2, "Report on the effect of treated and metal ties on track circuits," your committee submits the following report:

Historical.

In 1910 this committee was instructed to confer with the committee on Ties, and report on the effect of treated and metal ties on track circuits. Nothing was accomplished. (See page 128, Proceedings, Vol. 12, Part 1.)

In 1911 instructions were issued to report as above (omitting conference with committee on Ties). Other subjects were given preference. (See page 70, Proceedings, Vol. 13.)

This is the third year, therefore, that the subject has been assigned to this committee.

Report.

The effect of metal ties is self-evident. Each rail must be completely insulated from its ties to prevent a short-circuit (similar to the action of the wheels and axle of a train). Defective insulation at any point will cause leakage and defective insulation at both ends of only one tie

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will throw the track circuit out of service. The effect of creosoted ties is not serious and, with alternating current track circuits, is negligible.

The effect of zinc treated ties is more problematical.

In response to the circular sent to all members on June 1, 126 replies were received, representing 92 railroads—many of them trunk lines. Sixty-nine of these use no zinc-treated ties; four use them to such a limited extent as to render a report valueless, including two which are making the first installation this year; seven use them extensively, but not where track circuits are in service; twelve only use them with track circuits, showing that while the subject is decidedly important to these roads, it does not at the present time, in view of this small percentage, appear to be of great general interest; although, if it could be shown that this treatment did not affect circuits seriously, its use might be extended.

The following extracts from the reports of these twelve roads show that their experiences differ very considerably, due, doubtless, in some measure, to different methods of treatment, but mainly to varying conditions of track, road-bed and especially ballast:

(a) "We are obliged to cut or relay all of our track sections which exceed one-half mile in length, owing to the combined leakage due to treated ties, metal in our ballast and brine drippings. Therefore, none of our track circuits is more than one-half mile long, and with sections of this length we have no leakage trouble whatever, even on new lines where all of the ties are freshly treated. New zinc-treated ties undoubtedly increase the leakage at first, but the resistance seems to increase after they have been in service a year or so, and I do not think a 15 per cent. annual renewal would cause serious trouble on any track circuit of reasonable length if the conditions are fairly good otherwise.

(b) "Where track circuits were in operation and renewals were made of some 15 or 20 ties in one location, there was a considerably greater leakage or track circuit current than ordinarily. We had a number of indifferent working track sections. For some time we could not imagine what the trouble was; when finally we did discover it and improvements set in, in several cases the track circuits had to be shortened. It appears that in time the trouble diminished owing, as we believed, to the zinc treatment disappearing from the surface of the tie.

(c) "From our experience the influence of 15 per cent. new zinc-treated ties on a track circuit is not appreciable; where track circuits 4,000 ft. long have been established on new second track completely equipped with zinc-treated ties, and where ballast and drainage conditions were good. On the other hand, we have found it necessary in some instances to take out zinc-treated ties and replace them with untreated ties, where track circuit conditions were unusually bad, and the slight effect of zinc-treated ties was sufficient to overcome the safe operating margin. Such conditions, however, are extremely rare, occurring for the most part through station platforms where the rails are buried in material sometimes having relatively high conductivity.

(d) "A strange coincidence, however, was the fact that in those track circuits in which resistance seemed relatively low to the proportion of treated ties the ties were not uniformly spaced throughout the distance, but were bunched together at only a few points in each such track circuit. On the other hand, in other track circuits in which the resistance seemed relatively high in proportion to the number of treated ties the ties were spaced practically uniformly throughout the length of the track circuit. This would seem to indicate that the effect of a number of treated ties spaced closely is greater than their aggregate effect when spaced with several untreated ties between each two treated ones. In our investigation we also observed the electroytic action first observed by V. I. Smart, of the Illinois Central, and reported in the *Railroad Gazette* of March 13, 1908. It was noted that the resistance between the two rails, while very low immediately after the installation of a number of treated ties, became appreciably greater after tho ties had been in service a short time, due apparently to the insulation of spikes on the positive side of the circuit by the formation of chloride of iron crystals.

(e) "However, when they have been permitted to dry thoroughly before being placed, we have not had any bad effects. We find, if these ties are put in track immediately after treating, or while they are wet, we experience some trouble with leakage in our track circuits.

(f) "We afterward found that we could eliminate this trouble by letting the ties season, and I am quite sure if ties treated with chloride of zinc would be seasoned, you could put in more than 15 per cent. of them annually without interfering with the block signals. After the ties have been put in the track a sufficient length of time, even though they were not seasoned previously, the trouble will be eliminated. The experience on this road has been that where only a portion of the ties in a section are treated, it is necessary to use considerably more battery than where untreated ties are used, and I believe that if all the ties were zinc-treated, it would be very difficult to maintain a proper track circuit. The track circuit gets better as the ties get older, and in three or four years gets back to almost the same condition as if ties were untreated. In some cases where zinc-treated ties were used on this road, it was found necessary to reduce the length of track sections to 2,000 ft., and with these short sections we still experienced considerable trouble in damp weather. My general experience has been that it is a very hard matter to maintain a proper track circuit in sections where these zinc-treated ties were in use.

(g) "The peculiarity of this treatment is that it causes the most trouble on dry days, and apparently has very little, if any, effect on track circuits in cold or wet weather.

(h) "Where zinc-treated ties are used in all the renewals, and where from 8 to 15 per cent. of the ties are renewed per year, no appreciable effect is produced on the track circuits. In cases where zinc-treated ties are laid continuously, I have found that the length of track circuits would have to be reduced about one-half.

(i) "While we were using the zinc-treated ties we had one case where we had an automatic signal circuit about one mile long. It became necessary to renew a portion of the ties on this part of the track, and putting in the new ties placed in the track are zinc-treated. The effect of the zinc was very noticeable, especially during wet periods. In fact, the ties caused short circuits so that the signals would not work. The result was that we took out the zinc-treated ties and placed cypress ties. I do not know what per cent. of the total number of ties were renewed, but it would appear that it was possible to ruin a circuit with a very few.

(j) "The ordinary yearly renewals of ties cause no trouble. However, I have experienced cases where on new track all of the ties being treated caused us a good deal of trouble for a period of two or three months. After this time, the leakage stopped, or at least there was not enough of it to prevent the track circuits working. My feeling is that where one is putting in track circuits on zinc-treated ties for new track, the track sections should be made somewhat shorter than otherwise would be necessary.

(k) "We have been using ties treated with chloride of zinc for the last four or five years, and our men advise that they cannot trace any track circuit trouble to the fact that the ties are treated with chloride of zinc. We renew about 15 to 16 per cent. annually.

(l) "With these treatments ('Burnettizing' and 'Card' systems) we find that no difficulty is experienced with track circuits of 3,500 ft. (our standard length), provided that no more than 15 per cent. of treated ties is introduced in one season.

(m) "We have not many zinc-treated ties in our automatic territory; that is, not enough in any one spot to cause very much trouble. We had some trouble with some that were put in last year during the wet season, but it seems that this spring the trouble has disappeared, as we have had no failures on account of wet track so far.

(n) "In some of our zinc-treated ties, which were put in track before being properly seasoned, there was, for a short time, some interference with the circuit, but as soon as the salt on the outside of the tie washed off the trouble ceased. At no time was this trouble serious.

(o) "We have track circuits where practically every tie is treated with this process and find no leakage at all.

(p) "In support of my contention that each tie is a battery, I wish to state that we obtained readings of .002 volt and eight mil-amperes on one of the track circuits, with the track battery and relay disconnected. In other words, the ties alone were producing this much electrical energy. The spikes also appear to have a somewhat shiny surface, such as we would expect from a battery electrode. We are able to pick out all treated ties by means of a voltmeter, by taking readings between one of the rails and a spike driven at random in the tie. On an untreated tie in the track circuit we merely get a slight deflection of the voltmeter needle.

(q) "We now have treated ties in on 19 track circuits

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where treated ties are causing trouble. Ten of these circuits are new and nine are old circuits in which treated ties have recently been placed in renewals. Our record of signal failures shows that the trouble commences when the treated ties are put in. The trouble on the treated tie track circuits is due to a weak track circuit; i. e., with a sufficiently powerful track battery at one end of the circuit, the relay at the other end is not energized, due to insufficient current. This condition could be caused by too high resistance of the track circuit or by the track circuit becoming short circuited. The behavior of track batteries shows it is the latter which takes place, the battery being exhausted in five or six days, due to increased current generated. If the trouble were due to increased track circuit resistance, the batteries would have longer life. As no change has been made in our track circuits during the last year, other than to put in zinc chloride-treated ties, we feel sure the trouble is caused by the treated ties, as our records now show a large increase in the failures. At a distant signal a year ago the track battery was made up once in every 18 days. One signal failure was reported during 1911. This spring 360 zinc chloride-treated ties were put in on the 5,000-ft. track circuit, and we now renew the track battery once every four days, and even this does not keep the signals working when it rains. At the circuit of another distant signal, 4,600 ft. long, 140 treated ties are causing the same trouble.

"In addition the treated ties are spoiling our track relays. With a variable current at the relay near the amount which causes the relay to pick up, there is considerable sparking at the points, which open and close continuously. This causes the platinum points to burn furrows in the carbon contact points above them. The west-bound distant signal stuck while with a train in the track circuit, August 12, due to platinum points on the relay being caught in the furrows they had burned in the carbon contacts above them. Each time it rains we have a number of failures, and the question should be studied to see what can be done to remedy the trouble. We tried, on one of the track circuits, oiling the ties inside the rail, thinking this might help, but it was not successful. Reports from other railroads show that the trouble disappears in time, but on this division the trouble is now on the increase."

Summary.

The consensus of opinion is:

(1) That track circuits a mile in length are rendered inoperative by the extensive use of zinc-treated ties.

(2) That track circuits 2,000 ft. in length may be operated successfully, even with 50 per cent. or more of ties so treated.

(3) That 10 per cent. to 15 per cent. renewals a year will not materially affect such length circuits.

(4) That, where renewals are made of 15 or 20 adjacent ties, the leakage is much greater than where there are made singly at uniform distances, i. e., with 15 per cent. renewals (every sixth or seventh tie).

(5) That, while the surface salts are present, more leakage occurs during wet weather than with untreated ties, as these wet salts form a better conductor than ordinary wet wood.

(6) That, in dry hot weather, the salts are drawn to the surface and constitute a more or less perfect conductor.

(7) That, after a period varying from three months to a year, these salts disappear and subsequently no interference is noticeable.

CONCLUSION.

That this report be received as information.

On Subject No. 3, "Economics in Labor of Signal Maintenance," your committee begs to state that this subject is being considered with reference to the report in 1914.

A. H. Rudd, chairman; L. R. Clausen, vice-chairman; Azel Ames, C. C. Anthony, H. Baker, H. S. Balliet, W. B. Causey, C. A. Christofferson, C. E. Denney, W. J. Eck, W. H. Elliott, M. H. Hovey, G. E. Ellis, A. S. Ingalls, J. C. Mock, F. P. Patenall, J. A. Peabody, W. B. Scott, A. G. Shaver, T. S. Stevens, H. H. Temple, Edwin F. Wendt, J. C. Young, committee.

Discussion on Signals and Interlocking.

Subjects No. 1 and 2 were unanimously approved. Subject No. 3 will be reported on next year.

IRON AND STEEL STRUCTURES.

The subjects assigned for investigation during the past year were:

(1) Report on rules for instruction and guidance of inspectors in mill, shop and field.

(2) Report on methods of protection of iron and steel structures against corrosion.

(3) Study the design of built-up columns, co-operating with other investigators and committees of other societies.

A final report on rules for instruction and guidance of inspectors in mill, shop and field, accompanied by a general descriptive statement of the qualities desired in an inspector, is given in Appendix A. Mr. Buel presents a minority report in Appendix B. Mr. Schneider desires that the report be referred back to the committee for further study.

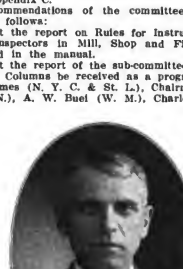
A progress report on the design of built-up columns is given in Appendix C.

The recommendations of the committee may be summarized as follows:

(1) That the report on Rules for Instruction and Guidance of Inspectors in Mill, Shop and Field be adopted and printed in the manual.

(2) That the report of the sub-committee on the Design of Built-up Columns be received as a progress report.

A. J. Himes (N. Y. C. & St. L.), Chairman; J. A. Bohland (G. N.), A. W. Buel (W. M.), Charles Chandler (C.



A. J. HIMES,
Chairman Committee on Iron and Steel Structures.

G. W.), C. L. Crandall (Cornell Univ.), J. E. Crawford (N. & W.), J. E. Greiner (B. & O.), W. H. Moore (N. Y., N. H. & H.), Albert Reichmann (Am. Br. Co.), O. E. Selby (C. C. C. & St. L.), vice-chairman; C. C. Schneider (Cons. Engr.), G. E. Tebbetts (K. C. Term.), L. F. Van Hagen (Univ. of Wis.), F. O. Dufour (Univ. of Ill.), C. E. Smith (M. P.), I. F. Stern (Cons. Engr.), F. E. Turneaure (Univ. of Wis.), committee.

APPENDIX A.

REPORT OF COMMITTEE ON RULES FOR THE INSTRUCTION AND GUIDANCE OF INSPECTORS IN MILL, SHOP AND FIELD WORK.

The duty of the inspector is to guard the interests of his employer. These interests include the safety of trains, persons and property; the quality of materials and workmanship; correctness of construction, and economy.

Some of the means at his command for protecting these interests are: The careful observance of such instructions as may be received from time to time; reports either received by him, as information concerning the status of the work at distant points, or prepared by him to exhibit the condition of the work under his immediate care; familiarity with the various means of communication between or among the several parties interested in the work and promptness in attending to messages and correspondence; and, by recording daily, in a journal kept for that purpose, the facts concerning all events that may affect the relations between his employer and the contractor, his employer and the public, the contractor and the

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contractor and the public. The term "public" is intended to include all third parties. The purpose of such a record is to aid in the settlement of disputes and claims that may arise because of or grow out of the work in hand.

The inspector should have some knowledge of bridge stresses and should be able to read drawings quickly and with accuracy. A knowledge of elementary mechanics and of the mechanics of materials will enable him to understand the reasons for many specifications and the ultimate effect of faults of various kinds. Some knowledge of these branches of bridge building with which he is not directly concerned will be of advantage to him in understanding the work of inspectors employed upon such work. A knowledge of detailed designing is often a help in meeting emergencies or overcoming unexpected difficulties. He should have such knowledge of the relations between the employer and his employes as will enable him to assist in maintaining harmony in the working force.

Temperamentally he should be judicial and diplomatic and not controversial. He should be deliberate in his consideration of new or unexpected conditions, but prompt and decisive in action. When making investigations and reports he should be thorough and exhaustive, in order that the person using the report may act thereon intelligently and correctly. An inspector's habits should be good, his honesty undoubted, and he should have a loyalty towarda his employer that does not come from the payment of salary. It is too much to expect that any one inspector will have all of these qualifications. His value will, however, be measured by the degree and extent to which he does possess them.

The inspector should be fully provided with the plans and specifications pertaining to the work. Often it is desirable that he should have masonry plans also in order that he may understand clearly the position which the structure is to occupy. He should have a copy of the contract or at least extracts therefrom covering those matters which might possibly need his attention. From time to time during the progress of the work he should be given special instructions covering its various phases. Should any further agreements or understandings be made or arrived at between the company which he represents and the contractor, he should be informed promptly concerning them.

Reports should be made at regular intervals defining the condition of the work and calling attention to matters of especial interest. Special reports should be made upon the happening of some event of more than ordinary interest. The amount of detail or the fulness of the regular reports should be governed by instructions. In general an inspector's time is more valuable when employed upon the site of the work where things are actually being done than in the office tabulating results. If a large amount of clerical work is required it is better to employ a clerk than to permit the inspector to perform duties which would keep him out of sight of the work which he is to inspect.

Instruction for the Mill Inspection of Structural Steel.

(1) Study the contract and specifications and secure such information concerning the proposed structure as will permit a full understanding of the use to be made of the various items of the order.

(2) Secure copies of the mill orders, shipping directions and other information concerning the material to be inspected.

(3) Attend promptly when notified of the rolling of material and so conduct the inspection and tests as not to interfere unnecessarily with the operations of the mill.

(4) Have the test specimens prepared and properly stamped with the melt numbers by the manufacturer. Observe the selection and stamping of specimens and verify the melt numbers when practicable.

(5) Attend and supervise the making of tensile, bending and drifting tests. Make sure that the testing machines are properly handled and that the specified speed of pulling is not exceeded. Note the behavior of the metal and check and record the results of the tests.

(6) Select the bars or other members for full-size tests as specified. Supervise such tests and check and record their results.

(7) Secure from the manufacturer records of the chemical analyses of the melts and accept only those in which the specified contents of impurities are not exceeded.

(8) Secure pieces of the test ingots and test specimens and have check analyses made outside of the manufacturers' laboratory when the analyses furnished by the manufacturer are erratic or for any other reason appear to be incorrect.

(9) Examine each piece of finished material for surface defects before shipment, requiring the material to be handled in a manner that will permit the examination to be thorough and complete. This inspection should detect evidence of excessive gagging or other injury due to cold straightening.

(10) Report promptly the shipment of any material from the mill, whose surface inspection has been waived. Such material should be examined by the shop inspector.

(11) Verify the section of all material by measurement and by weight.

(12) Study the operations of the plant and become familiar with the various processes of manufacture. Cultivate the acquaintance of the mill employes and become familiar with their work so as to have direct knowledge of the mill practice and determine as well as the circumstances permit the correctness of the mill practice in so far as it is covered by the specifications.

(13) Record all tests and analyses on the forms provided.

(14) Keep informed as to the progress of the work in the shop and endeavor to secure the shipment of material at such times and in such order as to avoid delay in the fabrication.

(15) Secure copies of the shipping lists, compare them with the orders and make regular statements of the material that has been rolled and shipped.

(16) Make reports weekly or as may be directed, submitting complete reports of tests, analyses and shipments and such other information as may be required.

Instruction for the Inspection of the Fabrication of Steel Bridges.

(1) Acquire a full knowledge of the conditions of the contract, such as the time of delivery, the railway company's actual need of the work, the desired order of shipment, and any special features in connection with the delivery such as the position of the girders or truss members on cars at the bridge site.

(2) Study in advance the plans and specifications and see that all provisions thereof are complied with. These instructions are not to be construed as altering the specifications in any way.

(3) Endeavor to maintain pleasant relations with foremen and the workmen and by fairness, decisiveness and good sense interest them in the successful completion of the work.

(4) Attend constantly to the work, making inspection during the progress of the work in the shop, and striving to keep up with the output in order that errors may be corrected before the work leaves the shop. Conduct the inspection so as not to interfere unnecessarily with the routine operations of the shop.

(5) When unusual circumstances require an explanation of the plans or some variation from the specified procedure, take the necessary action promptly.

(6) Study the field connections, paying particular attention to clearances and making notations on the drawings so that they may be checked rapidly.

(7) Check all bevels and field rivet holes.

(8) Give careful attention to the quality of the workmanship, the condition of the plain material, accuracy of punching, care in assembling, alignment of rivets, tightness of rivets, accuracy of finishing of machined joints, painting and general finish.

(9) Make sure that reamed holes are truly cylindrical and that drillings are not allowed to remain between assembled parts.

(10) Watch for bends, kinks, and twists in the finished members and make certain that when leaving the shop they are in proper condition for erection.

(11) Make sure that the webs of girders do not project beyond the flange angles and that the depth of web below the flange angles complies with the specification.

(12) Allow only the material rolled and accepted for the work to be used therein.

(13) Have the fabricated material shipped in the correct order for erection and in accordance with instructions as far as practicable.

(14) Measure the width of each column and the lengths of all girders between columns when they are to be placed consecutively in a long row so as to insure that the columns and girders will not "build out" in erection to exceed the calculated length.

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(15 Check "rights" and "lefts" and make sure that the proper number of each is shipped.

(16) Check base plates of girders before riveting and make sure that the camber is not reversed.

(17) Check the space provided for driving field rivets, allowing sufficient space for the pneumatic riveter.

(18) Examine field connections after riveting to insure proper fitting and ease of erection.

(19) Make sure that shop splices are properly fitted and that matched and milled surfaces to transmit bearing are in close contact during riveting as specified.

(20) Examine and measure bored pinholes carefully to insure proper dimensions and spacing and smoothness of finish.

(21) Measure the spacing center to center of the end connections for sections of I-beam floors or any similar construction in which the calculated spacing is liable to be exceeded because of the tendency of such work to "grow" as it is assembled.

(22) Make sure that stringers connecting to floor beams beneath the flange have sufficient clearance to care for their possible over-run in depth.

(23) Have the assembling of trusses and girder spans required by the specifications carefully done and, in any case, if a large number of duplicate parts are to be made, insure the accuracy of field connections by having an occasional part assembled with its connecting member. The number of parts to be so assembled should be governed by the workmanship. If errors are found, a sufficient number of parts should be assembled to make it reasonably certain that such errors have been eliminated. Have at least one upper and lower shoe of each kind assembled and make sure that there is no interference.

(24) Make sure that iron templets used for reaming are properly set and held to line.

(25) Secure match-marking diagrams for work which has been assembled and reamed and make sure that the match marks are plainly visible.

(26) Have proper camber blocking used in assembling trusses and secure the desired camber before the reaming is done.

(27) Require that all treads and supports for the drums of draw spans be carefully leveled with an instrument.

(28) Study carefully the machine details and discriminate between those dimensions which must be exact and those in which slight variations are permissible. Determine in advance the desired accuracy of driving fits for bolts or keys and similar parts and make sure that such accuracy is attained.

(29) Examine castings carefully for blowholes and other imperfections and discriminate between such defects as are unimportant and those which render the castings unfit for use.

(30) Make sure that bushings, collars and similar parts are held securely in place.

(31) Make sure that all drum wheels, expansion rollers, turnable rollers and similar parts are exact in size, so as to carry equally the loads which may be placed upon them.

(32) Ascertain in advance that the paint provided complies with specifications. Watch carefully the painting directions and make sure that paint is properly applied and only where intended.

(33) Verify all shop marks and make sure that they are legible as well as correct.

(34) Have important members so loaded as to be headed in the right direction upon arrival at the site of the work.

(35) Try a few countersunk head bolts in the holes where they are to be used to insure a proper fit.

(36) Make sure that small pieces are bolted in place for shipment as shown on the plans and that other small parts are properly boxed or otherwise secured against loss.

(37) Make sure that rivets, tie rods, anchor bolts and miscellaneous parts are shipped so as to avoid delay in erection.

(38) Examine the field rivets to insure that they are free from fins or other defects.

(39) Exercise special care in the examination of all movable structures and particularly their moving parts.

(40) Make reports weekly, or as directed, exhibiting carefully and concisely the actual conditions.

(41) Observe carefully and report such unusual difficulties as may be encountered and the means adopted in overcoming them and endeavor by a study of the details or other means to make recommendations which will prevent their recurrence in future work.

Instructions for the Inspection of Bridge Erection.

(1) Study and observe the plans and specifications for steel construction. Study the masonry plans and check the masonry as built with the steel plans.

(2) Familiarize yourself with the local conditions affecting erection. Make the acquaintance of the principal men engaged upon the work and of local residents whose interests may be affected thereby.

(3) Obtain and study carefully the employes' time table and be well posted concerning the time when regular and extra trains are due and their relative importance. Acquaint yourself with all special traffic arrangements made because of the work in hand.

(4) Secure full information concerning the conditions of the work in the bridge shop and the probable dates of shipment.

(5) Obtain reports of any uncompleted or erroneous work that must be attended to after arrival of the material in the field.

(6) Study the erection program in order to avoid delays and be able to recommend some other procedure in an emergency.

(7) Endeavor to have full preparations made before disturbing the track so that the erection may proceed rapidly and the period of such disturbance be made a minimum.

(8) Keep a record of the arrival of all materials. The contractor's record should be sufficient if available. Strive to anticipate any shortage of material and use all available facilities to hasten delivery of the needed parts.

(9) Study the progress of the work and determine whether it is likely to be completed in the time allotted. If not, endeavor to secure such additions to the force and equipment as will insure such completion.

(10) Make a daily record of the force employed and the distribution of labor, in a way that will assist in following clauses 9 and 23.

(11) Exercise a constant supervision of any temporary structure or falsework and make soundings if necessary with the purpose of discovering any evidence of failure or lack of safety and having it corrected before damage is done. Examine erection equipment with a view to its safety and adequacy.

(12) Be constantly on hand when work is in progress and note any damage to the metal, failure to conform to the specifications, or any especial difficulty in assembling.

(13) Make sure that each member of the structure is placed in its proper position. If match marks are used, examine them with care. Endeavor to have the several members assembled in such order that no unsatisfactory makeshifts need be resorted to in getting some minor members in place.

(14) Prevent any abuse or rough usage of the material. Bending, straining and heavy pounding with sledges are included in such abuse.

(15) Watch carefully the use of fillers, washers and threaded members to see that they are neither omitted nor misused.

(16) Make certain that all parts of the structure are properly aligned and that the required camber exists before riveting. It is possible for a structure to be badly distorted although the rivet holes are well filled with bolts.

(17) Watch the heating of rivets to insure against overheating and to make sure that scale is removed. Examine and test carefully all field-driven rivets and have any that are loose or imperfect replaced. Have cut out and replaced all rivets, whether shop-driven or field-driven, that may be loosened during erection and riveting. Prevent injury to metal while removing rivets.

(18) Present to the contractor at once for his attention any violation of the specifications or contract, and secure a correction or refer the matter to the proper authorities as soon as possible.

(19) Keep informed concerning the use of company material and work trains and assist in procuring such material and trains when needed, and preserve a record thereof.

(20) Secure a match-marking diagram of any old structure to be removed and see that each part of such structure is properly marked in accordance therewith. Make a record of the manner of cutting the old structure apart and report any damage to the members of the old structure. Indicate by sketches or otherwise such repairs or replacements as will be found necessary in re-erection.

(21) Secure photographic records of progress and the important features of the work wherever practicable.

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(22) Make a record of all flagging of trains, whether performed for the benefit of the contractor or otherwise, delays to trains, personal injuries, and accidents of every kind.

(23) Make reports as directed, showing the progress of the work, the size of the force and the equipment in use. Make a final report showing the cost of labor of erection per ton of material erected, the cost of labor per rivet in riveting, the cost of correcting errors in design and fabrication and commenting on the design and details; and give such other information as may be useful in planning similar work.

APPENDIX B.

MINORITY REPORT.

At the Buffalo meeting of the committee on September 9, the writer suggested that an effort be made to outline some method or system which would promise some improvement over existing mill and shop inspection, and that a co-operative railroad bureau, combining the good features of "company inspection" with those of "bureau inspection," deserves consideration, particularly on account of the very great advantages which the consolidation of a great tonnage would give, permitting the subdivision and specialization of work to a high degree under competent and experienced resident or district engineers and managers. The chairman of the committee seemed to think that our instructions from the Board to report on rules for instruction and guidance of inspectors in mill, shop and field," were not broad enough to include anything along the lines of this proposal and the matter was dropped.

Within the past few years the writer had occasion to do personally a considerable amount of shop inspection, and was impressed with the change in conditions and shop practice that had occurred within a comparatively few years. Certainly he had all along an "appreciation" of these new conditions, but that is quite a different thing from the actual, detailed experience of working with them. This recent experience is the basis of the suggestion offered above.

Company inspection is sometimes better, but often worse, than bureau inspection, and even with all the work for a system of allied lines does not consolidate sufficient tonnage to permit such an organization with division of work and specialization as the writer has in mind.

The rules of instruction as drawn may be applicable to "company inspection," but it is not clear how they are going to be applied to bureau inspection, which represents the greater tonnage. They would be entirely inadequate for such a co-operative railway bureau as suggested above. It is the writer's opinion that they will only be useful for company inspection, and that even for this kind they should contain more detail of technical and practical kinds.

The ideas I have suggested with the purpose of improving shop and mill inspection may be expressed as follows:

First.—That the shop and mill inspection of structural steel, to be efficient and satisfactory, should be done on a scale large enough to economically permit the employment at each shop or mill of a corps of men, who may be called checkers, each one of whom is specially fitted and trained for a certain part or detail of the work under a resident inspecting engineer, thoroughly familiar with all details of structural steel and its fabrication, competent to direct the corps of checkers and decide questions calling for the judgment of a man of experience and structural engineering training. Resident inspecting engineers should report to the district chief inspector or manager, who should be an expert in structural steel and its fabrication, as well as a competent bridge engineer, and he in turn should report to the executive head of what may be called the American Railway Inspection Association; except that on technical matters and with proper regulations, he may report to and receive instructions from the chief engineers and bridge engineers of the railway companies which are members of the association.

Second.—That the American Railway Engineering Association use its influence to induce the railway companies to delegate officials to meet and discuss ways and means and, if it appears practicable, to provide for establishing the American Railway Inspection Association as an organization to make a highly improved and standardized shop and mill inspection of structural steel, furnishing the same at cost to the railway companies which are members of or supporting such association. As this can hardly become effective without the support of railway companies representing about 75 per cent of the annual railway purchases of structural steel, it would seem advisable to have the official delegates empowered, under proper restrictions, to pledge the adherence of their respective companies to the support of the project.

Later on such an organization could be expanded to include the inspection of steel rails, but as this would require practically a separate corps—only the district chief and his office and probably a chemist, being common to the inspection of both structural and rail steel—it will no doubt be considered advisable to defer this question to a future time.

The size of each shop corps should include about one man for each 10,000 tons' annual capacity of the shop; the number of independent inspectors at present employed is probably equal to or greater than that. This would require that the inspection of about 50 per cent of the shop capacity be done by the proposed organization, otherwise the cost of inspection would be greatly increased, and my object is to try to show that a very superior inspection method can be devised without greatly increasing the cost.

The district chief, or manager, ought to be a man worth at least $200 to $300 per month, depending on the importance of the district, and could cover a radius of, say, 100 miles from Pittsburgh, Chicago, Philadelphia or Cleveland. Each resident inspecting engineer should be worth not less than $200 or $250 per month at the larger shops, down to a minimum of, say, $150 at the smaller shops. The wages of the other men in a shop corps would range, from about $1.00 per day for the scale boy to $4.00 per day for the men checking field fits, templets and laying out. This will work out to between 40 cents and 50 cents per ton for shop inspection in average shops down to 30 cents per ton in the largest shops.

The following is a tentative outline of a shop inspection corps and an estimate of cost for a shop of 100,000 tons capacity per annum, in one unit. For shops of two units a somewhat different arrangement would be required, and in each case the organization of the corps will have to be adjusted to the plan and character of the particular shop concerned:

District chief or manager	$3,600	
District chief, office expense	3,600	
District chief, expense account	1,200	
	$8,400	
25 per cent of $8,400		$2,100
Resident inspecting engineer	$3,000	
Templet checkers, 300 days @ $4	1,200	
Layout and punching checker, 300 days @ $4	1,200	
Assembling and fitting checker, 300 days @ $3.	900	
Reaming and rivet checker, 300 days @ $2	600	
Machine and finished work checker, 300 days @ $3	900	
Field connection checker, 300 days @ $4	1,200	
Painting and yard work checker, 300 days @ $3	900	
Scale and weight boy, 300 days @ $1	300	
Clerk, 300 days @ $3	900	
		11,100
		$13,200
Add 15 per cent for general expense		1,980
Total		$15,180
50 per cent of 100,000 tons shop capacity—50,000 tons; 50,000 tons @ 30 36/100c.		$15,180

There would, of course, have to be a general office to which the district chiefs or managers would report, but on technical matters I think the district chiefs or managers should report directly to and receive instructions from the chief engineer or bridge engineer of the railway companies, subject to proper regulations where extra expense is involved.

While it is practically impossible to secure individual inspectors with all the qualifications recommended in the report of committee 15, the desired combination of attributes may be closely approximated in such an organization as that outlined above.

A. W. BUEL.

APPENDIX C.

STUDY OF BUILT-UP COLUMNS.

The chairman got into touch with the chairman and secretary of the American Society of Civil Engineers' committee on Columns and Struts and ascertained the nature of the work being carried out under the direction of that

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committee so that no duplication of such work would be made.

The chairman then took up with S. W. Stratton, director of the Bureau of Standards, Washington, the question of the possibility of having several series of column tests made by the Bureau in its new 2,300,000-lb. Emery machine then being installed. Director Stratton kindly agreed to have such series made and to begin the tests as soon as the machine was in commission. The sub-committee decided to make detail drawings for a preliminary series consisting of eight sections commonly found in the compression members and struts. A light and a heavy section of each type is to be made up in lengths giving three l/r ratios (50, 85 and 120) and three specimens of each column are to be fabricated, making in all 144 test columns.

The detail drawings were made up by J. E. Crawford and presented to the general committee for discussion at its meeting in Buffalo on Sept. 9, 1912. Ten members having expressed their satisfaction with this preliminary series, with some minor modifications, the chairman arranged with Director Stratton and J. E. Howard to have the 18 columns representing column No. 1, series No. 1, at once fabricated and the tests commenced as soon as the final adjustments of the weighing apparatus were complete. It is hoped that the tests will be under way before Jan. 1, 1913. Before ordering the fabrication of the remaining columns of series No. 1, the committee will examine the results of the first 18 tests representing column No. 1 and will probably then proceed with a subseries on this column, changing one variable at a time in order to determine the best arrangement of details for the section. After the results of these tests are studied, the testing of the remaining columns of series No. 1 will be proceeded with, making such modifications as may be suggested by the results of the tests of column No. 1.

Discussion on Iron and Steel Structures.

A. J. Himes, chairman: The subject of third rail clearance was referred to the committee by the secretary on October 24, 1912, and is still under consideration. There seems to be a general agreement that a diagram should be made. The matter is to receive further study by a subcommittee which will investigate the dimensions of equipment passing over the railroads and propose a new diagram.

At a joint meeting an extended discussion was held and provisions made for a joint committee consisting of two members from Committee XV of the American Railway Engineering Association, two members from the Railway Signal Association and two members from Committee X of the American Railway Engineering Association, provided that Committee X shall elect to co-operate in the work. The following gentlemen were chosen as members of the joint committee: Mr. Chappell, chairman, and Mr. Johnson, of the Railway Signal Association, and Mr. Smith and Mr. Selby of the American Railway Engineering Association.

The committee recommends to the Association that the following subjects should be investigated during the ensuing year:

Methods of Protection of Iron and Steel Structures against corrosion. Design of Built-up Columns. Secondary Stresses. Protection of Traffic at Movable Bridges. Revision of the Bridge Clearance Diagram. Standard Specification for Phosphor Bronze. Riveted Joints and Locomotive Turntables.

Rule 9 under Instructions for the Mill Inspection of Structural Steel was then read.

W. R. Edwards, (B. & O.): It seems to me questionable whether we should insert an instruction of this kind which is entirely contrary to the mill practice at the present day, and which it is impossible for the inspector to carry out.

Mr. Himes: The particular question raised by Mr. Edwards is cared for in Section 10, which says, "Report promptly the shipment of any material from the mill, whose surface inspection has been waived. Such material should be examined by the shop inspector."

A. W. Carpenter (N. Y. C. & H. R.); I will read an extract from a letter from our chief mill inspector which may be of interest:

"Owing to the inability of mill inspectors to examine the finished mill product at the mill and before shipment, but little mill inspection is now made along the lines as at first set out. In order to fully comply with this provision it would be necessary to have a number of inspectors at the mill day and night, and who under the present mill arrangement, will have to be stationed at the hot beds beyond the finishing rolls. The mills, if they were required to handle the product for service inspection, for instance at the loading wharfs, or sheds, have not usually provided any room or facilities for laying out and turning over of the structural material. (Rails they have provided for.) They would object strenuously to such an arrangement, and it would certainly make endless contention and confusion. As a stand off, in lieu of this, they have their own inspectors who look after the surfaces and throw out all defective material. The following inspector, accepting the material on test, they then ship forward, and if it is found to be defective on arrival at the shops where it is to be fabricated into the members intended, by the shop inspector, it is thrown out and ordered to be replaced."

The secretary then read "Instructions for the Inspection of the Fabrication of Steel Bridges."

Mr. Carpenter: What does "Camber is not reversed" mean in Rule 16?

O. E. Selby (C. C. C. & St. L.): There is a certain liability of riveting the base plates on the wrong side of the girder, and as some are designed the top flange is just like the bottom flange and they might be mixed up by careless shop work, and the bottom plate might be riveted on the top flange, instead of the bottom flange. I think that is what the clause means in referring to the camber.

T. Earle (Penn. Steel Co.): I would suggest in place of camber that the word "Bevel" he used, and then I think the clause will have a definite meaning. (The suggestion was accepted.)

Mr. Himes: The committee would be willing to make Rule 20 paragraph read: "Examine and measure bored pinholes carefully to insure proper position, dimension and spacing and smoothness of finish."

Mr. Earle: It seems to me it is hardly proper in instructions as Rule 23 to tell an inspector to do something that is not in the contract. It says, even if the contract does not call for the assembling, that the inspector shall require it. That seems hardly proper.

F. W. Wolfe (M. P.): The clause is decidedly objectionable, because it will invite the inspector to ask for an assembling and save himself the trouble of carefully measuring up the connections, which ought to be a part of his duty.

Mr. Cartlidge: I move that the committee be asked to consider this paragraph 23 further. I believe with Mr. Earle and Mr. Wolfe that this clause will cause difficulty. (The motion was carried.)

Mr. Carpenter: It seems to me there is a little redundancy in paragraph 28. Seems to me the driving pit is pretty nearly a definition of accuracy in itself. I would recommend omitting the word "driving."

The President: The committee will accept that.

Mr. Carpenter: There are a few additional clauses which seem to me might be added to this list of instructions that are not as important as most of those mentioned. One of them is to check the dimensions of the material used in each member. I see no reference to that. It seems to me that the fundamental thing is to see that the proper material goes into the members, and if there is anything that we want to call the attention of the shop to it is the checking of the material in the members to see that everything corresponds. I make a motion that we check the material in each member.

O. E. Selby, (C. C. C. & St. L.): Clause 8 seems to cover the question raised by Mr. Carpenter. "Care in assembling," is a somewhat general expression, but "proper attention to the assembling" would include checking the dimensions of the material assembled.

E. A. Frink, (S. A. L. Ry.): In rising to second Mr. Carpenter's motion I would like to say, I think the question of the size of the material is of importance. It is not at all unusual to have members of the same size carrying weights on the same structure. (The motion was carried.)

Mr. Carpenter: In section 20 under Inspection of Bridge Erection, it is not always desired to re-erect old structures. I would suggest after the word, "removed" we insert "which it is desired to re-erect."

The President: The committee will accept that.

Mr. Carpenter: It happens very frequently that a number of parts are bent in erection, especially lattice parts, and compression rivets, and I think a clause reading the straightening of such parts, especially mentioning lattice parts, would be desirable.

Mr. Lindsay: There are no instructions requiring the inspector to look out for damaged new members, either in the unloading or the erection. I think another point to be guarded against in the unloading and storing of material is to prevent the accumulation of water on members.

The President: It is now in order to adopt these instructions as amended, for insertion in the Manual. Before putting the motion, however, the committee desires to omit

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paragraph 23, under fabrication of steel bridges, and it will be taken up as one of the matters for future improvement. If there is no objection we will consider it as referred to the committee in the sense of re-writing it as an additional clause next year, but it will be entirely disregarded in this action of accepting the three sets of instructions for printing in the Manual. Those in favor of adopting these instructions for publication in the Manual, please signify by saying aye. (The motion was carried.)

TRACK.

The committee presents statements of general principles to be followed in the design and manufacture of tie-plates, track bolts and anti-creepers and specifications for steel tie-plates, malleable tie-plates, wrought-iron tie-plates, track bolts, spiral spring nutlocks, ordinary track spikes and screw spikes.

TIE-PLATES.

General Principles to Be Followed in the Design.

The plates shall not be less than six inches in width, and as much wider as consistent with the class of ties to be used.

The length of the plates shall be not less than the safe bearing area of the ties divided by the width of the plate, and, when made for screw spikes, shall be so shaped as to provide proper support for the screw spikes.

J. B. JENKINS,
Chairman Committee on Track.

They shall be not less than 5/8 inch thick along either edge of the base of the rail.

The thickness of the plate shall be properly proportioned to the length.

The plates shall have a shoulder at least 1/2 inch high. The distance from the edge of rail base to the end of the tie-plate on the outer side must be uniform, and in excess of the projection inside of the rail base.

Where treated ties are used or where plates are for screw spikes, a flat bottom plate is preferable. Where ribs of any kind are used on base of plate, these shall be few in number and not to exceed 1/4 inch in depth.

The punching must correspond to the slotting in the splice bars, and, where advisable, may be so arranged that the plates may be used for joints. Spike holes may be punched for varying widths of rail base where the slotting will permit such punching without the holes interfering with each other and when the plate is of such design that the additional holes will not impair the strength of the plate.

SPECIFICATIONS FOR STEEL TIE-PLATES.

Material.

The plates shall be made of Bessemer or open-hearth steel.

Physical Properties and Tests.

The tie-plates shall conform to the following requirements:
Ultimate strength, not less than 55,000 lbs.
Elastic limit, not less than 50 per cent of ultimate strength.
Elongation, not less than 20 per cent in 2 inches.
Reduction of area, not less than 40 per cent.

Plates shall bend cold for 90 deg. without showing any sign of fracture.

A sufficient number of tests will be made to satisfy the inspector that the material meets the specifications in every respect.

Workmanship and Finish.

Subject to the following allowances, the form and dimensions of the plates shall conform to the drawings submitted to the manufacturer.

The length and width shall not vary more than 1/4 inch from the dimensions shown.

The thickness shall not vary more than 1/32 inch from the dimensions shown.

All variations in length shall be left on the inside end of the plate.

The distance from the shoulder to the outside end of the plate must be made uniform.

The spike holes must be punched from the top, clean cut, without burrs, and the plates must not be cracked or bent out of shape in punching the holes.

All plates must be stamped on the top side, outside of the base of rail, with the section and weight of rail.

The plates shall be free from burrs and imperfections.

Inspection.

When required, the manufacturer shall furnish samples of tie-plates from a preliminary rolling before proceeding with the filling of the order and give sufficient notice in advance of the date when they will be ready for inspection.

The inspector representing the purchaser shall have free entry at all times, while the work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

The inspection shall be made at the mill and the manufacturer shall afford the inspector free of cost all reasonable facilities to satisfy himself that the plates are being furnished in accordance with these specifications. The tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Tests shall be made of samples of the finished product selected by the inspector from each lot of 50 bundles. Two pieces shall be selected for each test, and if both meet the requirements of the specifications the lot will be accepted. If one of the test pieces fails a third test piece shall be selected and tested; if it meets the requirements of the specifications the lot will be accepted, but if it fails the lot will be rejected.

If, after shipment, any tie-plates are found to be defective, due to material or manufacture, they may be rejected.

Shipping.

Tie-plates shall be wired together in bundles, the weight not to exceed 100 lbs., and shipped with a uniform number in each bundle.

SPECIFICATIONS FOR WROUGHT-IRON TIE-PLATES.

Material.

The plates shall be made of wrought-iron.

Physical Properties and Tests.

The ultimate strength shall be not less than 45,000 lbs.

Plates shall bend cold for 90 deg. without showing any sign of fracture.

A sufficient number of tests will be made to satisfy the inspector that the material meets the specifications in every respect.

Workmanship and Finish.

Subject to the following allowances, the form and dimensions of the plates shall conform to the drawings submitted to the manufacturer.

The length and width shall not vary more than 1/4 inch from the dimensions shown.

The thickness shall not vary more than 1/32 inch from the dimensions shown.

All variations in length shall be left on the inside end of the plate.

The distance from the shoulder to the outside end of the plate must be made uniform.

The spike holes must be punched from the top, clean cut, without burrs, and the plates must not be cracked or bent out of shape in punching the holes.

All plates must be stamped on the top side, outside of the base of rail, with the section and weight of rail.

The plates shall be free from burrs and imperfections.

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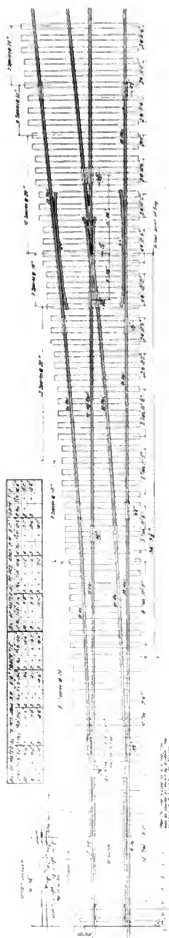

Typical Plan of No. 11 Main Line Turnout.

Inspection.

When required, the manufacturer shall furnish samples of tie-plates from a preliminary rolling before proceeding with the filling of the order and give sufficient notice in advance of the date when they will be ready for inspection.

The inspector representing the purchaser shall have free entry at all times, while the work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

The inspection shall be made at the mill and the manufacturer shall afford the inspector free of cost all reasonable facilities to satisfy himself that the plates are being furnished in accordance with these specifications.

These tests and inspections shall be so conducted as not to interfere unnecessarily with the operation of the works.

Tests shall be made of samples of the finished product selected by the inspector from each lot of 50 bundles. Two pieces shall be selected for each test, and if both meet the requirements of the specifications, the lot will be accepted. If one of the test pieces fails a third test piece shall be selected and tested; if it meets the requirements of the specifications the lot will be accepted, but if it fails the lot will be rejected.

If, after shipment, any tie-plates are found to be defective, due to material or manufacture, they must be rejected.

Shipping.

Tie-plates shall be wired together in bundles, the weight not to exceed 100 lbs., and shipped with a uniform number in each bundle.

SPECIFICATIONS FOR MALLEABLE TIE-PLATES.

Material.

The plates shall be made from furnace malleable iron.

Physical Properties and Tests.

All plates must be cast with a lug for test purposes. The test lug when broken off must not break easily, as cast-iron, but must bend and show signs of toughness. The fracture must show a narrow band of white metal on the surface, the center portion being dark and fibreless.

The plates must bend sufficiently to show thorough annealing.

A sufficient number of tests will be made to satisfy the inspector that the material meets the specifications in every respect.

Workmanship and Finish.

Subject to the following allowances, the form and dimensions of the plate shall conform to the drawings submitted to the manufacturer.

The length and width shall not vary more than 1-16 inch from the dimensions shown.

The thickness shall not vary more than 1-32 inch from the dimensions shown.

All plates must be properly and thoroughly annealed.

All plates must be well cleaned and free from warping, shrinkage, cracks, blow holes, fins, and other imperfections.

Inspection.

When required, the manufacturer shall furnish samples of tie-plates from a preliminary lot before proceeding with th filling of the order and give sufficient notice in advance of the date when they will be ready for inspection.

The inspector representing the purchaser shall have free entry at all times, while the work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

The inspection shall be made at the mill and the manufacturer shall afford the inspector free of cost all reasonable facilities to satisfy himself that the plates are being furnished in accordance with these specifications.

These tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

If, after shipment, any tie-plates are found to be defective, due to material or manufacture, they may be rejected.

Skipping.

Tie-plates shall be wired together in bundles, not to exceed 100 pounds, and shipped with a uniform number in each bundle.

TRACK BOLTS.

Facts and General Principles to Be Taken into Consideration in the Design.

As a rule, as large track bolts should be used as the rail and splice bars will permit.

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Bolts with rolled threads show a greater ultimate strength than those of the same size with cut threads. The elastic limit, however, is not materially different.

A workman pulling on a 33-inch wrench with a pull of 100 pounds will load a ⅞-inch diameter bolt to the extent of 45,000 pounds per square inch, where the threads are in average condition. Therefore, it is easy to see how a bolt with a low elastic limit will readily be stretched in being tightened.

A ⅞-inch bolt with an elastic limit of 45,000 pounds will require the same pull to stretch it as a 1-inch bolt with an elastic limit of 35,000 pounds. Again, a 1-inch bolt with an elastic limit of 75,000 pounds requires over twice the pull to stretch it as a 1-inch bolt with an elastic limit of 35,000 pounds.

SPECIFICATIONS FOR TRACK BOLTS.

Material.

Steel shall be made by the open-hearth or other approved process. If necessary to secure the properties desired, the bolts may be heat treated.

Physical Properties and Tests.

The bolts shall conform to the following requirements:

For carbon steel				
For untreated nickel or other alloy steel				
For heat treated nickel or other alloy steel				
Elastic limit	not less than	35,000	lbs. per sq. in.	
Elastic limit,	"	"	"	25 per cent in 2 in.
Elastic limit,	"	"	"	50 per cent.
Elongation,	"	"	"	45,000 lbs. per sq. in.
Elongation,	"	"	"	20 per cent. in 2 in.
Elongation,	"	"	"	40 per cent.
Reduction of area,	"	"	"	75,000 lbs. per sq. in.
Reduction of area,	"	"	"	15 per cent in 2 in.
Reduction of area,	"	"	"	40 per cent.

The heads and nuts shall be free from checks or hurrs of any kind. They shall have the U. S. Standard upset thread unless otherwise specified. The threads may be either cut or rolled and shall be full and clean, with not less than two, or more than five, finger threads.

Inspection.

When required, the manufacturer shall furnish samples of bolts from a preliminary rolling before proceeding with the filling of the order and give sufficient notice in advance of the date when they will be ready for inspection.

The inspector representing the purchaser shall have free entry at all times, while the work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

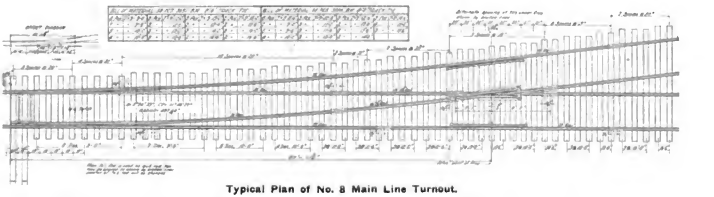
The inspection shall be made at the mill and the manufacturer shall afford the inspector free of cost all reasonable facilities to satisfy himself that the bolts are being furnished in accordance with these specifications. Tests and inspection shall be so conducted as not to interfere unnecessarily with the occupation of the works.

Tests shall be made of samples of the finished product selected by the inspector from each lot of 100 kegs. Two pieces shall be selected for each test and if both meet the requirements of the specifications the lot will be accepted. If one of the test pieces fails a third test piece shall be selected and tested; if it meets the requirements of the specifications the lot will be accepted, but if it fails the lot will be rejected.

If, after shipment, any bolts are found to be defective, due to material or manufacture, they may be rejected.

Marking and Shipping.

When the bolts are shipped they shall have the nuts applied for at least two threads, shall be properly oiled to



Typical Plan of No. 8 Main Line Turnout.

Elastic limit shall in no case be less than 50 per cent of the ultimate strength.

The elastic limit, elongation and reduction of area may be determined on a test piece ½x2 in. turned from a finished bolt.

The ductility of the bolts shall be determined by the cold bend test, which requires that the material used in the bolts shall bend cold through 180 deg. and flatten itself without fracture on the outside of the bent portion. This bend may be made on the unthreaded portion of a finished bolt, on a blank bolt, or on a test piece of the same size and same grade of steel, in any case, subjected to the same treatment as the finished bolt. It is not necessary that the bolt bend double in the threaded portion.

A sufficient number of tests shall be made to satisfy the inspector that the material meets the specifications in every respect.

Workmanship and Finish.

Subject to the following allowances, track bolts shall conform to the drawings submitted to the manufacturer:

The length shall not be more than 1/16 inch less or ⅛ inch more than the dimensions shown.

The diameter of the bolt shall not vary more than 1-64 inch from the dimensions shown.

The size of the head shall not vary more than 1-16 inch from the dimensions shown.

The outside dimensions of the nut shall not vary more than 1-32 inch from the dimensions shown.

The shoulder of the bolt shall not vary more than 1-64 inch from the dimensions shown.

prevent rusting and shall be packed in serviceable kegs. All kegs must be plainly marked as to material, size of bolts and name of manufacturer.

SPECIFICATIONS FOR SPIRAL SPRING NUTLOCKS.

Material.

The steel from which the nutlocks are made must be of open-hearth steel, or other approved process, and shall conform to the following chemical analysis:

Phosphorus,	not over	.05	per cent.
Sulphur	" "	.05	per cent.

Physical Properties and Tests.

After the finished nutlock has been subjected to pressure sufficient to compress it flat for a period of one hour, its reaction shall not be less than two-thirds its height or thickness of section, providing thickness is less than width of section. If the section is square, the reaction must not be less than one-half its thickness. If height or thickness of section is more than its width, reaction shall not be less than the width of the section.*

With one end of the finished nutlock secured in a vise, and the opposite end twisted to 45 degrees, there must be no sign of a fracture. When further twisted until

*Note.—The internal diameters naturally affect the percentage of reaction, and the above specifications apply to nutlocks of internal diameters from 13-16 in. to 1 5-16 in. Owing to the difficulty of establishing a common rate of percentage that shall be uniformly applicable to any internal diameter of any nutlock of any section, it has been sought to cover the matter as above. The amount and durability of the reactionary power under constant pressure is the true test of any spiral spring nutlock. The percentage of reaction increases proportionately with the increased internal diameter of any given section.

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broken, the fracture must show a good quality of steel.

A sufficient number of tests will be made to satisfy the inspector that the material meets the specifications in every respect.

Workmanship and Finish.

The dimensions and form of the nutlock shall conform to the drawings submitted to the manufacturer.

The nutlocks shall be clean, without burrs or rough edges. The coil and cross-section shall be uniform throughout.

The manufacturer is required to guarantee:

First. That the steel was thoroughly annealed and permitted to assume its proper molecular structure before being made into nutlocks.

Second. That the subsequent heat treatment was scientifically accurate according to the best methods known, to secure uniformity of temper and the highest efficiency attainable.

Inspection.

When required, the manufacturer shall furnish samples of nutlocks from a preliminary lot before proceeding with the filling of the order, and give sufficient notice in advance of the date when they will be ready for inspection.

The inspector representing the purchaser shall have free entry at all times, while the work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

The inspection shall be made at the mill and the manufacturer shall afford the inspector free of cost all reasonable facilities to satisfy himself that the nutlocks are being furnished in accordance with these specifications. The tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Tests shall be made of samples of the finished product selected by the inspector from each separate heat treatment. Two pieces shall be selected for each test and if both meet the requirements of the specifications the lot will be accepted. If one of the test pieces fails a third test piece shall be selected and tested; if it meets the requirements of the specifications the lot will be accepted, but if it fails the lot will be rejected.

If, after shipment, any nutlocks are found to be defective, due to material or manufacture, they may be rejected.

Marking and Shipping.

When the nutlocks are shipped they shall be packed in good serviceable boxes. All boxes must be plainly marked as to material, size and number contained therein, and the name of the manufacturer.

SPECIFICATIONS FOR ORDINARY TRACK SPIKES.

Material.

Steel shall be made by the open-hearth or other approved process. If necessary to secure the properties desired the spikes may be heat treated.

Physical Properties and Tests.

The spikes shall conform to the following requirements:

Ultimate strength, not less than 55,000 pounds.

Elastic limit, not less than 50 per cent of ultimate strength.

Elongation, not less than 20 per cent in 2 inches.

Reduction of area, not less than 40 per cent.

The finished spike, when bent back on itself through 180 deg. and hammered down, shall show no signs of fracture.

When the head of the spike is bent backward cold it shall show no signs of fracture.

When the body of the spike is twisted cold 1¼ turns it shall show no signs of fracture.

A sufficient number of tests will be made to satisfy the inspector that the material meets the specifications in every respect.

Workmanship and Finish.

Subject to the following allowances, the form and dimensions of the spike shall conform to the drawings submitted to the manufacturer.

The thickness shall not vary more than 1-32 inch from the dimensions shown.

The length shall not be less, nor over ¼ inch more, than the dimensions shown.

The thickness of the head shall not vary more than 1-16 inch from the dimensions shown.

The angle of the hook shall not vary more than one degree from that shown on the drawing.

The spikes must be neatly formed, free from burrs and rough edges, and have well-shaped heads and sharp points.

Inspection.

When required, the manufacturer shall furnish samples of spikes from a preliminary rolling before proceeding with the filling of the order and give sufficient notice in advance of the date when they will be ready for inspection.

The inspector representing the purchaser shall have free entry at all times, while the work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

The inspection shall be made at the mill and the manufacturer shall afford the inspector free of cost all reasonable facilities to satisfy himself that the spikes are being furnished in accordance with these specifications. The tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Tests shall be made of samples of the finished product selected by the inspector from each lot of 100 kegs or bags. Two pieces shall be selected for each test and if both meet the requirements of the specifications the lot will be accepted. If one of the test pieces fails a third test piece shall be selected and tested; if it meets the requirements of the specifications the lot will be accepted, but if it fails the lot will be rejected.

If, after shipment, any spikes are found to be defective, due to material or manufacture, they may be rejected.

Marking and Shipping.

When the spikes are shipped they shall be packed in good serviceable kegs or bags. All kegs or bags must be plainly marked as to material, size of spikes and name of manufacturer.

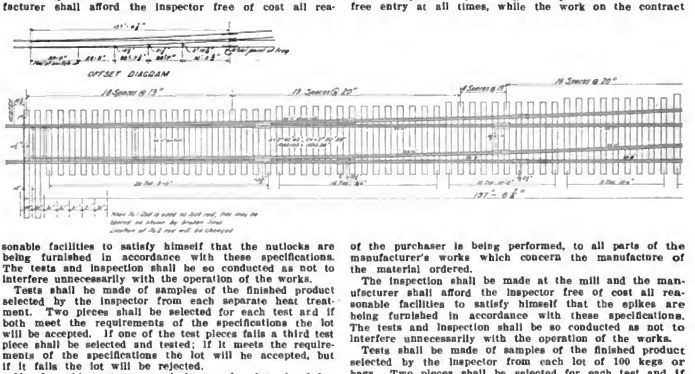
SPECIFICATIONS FOR SCREW SPIKES.

Material.

Screw spikes shall be made of open-hearth steel.

The chemical properties of the finished spike shall conform to the following limits:

Phosphorus, not over	.05 per cent.
Sulphur, " "	.05 per cent.



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Physical Properties and Tests.

The finished spike shall conform to the following requirements:

Ultimate strength, not less than 60,000 lbs. per sq. in.

Elastic limit, not less than 50 per cent of ultimate strength.

Elongation, not less than 22 per cent in 2 in.

Reduction of area, not less than 40 per cent.

The material used in the spikes when bent cold through an angle of 180 deg. and hammered down shall show no signs of fracture.

The finished spike when bent cold through an angle of 90 deg. shall show no signs of fracture.

A sufficient number of tests will be made to satisfy the inspector that the material meets the specifications in every respect.

Workmanship and Finish.

The dimensions and form of the screw spike shall conform to the drawings submitted to the manufacturer.

All spikes shall be finished smooth and in a workmanlike manner, having no rough edges. They shall be of exact size, with symmetrical heads the axis of which must be situated in the direct line of the shank axis produced.

Inspection.

When required, the manufacturer shall furnish samples of spikes from a preliminary rolling before proceeding with the filling of the order and give sufficient notice in advance of the date when they will be ready for inspection.

The inspector representing the purchaser shall have free entry at all times, while the work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

The inspection shall be made at the mill and the manufacturer shall afford the inspector free of cost all reasonable facilities to satisfy himself that the spikes are being furnished in accordance with these specifications. The tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Tests shall be made of samples of the finished product selected by the inspector from each lot of 100 kegs or bags. Two pieces shall be selected for each test and if both meet the requirements of the specifications the lot will be accepted. If one of the test pieces fails a third test piece shall be selected and tested; if it meets the requirements of the specifications the lot will be accepted, but if it fails the lot will be rejected.

If, after shipment, any spikes are found to be defective, due to material or manufacture, they may be rejected.

Marking and Shipping.

When the spikes are shipped they shall be properly oiled to prevent rusting and shall be packed in good serviceable kegs or bags. All kegs or bags must be plainly marked as to material, size of spike and name of manufacturer.

ANTI-CREEPERS.

General Requirements to Be Met in the Design and Manufacture.

They shall be so designed as to fit two or more different weights of rail and so that they can be readily removed and reapplied.

They must be easy to apply under full-ballasted track.

They must be substantial enough to stand driving to place without chance of breaking.

The least possible number of movable parts is desirable.

When applied they must be in position rigidly enough to carry the tie with them in any kind of ballast without slipping.

They shall be made with sufficient take-up to permit of proper tightening.

They must not loosen when in place, or sufficiently to slip when the rail slacks back.

Controlling or delicate parts should be made of non-rustable material.

Anti-creepers made of steel shall be of sufficient size to minimize the destruction by rust.

Anti-creepers made of malleable iron must be from furnace malleable iron properly annealed, and of sufficient weight to prevent breakage and distortion in application or in service.

STUDY OF DESIGN OF MAIN LINE TURNOUTS.

The committee presents typical plans illustrating recommended designs for Nos. 8, 11 and 16 main line turnouts. In addition, it has secured data as to the height of center of gravity of locomotives and tenders recently constructed and has under way a table showing the speed at which trains may be run through various turnouts and various curves with different elevations of outer rail, for publication as a matter of information. This information is not yet in shape for submission. The committee has also begun the preparation of typical plans for cross-overs.

Typical Plan of No. 16 Main Line Turnout.

ECONOMICS IN TRACK LABOR.

The committee adopted the following preliminary outline for future study, the plan being comprehensive and intended to cover the work of several years:

A system of reports to measure the efficiency of gangs for various kinds of work and the efficiency of various kinds of labor with a view to establishing tangible data to correctly measure efficiency.

A system of reports to establish unit costs of work.

The use of a system of work cards and other means of planning work and keeping records to measure progress.

The development of a plan and system for establishing a thoroughly accurate basis of comparison of track conditions as a means for measuring efficiency—equating for various conditions, such as rails, ballast, ties, drainage, length of track, etc.

A study of the use and efficiency of motor cars for track work.

A study of labor-saving devices.

A study of the method best suited to various kinds of track work, particular reference being made to rail, ballast and tie renewals.

A study of the method of renewing ties, as to renewal of ties on every mile of track each year or taking a portion of the track each year to avoid disturbing track too often.

A study of the matter of proper season for various kinds of track work.

A study of the organization best suited to carry on the above work as to extra gangs versus section gangs.

A study of the general suggestion to combine under section foremen such work as ordinary maintenance of signals and telegraph lines, rough carpentry, water station repairs, etc.

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Proper size of track supervisors' territory.
The establishment of a labor bureau to better control and secure labor.
Training laborers for track work by specially organized gangs for that purpose.
Rates of pay for section labor.
The matter of obtaining good section foremen.
The education of section foremen.
The rates of pay of section foremen.
The proper basis for providing section houses.
The subjects chosen for immediate investigation were the matter of educating and securing section foremen and method of making program of work and sequence of work.

Two circulars were prepared and submitted to the membership dealing with these subjects. A great deal of information has been received, some of which enables the committee to reach a conclusion with reference to certain matters, and in other instances the information furnished is not in sufficient detail to enable a conclusion to be reached at this time, and these matters will be the subject of further research. Eighty-seven replies were received to this circular, and the following represents the summary of the information received:

"A" Has your company in effect any plan for the systematic education of men to fill the places of section foremen?

"C" Do you have any defined plan of equipping gangs with apprentices and assistant foremen?

Of the total replies received
57 indicated no plan in effect.
23 reported the practice of employing assistant foremen.
6 reported the practice of employing apprentices.
1 reported the use of a "school gang" for the education of foremen.
1 reported no information.
2 reported the practice of using both assistant foremen and apprentices.

"D" Do you have any defined plan of educating foremen as a class by instruction, such as educational bureaus, periodical meetings, etc.?

Of the replies received
72 indicated no definite plan for education.
10 reported the practice of periodically instructing men through meetings.
3 reported the use of educational bureaus.
1 reported education by pamphlet, and
1 reported education by inspection trips to other roads.

"B" From what classes of men do you now select foremen?

The intent of this question was to develop to what extent selections were made for foremen from certain nationalities or classes of labor, but the information received is quite general and not sufficiently specific to enable the sub-committee to give a very accurate opinion upon this matter, and this is to be made the subject of further research with a view to determining the relative efficiency of various classes or nationalities, information showing the number of each nationality employed, their qualifications as to honesty, reliability and general efficiency, and the effect, in employing foreigners for section foremen, in improving the supply of labor for ordinary section work with a view to overcoming the difficulties now existing in foreign labor desiring to work generally in large gangs.

"J" What percentage of your foremen are foreign born?

25 report none employed.
27 report 25 per cent or less.
16 report 50 per cent or less.
8 report 75 per cent or less.
7 report 100 per cent or less, and
4 give no information.

CONCLUSIONS.

The committee recommends for adoption and publication in the manual:

1. As representing good practice:

(a) Tie plates—General principles to be followed in the design.
(b) Specifications for steel tie plates.
(c) Specifications for wrought iron tie plates.
(d) Specifications for malleable tie plates.
(e) Track bolts—Facts and general principles to be taken into consideration in the design.
(f) Specifications for track bolts.
(g) Specifications for spiral spring nutlocks.
(h) Specifications for ordinary track spikes.
(i) Specifications for screw spikes.
(j) Anti-creepers—General requirements to be met in the design and manufacture.

2. As representing good practice:

Typical plans of Nos. 8, 11 and 16 main line turnouts.

3. As desirable agencies to obtain a better class of section foremen:

(a) The application of the principle of apprenticeship for a defined period during which the rate of pay shall be the same as a laborer, following which those men who show the necessary qualities for foremanship to be given an increase in compensation and the title of assistant foreman. From this position those men should be promoted to that of section foreman.

(b) The application of a method of education by periodical instruction in the form of meetings, at which supervising officers should instruct as to practice and encourage discussion between the men.

(c) The application where possible of an educational system, such as is being conducted on several of the larger railways, for which articles are written by supervising officers dealing with the best practices, which articles are printed and sent to foremen and assistant foremen free of cost, following which an examination is conducted and promotions depending on the results of such examinations.

4. The "Table of Functions of the Ten-chord Spiral" as supplementing and completing the table on pages 102-110 of the manual and superseding the table on page 111.

5. The headings "W = Length Theoretical Point to Toe" and "K = Length Theoretical Point of Heel" in place of "W = Length Point to Toe" and "K = Length Point to Heel" in columns II and III, Table of Theoretical and Practical Switch Leads on page 92 of the manual.

The committee recommends that subjects 2 and 3 be reassigned, the former with instructions as to the features to be studied.

J. B. Jenkins (B. & O.), chairman; G. J. Ray (D. L. & W.), vice-chairman; Geo. H. Bremner (C. B. & Q.), A. Bruner (N. & W.), Garrett Davis (C. R. I. & P.), Raffe Emerson (Cons. Engr.), E. G. Ericson (Pa. Lines), J. M. R. Fairbairn (C. P. R.), T. H. Hickey (M. C.), E. T. Howson (Railway Age Gazette), J. R. Leighty (M. P.), Thos. Maney (L. & N.), Curtiss Millard (C. G. W.), P. C. Newbegin (B. & A), R. M. Pearce (P. & L. E.), H. T. Porter (B. & L. E.), W. G. Raymond (Univ. of Iowa), S. S. Roberts (I. C.), L. S. Rose (C. C. C. & St. L.), H. R. Safford, (G. T.), C. H. Stein (C. R. R. of N. J.), F. S. Stevens (P. & R.), A. H. Stone (K. C. Term.), W. J. Towne (C. & N. W.), C. C. Wentworth (N. & W.), Committee.

Discussion on Track.

Conclusion No. 2 was adopted, the term "timber," replacing the word "material." Conclusions No. 3, 4 and 5 were also adopted.

Mr. Jenkins: I would move the adoption and publication in the Manual of Specification (a) in conclusion No. 1.

Mr. Stimson: I move the third paragraph specifying 5/8 in. thickness be stricken out and that it be considered that the thickness of the plate is covered by the next paragraph, and that there are comparatively few tie-plates now in use 5/8 in. thick. (The motion was seconded and carried.)

The Secretary read the paragraph beginning, "The spike holes must be punched——"

Mr. Jenkins: I wish to announce that the committee by letter ballot amended that specification so as to read, "The spike holes must be punched clean cut, without burrs, and the places must not be cracked or bent out of shape in punching the holes." The committee recognizes in the majority of cases it is best to punch the holes from the top, and that should be the general practice, but there are special cases where the holes should be punched from the bottom, where the punching cannot be successfully done from the top.

Mr. Lindsay: In connection with section relating to the stamping of plates, I think that would be improved if it read, "All plates must be stamped on the top side, outside of the rail seat, with the prescribed mark indicating the section and weight of the rail." I make that suggestion because on many roads we have our standard tie-plate which gives a distinct letter or number for the tie plate that is to be used with certain weights of rails. There are certain letters which are to be used for the tie-plate at the joint, and others at the end of the angle bar. I believe if it is made to read in the form I have suggested, it would be more universally applicable.

The President: The committee will accept that amended reading.

Mr. Lindsay: Under the heading "Shipping" at the end of the specifications for steel tie-plates, I would like to substitute the following: . . . "Tie-plates shall be wired to-

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gether in bundles of uniform number, weighing not to exceed 100 lbs. and properly tagged."

Mr. Jenkins: The committee will accept that suggestion.

The President: A motion was made and seconded that the general principles to be followed in the design of tie plates, as amended be adopted for publication in the manual.

The motion was put to vote and carried.

Mr. Jenkins: I move the adoption for publication in the Manual of the Specifications for Steel Tie-Plates, as amended.

The motion was carried.

The secretary then read the Specifications for Wrought-Iron Tie-plates.

L. C. Fritch: I move that the specifications for wrought-iron tie-plates be amended to harmonize with the amendments in connection with the specifications for steel tie-plates, which are substantially the same as the specifications for wrought-iron tie-plates.

The motion was carried.

Mr. Lindsay: I suggest that the Specification for Malleable Tie-Plates be read, caption by caption.

Mr. Fritch: Under "Workmanship and Finish," it is stated that the length and width shall not vary more than 1/16 in. from the dimensions shown, while in the wrought iron and steel specifications it is given as ⅛ in. What is given as the difference?

Mr. Jenkins: The malleable tie-plates can be made to conform better to the dimensions than the steel tie-plates can.

Mr. Lindsay: I move that the shipping articles be changed to agree with the same article under steel tie-plates and wrought iron tie-plates.

The President: The committeee will agree to that.

Mr. Jenkins: I move that the specifications for malleable tie-plates be adopted. (The motion was carried.)

(The Secretary read the Facts and General Principles to Be Taken into Consideration in the Design of Track Bolts, which was adopted.)

The Secretary read the specifications for Track Bolts.

Mr. Lindsay: Under "Workmanship and Finish," I would like a clause somewhat as follows inserted: "Care must be taken to avoid damage to the metal by overheating in manufacture."

Mr. Jenkins: The committee will accept that.

Mr. Jenkins: I move that Specification for Track Bolts be adopted as amended for publication in the Manual. (The motion was carried.)

(The Secretary read the specifications for Spiral Spring Nut Locks, and they were adopted.)

The Specifications for Ordinary Track Spikes were then read.

The President: In connection with these specifications, it is understood that any changes made in the previous specifications that should be made in these specifications to make them harmonize with the others will be made in these specifications.

Mr. Fritch: I think somewhere in the specifications we should show how the length of the spikes should be measured, whether it should be the length over all, or the measurements should be under the head.

Mr. Jenkins: The committee will amend the paragraph just read by having it begin "The length under the head," etc.

The President: That will undoubtedly be acceptable.

Mr. Jenkins: I move the adoption, for publication in the Manual, of the Specifications for Ordinary Track Spikes. (The motion was carried.)

(The secretary read the specifications for screw spikes.)

Mr. Lindsay: Have the committee considered the method of making the thread on the screw spike, or do they think it necessary to specify how the thread should be formed?

G. J. Ray: There is only one way that the thread can be made economically, and that is rolled. When you buy them, you will find that the manufacturer who makes them in any other way will not be able to compete with the markets. I do not think there is any question but what the method of manufacture will take care of itself. You have to roll them to make them economically.

Mr. Lindsay: Many spikes are shipped in boxes. I think the paragraph should read "Good serviceable boxes, kegs, or bags."

Mr. Jenkins: The committee will change that by making it read "Shall be packed in good serviceable packages."

Mr. McDonald: Why was Bessemer steel cut out in connection with screw spikes as well as bolts, and retained in regard to tie plates.

Mr. Jenkins: We think a better quality of material is required in screw spikes and bolts than in tie plates.

Mr. Jenkins: I move the adoption and publication in the Manual of the Specifications for Screw Spikes. The motion was carried.

The secretary read the general requirements to be met in the design and manufacture of anti-creepers.

Mr. Lindsay: I think the clause should read: "They must not loosen when in place sufficiently to render the anti-creeper inoperative when the rail slacks back."

The President: The committee will accept that.

Mr. Jenkins: I move the adoption of the general requirements to be met in the design and manufacture of anti-creepers for publication in the Manual. (The motion was carried.)

E. F. Wendt (P. & L. E.): I want to make a few remarks on the question of "Economics in Track Labor," referred to in this report. A number of the committees have begun the study of economics. This work grows out of the paper of Mr. Loree submitted at the last convention, which showed that about 55 per cent of all of the expense of a railroad consisted in the cost of labor. The object of our association is the advancement of knowledge pertaining to the scientific and economic maintenance of railways. I submit that we have done well to take up these scientific studies which relate to the economics, and the beginning of this work marks an epoch in the history of our association.

The relation of the cost of labor to the gross revenue of all the railroads in America has risen, as shown by the figures of the Interstate Commerce Commission. During the past 20 years wages to gross revenue have risen from 37.7 to 41.9 per cent. During the same period the ton mile rate, which represents the amount of money the railroad company receives from the public, has declined from 9.3 mills to 7.5 mills, and during the same period the relation of dividends and interest to gross has declined from 28.3 to 24.2 per cent. It is, therefore, apparent that every effort should be made to bring about such economies in labor as are possible.

In our railroad industry there are three interests entitled to a hearing, the capitalist, the wage earner, and the people who use the roads. To show how each of these three interested classes has fared for some time past, here are the percentages of total gross earnings devoted to wages and to interest and dividend payments. How the third party of the contract, the public, as typified by the shipper, has fared can be seen from the average rate per ton per mile:

	Per cent. Wages to Gross	Per cent. Dividends and Interest to Gross	Ton-Mile Rate
1911	41.90 per cent*	24.27 per cent*	0.750*
1910	40.43	23.47	0.753
1909	40.03	24.32	0.760
1907	40.47	26.99	0.759
1906	39.36	23.84	0.766
1905	38.82	24.47	0.762
1900	37.99	25.74	0.728
1895	40.76	25.68	0.840
1890	37.71	28.37	0.936

Since 1890 wages have risen 11.1 per cent, as compared with gross earnings, while dividend and interest payments taken together, notwithstanding the rise of 26 years, show a net decline of 14.5 per cent. The general tendency has been to devote a decreasing portion of gross earnings to payments to the capitalist and an increasing portion to wages.

Mr. Lindsay: I ask the committee to study the question of cross-overs. It is a large subject that is in the air, and we are told the recommendations of this committee are all wrong, and that we must have a No. 20 cross-over, to be entirely safe, in order to operate a railroad safely. The committee has considered nothing longer than No. 16 as necessary, and one Public Service commission has gone on record as saying it is entirely safe to run at the normal speeds incident to every day operation through a No. 20 cross-over. I hope the committee in studying this question will give attention to the matter of curvature at the switch angle. I figured roughly with an engine of 17-ft. wheel base on a 15-ft. switch point, with a spread at the heel of 6 in., the curvature is equivalent to 22 deg. and 35 min.; with a 20-ft. switch point, it is 16 deg. and 15 min.; with a 30-ft. switch point, it is 13 deg. and 6 min. Assuming the rigid wheel base of a locomotive as incinding the distance from the forward pony truck to the rear driver, as 26 ft. with a 15-ft. switch point, the curvature is 14 deg. 24 min.; with a 20-ft. switch point, 10 deg. 55 min., and with a 30-ft. switch point, 8 deg. 30 min. Assuming the rigid wheel base as 34.66, with a 15-ft. switch point, the curvature would be 11 deg. 2 min.; with a 20-ft. swtich point, the curvature would be 8 deg. 55 min.; with a 30-ft. switch point the curvature would be 6 deg. 37 min. How fast is it safe to go over the switch point regardless of the curvature of the point, and go by a switch point without any elevation at normal speed?

Mr. Jenkins: The committee has gone ahead with its work

*Estimated.

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and has prepared designs for cross-overs which it will submit next year, and the committee has also undertaken to find out the relation of speed to turn-out radius, and the relation of speed to the switch angle, and we have made some progress along that line.

RAIL.

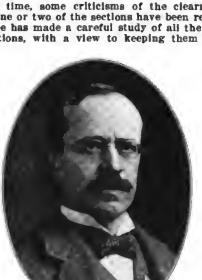
The work outlined by the board of direction for the year was as follows:

(1) Consider revision of the manual; if no changes are recommended, make statement accordingly.
(2) Present recommendations on standard rail sections.
(3) Continue investigation of rail failures and present conclusions drawn therefrom.
(4) Continue special investigation of rails.
(5) Make concise recommendations for next year's work.

REVISION OF MANUAL.

The work of the committee resulted, after several years, in the presentation of a set of specifications for carbon steel rails at the annual convention in 1912, which was adopted by the association.

Since that time, some criticisms of the clearness of the meaning of one or two of the sections have been received, and the committee has made a careful study of all the sections in the specifications, with a view to keeping them up to date



W. C. CUSHING,
Chairman Committee on Rail.

and making them as perfect as possible, with the result that a few revisions are now submitted for adoption by the association, some of them being merely changes in wording and rearrangement, which it is hardly necessary to point out in detail. The principal changes are, however, as follows:

Section 4. *Chemical composition:* The words "of each heat" have been added, so that the section reads, "The chemical composition of each heat of the steel from which rails are rolled, determined as prescribed in section 7, shall be within the following limits."

This change was made because the question arose at one mill as to whether it was necessary for every heat to have its chemical elements within the limits prescribed by the specifications.

Section 14. *Elongation or ductility:* A new paragraph has been added, as follows: "A sufficient number of blows shall be given to determine the complete elongation of the test piece of at least every fifth heat of Bessemer steel, and of one out of every three test pieces of a heat of open-hearth steel."

In measuring the elongation, acceptance or rejection is determined by the amount shown under one or more blows of the tup, but in addition to this, it is advisable to determine the total elongation or ductility of a certain number of test pieces, in order to keep informed on the toughness of the material, by repeating the blows till failure results. It is at present customary to carry on these tests, and it was thought advisable and proper to add the requirement to the specifications in order to make them more complete.

Section 17. *Bessemer process drop tests, clause* (b): The words "does not break and" have been added to the second line, so that the clause reads, "If the test piece breaks at the first blow or does not show the required elongation (section 14), or if the test piece does not break and shows the required elongation, but when broken shows interior defect, all of the top rails from that heat shall be rejected." The words "nicked and" have also been omitted from both clauses (a) and (b). Both the additions and omissions were brought about by discussion as to the precise meaning of the clause. Similar changes have been made in (c), (d), (e) and (f).

Section 18. *Open-hearth process drop tests:* Clauses (a) and (b) have been made to read as follows:

(a) "If two of these test pieces do not break at the first blow, and if both show the required elongation (section 14), all of the rails of the heat shall be accepted, provided that none of the three test pieces when broken show interior defect."

(b) "If two of the test pieces break at the first blow, or do not show the required elongation (section 14), or if any of the three test pieces when broken show interior defect, all of the top rails from that heat shall be rejected."

In clause (a), the changes were the addition of the words "if both," the addition of the words "none of the three," and the omission of the words "nicked and," also "do not."

In clause (b), the additions were the words "three tests" and the omission of the words "that have been tested under the drop" and "nicked and."

The changes were made necessary to abolish any cause for dispute as to the meaning, because, as already explained for section 17 (a) and (b), some were inclined to lay too much stress on the words "nicked and" when considering the rejection of certain rails represented by the test piece which showed interior defect, although it had not been nicked. Similar changes have been made in clauses (c), (d), (e) and (f), for the same reasons.

Section 30. *Straightening:* A new clause (b) has been added as follows: "Rails heard to snap or check while being straightened shall be at once rejected."

It is well known that the present method of straightening rails is undesirable, but it is the one almost universally employed and no other method now known is considered practicable. Sometimes, during this straightening process, rails are heard to snap, indicating that some unusual injury has been done, and it is the object of this clause to make that grounds for rejection.

Section 32. *Finishing:* A new clause (c) has been added, as follows: "When any finished rail shows interior defects at either end or in a drilled hole, the entire rail shall be rejected."

The rejection of such rails at the mills has been a source of dispute for several years, and in order to remove the cause for further contention, this clause has been added.

(b) *Revision of rail record forms.* "*Report of Mill Inspection, Form M. W.* 401." On page 59 of the manual is shown the present standard form of the association, entitled "Report of Chemical and Physical Examination," but since the change in the rail specifications, it is no longer suitable for the purpose, because, in the case of open-hearth heats, three ingots of each heat are tested instead of one, and an elongation or ductility requirement has been added; consequently, it is necessary to have a form on which the additional results can be reported. The name has been changed to "Report of Mill Inspection," because of the similarity of the form name to that of M. W. 407, "Laboratory Report of Chemical and Physical Examination." A new form, to take the place of the old one, is therefore submitted.

"*Certificate of Inspection, Form M. W.* 402." In connection with the new specifications adopted by the association, it has become advisable to make changes in the above form, now printed on page 60 of the manual, and therefore a revised form is submitted. The principal change is the tabulation in two columns of the "Rails Accepted" and the different causes for "Rails Rejected."

"*Laboratory Report of Chemical and Physical Examination of Rail, Form M. W.* 407." The present standard form is illustrated on page 67 of the manual, but, owing to progress in testing, which has resulted in the addition of tests, it has been found advisable to provide for the report of those additional tests; consequently, this form has been entirely revised, and a new blank is presented. The old form provided only for chemical analyses and the usual physical tests of tensile strength, elastic limit, elongation and reduction of area, while the new form provides for the report, in addition, of the drop test, hardness test, and transverse test of base.

"*Tabulation of Results of Mill Inspection of Rails, Form M. W.* 418." Owing to the change in the rail specifications, it will be necessary to revise this form, which is now illustrated between pages 60 and 61 of the manual. A new form, with the necessary additions in columns for entering the observed data, is submitted to you for your approval.

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STANDARD RAIL SECTIONS.

The American Railway Association delegated to the Rail Committee of the American Railway Engineering Association the question of sections of rail and other matters connected with them, as well as that of specifications.

The sections used by the various railroads were collected, comparison between them and sections suggested by members of the committee was made, and all of the information as to rail failures in connection with the sections which could be obtained was considered. Some members of the committee submitted sections for consideration where their studies suggested that changes might be made for a better section, the desire being to keep the section within certain lines so that rail joints could be used and have a bearing on the straight portion of the rail both under the head and on top of the base, with as little additional metal as the bolts as possible.

At the meeting of the sub-committee in Pittsburgh it was decided that, while there was some merit in the suggested sections, the committee is not in a position to recommend any new section at the present time, as the sections of the so-called A.R.A. types "A" and "B" had been used by a number of roads, with good results as compared with other sections, but they have only been in use for about three years at the most, and with a great many roads only about two years. It is the consensus of opinion of the sub-committee that it may be advisable to add a little metal to the fillets both under the head and at the base.

The sub-committee, however, has under consideration modified sections, and will continue its study from time to time as it obtains information concerning the weak spots in the present sections. It will also undertake to make a study of rail joints and report at future meetings.

In regard to rail stresses; there is a great deal of indefiniteness regarding the methods by which various parties have estimated them. P. M. La Bach, of the Rock Island Lines, has worked on this problem, and the results have been sent out in sections to the members of the Rail committee. He is now revising the information and putting it in better shape. The committee will also have other data that it will use in connection with the above, and it may be necessary for some members of the association to make experiments of their own.

The subject of "Stresses in Rails As Established in Service" has been under preliminary investigation for the past year by Sub-Committee "D," Mr. Baldwin, chairman.

STATISTICS OF RAIL FAILURES.

The statistics of rail failures for the year ending October 31, 1911, were prepared by Mr. Trimble. The responses have been more complete than ever before, and the information furnished relates to 12,893,007 tons of rail. The report contains a great deal of valuable and useful information, nevertheless, it is proper to call the attention of the members to the fact that it is impossible to make comparisons under similar conditions of traffic, roadbed and weight of rail when dealing with the reports from companies whose problems vary widely, and because it is not feasible to obtain the information which would be necessary to make comparisons accurate, such, for instance, as the tonnage which has passed over rail of equal age and with the same quality of roadbed. The record of comparative wear of special rail, however, is being kept in such a way that comparisons are possible.

SPECIAL INVESTIGATION OF RAILS.

Experiments and Tests.

M. H. Wickhorst, engineer of tests for the committee, has continued his work on experiments and tests under the direction of sub-committee "A" during the past year, and the results of his work are issued in appendices. The cost of this work to the railways has been borne entirely by the American Railway Association, and the total appropriations made since November, 1909, up to November 1912, has been $21,000, while the expenditures to the end of the same period were $21,011.41.

In addition to the above, some of the manufacturers have incurred large expenses through the use of their facilities and material when the investigations were made, the amount of which is not known.

During the year 1912 the engineer of tests made reports to the rail committee on: Abrasion test of rails on a revolving machine; Influence of titanium on Bessemer ingots and rails; Pipeless Ingots; Transverse ductility of base of rails, and Influence of silicon on open-hearth ingots and rails.

The first report gave the results of abrasion tests of rails made at several different mills. The tests were made at the South Chicago works of the Illinois Steel Company on a "revolving machine," consisting of a circular track 20 ft. in diameter, on which a heavy beam revolved which could be given additional load by means of springs. Under the conditions of this test open-hearth steel of .74 per cent. carbon abraded more slowly than Bessemer steel of .50 to .54 per cent. carbon, but the tests were not entirely satisfactory and were few in number.

The next study gave the results of an investigation made at the works of the Lackawanna Steel Company at Buffalo, to determine the influence of titanium on Bessemer steel ingots and rails. A series of heats was made with treatments varying from nothing to .6 per cent. metallic titanium added in the form of a cold 15 per cent. alloy. According to the results obtained, the use of amounts of .1 per cent. or more of metallic titanium in the manner mentioned, prevents the "honeycombed" condition of the upper part of the ingot found in plain Bessemer steel, but was also attended with a larger and deeper "pipe." The heavy segregation and concentration of carbon, phosphorus and sulphur found in the interior and upper part of ingots of plain Bessemer steel was largely restrained, but the mild negative segregation found in the interior and lower part of the ingot was not materially altered. The brittle zone found in rail of plain Bessemer steel from the upper part of the ingot, as determined by drop and tensile tests, was avoided, but the properties of the rail from the lower two-thirds of the ingot were not changed. Large internal flaws were found in rail considerably lower down from the top of the ingot in steel treated as mentioned, than in rail made from plain steel. Treatments with .05 per cent. metallic titanium produced the above results only in part, but treatment above .1 per cent. had only little additional influence.

The third report dealt with an investigation of two special ingots made by the Standard Steel Works Company at Burnham, Pa., by a process which prevents the formation of a "pipe" in the interior of the ingot. The steel was acid open-hearth steel treated with titanium. The ingots were shipped to the Maryland Steel Company at Sparrows Point, Md., where they were tested. The main feature of the casting process was a metal core on top of the iron mold. The ingots were cupped down at the top, but contained no interior pipe.

The fourth report described a method for determining the transverse ductility of the bottom of the base of a rail and the load required to break the flange of a rail supported near the edges of the flanges. The results were given of a few tests made at Buffalo at the works of the Lackawanna Steel Company, of Bessemer and open-hearth rails. The method of making the tests was to support a piece of rail 3 feet 6 in. long on two supports placed opposite each other near the edges of the flanges under the middle of the length of the rail. The supports were six in. long and placed one-half in. in from the sides of the flanges. The load was applied in the test machine to the top of the rail at the middle. The method may be considered a means of determining the strength of the flange and of determining the transverse properties of the base of the rail, as regards the transverse ductility of the metal in the base and the presence of structural flaws such as seams.

The last report gave the results of an investigation made at the Gary works of the Illinois Steel Company on the influence of silicon on open-hearth ingots and rails. Heats of about .15 per cent. silicon was used and a series of higher silicons in this steel up to above .5 per cent. was obtained by means of mold additions of finely crushed ferro-silicon. With about one-fourth per cent. silicon or more the ingots were free from out of the honeycomb present in the upper third of the ingot with the heat amount of silicon, but they also had larger pipes. The higher silicons also had less concentrated segregation of carbon, phosphorus and sulphur. Silicon had but little influence on the results in the drop test. When tested in the test machine as a beam, the stiffness and breaking load of the rails increased with increase of silicon, while their ductility was not greatly influenced. In longitudinal tensile tests, the yield point and tensile strength increased somewhat with the increase of silicon, while the ductility remained about the same. In tests of the flange, the load required to break the flange increased somewhat as the silicon increased, while the transverse ductility of the base remained about the same.

The above work concerning both titanium and silicon indicate that they tend to restrain segregation of carbon, phosphorus and sulphur, but used as they were in this work they were attended with larger pipes. This suggests the idea that in order to obtain the full benefits of their use, a method of casting the ingots is necessary whereby the pipe is avoided or minimized.

Testing Each Ingot.

The question of testing each ingot has been quite thoroughly considered by correspondence and by discussion, and the committee recommends that no change be made in the specifications in this respect at present, for the following reasons:

(a) The tests now required by the specifications are sufficient to determine the character of the metal in the heat. In

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so far as it is intended to discover specific flaws in the rail, additional tests would have relatively little value, as these defects are quite local, and are apt to occur in any part of the ingot, or rail-bar, so that the presence or absence of internal defects in the piece tested is no certain criterion of the presence or absence of similar defects in other parts of the same bar.

(b) The character of the metal in the rails of one heat varies *down* the ingot more than it does from one ingot to another, and in making the complete drop test of an open-hearth heat, the three tests made from approximately the poorest parts of the ingots designate the average of the poorest part of the metal fully as well as if we tested a piece from each ingot.

(c) Careful examination in detail of the many tests of open-hearth rail made in the last two years on the New York Central Lines fails to show any necessity for the testing of each individual ingot.

RECOMMENDATIONS FOR WORK IN 1913.

The subjects recommended for assignment to the committee for 1913 are the same as those already assigned for the year 1912, and in addition the subject of rail joints.

The general line of investigation which the committee has in view for Mr. Wickhorst is submitted below, and embraces a great deal more work than he can cover in any one year. The main point kept in mind in the work of the last two or three years has been to conduct it so as to bring out if possible information useful in improving rails for the purpose of making them uniformly safe, and it is probable that this must continue to be our guiding principle for some time to come. Investigations intended to improve the wearing properties of rails must, it would seem, be considered as secondary to those which have nniform safety as the prime consideration. It soon developed that the type of rail failure which was uppermost in our attention a few years ago, namely, split and mashed heads, was traceable to the interior condition of the ingot and our work has consisted therefore largely of "ingot" studies. Recently, failures classified as broken rails and broken base, have been brought more to our attention, due largely to last winter's crop of broken rails. It seems that such failures are largely attended or perhaps caused by deep seams in the base of the rail and it is now proposed that the work of the immediate future be directed toward throwing light on the cause of such seams and methods for their prevention.

CONCLUSIONS.

The committee makes the following recommendations:

(1) That the revision of the specifications for carbon steel rails be approved for printing in the manual.

(2) That Form M. W. 401, "Report of Mill Inspection," as revised, be approved for substitution in the manual for the present standard form.

(3) That Form M. W. 402, "Certificate of Inspection," as revised, be approved for substitution in the manual for the present standard form.

(4) That Form M. W. 407, "Laboratory Rail Report" be approved for substitution in the manual for the present standard form.

(5) That Form M. W. 418, "Tabulation of Results of Mill Inspection of Rails," as revised, be approved for substitution in the manual for the present standard form.

W. C. Cushing, chairman (Pa. Lines); R. Montfort, vice-chairman (L. & N.); E. B. Ashby (L. V.), J. A. Atwood (P. & L. E.), A. S. Baldwin (L. C.), J. B. Berry (C. R. I. & P.), M. L. Byers (D. & H.), Chas. S. Churchill (H. & W.), F. A. Delano (Wabash), P. H. Dudley (N. Y. C. Lines), C. H. Ewing (Atlantic City Ry.), L. C. Fritch (C. G. W.), C. W. Huntington (C. R. R. of N. J.), J. D. Isaacs (S. P.), Thos. H. Johnson (Pa. Lines), H. G. Kelley (G. T.), C. A. Morse (A. T. & S. F.), G. W. Kittredge (N. Y. C. & H. R.), Jos. T. Richards (P. R. R.), J. P. Snow (Cons. Engr.), A. W. Thompson (B. & O.), R. Trimble (Pa. Lines), M. H. Wickhorst, Committee.

SPECIFICATIONS FOR CARBON AND STEEL RAILS.

Inspection.

1. *Access to Works*—Inspectors representing the purchaser shall have free entry to the works of the manufacturer at all times while the contract is being executed, and shall have all reasonable facilities afforded them by the manufacturer to satisfy them that the rails have been made in accordance with the terms of the specifications.

2. *Place for Tests*—All tests and inspections shall be made at the place of manufacture, prior to shipment, and shall be so conducted as not to interfere unnecessarily with the operation of the mill.

Material.

3. *Material*—The material shall be steel made by the Bessemer or open-hearth processes as provided by the contract.

Chemical Requirements.

4. *Chemical Composition*—The chemical composition of each heat of the steel from which the rails are rolled, determined as prescribed in section 7, shall be within the following limits:

Elements.	Per Cent for Bessemer Process 70 lbs. and Over, but Under 85 lbs.	85-100 lbs. Inclusive.
Carbon	0.40 to 0.50	0.45 to 0.55
Phosphorus, not to exceed	0.10	0.10
Manganese	0.80 to 1.10	0.80 to 1.10
Silicon, not to exceed	0.20	0.20

Elements.	Per Cent for Open-Hearth Process. 70 lbs. and Over, but Under 85 lbs.	85-100 lbs. Inclusive.
Carbon	0.53 to 0.66	0.63 to 0.78
Phosphorus, not to exceed	0.04	0.04
Manganese	0.60 to 0.90	0.60 to 0.90
Silicon, not to exceed	0.20	0.20

5. *Average Carbon*—It is desired that the percentage of carbon in an entire order of rails shall average as high as the mean percentage between the upper and lower limits specified.

6. *Modification of Carbon for Low Phosphorus*—When the material used at any mill is such that the average phosphorus content of the ingot metal used in the Bessemer process is running below 0.08 and in the open-hearth process is running below 0.03, and if it seems mutually desirable, the carbon may be increased at the rate of 0.035 for each 0.01 that the phosphorus content of the ingot metal used averages below 0.08 for Bessemer steel, or 0.03 for open-hearth steel.

7. *Analyses*—In order to ascertain whether the chemical composition is in accordance with the requirements, analyses shall be furnished as follows:

(a) For Bessemer process the manufacturer shall furnish to the inspector, daily, carbon determinations for each heat before the rails are shipped, and two chemical analyses every 24 hours representing the average of the elements, carbon, manganese, silicon, phosphorus, and sulphur contained in the steel, one for each day and night turn respectively. These analyses shall be made on drillings taken from the ladle test ingot not less than ¾ in. beneath the surface.

(b) For open-hearth process, the makers shall furnish the inspectors with a chemical analysis of the elements, carbon, manganese, silicon, phosphorus and sulphur, for each heat.

(c) On request of the inspector, the manufacturer shall furnish a portion of the test ingot for check analyses.

Physical Requirements.

8. *Physical Qualities*—Tests shall be made to determine:
(a) Ductility or toughness as opposed to brittleness.
(b) Soundness.

9. *Method of Testing*—The physical qualities shall be determined by the drop test.

10. *Drop Testing Machine*—The drop testing machine used shall be the standard of the American Railway Engineering Association.

(a) The tup shall weigh 2,000 lbs., and have a striking face with a radius of 5 in.

(b) The anvil block shall weigh 20,000 lbs., and be supported on springs.

(c) The supports for the test pieces shall be spaced 3 ft. between centers and shall be a part of, and firmly secured, to the anvil. The bearing surfaces of the supports shall have a radius of 5 in.

11. *Pieces for Drop Test*—Drop tests shall be made on pieces of rail not less than 4 and not more than 6 ft. long. These test pieces shall be cut from the top end of the top rail of the ingot, and marked on the base or head with gage marks 1 in. apart for 3 in. each side of the center of the test piece, for measuring the ductility of the metal.

12. *Temperature of Test Pieces*—The temperature of the test pieces shall be between 60 and 100 deg. Fahrenheit.

13. *Height of Drop*—The test piece shall, at the option of the inspector, be placed head or base upwards on the supports, and be subjected to impact of the tup falling free from the following heights:

For 70-lb. rail.....16 ft.
For 80, 85 and 90-lb. rail.....17 ft.
For 100-lb. rail.....18 ft.

14. *Elongation or Ductility*—(a) Under these impacts the rail under one or more blows shall show at least 6 per cent. elongation for 1 in., or 5 per cent. each for two consecutive inches of the 6-in. scale, marked as described in section 11.

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(b) A sufficient number of blows shall be given to determine the complete elongation of the test piece of at least every fifth heat of Bessemer steel and of one out of every three test pieces of a heat of open-hearth steel.

15. *Permanent Set*—It is desired that the permanent set after one blow under the drop test shall not exceed that in the following table, and a record shall be made of this information.

Section.	Rail. Weight per Yard.	Moment of Inertia.	Permanent Set, Measured by Middle Ordinate in Inches in a Length of 3 ft. Bessemer Process.	Open-Hearth Process.
A.R.A.-A.....	100	49.84	1.66	1.45
A.R.A.-B.....	100	41.30	2.05	1.80
A.R.A.-A.....	90	38.70	1.90	1.65
A.R.A.-B.....	90	32.30	2.20	2.00
A.R.A.-A.....	80	28.40	2.45	2.15
A.R.A.-B.....	80	25.00	3.15	2.85
A.R.A.-A.....	70	21.05	3.50	3.10
A.R.A.-B.....	70	18.60	3.85	3.60

16. *Test to Destruction*—The test pieces which do not break under the first or subsequent blows shall be nicked and broken, to determine whether the interior metal is sound.

17. *Bessemer Process Drop Tests*—One piece shall be tested from each heat of Bessemer steel.

(a) If the test piece does not break at the first blow and shows the required elongation (section 14), all of the rails of the heat shall be accepted, provided that the test piece when broken does not show interior defect.

(b) If the test piece breaks at the first blow, or does not show the required elongation (section 14), or if the test piece does not break and shows the required elongation, but when broken shows interior defect, all of the top rails from that heat shall be rejected.

(c) A second test shall then be made of a test piece selected by the inspector from the top end of any second rail of the same heat, preferably of the same ingot. If the test piece does not break at the first blow, and shows the required elongation (section 14), all of the remainder of the rails of the heat shall be accepted, provided that the test piece when broken does not show interior defect.

(d) If the test piece breaks at the first blow, or does not show the required elongation (section 14), or if the test piece does not break and shows the required elongation, but when broken shows interior defect, all of the second rails from that heat shall be rejected.

(e) A third test shall then be made of a test piece selected by the inspector from the top end of any third rail of the same heat, preferably of the same ingot. If the test piece does not break at the first blow and shows the required elongation (section 14), all of the remainder of the rails of the heat shall be accepted, provided that the test piece when broken does not show interior defect.

(f) If the test piece breaks at the first blow, or does not show the required elongation (section 14), or if any of the three test pieces when broken show interior defect, all of the remainder of the rails from that heat shall be rejected.

18. *Open-Hearth Process Drop Tests*—Test pieces shall be selected from the second, middle and last full ingot of each open-hearth heat.

(a) If two of these test pieces do not break at the first blow, and if both show the required elongation (section 14), all of the rails of the heat shall be accepted, provided that none of the three test pieces when broken show interior defect.

(b) If two of the test pieces break at the first blow, or do not show the required elongation (section 14), or if any of the three test pieces when broken show interior defect, all of the top rails from that heat shall be rejected.

(c) Second tests shall then be made from three test pieces selected by the inspector from the top end of any second rails of the same heat, preferably of the same ingots. If two of these test pieces do not break at the first blow and if both show the required elongation (section 14), all of the remainder of the rails of the heat shall be accepted, provided that none of the three test pieces when broken show interior defect.

(d) If two of these test pieces break at the first blow, or do not show the required elongation (section 14), or if any of the three test pieces when broken show interior defect, all of the second rails of the heat shall be rejected.

(e) Third tests shall then be made from three test pieces selected by the inspector from the top end of any third rails of the same heat, preferably of the same ingots. If two of these test pieces do not break at the first blow, and if both show the required elongation (section 14), all of the remainder of the rails of the heat shall be accepted, provided that none of the three test pieces when broken show interior defect.

(f) If two of these test pieces break at the first blow, or do not show the required elongation (section 14), or if any of the three test pieces when broken show interior defect, all of the remainder of the rails from that heat shall be rejected.

19. *No. 1 Rails.*—No. 1 classification rails shall be free from injurious defects and flaws of all kinds.

20. *No. 2 Rails*—(a) Rails, which, by reason of surface imperfections, or for causes mentioned in section 30, hereof, are not classed as No. 1 rails, will be accepted as No. 2 rails, but No. 2 rails which contain imperfections in such number or of such character as will, in the judgment of the inspector, render them unfit for recognized No. 2 uses, will not be accepted for shipment.

(b) No. 2 rails to the extent of 5 per cent. of the whole order will be received. All rails accepted as No. 2 rails shall have the ends painted white and shall have two prick punch marks on the side of the web near the heat number near the end of the rail, so placed as not to be covered by the splice bars.

Details of Manufacture.

21. *Quality of Manufacture*—The entire process of manufacture shall be in accordance with the best current state of the art.

22. *Bled Ingots*—Bled ingots shall not be used.

23. *Discard*—There shall be sheared from the end of the bloom, formed from the top of the ingot, sufficient metal to secure sound rails.

24. *Lengths*—The standard length of rails shall be 33 ft., at a temperature of 60 deg. Fah. Ten per cent. of the entire order will be accepted in shorter lengths varying by 1 ft. from 32 ft. to 25 ft. A variation of ¼ in. from the specified lengths will be allowed. No. 1 rails less than 33 ft. long shall be painted green on both ends.

25. *Shrinkage*—The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass, the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a rail 33 ft. in length and of 100 lbs. section, of 6⅜ in. and ¾ in. less for each 10 lbs. decrease in section.

26. *Cooling*—The bars shall not be held for the purpose of reducing their temperature, nor shall any artificial means of cooling them be used after they leave the finishing pass. Rails, while on the cooling beds, shall be protected from snow and water.

27. *Section*—The section of rails shall conform as accurately as possible to the template furnished by the railroad company. A variation in height of 1/64 in. less or 1/32 in. greater than the specified height and 1/16 in. in width of flange, will be permitted; but no variation shall be allowed in the dimensions affecting the fit of the splice bars.

28. *Weight*—The weight of the rails specified in the order shall be maintained as nearly as possible, after complying with the preceding section. A variation of one-half of 1 per cent. from the calculated weight of section, as applied to an entire order, will be allowed.

29. *Payment*—Rails accepted will be paid for according to actual weights.

30. *Straightening*—(a) The hot straightening shall be carefully done, so that gagging under the cold presses will be reduced to a minimum. Any rail coming to the straightening presses showing sharp kinks or greater camber than that indicated by a middle ordinate of 4 in. in 33 ft., for A. R. A. type of sections, or 5 in. for A. S. C. E. type of sections, will be at once classed as a No. 2 rail. The distance between the supports of rails in the straightening presses shall not be less than 42 in. The supports shall have flat surfaces and be out of wind.

(b) Rails heard to snap or check while being straightened shall be at once rejected.

31. *Drilling*—Circular holes for joint bolts shall be drilled to conform accurately in every respect to the drawing and dimensions furnished by the railroad company.

32. *Finishing*—(a) All rails shall be smooth on the heads, straight in line and surface, and without any twists, waves or kinks. They shall be sawed square at the ends, a variation of not more than 1/32 in. being allowed; and burrs shall be carefully removed.

(b) Rails improperly drilled or straightened, or from which the burrs have not been removed, shall be rejected, but may be accepted after being properly finished.

(c) When any finished rail shows interior defects at either end or in a drilled hole the entire rail shall be rejected.

33. *Branding*—(a) The name of the manufacturer, the weight and type of rail, and the month and year of manufacture shall be rolled in raised letters and figures on the side of the web. The number of the heat and a letter indicating the portion of the ingot from which the rail was

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made shall be plainly stamped on the web of each rail, where it will not be covered by the splice bars. The top rails shall be lettered "A," and the succeeding ones "B," "C," "D," etc., consecutively; but in case of a top discard of 20 or more per cent., the letter "A" will be omitted. All markings of rails shall be done so effectively that the marks may be read as long as the rails are in service.

(h) Open-hearth rails shall be branded or stamped "O.-H.," in addition to the other marks.

34. *Separate Classes*—All classes of rails shall be kept separate from each other.

35. *Loading*—All rails shall be loaded in the presence of the inspector.

Discussion on Rail.

Mr. Cushing: Apropos of the question of steel rails it is interesting to read the following remarks made by former president John Edgar Thomson in his annual report to the stockholders in 1864, nearly 50 years ago:

"The rapid destruction of iron under the high speeds and heavy locomotives now used upon railways, has become a subject of serious consideration, not only to the managers of these improvements in this country, but also in Europe. When the Pennsylvania Railroad was planned, a locomotive weighing 45,000 to 50,000 lbs. was considered as the extreme limit to these machines, justified by prudence. But the demands of the public for high speeds has compelled the introduction upon the highfares of much more powerful engines. These could only be obtained by adding to their dimensions and weight, which has produced its natural result—great wear and tear of iron rails and the superstructure of the road. This evil has been still further increased by the inferiority of the rails now manufactured, compared with those placed upon railways when the edge rail was first introduced. It was then deemed essential that rails should be made from the best refined iron produced from selected ores. The great increase in the demand for iron under the rapid development of the railway systems in England and this country soon caused the substitution of an inferior article, which seemed for a time to answer the purpose, but which experience has proven to be insufficient to resist the causes referred to, as continually operating for its destruction. A return to the quality of iron originally used on railways, would be the natural remedy for this difficulty, but this will require time, as none of the rail mills have the requisite furnaces to refine their metal. In Europe this subject has been longer considered, and the determination appears to be general, to gradually substitute a still more expensive material—either a rail made wholly of steel—with a steel head only—or the wearing surface converted into steel after the iron rail is made. The present high cost of rails made entirely of steel will probably prevent their general adoption, although the rapid destruction at the terminal and stations, where the iron rail in some positions does not last 18 months, will fully justify their introduction. For the purpose of testing the relative value of steel and iron rails in such positions, we have procured 150 tons of rails made wholly of cast steel. A trial is also being made of a rail with a steeled wearing surface passed through the rolls, when drawn from the converting furnace, which promises well. It is understood that favorable results have been obtained from rails, the top plate in the pile from which they were made being puddled steel. If the two metals can be firmly welded together, this improvement in railway bars will be generally adopted. This is a subject of such great importance to the company that it will continue to meet the earnest attention of your directors, and if necessary to effect the reformation desired in the quality of rails, it should become important to erect works to effect that object, such a policy will be adopted. The frequent renewal of rails is not only expensive, but it adds to the interruption of the traffic of the line."

The only conclusions I have to offer to the association for adoption this year are in line with proposed revisions of what is already in the Manual. As these changes are due to criticisms made at the last annual convention and those received during the year, it is presumed that they are in line with the wishes of the association, and I make the motion now for their adoption.

(Conclusions 1, 2, 3, 4 and 5 were adopted.)

H. M. Wickhorst: Taking the statistics of rail failures as published in one of our recent bulletins, 90 per cent of the failures can be divided into two general classes. First of all, we have failures of the crushed heads, split heads, and also in that should probably be included most of the web failures. This class of failures is traceable finally to the interior condition of the ingot from which the rails were made; that is, they are a matter of excessive segregation, which produces a brittleness in the interior of the section. Under wheel loads the head spreads sideways. The top metal is always ductile, but the interior metal may not be so, sometimes due to structural flaws or laminations, but most particularly due to excessive carbon and phosphorus, which makes extremely brittle non-ductile material inside, so that when the top of the head spreads sideways a crack develops internally and finally comes to the surface at the under side of the head at its junction with the web. Sometimes, in the case of a badly segregated rail, it will run farther into the web and come out to the surface at the side of the web. So a good many failures, classed as web failures, would come under that head. That would include probably 50 per cent of the failures. Then, second in the class, we have broken bases, and broken rails, which, I will simply state very briefly, we think we can now definitely trace to a seam in the bottom of the base. If the bottom of the base contains a seam, when excessive load comes on, when the load come on, for any reason, or if there is an eccentric bearing, then the seam opens, and if the seam happens to be away from the center a piece of the flange may break out and we get a moon-shaped or crescent break. If, however, as is more generally the case, the seam opens up near the center of the base, the base will open up and a piece of the flange start to break off, and then the break goes through the whole of the section. So what are classed as broken rails (square breaks—angular breaks), and base breaks in general, can be traced to the presence of a longitudinal seam in the bottom of the base. This will probably include about 40 per cent of the rail failures. These two classes will account of about 90 per cent of all the rail failures of the country. Now, to sum up, then, we may say 50 per cent of the rail problems consists in getting sound metal of fairly even composition and 40 per cent consists in so rolling the steel as to avoid the seams in the base.

A vote of thanks was offered to the committee.

The meeting adjourned until 9 a. m. Wednesday, March 19.

FIVE DIRECTORS OF THE A. S. C. E. HERE.

Professor G. F. Swain of Harvard University, president of the American Society of Civil Engineers, is attending the convention. It was interesting to note yesterday that in addition to President Swain and Vice-President C. S. Churchill at least two other members of the board of directors of this society were in attendance—C. F. Loweth and Lincoln Bush.

PRACTICAL MEN AT THE COLISEUM.

Considerable comment was heard at the Coliseum yesterday regarding the number of roadmasters and foremen who are visiting the show. One western road sent in a number of the foremen on its Illinois lines, while a division engineer of one of the large roads running east from Chicago sent a ticket to the Coliseum and a railroad pass to Chicago to each of his foremen with the suggestion that they attend some day this week. The increasing recognition of the value of this exhibit to the practical man is one of the best indications of its real merit.

WARWICK IN OUR MIDST.

William Jennings Bryan, Secretary of State of the United States, came as near being present at a meeting of the Railway Signal Association night before last as he may ever get. He attended the wedding, the preparations for which were begun almost before the Monday afternoon session, in the Florentine room of the Congress Hotel had adjourned. His coming was unheralded, his stay short—and diplomatic—and his departure unostentatious. Few besides those being married and those helping them get married knew he was there. The few straggliers from the R. S. A. meeting who saw him thought he was "Jim" Lorenz. But he was there, all right, and he dispensed silence and smiles, and kissed the bride with as much dignity and eclat as if he were concluding a treaty with the court of St. James. The bride, who was Miss Amy Wessel, is the daughter of an old-time friend and neighbor of Mr. Bryan's.

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Harley, Roadmaster, Lackawanna, Binghamton, N. Y.
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After careful consideration for the past year, the American Railway Engineering Association has made application for second-class mail privileges for the bulletins of the association. If this can be secured it will mean a saving of $500 annually in the expenses of mailing.

J. B. BERRY TO BE ASSISTANT TO THE PRESIDENT.

J. B. Berry is to become assistant to the president of the Rock Island Lines, being succeeded as chief engineer, as already announced in the Daily, by C. A. Morse, chief engineer of the Santa Fe.

Mr. Berry has been chief engineer of the Rock Island Lines since 1905. He was for a while, when the Rock Island and Frisco Lines were under the same financial control, also consulting engineer of the Frisco. Before coming to the Rock Island he was for seven years chief engineer of the Union Pacific.

Mr. Berry entered the service of the Chicago & Northwestern in 1878, and was employed in its engineering department until 1893. He then went to Omaha as chief engineer of the Fremont, Elkhorn & Missouri Valley, where he remained until he became chief engineer of the Union Pacific.

Mr. Berry's work in the reconstruction of the Union Pacific was one of the notable pieces of engineering work in the railway history of the country, and he has ever since occupied a prominent place among railway engineers.

NEW COAL HANDLING BRIDGE AT DULUTH, MINN.

A new dock and storage plant for unloading, stocking and reshipping coal has recently been completed at Duluth for the Clarkson Coal & Dock Co. The plant is reached by boat from a slip on one side of the property and provision has been made in the design of the plant for unloading from a second slip, which may be located along the other side of the storage ground in the future. The storage space is 630 ft. wide and has a capacity of upwards of 200,000 tons. It is spanned by two steel bridges placed end to end which are built in duplicate, with the exception that the unloading machinery which will be used to unload boats in the future slip, if this is added, has not been placed as yet. The span of each bridge between the tower leg and the shear leg is 201 ft., with a 68-ft. cantilever outside of the tower leg extending over the slip in the case of one of the bridges, and over a storage pile in the other case. Each bridge also has an 80-ft. cantilever extending over the storage space between the two bridges. The shear legs of the two bridges are 160 ft. apart so that the ends of the two cantilever arms just clear each other. This arrangement allows the two bridges to be operated independently or to be lined up and operated in tandem. The storage piles are about 40 ft. high and the clearance to the underside of trusses is 55 ft.

One of the unusual features in the design of these bridges is the use of single rail trucks under both the tower and shear legs. This feature was made necessary by limitations imposed by the owners and necessitated numerous changes in the design from the type of bridge ordinarily used for this purpose. In order to secure longitudinal stability for the bridge, tower bracing is provided extending back two panel points from the leg, or about 27 ft. The tower leg, the tower bracing and the bridge span are thus rigidly connected. The span is supported on the shear leg by a nest of ball bearings which allows movement in both directions. The single rail trucks have center pins which carry the load from the tower and allow movement of the trucks due to inequalities in the track. Roller bearings are provided at the ends of these trucks.

The coal is unloaded from boats by a 2.5 ton grab bucket operating from the cantilever boom over the slip. This boom is made to swing vertically in order to clear the masts of vessels in the slip. The bucket is operated by Watson's cable rig and remote control from an operator's house on the tower leg of the adjacent bridge. The bucket is able to make two trips per minute, giving it a capacity of 300 tons per hour. The unloading bucket dumps the coal into a 10-ton hopper, supported by the tower bracing, from which it is fed by a

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Coal Bridge of the Clarkson

reciprocating feeder to a 36-in. belt conveyor supported from the lower chord of the bridge. This belt conveyor extends nearly to the middle of the bridge span above the storage pile. Coal intended for storage under the main span of this bridge can be deposited at any desired point by the use of a shuttle conveyor, which is supported under the main conveyor, and can be moved back and forth on the bridge to bring its discharge end to any desired point.

If it is desired to carry the coal from the boat to the screening plant at the shear leg of the first bridge, the shuttle conveyor is arranged to receive the coal from the first conveyor and deposit it on a third conveyor, which discharges it into a 40-ton hopper carried by the shear leg. This hopper can feed the mine-run coal directly into standard gage cars on the two tracks adjacent to the shear leg or into the screening plant supported on the shear leg from which the slack and lump coal can be loaded directly or placed in bins for later shipment, as desired. A Christy box car loader is provided below the screening plant in case it is necessary to load the coal into box cars.

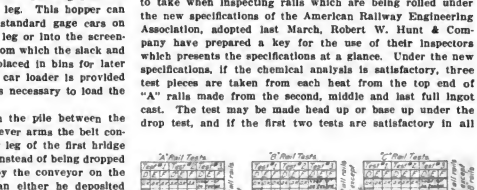
When it is desired to store coal in the pile between the two shear legs under the inside cantilever arms the belt conveyors are so adjusted over the shear leg of the first bridge that the coal is carried past this point instead of being dropped into the hopper. The coal received by the conveyor on the cantilever arm of the first bridge can either be deposited directly into the storage pile under that arm or fed to the conveyor under the cantilever arm of the second bridge when the two are lined for operation in tandem. The latter conveyor carries the coal past the shear leg of the second bridge and deposits it on a shuttle conveyor under the main span of that bridge which can place it either in the storage pile under that span or in the screening and loading plant on the shear leg of that bridge, which is a duplicate of the one described for the first bridge.

This arrangement of belt conveyors is so complete that it is possible to secure almost any combination and by adjustment of the shuttle conveyor under each bridge and the tripping arrangements at the ends of the conveyors, coal can be deposited at almost any desired point. For reclaiming the coal from the storage piles, a 2.5-ton grab bucket is operated on the lower chord of each bridge. These buckets are dumped directly into the large hoppers over the screening and loading plant.

The belt conveyor equipment for the entire bridge was furnished by the Robins Belt Conveyor Co., Chicago. The entire bridge was designed and constructed by the Roberts & Shaefer Co., Chicago, under the direction of E. E. Barrett, chief engineer.

KEY TO 1912 A. R. E. A. OPEN HEARTH STEEL RAIL SPECIFICATIONS.

To simplify the duties of the inspectors at the rail mills and to enable them to know immediately the correct action to take when inspecting rails which are being rolled under the new specifications of the American Railway Engineering Association, adopted last March, Robert W. Hunt & Company have prepared a key for the use of their inspectors which presents the specifications at a glance. Under the new specifications, if the chemical analysis is satisfactory, three test pieces are taken from each heat from the top end of "A" rails made from the second, middle and last full ingot cast. The test may be made head up or base up under the drop test, and if the first two tests are satisfactory in all



Key for the Inspection of Rail.

respects, the third need not be made. To pass the test satisfactorily the specimen must not break on the first blow of the drop, indicated by column D in the diagram, must show 6 per cent. elongation in one inch or 5 per cent. in two consecutive inches as the result of one or more blows, indicated by column E in the diagram, and must show no interior defect or fracture when broken, indicated by column F. A shaded square in the diagram indicates a failure, in which event the inspector's course of procedure will be outlined as

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Coal and Dock Co., Duluth, Minn.

shown at the right. A cross in the diagram shows possible unnecessary tests.

Referring to the diagram, the inspector can tell at a glance, for instance, if one specimen failed under the drop test and in elongation, but the other two tests were satisfactory in all details, that all rails of the heat should be accepted, while, on the other hand, the key shows that if the first test specimen fails under the drop test and the second in elongation, all the "A" rails should be rejected. Where the "A" rails are rejected the key shows likewise the action in testing "B" and also "C" rails.

This diagram applies for the proposed revised 1913 American Railway Engineering Association specifications, with the exception that all three test pieces must be broken and must all be free from interior defects to insure acceptance. Therefor, the cross in columns F of tests two and three should be omitted. The new specifications also require that one test piece from each heat must be struck repeated blows to determine the full elongation.

SIGNAL APPLIANCES ASSOCIATION MOVING PICTURES.

The Signal Appliances Association will give an exhibition of moving pictures at 166 N. State street, Chicago, at 3:00 o'clock p. m. on Thursday. The Richmond pictures, some new films on "Keeping the Blocks Open" in the Cascades and some other new pictures will be shown.

THE WEATHER.

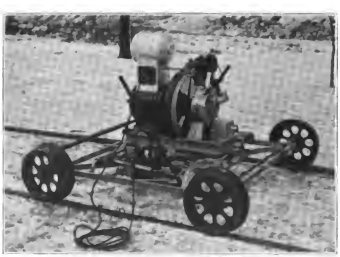
A year ago the convention of the Railway Engineering Association was held in the midst of a severe blizzard. This year's weather has not been exactly all that could be desired, but it has been a marked improvement, and on the whole has been satisfactory, considering that the month is March.

AN ELECTRIC SIGNAL BONDING OUTFIT.

An electric signal bonding outfit has been designed by the Chicago Pneumatic Tool Co. to furnish electric current for the operation of the drills for signal bonding. This apparatus consists of a single cylinder, 4-cycle gasolene engine, direct connected to a 1¼ k. w. generator, wound for 25 volts. The engine and dynamo are direct connected and mounted on a welded steel frame made of 3-in. channel steel. When detached from the truck they can be equipped with two handles so that the entire outfit can easily be carried by two men.

The generating unit may also be mounted on a 4-wheel truck with a welded channel steel frame. This truck has a wheel base of 50 in. The generating outfit is held to the truck frame by two bolts, which may be readily removed if desired. The weight of this 4-wheel truck is 130 lbs., and the combined weight of the truck and generator is about 500 lbs.

The engine develops 5 h. p. at normal speed of 1,500 r. p. m. Both valves are mechanically operated. The hardened steel crank shaft running in ball bearings is entirely



Electric Rail Bonding Outfit.

enclosed and dust-proof. Lubrication is provided by a force feed oiler which takes care of all bearings except those of the dynamo.

Ignition is by means of a Bosch high-tension magneto, and cooling is effected by means of a fan-shaped fly wheel of large diameter. The switchboard has provision for making connections to two electric bonding drills. A fuse block is enclosed in the switch case.

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NEW TYPE OF SHEFFIELD STANDPIPE.

A new telescopic spout Sheffield standpipe, recently brought out by Fairbanks, Morse & Co., Chicago, is shown for the first time at the railway appliance show. The Sheffield standpipe was one of the first to make its appearance in the field and it has been constantly improved. The lower

New Sheffield Standpipe.

part of the new No. 11 pipe is similar to the Nos. 6, 7, 8 and 10 Sheffield columns, having the Sheffield water balanced horizontal main valve and regularly provided with automatic relief valve, which takes care of water hammer in mains having high pressure.

The spout is the distinctive feature of the new No. 11 standpipe. In addition to a vertical movement of five ft. at the end of spout, it has a lateral movement of about four ft., and a "cross-track" movement of about three ft. In other words, the end of the spout will describe an oval about three by four ft., so that it is unnecessary to spot the man-hole so exactly as with other types of standpipes. This oval movement feature also lessens the chances for damaging the pipe should the engine move while taking water.

FLASH LIGHT INVENTOR AWARDED NOBEL PRIZE.

The Nobel prize for physics for 1912 was awarded to Gustaf Dalen of Stockholm for his inventions of the flash light and sun valve, both of which have been such great aids to navigation. These devices have been adopted all over the world for marine signaling, and the fact that the inventor was awarded the Nobel Prize for his inventions speaks much for their merit.

The application of the flashlight to railway signaling was described in the Railway Age Gazette of March 7, and in the Signal Engineer for March, 1913. As mentioned the flashlight is being introduced by the Commercial Acetylene Railway Light & Signal Co., New York, and in its first installation in the west was on an automatic block signal near Maywood, Ill., on the Chicago Great Western. The light it produces is visible further than the steady light ad the colors are more fully brought out. A tank of acetylene is placed at the foot of the mast and the gas is piped up the mast to the lamp, inside of which the flashing device is placed. The flasher is controlled by a diaphragm valve, and produces 60 flashes per min.

Recent experience shows that the gas is ignited by a pilot flame which burns continuously and that the total consumption, including both the flash light and the pilot flame, is 4-5 of a cu. ft. of gas in 24 hours, and it is therefore, possible to run one of these lights for nine months from one tank without any attention.

SEMAPHORE LONG-TIME BURNING OIL.

The problem of producing a signal oil that will withstand low temperatures is bad enough. The Moloney Oil & Manufacturing Co., of Scranton, Pa., having solved that problem, has tackled one that is even more difficult. The service record of its product during the hard winter of 1911-12 showed that the company's semaphore long-time burning oil will not freeze. But the company recently completed some exhaustive experiments to produce a signal oil that cannot freeze. Service records show that the recent output of signal oil will burn through periods of lower temperatures than 25 deg. below zero. It withstood as low as 30 deg. below zero in 1912, in actual service.

The semaphore long-time burning oil is scientifically refined, contains no sulphur—which causes crustation on lamp wicks—has a fire test of 150 deg., and is designed to burn for from 150 to 170 hours without attention.

It is not generally understood that there is a difference between the requirements for one-day burners in signal lamps and for long-time burners. There is, however; and the semaphore long-time burning oil is designed to satisfy the more rigorous demands of the signal system which requires continuous day and night illumination of the signals with inspection by the maintenance force only at intervals of from one to three days. As the result of three years' trial under service conditions and exhaustive laboratory tests, the company is now offering to submit samples of its signal grade—the semaphore long-time burning oil—for test purposes.

STEEL TIE INSULATION.

One of the objections most frequently urged against steel ties is the difficulty of insulation, especially with reference to signal circuits. To give satisfactory service in track,

Steel Tie Track on Pittsburgh & Lake Erie Insulated with Fibre Shims.

they must not only provide the required insulation when installed, but must maintain it under the wear and load of the rail and other track fastenings regardless of whether the insulation is riveted or bolted between the rail and the tie. The Pittsburgh & Lake Erie has an installation of

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3,000 Carnegie I beam steel ties in the main westbound freight track at McKee's Rocks, Pa., which was put in during the summer of 1907. This track, which is shown in the accompanying photograph, is insulated with 6,000 American Vulcanized Fibre Co.'s fibre shims. This track carries an average daily traffic of 16 heavy freight trains and about 10 trains of miscellaneous freight and about 25 heavy engine movements. It is said that in spite of this traffic not a single signal failure has occurred because of defective insulation since this fibre has been in service.

NEW HEAVY TRACK SCALE.

The Southern Railway has recently installed a new track scale at Granite Quarry, near Salisbury, S. C., which is of an improved type and especially heavy construction. Several features of note are included in the design, which was built in accordance with specifications of the engineering department.

This scale has a Strait suspended platform and is of the four-section extra heavy railroad pattern. It is 54 ft. long and has a capacity of 150 tons, although provision is made for an additional load of 150 tons for impact, so that its strength is sufficient to carry and to weigh a dead load of 300 tons.

The length of knife and pivot edge bearings are also proportionately increased throughout, and are backed or supported by the metal being carried out as shown in the half-tone cut. The excess strength and increased proportions are for the purpose of insuring the utmost accuracy as well as the greatest durability and freedom from breakage under the hardest service.

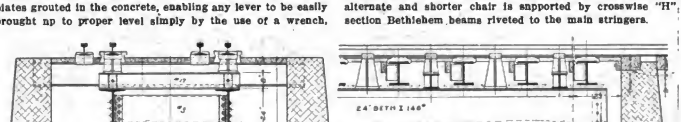
The scale itself has no action other than that of weighing, not being set in motion by the vibration of the platform. The platform is suspended from "bearing feet" resting on the knife edges, permitting it to vibrate independently. All pivots and knife edges are thereby relieved of unnecessary wear. No check rods are used; the platform being in no way connected with the frame work or any stationary part, is always free, so that inaccurate weights from interference are prevented. The bearing feet are so designed that they cannot shift on the knife edges which prevents change in balance, the cause of much inaccuracy.

The scale is erected upon "wedge adjustable" foundation plates grouted in the concrete, enabling any lever to be easily brought up to proper level simply by the use of a wrench, should there be any change or settling of the foundation. Bronze adjusting bolts are used so that rust will not prevent operating. No underframing of structural steel is employed, thereby reducing the expense of painting, which is necessary to prevent rust when this material is used in such locations.

The superstructure is what is known as the stationary deck or platform, being supported by crosswise steel beams laid in recesses in the coping wall. The "dead" track rails are carried by cast iron bearing blocks resting directly on the crosswise supporting "H" section Bethlehem beams, these

Main Lever and Suspension Bearing Supporting I Beams of Scale Track.

blocks being of suitable shape to fit over the beams and to receive the rails. The live track is carried by cast iron chairs projecting through openings in the stationary deck. These openings are protected by dirt shields. Each alternate chair rests on the lengthwise main stringers and each other alternate and shorter chair is supported by crosswise "H" section Bethlehem beams riveted to the main stringers.



Cross and Longitudinal Sections Showing All-Steel Construction, with Overhang and Wedge Adjusting Foundation Plates.

Filler blocks are provided in the crosswise "H" section beams under the chairs, giving the same effect as if solid. The main stringers are 24 in., 140 lb. Bethlehem girders, having a flange 13 in. wide, which, in connection with the fillers and lateral bracing, makes an exceedingly stable and

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substantial construction. Neither the live nor dead tracks or any part pertaining to the operation and maintenance of the scale is connected to or depends on timbers or any perishable material.

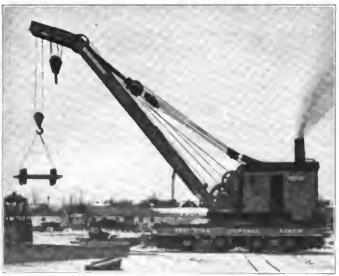
The scale is built with overhang construction or what is sometimes called bridge-ends. The approach tracks are carried over the scale two ft. at each end, leaving a 50 ft. live or weighing track. The load, therefore, is delivered directly over the center of the main levers of the first section, producing no tilting or cantilever effect.

The levers and all active parts are carried up well above any possible interference from accumulating ice or debris. In connection with the fact that no check rods are used, this prevents the scale from freezing up, a cause of much annoyance in cold countries. There is ample room for a man to pass above the main levers in going through the pit, and every part is convenient to inspect. The design of the scale allows any lever to be easily removed without taking out a single bolt or knocking out any pivot. This may be done without even losing the use of the track. The pit has a level floor, making it very convenient to do such work and to keep the pit clean.

A type registering (printing) beam was, of course, furnished with this scale.

NEW YORK CENTRAL CRANE.

The Browning Engineering Co., Cleveland, O., has just shipped a new wrecking and erecting crane to the New York Central which is equipped with a standard goose neck boom for wrecking purposes and also with a 60 ft. boom for use in erection. A special feature of the design of this crane was the necessity for clearing the third rail on the electrified lines



New Wrecking Crane for New York Central Lines.

of the New York Central. The car body is 25 ft. 8 in. long and made of 18 in. girder beams. The wheel base is 16 ft. ½ in., the trucks conforming to the M. C. B. standard.

The rotating superstructure is carried on a roller 7 ft. 10 in. in diameter, and the crane is housed in with sheet iron. The goose neck boom is 40 ft. long, with an extension of 10 ft. at the bottom, by means of which it may be used as a 50 ft. boom. There is a main hoist block having a capacity of 45 tons and an auxiliary block of 15 tons capacity. The weight of the crane in working order is about 190,000 lb. The speed of the main hoist block on the six-part line is 20 to 25 ft. a min., and the auxiliary hoist on the two-part line is about 60 ft. per min. The crane is self-propelled through a gear on the inside axle of each truck and has a travel speed on level grade of about 500 ft. a minute.

A LARGE RAILWAY STYLE WATER TOWER.

On account of an error in the make-up of yesterday morning's Daily, by which the illustration of the steel tank at Lakewood, O., was omitted from the description, we are repeating this description below to accompany the cut, as shown herewith.

This tank is believed to be the largest steel tank on a short steel tower ever built and is of a style commonly used by railways. It has a capacity of 560,000 gal. and height to bottom of tank of about 18 ft. The total height is 70 ft. and the diameter 46 ft. The bottom of the tank is constructed of compound curve, the largest radius of

Large Steel Water Tank at Lakewood, O.

curvature being about 24 ft. The twelve columns are each supported by a pier 10 ft. square at base and 6 ft. high. No roof is used on this tank. The two balconies are for ornamentation and also for convenience in inspection. The initial cost of tanks of the size illustrated approximates five cents per gallon.

This structure illustrates the tendency of engineers to abandon the steel stand pipe having a flat bottom resting on a masonry pier. A large portion of the cost of flat-bottom stand pipes is included in the extra masonry required to support them. The water in the lower portion is usually not available for service and failures due to rusting out of metal sometimes occur. The structure shown was designed and built by the Des Moines Bridge & Iron Co., Pittsburgh, Pa.

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STRAUSS BASCULE BRIDGE AT SOUTH CHICAGO.

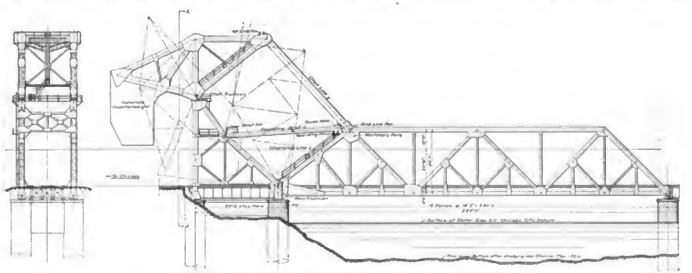
The erection of the Strauss bascule bridge for the Baltimore & Ohio over the Calumet river at South Chicago, which is the longest and heaviest single leaf bascule span in the world, has just been completed. This bridge has a 50 ft. tower span and a 235 ft. single leaf double track movable span. The substructure includes six cylindrical concrete piers about 80 ft. high and 12 ft. in diameter. In the construction of these piers an unusual method of internal bracing was used in the open wells which were sunk to rock in which to build the cylinders. Cofferdams of 3 in. by 12 in. tongue and groove sheet piling were used for about the first 18 ft. of the excavation, which was through quicksand. At this depth a stiff blue clay was reached, which extended down to rock. An open well was driven in the bottom of each cofferdam and was lined with horizontal sections of No. 20 corrugated iron. Commercial sheets about 9 ft. long were bent to a 6 ft. radius, each sheet having riveted to its ends 2 in. by 2 in. angles, with holes in the outstanding legs to allow the connection of abutting sections in the same course to form a solid ring. The courses were placed from the top down, each course overlapping the upper one by a single corrugation. It was found that this construction provided tight joints and only at one point was there any tendency for the sheeting to yield to the external pressure. After the completion of these wells, they were filled with 1:3:5 concrete.

The structural steel in the superstructure of this bridge weighs 1,300 tons and the counterweight 2,000 tons. The bridge is designed for a loading of Cooper's E-50, the trusses differing only slightly from a stationary span of similar dimensions. The trusses bear directly on the river piers and the floor system and top and bottom laterals are the same as those ordinarily used in fixed spans. This bridge, in common with all other heel trunnion bridges of this type, has constant and vertical reactions upon the supporting piers, allowing an economical design of these piers. This was the first bridge of the Strauss design which has been built without side bracing for the towers. It was necessary to omit the bracing in this design on account of the close proximity of the tracks of another road, but after a careful analysis of the stresses in the tower, it was found that this bracing is not in any way essential, and it is expected that in future these structures will in general be built without it. The stability of the tower is increased as the size and weight of the bridge increases, so that it will not be difficult to apply such towers without side bracing to even the largest bridges. The steel work was designed according to Greiner's bascule specifications.

The bridge is designed to move from the closed to the fully opened position in 1.25 min. The operating machinery is located over the end portal at the trunnion end of the movable span. In some of the later designs by this company, the machinery is located on the tower, a feature which has some advantages. Electric power will be used for the operation of the bridge, and an auxiliary gasoline engine plant has been installed, which is capable of operating the bridge in case of any failure of the electric power. The operator's tower is located alongside the bridge, but is built as an independent structure and is so designed that it can serve both the present bridge and a future double track bridge, which has already been contracted for, to be built alongside the present one.

Bridge Shortly After Being Lowered.

The movable span was erected in the open position, which has been found advantageous, and was first lowered on Saturday, February 15. At this time a complete set of tests was made on the operation of the bridge. The tests included observations on the time required for operating the leaf, the power consumption in various positions, and all other features that will have a bearing on its efficient operation.



Elevation and Section of Strauss Bascule at South Chicago.

When the structure was first lowered, it was found to be only ¼ in. out of alinement. The operating time of 1.25 min. was made exactly at the first trial. The bridge is not to be placed in operation immediately, as the swing span of the Lake Shore & Michigan Southern, which is closely adjacent to the new Baltimore & Ohio bridge, swings over the

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site of the rest pier of the new trunnion bridge so that this pier cannot be completed up to its full height. The Lake Shore & Michigan Southern is at present replacing its span, however, and when that company's new bridge is complete, the rest pier will be finished and the B. & O. bridge put into operation. In the meantime, the movable leaf will be allowed to stand in the fully opened position.

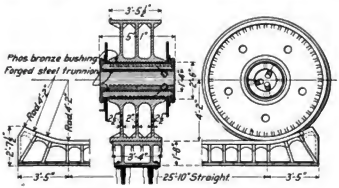
The substructure for this bridge was built by the Foundation Co., New York. The superstructure was designed by the Strauss Bascule Bridge Co., Chicago, and was fabricated and erected by the Pennsylvania Steel Co., Steelton, Pa. The entire work was under the direction of J. E. Greiner, consulting bridge engineer; F. L. Stuart, chief engineer, and W. S. Bouton, bridge engineer, Baltimore & Ohio.

RALL BASCULE BRIDGE AT PORTLAND, ORE.

The two leaf Rall bascule span of the Broadway bridge over the Willamette river, Portland, Ore., is the largest rolling trunnion bridge ever built. The span center to center of piers is 278 ft., and the clear distance at the top of the raised leaves when fully opened is 250 ft. The roadway is 46 ft. 6 in. wide between guards and provision is made for two street car tracks and two wagon ways. On the outside of the main trusses, which are 50 ft. on centers, 9 ft. sidewalks are provided, making the width of the bridge 70 ft. over all.

A special feature of this bridge was that the specifications required the trusses of the bascule span to be in line with the trusses of the approach spans. This necessitated special recesses in the counterweight boxes and their truss supports to enable them to pass between the trusses of the approach spans and also developed many interesting problems in the design of the bracing and other details for adjustment, expansion, etc.

The rolling load of each leaf, including the counterweight, is approximately 2,000 tons, each roller, therefore, carrying a load of about 1,000 tons. The rollers are each 8 ft. 4 in. in diameter and 40 in. long. In order to properly distribute the rolling load to the carrying girder a steel track casting 20 in. high is provided, which transfers the load directly to the web section of the supporting girder without depending on rivets for the distribution. The rollers and the bearing castings are of nickel chrome steel. The distributing castings, as well as the rollers, are without cogs or teeth, so that the operation of the bridge is smooth and practically noiseless. When the bascule span is closed, the heel of the river arm bears on a lower support directly over the pier. This support carries all the live load of the bascule span and, if desired, may be adjusted vertically to carry a portion or all of the rolling load.



Main Trunnion, Roller and Supporting Track of Rall Bascule Bridge.

Ralph Modjeski of Chicago is chief engineer in charge of the general design and construction for the city of Portland. The bascule span was designed by the Strobel Steel Construction Co., Chicago, which controls the Rall patents. The Pennsylvania Steel Co., Steelton, Pa., is the contractor for the superstructure of the entire bridge, including the machinery and electrical equipment for the bascule span. The bridge is nearly completed, and the bascule span has been successfully operated.

Rall Rolling Bascule Span Over Willamatta River, Portland, Ore.

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Railway Age Gazette

DAILY EDITION

Copyright, 1913, by the Simmons-Boardman Publishing Co.

Vol. 54. CHICAGO—MARCH 20, 1913—NEW YORK No. 11c.

PUBLISHED DAILY BY

Simmons-Boardman Publishing Co., Transportation Bldg., Chicago, Ill., on the occasion of the annual convention of the American Railway Engineering Association.

NEW YORK: 83 Fulton Street CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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United States and Mexico.....$5.00
Canada.....6.00
Foreign Countries (excepting daily editions).....8.00
Single Copies.....15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily Issues, North America, $1.00; foreign (excepting daily editions), $2.00.

Application made at the Post Office at Chicago, Ill., for entry as mail matter of the second class.

WE GUARANTEE, that of this issue 11,000 copies were printed; that of these 11,000 copies, 9,869 copies were mailed or delivered by messenger to regular paid subscribers; 950 copies were distributed among members and guests of the American Railway Engineering Association and at the Coliseum; 131 copies were mailed to advertisers; and 50 copies were set aside for office use.

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Edwin F. Wendt, who was elected president of the American Railway Engineering Association yesterday, is assistant engineer of the Pittsburgh & Lake Erie, with office at Pittsburgh. Mr. Wendt was educated in the public schools of New Brighton, Beaver County, Pa., and was graduated from Geneva College, Beaver Falls, Pa., in 1888, with highest honors in the classical course. He entered railway service in 1888 as axeman and chainman in the engineering corps of the Pittsburgh & Lake Erie and served continuously with that road in the different positions of axeman, chainman, rodman, leveiman and transitman up to October 1, 1898, since which time he has been assistant engineer in charge of maintenance of way, construction and contract work. Since he has been connected with the engineering department of the Pittsburgh & Lake Erie, this road has been extended and reconstructed; second, third and fourth tracks have been built, large terminal and classification yards and the extensive new locomotive and car shops at McKees Rocks have been constructed and the new Pittsburgh station and general office building has been built. Mr. Wendt was elected a member of the Engineers' Society of Western Pennsylvania in 1890; a member of the American Society of Civil Engineers in 1903, and a charter member of the American Railway Engineering Association in 1900. He has been especially active in the work of the latter association, being chairman of the committee on "Records and Accounts" during 1903-4-5; a member of the committee on "Signals and Interlocking," 1906-13, inclusive; a member of the Board of Direction during 1908-9-10; chairman of the committee on "Publications" during 1912-13; second vice-president in 1911 and first vice-president in 1912. He has also been a member of the Board of Trustees of Geneva College, Beaver Falls, Pa., since 1907, and is a member of the University Club of Pittsburgh. By training, experience, talents and personality Mr. Wendt is fitted for the presidency of the greatest railway engineering association in the world—an association that has numbered among its presiding officers some of the leading engineers of the railways of North America.

In his discourse at the dinner last night on the effect of music on the railways George A. Post suggested to the railway men that they push from the center of the stage those who sing of what is the matter with the railways and themselves trill a few notes about what is not the matter with the railways—about what they have and the creditable things they do. The public seems to need to learn that the music of railway operation and development is more important and necessary than the music of railway regulation—and this is not said to minimize the need and importance of regulation. About the only feasible way of informing the public about the good features of railway management and operation in this country, one of the things that are needed to make them better, is, as Mr. Post indicates, for railway men to sing about them. After a while railway men may be able to get other people to take up the tune; but they will have to teach it to them first.

In the discussion of the first conclusion of the committee on Wooden Bridges and Trestles, that it be recommended as good practice to use guard timbers on all open floor bridges, the legal aspect of the matter should be borne in mind. There is a difference of opinion as to the necessity for guard rails on bridges. Many engineers believe that their installation does not insure the safety of a derailed car. One member went so far as to say that he believed that in many cases a black mark painted upon the tie would be equally effective. This view is not shared by most of the membership of the Association; and many roads place guard rails on all open floor bridges. But if the Association goes on record as recommending guard rails on all open floor bridges as good practice, it places the railroad which does not install them in an embarrassing position in a lawsuit. The recommendations of this important Association have great weight in court; and they should not be made without due regard to this fact.

After working under difficulties in securing information for the past two years, the committee on Economics of Railway Location made a report yesterday which, while incomplete in many ways, presented many points to be considered in the locating of main lines. No other report made at this year's convention has brought out so much discussion; and this fairly measures the interest aroused by it. Many of the statemens of facts and some of the conclusions drawn are open to argument; and probably the committee presented them in the form it did to draw out discussion. It has been unusually difficult to get the data essential to a thorough study of the subject, the principal reason being that very little information regarding the cost of operation of trains

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under varied conditions of grade, curvature, temperature, etc., has been kept in such form as to make practicable valuable comparisons. The facts brought out by the committee should serve as the basis for further useful investigation that will call forth data confirmatory or some and contrary to others of the conclusions drawn. In his written discussion W. J. Wilgus points out a number of places in which the conclusions of the committee may be questioned. But the conclusions of Mr. Wilgus are open to some of the same objections as those of the committee. There are not sufficient data in existence for accurate determination of the importance of the various factors to be dealt with; and until this ceases to be true it will continue to be difficult to draw sound conclusions.

It is probably too much to expect that any simple formula regarding railway location can be developed which will be applicable to all conditions. But there are many elements of uncertainty which can be eliminated. The principal business of a railway, from a purely revenue standpoint, is the transportation of freight. The net earnings depend mainly on the economy with which this traffic is handled. Therefore from a business standpoint the subject of this committee is very important; and effective study of it will be productive of large results in the form of net revenue. In a study of the savings which would be made by the construction of a new line on an eastern railway a few years ago, it was found that the old line was not being operated to its best advantage, and as a result of a careful engineering investigation the method of operation was so changed that a very great reduction in the cost of operation on the old line was made. The objection sometimes raised that the association should be careful not to step over into the realm of the transportation department is not weighty, for the function of the engineering department, as of all other departments, is to move traffic. As Mr. Himes aptly expressed it, the engineering department might rather be called the "co-operation department." It is to be hoped that this committee's report and the discussion of it will serve as a means of bringing out much further information. To collect and compile the data essential for a thorough study of the subject will require the continual service of a number of men; and it would seem that the railways either individually or through the American Railway Association could well afford to assume the necessary expense for this.

PRESIDENT WORTHINGTON'S ADDRESS.

The address made by President Worthington of the Chicago & Alton at the annual dinner of the Engineering Association last night was typical of the public utterances now being made by railway executives who are progressive and public-spirited and who clearly recognize the conditions with which railway managers are confronted. Mr. Worthington was optimistic. He expressed the belief that the railway problem in this country can be solved by government regulation; and he implied that government ownership would not solve the present problem but merely substitute for it a much harder one. While he was optimistic, he based his optimism not on the belief that all the present tendencies and methods of public regulation would work out satisfactory results, but that the wisdom of the American public would change some of these tendencies and methods.

Railway managers formerly were reticent. They have become very frank. They are telling their troubles to the public as frankly as Mr. Worthington did last night, not because they especially like to tell them—they would greatly prefer not to have any of them to tell—but because, as the public now regulates and controls railway managements, the railway problem can be solved only by co-operation between the managers and the public.

Some railway men at times despair regarding the results of frank and full discussion of the railway situation. They say that spokesmen of the railways have been presenting their case to the public for years now, and that the number of people who have learned very many facts about railway conditions and that believe what the railway managers say is still small. As a matter of fact, the number of people who now have some understanding of the railway situation and a desire to see the railways intelligently and fairly regulated unquestionably is greater than it ever was before. That the number is not still greater is not surprising. The management of railways was not formerly so circumspect in many ways as it is now. Meantime, there was a growing storm of both just and unjust criticism. Railway managers neither did enough during this period to effect needed reforms nor to explain and defend the conditions that were explicable and defensible. The work of years cannot be undone by the work of months. The railways are much better managed and much better defended than they ever were before. But they will have to be thus managed and defended for a long time yet before public opinion regarding railway matters will become satisfactory.

The engineering department has not come so much in contact with public regulation as some other departments. The traffic department now has the rates that it may charge largely dictated to it. The mechanical department must comply with federal and some state laws in inspecting locomotive boilers, installing safety appliances, etc. The operating department has the number of men it must employ in train crews fixed by law in many states, as well as the hours that employes may be kept at work, etc. The engineering and maintenance of way department is quite likely at almost any time to be confronted with measures for the regulation of various details of roadway, track and structures. There are two ways to deal with proposed regulation. One is, if it is right, to do voluntarily the thing it is proposed to require to be done. The other, if the thing proposed is wrong, is to meet the advocates of the proposed legislation squarely and try by facts and logic to prove to their satisfaction and that of the public that their proposals are wrong. Fortunately, the railway engineers of this country understand these things. While, however, the engineering department has not as yet come very directly in contact with public regulation, it has felt its effects. Regulation has tended to hold down and reduce earnings, and this has tended to interfere with adequate expenditures for maintenance and new construction.

There seems to be only one way to improve regulation and its results, and that is constantly to discuss them fully and frankly. Some years ago Edwin Lawrence Godkin, long the editor of the *New York Evening Post*, and of the *Nation*, wrote a paper entitled "The Duty of Educated Men in a Democracy," in the course of which he said: "One hears every day from educated people some addition to the number of things which 'governments' ought to do, but for which any government we have at present is totally unfit. One listens to them with amazement, when looking at the material of which our government is composed, for the matter of that, of which all governments are composed, for I suppose there is no question that all legislative bodies in the world have in twenty years run down in quality. The parliamentary system is apparently failing to meet the demands of modern democratic society, and is failing into some disrepute; but it would seem as if there was at present just as little chance of a substitute of any kind as of the dethronement of universal suffrage. It will probably last indefinitely, and be as good or as bad as its constitu-

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ents make it. But this probable extension of the powers and functions of government make more necessary than ever a free expression of opinion, and especially of educated opinion. We may rail at 'mere talk' as much as we please, but the probability is that the affairs of nations and of men will be more and more regulated by talk. * * * So I shall, in disregard of the great laudation of silence which filled the earth in the days of Carlyle, say that one of the functions of an educated man is to talk, and, of course, he should try to talk wisely." Mr. Worthington said in his address that the Engineering Association is "a body of professional men whose fundamental requirement in order to qualify in their calling is a most liberal technical education; gentlemen who, I might say, represent the culture and aristocracy of the railroad profession." The application of Mr. Godkin's remarks to men of the class which Mr. Worthington thus described is obvious. Do the highly-educated, broad-minded and able railway engineers of this country fully live up to their duty as "educated men in a democracy" by discussing the railway business with people outside that business as much as they might?

TO-DAY'S PROGRAMME.

XIV.	Yards and Terminals	Bulletin 154
XVIII.	Electricity	Bulletin 155
XIX.	Conservation of Natural Resources	Bulletin 154
II.	Ballast	Bulletin 154
VI.	Buildings	Bulletin 154
VIII.	Water Service	Bulletin 154
Special.	Grading of Lumber	Bulletins 144, 154
I.	Roadway	Bulletin 154
XI.	Records and Accounts	Bulletin 155
	New Business.	
	Installation of Officers.	
	Adjournment.	

A. H. RUDD RESIGNS AS CHAIRMAN OF COMMITTEES X AND I.

Committee X on Signals and Interlocking of the American Railway Engineering Association and Committee I on Signaling Practice of the Railway Signal Association had their annual dinner at the Congress Hotel Tuesday evening. A. H. Rudd resigned as chairman of both committees, and the members decided upon T. S. Stevens, signal engineer of the Atchison, Topeka & Santa Fe, as his successor to both of them, subject, of course, to the action of the directors of the two associations. C. C. Anthony, assistant signal engineer, Pennsylvania Railroad, was chosen for vice-chairman. The membership of these committees is practically identical. It is customary to appoint to membership on Committee I of the R. S. A. all members of that organization who also belong to the A. R. E. A., and are members of Committee X.

THIS FROM A RAILROAD MAN!

A well known railroad man was asked this morning what he thought of the exhibit as a whole. His reply was, "It is very artistic."

This coming from a railroad man was more than unexpected, but it is highly expressive at that. The exhibits of some previous years have been some other things than artistic, principally because it is rather difficult to get together a bunch of "stuff" made of iron and steel, concrete and brass, wire and paint, in a shape that has a right to any of the very numerous and elastic applications of the word "artistic."

The show this year, however, is artistic, and the general arrangement is much better, and the exhibits more attractive than ever before—if such a thing is possible.

PENNSYLVANIA IMPROVEMENTS AT PHILADELPHIA.

The board of directors of the Pennsylvania Railroad have authorized the electrification of the main line for suburban passenger traffic from Philadelphia to Paoli, a distance of 20 miles. Involved in the scheme is some six-track improvement work which, with the widening of the Broad Street station, will afford much needed terminal relief. The first work to be undertaken will be that previously announced in the *Railway Age Gazette*, which includes the construction of an eight-track station at North Philadelphia, and the building of additional tracks on the connecting railway, involving a new arch bridge over the Schuylkill river at Girard avenue.

BY REQUEST OF COMMITTEE ON ARRANGEMENTS.

The committee on arrangements on being notified through yesterday's Daily of the action of the convention in referring to them paragraph 34 of the "Instructions for the inspection of the Fabrication of Steel Bridges" reading, "Have important members so loaded as to be headed in the right direction upon arrival at the site of the work," delegated L. C. Fritch to advise the convention during yesterday morning's session that the committee would accept this assignment on the condition that members come to them fully loaded and with their headlights burning so that there can be no mistake as to which direction they are going.

J. T. BRANTNER GIVEN MEDAL FOR FIFTY YEARS' SERVICE.

J. T. Brantner, superintendent, Martinsburg shops, maintenance of way department, Baltimore & Ohio, Martinsburg, W. Va., has been awarded a gold medal for the completion of 50 years' continuous service on that road. Mr. Brantner entered the service January 1, 1863, so that his half century of connection with the system was completed December 31, 1912. He is the first man to be awarded a medal for such service. Mr. Brantner is attending the convention of the American Engineering Association.

BALTIMORE & OHIO DINNER.

Sixty-three officers of the Baltimore & Ohio attended the annual dinner yesterday noon of representatives of this road attending the convention. Earl Stimson, chief engineer maintenance of way, presided and gave a short talk, being followed by J. A. Spleiman, engineer maintenance of way, Pittsburgh; G. W. Andrews, general inspector of maintenance, Baltimore, and J. T. Brantner, superintendent, frog and switch shops, Martinsburg, W. Va.

HOWARD & ROBERTS.

Through an error, C. P. Howard of the newly organized firm of Howard & Roberts, was referred to in Tuesday morning's Daily as having been connected with the Canadian Pacific. Mr. Howard has been with the Illinois Central for several years and many of his friends no doubt realized the error in the previous notice.

DEAN TURNEAURE HERE.

F. E. Turneaure, dean of the college of engineering, University of Wisconsin, who is in attendance at the convention, has just returned from Europe, where he has been making a study of railway conditions on the European roads.

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Proceedings.

PROCEEDINGS.

The Wednesday morning session of the American Railway Engineering Association was called to order at 9:20 a. m. by President Churchill.

ECONOMICS OF RAILWAY LOCATION.

The chairman has made a study to determine the approximate general laws affecting such maintenance of way accounts as are influenced by changes in physical characteristics of locations and presents the results of this study for the consideration of the association. It is not assumed that the analysis of the accounts for the 53 railroads shown in the table gives the correct cost per mile of main track, but it is believed that for the major portion the figures are within reasonable proximity of the truth, and that the individual diagrams show with sufficient accuracy the general law of ratios of increased cost for a fixed unit of traffic to the portion of expense due to age or decay.

The conclusions presented are recommended for adoption, believing that the application of the formulas therein to the normal annual charge for each account will eliminate

A. K. SHURTLEFF,
Chairman Committee on Economics of Railway Location.

considerable of the guesswork of the past. The ratios of cost per mile of side track to mile of main track on any particular line can be estimated without too great an element of guesswork, and in the average case it will not be found far from the suggested value in the table. With these conclusions adopted your committee has a way opened for the further study of questions entering into economics of location.

ANALYSIS OF MAINTENANCE OF WAY AND STRUCTURE ACCOUNTS.

The majority of the problems of economics of railway location deal only with main track questions, although an occasional problem introduces the consideration of side-tracks. It is therefore necessary to analyze and separate certain of the primary operating accounts between coste for main track and costs for sidings, particularly those accounts covering maintenance of way and structures.

Great difficulty has been found in obtaining the necessary information from the railway companies to aid in the proper analysis of the questions. Only three or four railroads out of the many asked for information have attempted to give any data to aid in the digest of this particular question. However, the question has been studied on one large system of nearly 8,000 miles of main tracks and does not vary materially from the ratios of cost per mile of main and side tracks of the other three roads. The figures cover a period of four years and are used in the following analyses, believing them to represent a fair and reasonable average of the relative costs of maintaining main and side tracks for most of the railways of the United States. The figures will not apply to roads lying entirely within a dense manufacturing or mining district where the necessary mileage of side track nearly equals or sometimes exceeds the main track mileage, and the switching mileage is so heavy as to make the tonnage over the side tracks exceedingly large. The methods of this analysis can be followed in such a case, using the ratios of costs that have been found proper for the heavy switching traffic on the industrial sidings.

The following gives only the accounts which are particularly due to both main and side track usage:

Account 1.—Superintendence of Way and Structures. One mile of side track requires practically one-third the cost of one mile of main track.

Account 2.—Ballast. One mile of ballasted side track averages only about one-fourth the cost of one mile of ballasted main track. This factor is a difficult one to reach logically and is a matter of judgment. No detailed figures have been obtainable, as usually only a minor portion of side tracks are ballasted and not all main tracks.

Account 3.—Ties. The number of renewals per mile of side track for four years averaged about 70 per cent of the number per mile of main track. The side track renewals embraced No. 2 ties as well as No. 1, and the average cost per side track tie was about 70 per cent of the cost per ties for main track, making the total charge per mile of side track practically one-half of the cost per mile of main track.

Account 4.—Rails. Main line rail was relaid by new rail, re-rolled rail or good relayer rail of heavier section, in all cases the renewal portion of the charges being only the tonnage equal to the weight of the released rail at the charge per ton for the material replacing it. Side track renewals were from relayer rail only and charged out on the above principle according to the form prescribed by the Interstate Commerce Commission. The arbitrary credit for relayer rail released and charge for same used was practically 75 per cent of the cost of new rail. Scrap released was credited at approximately market value. The average charges per mile of side track for rail renewals was about 25 per cent of the cost per mile of main track.

Account 5.—Other Track Material. Practically 37 per cent of this account was account of frogs and switches, the major portion being to frogs, hence due entirely to side tracks, although many existed in the main track. A careful analysis shows that one mile of side track costs practically the same as one mile of main track for this account due almost wholly to the costs of turnout frogs and switch points.

Account 6.—Roadway and Track. The cost per mile of side track averages about one-third the cost per mile of main track. This is due not only to the lower grade of maintenance of side track, but to the fact that many items charged into this account are principally main track items, for example, ditching, bank widening, track walkers, cutting weeds on right of way, etc.

Account 9.—Bridges, Trestles and Culverts.

Account 10.—Over and Undergrade Crossings. Occasionally a small portion of these two accounts is chargeable to side tracks, but for the majority of cases the amount is so small as to be negligible in economic calculations.

Account 18.—Roadway Tools and Supplies. One mile of side track requires about one-third the cost of one mile of main track.

In the remaining accounts of maintenance of way structures the side track mileage rarely affects the amount of the account and can be neglected in economic calculation. The main track portion of these accounts per mile of main track can be obtained by dividing the total charge to each account by the equivaleut main track mileage, the latter being the total main track mileage plus the product of side track mileage by the proper per cent of cost per side track mile for the given account.

The above accounts are all materially affected by volume of traffic except Account 2, ballast, and Accounts 9 and 10, bridges, culverts, over and under grade crossings.

The train mile has been commonly used as a traffic unit in economic studies in the past; but it is illogical to use this unit as a measurement of wear and tear on the track owing to the wide limits in weights of trains that can be handled by the same locomotive in districts of different gradients. A train with gross weight of 2,000 tons will cause about double the wear and tear on the structure that would be caused by one of half the weight. The ton mile would be the best unit considering total weights on

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RAILROAD	Equivalent 1,000 Ton Miles per Mile Main Track			Costs per Mile Main Track						Renewals per Mile of Main Track		
	Freight	Passenger	Total	Acct. 1 Surf.	Acct. 6 R.W. & T.	Acct. 18 R.W. Tools Etc.	Acct. 4 Rails	Acct. 5 Other Track Material	Acct. 16s Building	Tons Steel	Ties No.	Ties Average Cost
Pennsylvania R. R.	8,920	4,896	12,724	$142	$618	$ 28	$120	$131	$339	11.51	248	$1.00
D. L. & W.	7,338	4,532	11,870	111	619	33	301	155	794	20.22	209	83
Pennsylvania Co.	7,628	4,106	11,735	109	774	12	107	101	265	3.86	228	1.13
P. & L. E.	9,269	2,771	11,040	130	1,282	60	171	151	345	24.96	384	1.17
N. Y., C. & St. L.	8,898	2,120	11,018	71	665	20	119	101	121	11.39	367	.78
P. & R.	7,888	3,627	11,515	100	681	26	130	117	279	12.22	287	.87
Vandalia	3,817	2,900	6,717	105	455	13	87	51	95	2.38	785	.65
L. S. & M. S.	6,060	4,412	10,472	77	824	48	90	105	260	5.78	280	1.12
N. Y. C. & H. R.	5,451	5,062	10,513	139	610	23	165	107	279	15.50	296	.85
C. R. R. of N. J.	6,263	3,966	10,259	71	744	14	128	120	457	16.24	742	.94
Northern Cen.	6,500	3,255	9,758	133	743	20	144	138	677	9.61	215	1.42
N. & W.	7,052	1,786	9,418	51	517	32	107	106	167	11.06	380	.57
P. C. C. & St. L.	5,979	3,368	9,347	100	704	9	97	85	161	3.39	205	1.39
Erie	5,766	3,280	9,045	82	589	10	116	89	157	18.02	233	.84
Lehigh Valley	6,405	2,280	8,685	76	499	17	100	70	196	7.54	153	.98
B. & O.	6,053	2,799	8,852	83	598	11	92	52	184	6.37	170	.93
P. B. & W.	3,478	5,588	9,066	141	678	26	56	93	293	5.73	310	.89
D. & H. Co.	6,151	2,311	8,462	46	377	15	77	77	134	5.00	176	.73
C. C. C. & St. L.	4,720	3,424	8,144	88	496	16	53	87	157	6.04	327	.87
C. & O.	5,668	1,770	7,458	50	504	18	69	73	123	6.11	317	.64
Wabash	4,155	2,642	6,797	34	445	8	71	56	100	3.41	397	.59
C. & A.	3,897	3,001	6,898	57	532	12	42	92	136	5.58	273	.67
Illinois Cen.	3,965	2,341	6,306	60	486	18	44	62	158	4.36	258	.64
Long Island	905	5,851	6,456	125	525	25	43	251	230	9.30	193	.92
D. M. & N.	4,749	790	5,539	46	149	23	69	66	176	5.89	304	.44
C. & E. I.	3,846	1,778	5,625	58	253	7	28	47	63	3.00	123	1.07
Mobile & Ohio.	4,677	1,402	5,469	41	364	12	38	54	88	4.36	476	.40
L. & N.	3,487	1,888	5,375	84	427	18	113	67	200	7.02	324	.68
S. P.; G. H. & S. A.	2,170	3,146	5,316	92	602	31	76	96	147	6.00	283	.57
A. T. & S. F.	2,803	2,536	5,130	90	564	28	53	56	160	7.01	302	.74
T. P.; O. S. L.; O.-W. R. R. & N. Co.	2,322	2,455	4,777	77	514	28	30	37	128	5.25	243	.78
N. C. & St. L.	2,739	1,931	4,670	52	607	14	42	47	115	2.74	519	.43
C. G. W.	2,526	1,898	4,424	84	342	7	17	43	78	16.99	441	
C. B. & Q.	2,351	1,943	4,294	62	454	8	69	28	126	11.01	357	.56
C. & N.-W.	2,289	2,074	4,363	41	407	8	46	33	112	4.58	257	.52
C. R. I. & P.	2,176	2,184	4,360	62	371	11	34	33	132	3.55	243	.79
Canadian Pac.	2,298	1,879	4,177	45	580	16	68	40	164	9.11	240	.40
M. K. & T.	2,072	2,063	4,135	47	434	16	11	45	83	3.00	420	.48
Southern.	2,176	2,033	4,209	55	599	9	73	47	83	5.99	374	.69
C. St. P. M. & O.	2,118	1,963	4,071	40	367	8	59	34	106	6.24	283	.50
C. M. & St. P.	2,491	1,618	4,018	78	311	15	53	34	89	7.24	197	.34
Northern Pacific	2,074	1,935	4,009	39	501	11	28	30	79	3.17	404	.45
Great Northern	1,988	1,933	3,921	64	561	11	28	41	66	3.14	320	.52
St. L. & S. F.	2,030	1,908	3,938	70	335	14	21	37	76	2.67	396	.52
Pere Marquette.	2,295	1,300	3,595	33	267	6	18	33	65	4.63	192	.66
Texas & Pacific.	2,051	1,439	3,490	30	304	13	32	41	135	2.64	329	.50
Mo. P.; St. L. I. M. & S.	2,050	1,492	3,542	76	384	15	61	53	77	6.64	469	.53
D. & R. G.	1,945	1,655	3,539	73	493	21	21	31	69	1.80	283	.70
Y. & M. V.	1,952	1,125	3,057	65	466	28	33	66	118	3.19	430	.58
Seaboard Air Line.	1,674	1,538	3,212	38	319	13	23	46	91	4.09	381	.35
Atlantic Coast Line.	1,586	1,536	3,122	39	269	11	66	41	89	2.92	324	.41
M. St. P. & S. Ste. M.	1,788	1,293	3,081	17	286	7	2	16	53	1.75	254	.27
Cen. of Georgia.	1,453	1,360	2,813	63	270	11	62	42	84	6.42	362	.43
A average cost per mile of side track in per cent of main track cost.				33⅓%	33⅓%	33⅓%	25%	100%				

Cost of Maintenance on Accounts Affected by Traffic.

the rails if freight traffic only passed over the track, but passenger traffic also must be considered and owing to the higher velocity of trains the damage done per ton of passenger train is greater and the labor of maintaining track for the higher velocities is increased. With velocities equal, the damage done to track will vary about directly proportional to the load per axle and one ton of locomotive will create more disturbance to track than one ton of car and contents.

The following gives some average axle loads for the heaviest types of modern locomotives and for average loading for cars. It will be many years before the average locomotive loading reaches these figures, while the average car loading will probably increase:

	Average load per axle.
Passenger service.	
Atlantic locomotive	39,100
Pacific locomotive	37,800
10-Wheel locomotive	22,000
Average passenger train car	22,000
Freight service.	
Mikado locomotive	48,500
Consolidation locomotive	44,600
Mallet Comp. locomotive	42,300
50-ton capacity gondola car, loaded one way return empty	22,500
Average 35 tons per car of freight train (above present average)	17,500

The present average of load per axle of freight and passenger locomotives in less than double the average load per axle of train.

In studying average maintenance expenses by divisions for a period of years on the large system previously mentioned it appeared that the best unit of traffic measurement of expense was what we will term the equivalent ton mile. The total equivalent ton miles would be the sum of the following:

Double the freight locomotive mileage times average weight per locomotive.

Four times the passenger locomotive mileage times average weight.

Total freight ton miles (cars and contents).

Double the passenger ton miles (cars and contents.)

This unit considers that one ton of passenger car does double the injury of one ton of freight car, and that one ton of locomotive affects the track as much as two tons of the train back of the locomotive. This unit of measurement even best fits the increase of maintenance of buildings due to increase of traffic and consequent increase in number and size of buildings. Passenger traffic demands a higher type and better grade of maintenance than freight, and even a better type of shop buildings for repair.

With the exception of Account 4, rails, there is a minimum expense for the accounts affected by the volume of traffic due to depreciation and decay. This expense must be met to keep the road in shape for operation. The increase in expense above this minimum is practically directly proportional to the equivalent ton mileage passing over the tracks. There may be a slight loss of rails by corrosion, but its effect on the general account cannot be noticed and the cost can safely be considered directly proportional to the equivalent ton mileage.

Criticism may be made of adopting a traffic unit that involves the estimating of passenger train tonnage. Nothing can be done of value if the work of the committee is to be based in the terms of statistics as kept at the present time. Net ton miles, freight and passenger train

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car mileage is kept, also road engine mileage separated between freight and passenger service. Weights of locomotives are a matter of record. The estimating covers the assumption of an average weight for empty freight cars, which at present is about 18 tons, and an average weight per car and load of passenger train cars. At the present time 44 tons per passenger train car of the average train will not lead to great error, and the average passenger train of the United States has approximately 5.3 cars per train. This last figure is not necessary for use where passenger train car mileage is available.

Early in the present year the Interstate Commerce Commission published a pamphlet, "A Preliminary Abstract of Statistics of Common Carriers for the Year Ended June 30, 1911." The information in this pamphlet is more complete with reference to operating data of individual roads than has heretofore been published. The accompanying table showing the items of costs of the maintenance accounts affected by traffic is deduced from data given by the Commission, using the ratios of costs per mile of sidetrack as outlined to reduce to cost per mile of main track only. As only average weights of locomotives, excluding tender, were given, two-thirds of the weight was added to cover weight of tender and the same weight of engine was assumed for both passenger and freight service. The ton mileage was worked from net ton mileage and the mileage of the two classes of cars and road engines.

There is no attempt to place the cost of ties in dollars per mile of track as there is probably no account in which there is a wider variety of materials or unit costs than in ties. Climatic conditions affect the tie problem, particularly noticed when comparing the roads of the South with those of the North. It is evident that the roads using either properly treated woods or timber of a high grade, and protecting the ties from mechanical wear by heavy tie plates with good bearing area, are receiving good returns because of the practice.

In all of the accounts it must be recognized that some of the roads were above the normal in the various accounts and other roads below. Taking the data from several years' operation of a railway, the following formula will give the average expense of maintenance due solely to age and decay for the accounts where both decay and mechanical wear enter the question and using the tabular values for the functions as deduced from these statistics for 1911 the average expense for any volume of traffic per mile of main track can be estimated:

A = Total main track mileage.
B = Total side track mileage.
C = Average annual charge to the given account.
P = Proportional charge per mile of side track as compared with charge for main track only.
X = Annual charge per mile of main track to keep in condition for proper operation covering the amount due to age or decay.
R = Proportion of X representing the additional charge per mile of main track for each million equivalent ton miles per annum.
M = Million ton miles traffic per annum per mile of main track.
E = Charge per annum per mile of main track only, for the given account.

$$E = \frac{C}{A + BP} = X + MRX = X\ (1 + MR)$$

$$\text{Then } X = \frac{C}{A + BP + MR\ \ (A + BP)}$$

The values given for P and R in the tables with conclusions are suitable to determine the average value of X for the great bulk of the railroads of the country, providing a sufficient number of years' data is used to produce a normal average. For the exceptional cases where a large portion of the total track mileage consists of busy industry spurs and sidings, suitable values for P must be ascertained.

The data given for ties is based on a study of renewals on different divisions of the same line with widely varying traffic. On track where ties were of a high grade timber or creosoted and with a large proportion of ties protected by heavy tie plates, the renewals in main track were 6.5 per cent. of the total in the track plus 0.3 per cent. for each million equivalent ton miles traffic. This figure appears to fit very closely the northern half of the United States, where the roads have taken means to properly protect the ties. In the southern portion the percentage due to decay will be greater, but by multiplying the proper percentage by the value 0.46 per million equivalent ton miles, the average renewals can be approximated for cases where proper methods are used to retard mechanical wear. Each locality can determine within reasonable limits the value of the constant renewals required due to decay for the available timbers.

Account 4, rail renewals, apparently costs about 11 per mile of main track for each million ton miles and requires about 1.1 tons of new rail for this traffic. This figure will answer under present conditions of rail renewals and checks very closely with some data gathered on the equivalent ton mileage per mile of track during the life of 80-lb. tangent rail on a busy double track division. The maximum equivalent tons over any of the rail was 147 millions. The tangent rail released was in condition for relaying or re-rolling and considering 110 million miles the average for this rail would make practically 1.1 tons per million equivalent ton miles.

According to custom the maintenance charges are only for the weight released less the arbitrary credit for the usable released material, although heavier sections may be used for replacements. The relaying rail when used to replace still lighter sections on districts of less traffic will further reduce the maintenance charge, as the rail finally released fixes the final distribution of the total cost between maintenance and betterments. It is apparent that as the average weight of rail approaches the modern heavier section betterments will absorb a less proportion of expense of rail renewals and maintenance charges will be increased. Sufficient data is not at hand to show whether the heavier rail will withstand an equivalent increase in tonnage directly proportional to its weight. It can hardly be expected to do so as head wear determines the necessity of renewals where rail sections are sufficiently stiff for the axle loads. The cost of rail renewals will probably be found to bear a different relation to the volume of traffic in a very few years.

The other maintenance of way and structures accounts affecting main track are for all practical purposes independent of the volume of traffic. Most of them are dependent either on mileage of main track or mileage of road. Tunnels, bridges and culverts and over and under grade crossings are dependent on the topography of the country and materials of construction, and in comparing the relative economy of different locations the amount and character of the tunnels and bridges on each must be considered in estimating the difference in maintenance costs.

The tables in the conclusions give the accounts under their respective headings. Other maintenance of way and structures accounts may be ignored, as they bear practically no relation to location.

Average values for any of these main accounts can be obtained from Interstate Commerce Commission reports for the leading roads in all sections of the country.

The foregoing covers only the foundation of the work for analyzing the effect of changes in physical characteristics on maintenance of way and structures accounts. It can be seen that distance affects nearly all of the accounts mentioned and that the volume of traffic affects only a portion of them. Curvature affects only the rail renewals and roadway and track accounts with a very slight addition to tie renewals, providing that good substantial tie plates having large bearing area are used. It must be assumed that proper details of construction are used in the initial work in estimating relative values of different lines. Future study of the committee should be to determine the effect of curvature on the accounts mentioned and then take up the study with reference to maintenance of equipment and conducting transportation expenses.

The following are the conclusions with reference to the present study:

CONCLUSIONS.

1. The problems of economic location deal only with main track in the majority of cases, side tracks entering into the question only where differences in distance are so great as to necessitate additional side tracks.

2. The annual charge per mile of main track for any account embracing both main and side track can be approximated for any operated line by the following formula:

A = Total average main track mileage.
B = Total average side track mileage.
C = Average annual charge to the account.
P = Proportional charge per mile of side track as compared with charge per mile of main track.
E = Average annual charge per mile of main track only.

$$E = \frac{C}{A + BP}$$

The average value of P is shown in the table, but for roads located almost wholly within dense mining or manufacturing districts requiring an exceedingly large proportion of busy side and spur tracks the values would be higher and should be determined.

3. The accounts covering maintenance of main track do

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not all vary by the same general law, but vary most directly according to the following groups:

(a) Affected by both miles of track and volume of traffic.
(b) Affected by miles of main track.
(c) Affected by miles of road.
(d) Affected by local topographical features.

Therefore no single unit of measurement of relative maintenance expense is applicable to all accounts in comparing the relative economies of two locations. The tables show the groupings of the accounts under their proper heading.

4. One ton of passenger train does more damage to track than one ton of freight train and the locomotive creates more disturbance than an equal weight of cars and contents. Until data is available to correctly estimate the relative damage, it is recommended that the following ratios be used in estimating effect of traffic on the accounts in group (a):

One ton of passenger car and contents produces approximately the effect of two tons of freight car and contents.

One ton of locomotive produces approximately the effect of two tons of the balance of its train.

The total ton mileage reduced to terms of ton miles of freight car and contents is termed the *equivalent ton mileage.*

Most of the accounts in group (a) have a constant maintenance expense due to age and decay, plus an additional expense depending on volume of traffic. This additional expense per mile of main track varies most directly with the *equivalent ton mile.* The equivalent ton mileage can be approximated by adding together the following:

Net freight ton mileage.

Double the freight locomotive mileage times average weight in tons.

Freight train car mileage times the average weight of empty cars (at present about 18 tons).

Double the passenger train car mileage times the average weight of car and contents (at present about 44 tons).

Four times the passenger engine mileage times the average weight in tons.

5. The average annual expense per mile of main track due to age or decay for the accounts in which this item enters can be approximated for any road by the following formula:

E = Charge per annum per mile of main track only.

X = Annual charge per mile of main track due to age or decay.

R = Proportion of X covering the additional charge per annum per mile of main track for each million equivalent ton miles.

M = Million equivalent ton miles per annum per mile of main track.

Then from the above and the equation in Conclusion 2.

$$E = X + MRX = X\,(1 + M) = \frac{C}{A + BP}$$

$$X = \frac{C}{A + BP + MR\ (A + BP)}$$

Average values for P and R are shown in the tables.

ACCOUNTS AFFECTED BY MILES OF TRACK AND VOLUME OF TRAFFIC.

No.	Account.	Avg. Values. P	R	Avg. Values. X	RX	1911. $	$	Remarks
1	Superintendence	0.32	0.44	$ 18				Cost, quality and climatic conditions vary widely.
2	Ties (based on number used)	0.7	0.046	Varies	...			Local conditions must determine value of X. Curvature affects charges but lightly where protected by proper plates and fastenings.
2	Ties (based on cost)	0.5	0.046	Varies	...			
4	Rails	0.25	.....	6	...			Present average annual charge per mile of main track is $11 per million ton miles, or 1.1 tons new rails for same traffic. Curvature affects this account.
5	Other track material	.....		0	...			Present average annual charge per mile of main track is $10 per million ton miles. Affected slightly by curvature.
6	Roadway and track	0.33	0.245	$200	$49			Affected by curvature.
16	Buildings	0	2.4	10	24			Affected only where distance or increased volume of traffic makes additional buildings necessary.
18	Tools and supplies	0.33	0.10	5	2			

ACCOUNTS AFFECTED BY MAIN TRACK MILEAGE.

No.	Account.	Remarks.
2.	Ballast	For full ballasted track this varies with the quality of ballast and cost laid down at side of track.
7.	Removal of snow and ice	Varies widely, depending on climatic conditions.
12.	Signals (block signals only)	Present average cost $125.00 per mile with average of one signal to the mile. Curvature may necessitate additional signals.
20.	Stationery and printing	

ACCOUNTS AFFECTED BY MILEAGE OF ROAD.

11.	Grade crossings, Fences, cattle guards and signs	Mileage of main track affects this account slightly, but variation is most directly in proportion to miles of road.
12.	Snow fences and snow sheds	Varies widely, dependent on climatic conditions.
14.	Telegraph and telephone lines	Varies slightly per mile of road, depending on number of wires.

ACCOUNTS AFFECTED SOLELY BY TOPOGRAPHICAL FEATURES.

8.	Tunnels	
9.	Bridges, trestles and culverts	The expense of these items depends on the number, size and character of the structures on each location.
10.	Over and under grade crossings	

REVISION OF MANUAL.

The committee recommends that Conclusion 2, page 436, of the Manual, be changed to read: Numerous tests demonstrate that there is no absolute value for train resistance. For practical purposes freight train resistance can be considered constant between velocities of 7 and 35 miles per hour; that Conclusions 3 and 7 be eliminated and the matter under subhead 1 on page 618 of this report be substituted; also the table on page 615; that for conclusion 4 there be substituted conclusions 1-4 on pages 620 and 621, and that conclusions 8 and 9 be renumbered 7 and 8, respectively.

A. K. Shurtleff (C. R. I. & P.), Chairman; R. N. Begien (B. & O), Vice-chairman; F. H. Alfred (P. M.), A. C. Dennis (Can. Engr.), C. P. Howard (T. C.), F. W. Green (La. & Ark.), P. M. LaBach (C. R. I. & P.), Fred Lavis (Cons. Engr.), F. W. Smith (C. C. C. & St. L.), H. J. Simmons (E. P. & S. W.), Walter Loring Webb (Cons. Engr.), M. A. Zook (C. G. W.), Committee.

APPENDIX A.

RATIO OF LOCOMOTIVE EQUIVALENT TON MILEAGE TO TOTAL.

The accompanying table shows the per cent. of equivalent ton mileage that the locomotive bears to the total equivalent ton mileage of its class of traffic for the roads given in the table in the body of the report. Owing to the fact that both tables were made on the average weight of locomotives of the road, passenger and freight engines considered the same, the percentage shown for freight locomotives is probably lower than it should be and the percentage for passenger service higher since the average freight locomotive weighs more than the passenger types.

PER CENT. LOCOMOTIVE EQUIVALENT TON MILEAGE BEARS TO TOTAL EQUIVALENT TON MILEAGE OF ITS CLASS OF TRAFFIC.

Road.	Frt.	Pass.	Road.	Frt.	Pass.
Pennsylvania R. R.	20	55	Sou. Pac. and G. H. & S. A.	23	49
D. L. & W.	23	49	A. T. & S. F.	28	53
Pennsylvania Co.	21	51	Union Pac., L. V.		
Erie	11	57	O.-W. R. & N.	24	51
N. Y. C. & St. L.	19	39	C. C. & St. L.	29	47
P. & R.	21	57	Vandalia	24	54
Vandalia	24	50	C. G. W.	24	54
L. S. & M. S.	20	52	C. B. & Q.	22	48
N. Y. C. & H. R.	24	53	C. & N.-W.	28	53
C. R. R. of N. J.	28	58	C. R. I. & P.	27	52
Northern Cen.	21	51	Can. Pac.	25	45
N. W.	24	55	M. K. & T. (Including Texas)		
C. C. C. & St. L.	23	62	Southern	28	53
Erie	22	51	C. St. P. M. & O.	27	44
Lehigh Valley	21	54	C. M. & St. P.	26	47
B. & O.	26	57	Nor. Pac.	24	53
P. B. & W.	24	52	Great Nor.	21	48
D. & H.	28	60	St. L. & S. F.	29	53
C. C. C. & St. L.	22	54	Pere Marquette	23	53
C. & O.	18	55	Texas & Pac.	24	48
Wabash	22	52	Mo. Pac., St. L. I. M. & S.	26	54
C. & A.	23	54	D. & R. G.	34	56
Ill. Cent.	22	49	Y. & M. V.	17	46
Long Island	40	41	Seaboard Air Line.	17	48
D. M. & N.	15	61	Atlantic Coast Line.	24	47
C. & E. I.	19	63	M. St. P. & S. S. M.	23	49
Mobile & Ohio	25	50	Cent. of Georgia	24	41
L. & N.	27	50			

This table is given as information to show the approximate amount of damage done by the locomotive for each class

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of traffic, on the basis of one ton of locomotive doing double the damage of one ton of the balance of its train. The question of the exact ratio of damage is an intricate one and would require more data than the committee has at present. There is no strong probability that the average axle load of locomotive and tender will reach the exceptionally heavy loading given for the extra heavy Mikado type in the report for many years, even if it ever does, and the modern consolidation will, in the majority of cases, represent the average to be considered in estimating values of locations.

It is interesting to note that by the proposed method of equivalent ton miles the passenger locomotive does as much damage as the balance of its train, while the freight locomotive does about one-third as much as the balance of its train on the average. The two extremes of freight service are represented by the Pittsburgh & Lake Erie, which with its low grades averages about 16.5 tons of cars and contents to each ton of locomotive, and the Denver & Rio Grande with its very heavy mountain gradients averages about 3.9 tons cars and contents per ton of locomotive. The extremes in passenger service are the New York, Chicago & St. Louis, averaging 3.15 tons passenger cars to one ton of locomotive, and the Chicago & Eastern Illinois Railroad, average 1.88 tons per locomotive ton.

In former practice the locomotive has been frequently considered as affecting a track in a fixed ratio to the balance of its train, but examples above will show the inconsistency of using such methods. It is to be hoped that data will become available to fix the factor with more certainty than the one assumed in this report.

Discussion on Economics of Railway Location.

W. J. Wilgus, consulting engineer: I have been much interested in reading the report of the Committee, especially the part bearing on the suggested method of segregating certain items of maintenance expenditures between passenger and freight service. It would seem that this point has a vital bearing not alone on economics of railway location, but also on another matter that is at least equally important.

The ascertainment of reasonably accurate costs of transporting passengers and freight is becoming increasingly necessary as a basis for resisting improper rate reductions, and for securing higher rates where their fairness can be proven. While a few of the I. C. C. classification items of maintenance fluctuate in proportion to train mileage handled, the majority of them are, as stated by the committee, directly or indirectly affected by the gross weight ton mileage that rolls over the rails. The question then arises—should the actual tonnage be taken, embracing locomotives, cars and contents, or should an attempt be made, as recommended by the committee, to make allowance through "equivalent ton mileage" for excess damage assumed to be done to track and structures by the higher speed passenger trains and by locomotives as compared with the load they haul?

As regards the comparative effect of passenger and freight trains, it is the opinion of the writer that, generally speaking, there is no appreciable difference, if in considering the higher speeds in passenger service equal attention is given to destructive agencies peculiar to the freight service, such as drippings from coal and refrigerator cars, imperfections of equipment, heavier wheel concentrations, twisting action of locomotives at slow speeds, littering of roadbed and the fouling and destructive action of the products of combustion of inferior grades of coal used in freight service. Corrosive drippings are detrimental to floor beams and stringers and solid floors of bridges; to track fastenings such as spikes, tie plates, bolts and splices; and to rails, frogs and switches. Side bearings on freight cars are so stiff as to provide much less freedom of adjustment to varying track conditions than on passenger cars. This has been strikingly shown on tracks used exclusively for freight traffic, where trucks in passing from curve to tangent retain their skewed position and grind the outer rail for considerable distances.

Springs under freight cars are less delicately adjusted than on passenger cars, with correspondingly greater shock to track and structures, especially in the case of eight-wheel coal cars having 18,750 lbs. per wheel as contrasted with 12-wheel passenger coaches weighing but 12,500 lbs. per wheel. Superworn tires, flat spots on wheels, dragging brake beams and draft rigging, and similar imperfections peculiar to freight equipment, cause additional wear and tear. Slowly moving freight locomotives when exerting their maximum tractive force, cause a twisting action from side to side that tends to work track out of line as much or more than higher speed passenger trains.

Droppings from freight trains, such as lumps of coal, rubbish, loose doors and other broken parts, increase the danger and add to the cost of policing. Freight locomotives consume more coal and use a poorer grade of fuel, and the resulting larger volume of cinders, gases and smoke fouls the ballast, corrodes metallic structures, and injures paint on buildings, bridges and signals to a greater extent than with passenger power. Freight locomotives under load stop and start more frequently, causing slipping of drivers that blisters and wears the rail. Local freights do more or less switching on main tracks and at stations, with accompanying wear and tear on track and structures.

On many railroads both "drag" and preferential freight trains on certain divisions are run at high speeds, in order not to interfere with the passenger service, and any fixed rule for calculating "equivalent ton mileage" would have to be varied to meet these frequent conditions.

It therefore seems clear that relative speeds of passenger and freight trains are so variable and the instances in which the latter are more destructive to track and structure so numerous, that any attempt to arbitrarily fix the percentage that one exceeds the other would lead to questionable results. Judgment, which in any event must guide a decision, would seem to lead to the conclusion that, taking all these facts into consideration, the added cost of maintenance chargeable to passenger service by reason of higher speeds is practically offset by many features incident to the slower speed traffic.

As to the comparative effect of locomotives and of the load they haul, it is possibly true that the former cause somewhat more damage per ton than the latter, but not to the extent that might be imagined. For instance, taking two loaded coal cars weighing 160 tons, their smaller diameter wheels, less perfect construction and maintenance, and drippings and droppings, may be said to go far toward equaling the twisting and corrosive effects of a locomotive of the same weight; and in passenger service the smaller wheels and tail-end side swing may be considered as going far toward equaling the destructive action of the locomotive.

To gross that the locomotive, including its tender, creates twice as much destructive action per ton of gross weight as the load it hauls, may yield a result more in excess of the truth than the making of no allowance may understate the truth.

Summarizing, in the absence of precise data, and taking into account the complexity of the problem, is it not fair to say that under average conditions a gross weight ton of passenger train creates the same destructive effect on track and structures as a gross weight ton of freight train; and that an attempt to assign constructive tonnage to portions of the rolling load as the measure of their assumed excess wear and tear on track and structures, will result either in complications and contradictions, or in so many variations in the formula as to make the exceptions prove the rule?

A. K. Shurtleff, committee chairman: It is sometimes supposed that the problems of this committee can be reduced to an exact science and that simple formulæ can be deduced which will be mathematically correct in all cases when applied to the problems regardless of the varying conditions. This is impossible, owing to the fact that, were it possible to determine accurately the proper coefficients for each of the variables under different conditions, the formula would become very complex, and the judgment of the engineer would have to be exercised in selecting the particular value of each coefficient for the condition which he thinks may exist. Such complicated equations would probably lead to no greater accuracy than the approximate simpler formulæ such as this committee is attempting to establish.

We are trying to formulate methods for analyzing the problems of economics with reasonable accuracy. In so doing, we give equations which, to our best knowledge, cover average conditions. We expect that many roads will find the values of certain terms of the equations different under their conditions of operation from those given by this committee. In such cases we believe that by the use of the methods to be proposed by this committee and the coefficient values as they find them, satisfactory results will be obtained in weighing the relative economic values of various locations.

In our present report we have attempted to give a method for analysis of maintenance of way accounts, hoping at a later date to simplify to an equation form of sufficient accuracy for the field engineer. We are attempting to analyze the items which are affected by volume of traffic on the basis of equivalent ton mileage, reducing locomotive tonnage and passenger train tonnage to an approximate equivalent of freight car tonnage, using multipliers for each, which, in our present judgment, appear to represent the relative damaging effects of a ton of each class, as compared to the average effect of one ton of freight car and load.

In this connection I desire to call attention to the criticism of W. J. Wilgus, and his suggestion that actual tonnage be used in dividing between the two classes. The points raised

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by Mr. Wilgus showing expenses created by freight service which do not apply to passenger traffic are excellent. At the same time the points brought out about the locomotives can be used as an excellent argument in favor of considering one ton of locomotive as producing greater damage than a ton of car and contents.

There is wide difference of opinion with reference to the relative damage per ton of passenger train when compared to a ton of freight. It is certain that our roads require a much higher grade of maintenance, both in labor and material, to take care of the higher speeds of passenger service than they would if the entire tonnage over the rails was freight. Unfortunately, the tests at St. Louis covering counterbalancing were only made on Atlantic Passenger Locomotives of the so-called balanced compound type, no such tests being made on simple locomotives.

With the exception of the Cole engine, the nosing of these locomotives increased materially with the velocity, and in the Baldwin balanced compound was as great as 0.74 in. per revolution at 240 r. p. m. or 66 m. p. hr. In this locomotive at the same speed the load on each wheel of the first set of drivers became very light through one-quarter of each revolution and returned abruptly in about one-eighth revolution. At 320 revolutions one forward driver left the rails. It is well known that counterbalancing can be most satisfactorily accomplished in four-cylinder locomotives, but statistics show that less than 7 per cent of the Atlantic and Pacific type locomotives have 4 cylinders, the balance being simple. The great bulk of passenger locomotives are of the simple engine type and at the high velocities undoubtedly cause much greater disturbance to the track than the balanced compound cited above.

In view of these disturbing forces at high speeds and the necessity of higher grade of maintenance, it would seem that the costs of maintenance in those accounts affected by the volume of traffic would be greater per ton for passenger service than for freight and that the equivalent ton mileage principle should be used in the analysis of costs for these accounts.

The factors for reducing to equivalent ton mileage may vary somewhat. Data covering several years' operation on a 4-track road having 2 tracks devoted to each class of traffic would help materially in fixing the relative values.

(It was moved and seconded that conclusion 2 under Revision of Manual in the report be accepted.)

L. C. Fritch (C. G. W.): This subject is something that is so much involved that it is very hard to lay formula or rules that will fit all conditions. I believe some resistances will increase with the speed and others will decrease with the speed, but it looks to me like the limits between 7 and 35 m. p. h. are rather high. The limit ought to be from 5 to 20 m. p. h. The higher limits are really the more practicable for freight train speed, and I think Mr. Begien reaches the conclusion that one is almost forced to reach, that it is almost impossible to establish any formula that will fit the train resistance; that with all the numerous tests that were made, according to his report, it is very hard to get anything that will serve as a guide. Of course, the main difficulty is that there is such a vast difference in equipment, and it is not always possible to fix any definite resistances. My own opinion is that the railroads of this country are going to extremes in tonnage. They are overloading trains. I have always believed that there is an economical maximum tonnage which is very much below the maximum tonnage which locomotives are able to draw. I think that many roads are expending more money in overtime and interference with traffic than would he the case if they established an economic loading, which would be much better than the maximum tractive power of the locomotive; the tonnage could be used in such cases with less delay and interference.

F. S. Stevens (P. & R.): I might say on the question of tonnage it appears to me to be a self-evident fact that the most economical tonnage to handle is that which will enable an engine to deliver the greatest tonnage from one point to another within a given time at the least expense. This holds true, no matter whether you wear your engine out in one month, or one year, or ten years—the quicker you wear it out the better. The whole question is to move the tonnage, the most of it, in the least time, at the least expense; that is the whole thing to be worked out.

C. P. Howard (I. C.): I have recently used this data in calculating the time and fuel consumption and other items for a division of 130 miles. In a case where it would be practicable to haul a 5,000-ton train at about 3.5 m. p. h. over the proposed 0.3 per cent. grade, it was found a 4,000 train would be just about the economical limit. The fuel consumption per ton mile remains practically the same for the 5,000-ton train as for the 4,000-ton train. The time increases a great deal. In fact the time for the 4,000-ton train was about 15 per cent greater than the time for a 2,700-ton train. The fuel consumption for the 2,700-ton train, as calculated from the information given by Mr. Shurtleff in his bulletin, checked out very closely with that given by the superintendent in his estimate.

F. S. Stevens: One of the principal questions is interference. The tonnage rating that is worked out absolutely correctly, which will give the best results and move the greatest tonnage in the least time, is indefensible in many cases, because to put that tonnage over the road means that you cannot put anything else over it. The local freight and the passenger service must be put out of commission. The tonnage trains can only move to the limit of the sidings, and they must have a limit of speed, and if they get into a hole in some place on account of the preferred service, they cannot get out. All these things have to be considered.

(Conclusion 2 was then adopted as revised.)

Mr. Shurtleff: We propose to change conclusion 7 of the Manual to agree with Mr. Begien's conclusions from dynamometer tests, presented elsewhere in this issue, except that we desire to omit his conclusion 2, and state under D in conclusion (1): "The following formulæ are practicable where train has been in motion at least 15 minutes." Then give the formula for A rating, which is the same as the present formula given in 3, or practically the same; the formula for B rating, the formula for C rating, and the formula for D rating. Those give the ratings for different conditions of temperature. Then insert the table shown on page 615 of the Manual. In that way we cover in the one conclusion what was covered in the two conclusions at the previous meeting.

L. C. Fritch: How are we going to get the train in motion the first 15 minutes? I cannot see that there is any practical use in that. Of course, they could beat up the journals, but they could not put on additional tonnage after the train had been in motion fifteen minutes. So of what use is the resistance at that time? It is probably well enough for information, but I cannot see that it is of any practical value to us.

G. R. Brooke (B. & O.): As I understand the adaptation of this formula to actual practice, a certain speed will have to be assumed and that would be the speed that probably would be attained on the ruling grade after the train had been in motion 15 minutes, in starting, of course, and for the first 15 minutes of the run. If the run after that period is on the ruling grade, the train would proceed at a considerably lower speed than the assumed speed, but that lower speed for a period of 15 minutes would not appreciably affect the running of the train over the division; so the value of the formula would not be affected.

Mr. Shurtleff: The rating is always given as two things that govern the time allowable over the district, and your ruling grade. The time allowable over the district would fix the speed on the ruling grades, and this speed would in many cases not fall below 6 m. p. h., and more often it runs to 8 and 10. At 10 m. p. h. the locomotive has a great deal less tractive power than it has at 5 m. p. h. In spite of the fact that we have in the past assumed that the locomotive could work with reverse lever down in the corner, up to 8 or 10 m. p. h., we have yet to find a fireman who can fire the modern locomotive under these conditions. Therefore, when you get to working at 7½ or 8 m. p. h., you have a new bar pull to move less and during the early few minutes of the run the locomotive has greater power to overcome the starting resistances. I do not think it would make so much difference at mere stop for a signal, where the journals would not have a chance to cool down.

Mr. Sullivan: It is unfortunate in a great many cases that the operating department and the engineering department do not work closer together than they do. I do not think this committee can go too far into the other fellow's department. Take a practical case. Suppose we have a superintendent who wants to load everything up to the very last notch, and we have some 0.4 per cent grades that could possibly be reduced to 0.3 per cent. We do that work and spend thousands of dollars on a division. The next superintendent comes along and says, "We are loading too high; we are going to load at a 10 or 15 per cent reduction." The chances are that the money that you have spent on the grade reduction has been thrown away for the reason that if the former superintendent were loading for the short grades, the loads could be carried over. I am very much opposed to any restrictions of this committee in the way of figuring out economics and going into the costs, and also the method of transportation. That problem would have to be solved by each road itself. They must get together with the operating

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and engineering departments, but the general information that this committee can give should not be restricted.

A. J. Himes (N. C. & St. L.): In pursuing the subject along this line, it is primarily the duty of the engineer to be thoroughly posted with the work of the operating department as it is actually done and to learn from it all that he can and to offer his assistance in any case where it appears that the best results are not being secured in the operation of the road. In many cases too sharp a division has been made between the different departments. The particular development of the present generation in all kinds of economic work has to do with co-operation as the great secret of success in large enterprises is to bring about accurate and hearty co-operation between the many units of an organization.

(The recommendation of the committee in the second paragraph of the Revision of the Manual was adopted.)

J. L. Campbell: I believe that a safe rule for a locating engineer to follow is to assume that the operating department will make a proper and efficient use of the plant, that the engineering department gives for the conduct of transportation.

The substitution of conclusions 1-4 under "Tonnage ratings" in Mr. Begien's Appendix B (published elsewhere in this issue) for conclusion 4 of the Manual was next considered.

J. B. Jenkins (B. & O.): There seems to be a considerable difference of opinion based on different results and tests, as to whether degree of curve increases the resistance, per degree, or whether it decreases it. In general it seems if you disregard all other conditions that a 2 deg. curve seems to require less compensation per degree than a 2 deg. curve, but I believe if we consider other conditions we will find the case to be quite the opposite. I think the reason why the 10 deg. curve seems to require less compensation is that, the speed at which the freight train passes over the 10 deg. curve is more nearly that for which the curve is super-elevated, while with a 2 deg. curve, the curve is liable to be elevated for fast passenger service and the freight train goes around it at a much slower speed, resulting in greater friction. The principal factor in changing the rate of compensation should be the relation of the elevation of the outer rail to the elevation required for the average speed of freight trains. Undoubtedly there is more friction in rounding the truck on a 4 deg. curve than there is on a 2 deg. curve. I believe if all conditions were taken into account, that these figures should be more nearly reversed; that it should be more nearly 0.04 for the 2 deg. curve, 2,000 ft. long, and more nearly 0.03 for the 4 deg. curve 1,000 ft. long.

G. D. Brooke (B. & O.): It appears to me that there is confusion here between the degree of curve, and the central angle of the curve. The total compensation will be the same whether it is a 4 deg. curve, or a 2 deg. curve, but the rate per degree will be different. Take the example just cited, with a 2 deg. curve 2,000 ft. long, 40 deg. of central angle, the total compensation would be 1.2 ft. With a 4 deg. curve 1,000 ft. long, your compensation would be at the rate of 1.2 or the total compensation for the whole curve will be the same thing, 1.2. In other words your degrees of central angle would be constant, but your rate of compensation would increase with the degree of curve, while the length of your curve will decrease in inverse proportion.

J. L. Campbell (E. P. S. W.): I ask the committee to state the reasons for making the curve length a factor in determining the rate of compensation.

Mr. Shurtleff: There is only a portion of the train being subjected to the resistance at one time, and the draw bar pull of the locomotive is constant. If the whole train was subjected to the resistance it would mean that each ton of the train was subjected to that resistance, but in cases where only half of the train is subjected to that resistance, work out as Mr. Begien did, we think a less resistance would be suitable in each case.

S. S. Roberts (I. C.): Would it not be better to drop the word "super" in paragraph 3 of the conclusions from the word "Super-elevation?

Mr. Shurtleff: The committee will accept that.

Mr. Brooke: There is one remark I wish to make for the information of the Association and that is that the dynamometer tests referred to in the paper of Mr. Begien embraced almost every conceivable class of line and traffic. The tests were made on lines having from 2 to 2.1 per cent. grades, with curves as high as 14 deg., and they were made over 0.3 per cent. lines, with maximum curvature of 4 deg., on which there was no passenger travel whatever. They embraced other high-speed lines having curves of 5 and 6 deg., with mixed traffic, and practically level lines having some curves as high as 9 to 10 deg. curves, on which the speed of passenger trains was high, and the speed of the freight trains was low.

E. Gray, Jr. (C. & O.): It has been suggested that compensation is not necessary in the case of minor grades or very light grades. I think that this view is wrong. Much mischief has been done and the possible train load of railroads cut down by the contrary practice. It often happens that a railroad might have long stretches of very long grades and only a few governing grades and that compensation has been carried out only on those heavy grades, and it occurs afterwards that those stretches of light grade become the governing grade either because helper engines are employed on the heavier grades, or the grades are reduced by changing the route.

M. L. Byers (B. & H.): I want to offer a suggestion to the committee. My idea is that curved resistance depends on three principal factors, the first is the degree of curvature, the second is the relation between the length of the curve and the length of the train, and the other in the super-elevation of the curve. The formula which the committee has offered us seems to agree pretty well, perhaps I should say very well, for the first two factors. I suggest that the committee keep in mind the matter of looking into the question of the effects of variation in super-elevation on the curve resistance in the future.

J. L. Campbell: I do not believe the curve length is the proper element to take into consideration in determining the rate of compensation. I think on a 1 per cent grade, if a properly compensated grade is one-half the length of the curve, that you must eliminate that part of the train which is off the curve.

Prof. W. G. Raymond (Iowa University): I think, from theoretical grounds, the curve resistance varies with the degree. Therefore, the compensation to be theoretically exact, to produce the effect that the chairman of the committee says he wishes to produce, namely, a constant pull on the drawbar, or at least a constant effort of the locomotive, to produce that as nearly as possible, his compensation should vary with the curve resistance, and I think it is pretty well established that curve resistance must vary with the degree of the curve. I think this is evident, from the fact that a large part of this resistance is due to the twisting of the truck on the track, and that means simply the friction between the wheel and the rail, and that must be largely independent of the degree of the curve. In these days we are devoting a large part of our effort to the betterment of the submerged tenth, and it seems to me the submerged tenth that have four tracks are as well entitled to consideration as the 90 per cent of the roads who have only one track, and therefore it seems to me that in the committee's report, when it is finally made up, that there shall be rules for one track roads and other rules for four-track roads, and I believe the committee should take notice of that fact in making its conclusions.

(The new conclusions 1-4 were then adopted by vote of the association.)

Mr. Shurtleff: The conclusions presented in the main report are in reference to the present matter published in the Bulletin and attempt to lay down an approximate method of analysing the maintenance of way expenses, particularly those expenses which vary with the volume of traffic. They are presented to aid in the analyzing of the expenses referred to, but this committee cannot feel it has hit the exact method. We believe, however, we have made a long stride toward a proper method of analysis.

Conclusion 1 was adopted.

Conclusion 2 and 3 were adopted as information.

L. S. Rose (C. C. C. & St. L.): Concerning conclusion 4, I do not believe as a general proposition that the passenger train is twice as severe on a track as the freight train. It depends somewhat on the speed. I believe that the passenger cars are kept in better condition than the freight cars and have fewer flat wheels. The damage to the track which causes repairs depends on the speed, and that should be taken into consideration.

L. C. Fritch: I have not any constructive criticism to make in this case, but it does seem to me before we adopt even as information a conclusion that may be as far reaching in its effects as this we ought to get all available data on the subject. We all know that efforts are being made to determine the cost as between passenger and freight service. If we establish a principle here that it costs twice as much to maintain the track for passenger service as for freight service I think we want to be very sure of our ground.

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Mr. Shurtleff: The committee did not have any definite information on this subject but studied the question carefully. It is just merely a guess. This committee has got to stop work now on the advance study of this question until we get some means of going ahead and analyzing these accounts. We will be glad to receive all assistance from any of the roads that can be given us, in order to determine this question.

C. E. Lindsay (N. Y. C. & H. R.) We have a 4-track road, two tracks being devoted to passenger traffic, and two tracks being devoted wholly to freight traffic, although the passenger tracks are also used for high-speed freight traffic. If it was my guess, I would reverse the guess of the committee. I think the committee has been misguided by the effect of the train as a whole and the committee has overlooked the question of speed. In my opinion the design and maintenance of passenger equipment is far superior to that of freight equipment. In the passenger equipment we have 6-wheel trucks, with a very superior spring arrangement. In the freight service we have 4-wheel trucks and the spring arrangement is hard and rigid on the track.

Mr. Byers: I do not believe a fast freight train running at 60 m. p. h. is different in its effects from a passenger train running at the same speed, and my experience with the relative cost of maintenance of track under high and low speed traffic is that it depends mostly on the standard of the maintenance of the tracks as to the cost. The cost of track maintenance, as the result of deterioration under train service, is principally for surfacing, that is, the labor cost, and the labor cost of picking up a low joint, ¼ in. low, is almost the same as picking up a joint ½ in. low. If you had trains running 60 to 70 m. p. h. you must maintain the joints more nearly to a perfect level than on a track where the trains run 30 m. p. h. Any examination of ordinary freight track will show that this element is taken into consideration and that the maintenance is much less perfect in that case than in the higher speed tracks.

Mr. Lindsay: The conditions of our roads are these: Up until 3 or 4 years ago the passenger tracks were sacred, but recently the density of traffic has increased to such a point that it has been necessary, in order to take care of the freight traffic, to run a great many freight trains, both of the slow freights and the fast freights, on these passenger tracks, and the effect on the cost of maintenance has been very marked. Mr. Byers calls attention to the sameness of cost in raising a small low joint or a very bad low joint. That is a question of comfort with relation to passenger trains and does not enter materially into this case.

(Conclusions 4 and 5 were referred back to the committee.)

WOODEN BRIDGES AND TRESTLES.

The Association directed that the outline of committee work for the year 1912 be as follows:

(1) Report on formulæ for use in determining the strength of sheet piling.

(2) Report on fire protection of wooden bridges and trestles.

(3) Complete report on the use of guard-rails for wooden bridges and trestles.

On subject No. 1 the committee reports progress.

On subject No. 2 the committee does not deem it advisable to make any recommendations, but submits its report as information.

On subject No. 3 the committee makes the following recommendations:

(1) It is recommended as good practice to use guard timbers on all open-floor bridges, and they should be so constructed as to properly space the ties and hold them securely in their places.

(2) It is recommended as good practice to use guard-rails to extend beyond the ends of the bridges for such a distance as required by local conditions, but that this length in any case be not less than 50 ft.; that guard-rails be fully spiked to every tie and spliced at every joint, the guard-rail to be some form of a metal guard-rail.

(3) It is recommended that the guard timber and guard-rail be so spaced in reference to the track rail that a derailed truck will strike the guard-rail without striking the guard timber.

(4) The height of the guard-rail to be not over one inch less than the running rail.

The committee recommends that the following subjects be assigned for the ensuing year:

(1) Complete report on formulæ for use in determining the strength of sheet piling.

(2) Report on the subject of docks and wharves.

I. L. Simmons (C., R. I. & P.), Chairman; W. S. Bouton (B. & O.), Vice-Chairman); H. Austill, Jr. (M. & O.), Henry S. Jacoby (Cornell Univ.), F. E. Bissell (A. C. & Y.), P. B. Motley (C. P. R.), R. D. Coombs (Cons. Engr.), D. W. Smith (H. V.), E. A. Frink (S. A. L.), W. P. Steffens (B. & A.), E. A. Hadley (M. P.), H. B. Stuart (G. T.), Hans Ibsen (M. C.), Committee.

APPENDICES.

Illinois Central:

All through bridges and high steel viaducts are being equipped with rerailing devices, especially where a high rate of speed is maintained. Some few high and long wooden structures have been equipped with rerailing devices. These rerailing devices are placed 12 ft. 6 in. from the end of the structure on the roadbed. The inside guard rail is continued out 20 ft. past the rerailing device, running to a point connected by a cast steel casting 2 ft. 3 in. long and bolted to casting with 2⅝-in. bolts. The outside guard timber is connected near the rerailing casting with a steel guard rail 18 ft. 7 in. long, turned out at the end near the guard rail point 1 ft. 7 in. from the running rail. The rerailing device consists of two separate castings made of semi-cast steel. The casting between the traffic rail and the outside special guard rail is 5⅝ in. high and shaped in between both rails. The casting has a 10-in., flat-bearing surface. The casting between the traffic rail and the inside guard rail is 5 ft. 8 in. long and 9 31/32 in. wide. It has a rib 3½ in. high at center running down to a flat surface at each end. This rib is 2½ in. at center of casting from ball of main rail, beveling back at the ends of the casting 5½ in. to the guard rail. These devices have proved effective. An engine weighing 100 tons was rerailed on a high viaduct while running at 30 miles an hour. Freight cars have been rerailed on another high viaduct and on a long through truss bridge.

Pittsburgh & Lake Erie:

A rerailing device at the south end of the bridge over the Youghiogheny River at McKeesport has rerailed cars frequently, as evidenced by cut ties approaching the rerailing device and vanishing at that point. Other cars have been rerailed at the device placed at the end of the bridge over the Mahoning River at Lowellville Junction. At both of the above points the absence of the rerailing device would undoubtedly have resulted in the destruction of the bridge.

Philadelphia & Reading:

When a No. 6 frog is used, the guard rails on the approach end are extended 41 ft. 3 in. On the trailing end they are extended 20 ft. and the rails bent until the ends are 18 in. apart. When a No. 8 frog is used, the guard rails are extended 54 ft. 7 in. on the approach end. On the trailing end they are extended 35 ft. and bent as above. When a No. 10 frog is used the guard rails on the approach end are extended 68 ft. On the trailing end the guard rails are extended 50 ft. and bent as above. On single track the frog points shall be bent on both ends. On double track the frog is used only on the ends facing traffic.

Lehigh Valley:

On double track guard rails extend 200 ft. from the bridge on approach side and 30 ft. on the leaving side, where the speed is over 35 miles an hour. When the speed is less than 35 miles an hour the guard rails extend only 100 ft. on the approach side. On single track the guard rails extend 100 ft. or 200 ft. from the end of the bridge, depending on whether the speed is low or high.

Chicago, Rock Island & Pacific:

The minimum length for the extension of guard rails beyond the bridge is 60 ft. In cases where the span has a pile or timber trestle approach, the guard rails should extend over this approach and 60 ft. beyond, providing the approach is not more than 200 ft. long. In case the approach is more than 200 ft. long, the guard rail should extend 300 ft. from the end of the bridge.

Lake Erie & Western:

Within the last two years we have had five derailments which we consider would have been considerably more serious if it had not been for the guard rails. In one case the derailed truck struck the point of the guard rails within a few inches of the center of the track and the truck was pulled

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over so that the car safely crossed the bridge and the wheels between the running rail and the guard rail.

Pennsylvania Lines West:

We know of cases where derailed wheels have crossed safely over a bridge on which there were guard rails, when the train would undoubtedly have been wrecked had no guard rails been provided. As a specific instance, I abstract from report of a derailment on the Ohio Connecting bridge (Pittsburg), on March 2, 1907:

"This bridge has a total length of 4,520.3 ft., and crosses both channels of the Ohio river, Brunot's island, and about 1,400 ft. of the city, north of the river, at an elevation of 50 ft. above high water level.

"On the above date, a westbound freight train approached the bridge at a speed of about 19 miles an hour. The train comprised 32 cars, and the third car from the rear was a 70,000 lbs. capacity coal car, loaded. About 20 ft. from the east end of the bridge a flange, on the front wheel of the rear truck of the above car broke, on an 11-deg. approach curve, and the car was derailed at a point about 197 ft. on the bridge. From this point the derailed truck ran over the bridge about 740 ft., until the train was stopped by the wrecked floor and separated air hose.

"The running rails on the bridge were 85 lbs. per yard, and in addition to the standard outside timber guards there were inner guard rails of old 85 and 80 lb. rail, placed 8 in. in the clear, inside of the running rails, and spiked to every other tie."

The conclusion of the report stated: "That the presence of the inner guard rails, beginning at the east end of span No. 3 (through span, 416.1 ft. long), undoubtedly prevented a serious accident to this span, which might possibly have been its destruction. That the continuance of the inner guard rails across span No. 3 and the deck spans controlled the movement of the wrecked truck, and it not been for the old ties on the deck spans, might possibly have prevented further accident.

"On span No. 3 the north wheels sheared the spikes on the north of inner steel guard rail, and the lateral force of the wheels against this guard rail bent over the spikes on the south, moving the rail inward an inch or two. When the train reached the deck spans, the ties on which were nine years old, the inner steel guard rail was moved inward as much as a foot in places.

"Inner guard rails of steel rails are not desirable for bridges of this length or character, because the spikes are sheared by derailed wheels, and guard rails moved inward, even on perfect ties.

"Inner guard rails, consisting of timber, 7x8, laid flat and lock-dapped to the ties, should be used."

Chicago, Milwaukee & St. Paul:

We have had a number of cases of derailments on bridges which have clearly and unequivocally demonstrated the value of the guard rails, and especially of the type we use. Several of these cases have been on important bridges, where the result of a car breaking through or running off the floor would have been a very serious matter. One case was a heavily loaded refrigerator car, which passed over three 200-ft. spans on a 6-deg. curve. Another case was on one of our Mississippi River bridges, where the derailed wheels traveled over several spans, and a considerable distance of the approach, part of which was on a curve. In both of these cases there was no injury to the structure, and no complete wreck of the car. We are firmly convinced that the type of guard rail used was responsible for our escaping with so little damage.

Norfolk & Western:

On one timber trestle, 200 ft. long, we put a gravel floor as a trial three years ago. As this bridge is on a curve, we have had to keep the gravel from shaking down to the low rail. This is done by the trackmen. It is a defect in the plan, and longitudinal obstructions should be placed to prevent the gravel from shaking down. Before fireproofing this trestle we had eight to ten small fires a month and one complete destruction, but have had no fires since it has been fireproofed.

Chicago, Rock Island & Pacific:

In 1909 we started the use of ballasted deck trestles. For the year ending June 30, 1910, we had 368,253 lin. ft. of pile trestles, including approximately 7,500 ft. of ballast deck trestles. During this year we had 88 fires. The statistics for 1911 have not yet been completed, but we now have approximately 10,000 lin. ft. of ballast deck trestles. For the nine months ending March 31, 1911, the fire loss amounted to $6,444.71. We also have a large number of trestles having "fireproof deck," which consists of 1-in. thick boards between the ties, covered with crushed stone, gravel or slag. We have no means of telling just how much the use of fireproof or ballast deck trestles has decreased our fire losses, except that in not a single case since we have adopted their use has a fire been reported on any of them.

Chicago, Milwaukee & St. Paul:

This company uses two methods of protecting the floors of timber bridges from fires originating from locomotives. No method has been adopted for protecting timber floors on steel bridges. One of the methods of fire protection used by this company consists in spreading a layer of gravel over the ties to a depth of about 3 in. The gravel is supported between the ties by nailing 1-in. boards either over the openings or between the ties. The gravel timbers are protected by strips of galvanized sheet iron. The other method consists of laying strips of galvanized iron so as to completely cover the ties and guard timbers.

Although no means have been adopted by this company for protecting the timber floor of steel bridges, the danger aris-

FIRE PROTECTION ON WOODEN BRIDGES AND TRESTLES.

Railroad.	Method Used. Timber Bridges.	Steel Bridges.	Have you ever suffered from a fire loss on bridges fireproofed by your method? If so, state where fire originated.	Give No. of Lin. Ft. Fireproofed. Timber Bridges.	Steel Bridges.	Give Approximate Cost per Lin. Ft.	Remarks.
S. F. & Seattle	Gravel	None	Yes. Burning rubbish beneath	20,000	.....	40c.	
A. T. & S. F.	Gravel	None	Yes. Fire caught in piling	6,000	.....	50c.	
Pitts. S. & Nor.	Cinder or clay	None	No	1,000	.....	6c.	Method abandoned account rotting ties and str's.
Norfolk & Western	Gravel	None	No	200	.....	50c.	
El Paso & S. W.	Rock	None	One caught in deck	.....	.....		Method abandoned for solid floor.
Illinois Central	2-in. ballast	2-in. ballast	No	2,000	1,600	40c.	
C. R. I. & P.	Gravel	None	No	.....	.....	20c.	
C. M. & St. P.	3-in. gravel, gal. iron	None		.....	.....	{Gravel, 50c. / Gal. iron, 75c.}	Guard timbers protected by gal. iron.
Virginian	Gal. iron on high trestles	None	Yes	47,417	.....		
Maine Central	Chapple fire resist paint	None	No	1,330	.....		
Mich. Central	Gravel or rock, gal. iron	None	No	1,160	.....	{Gravel, 70c. / Gal. iron, 75c.}	
Great Northern	Gal. iron, gravel or rock	Gal. iron proposed		Entire System	None	{Gal. iron—70c old plan / 97c new plan. / Gravel, 32c.}	
P. & R.	Sheet iron	None		.....	.....		
N. C. & St. L.	Gal. iron	None	Yes. Occasionally.	94,548	.....	40c.	
L. & N.	Gal. iron	None		.....	.....		
Mo. Pac.	Gravel, gal. iron	None		10,000	.....	{Gravel, 90c. / Gal. iron, 58c.}	
M. & St. L. and Ia. Cent.	Gal. iron	None		.....	.....	50c.	
G. C. & Santa Fe.	Gal. iron	None	None in deck. Few in piling	.....	.....	30c.	

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ing from fires on timber floors on deck girders has been eliminated on all of the more recent deck girder bridges by the use of either reinforced concrete slab ballast floors or creosoted timber ballast floors.

This company has two instances on record of bridge fires starting on bridges with fire protection. The first instance was on the Pacific Coast extension, where a bridge protected by gravel was destroyed. It is supposed that the high winds prevalent in this particular locality bad blown the finer particles of ballast away and had shifted the coarser, thus leaving spots unprotected. The second instance occurred on a bridge which was protected by sheet iron only between the rails. In this case the fire started on the guard timbers.

At the close of the season of 1910 this company had protected 47,417 ft. of timber bridges against fire. At the close of the season of 1911 it is expected to have about 80,000 ft. of timber bridges so protected. In addition to tbis, all of the timber bridges on the C. M. & P. S. have been protected. During the period between January 1, 1911, and August 25, 1911, there has been about 50 per cent. less fires reported, caused by locomotives, than for the corresponding time during 1910.

Wherever beadroom is sufficient, we use a ballasted treatle. No fireproofing of open-deck trestles is provided, but grass and rubbish are kept away from the piles.

Pennsylvania Lines:

On four of the nine operating divisions of this company fire protection is provided on some of their bridges. One division covers stringers between the ties and tops of caps with galvanized iron, projecting 1 in. over each side of the stringers and caps. One division formerly covered tbe tops of stringers between and under the ties with tin, but has discontinued the practice, as when the tin rusted through or broke and a spark passed through the opening to the dry timber beneath, the fire was difficult to reach, and in putting it out the fireproofing was entirely destroyed. This division has recently fireproofed the floor of one bridge over a street by attaching on top of the plank floor old Winslow car roofing, scrapped at the sbops during the repair of cars. This protection has so far been satisfactory.

A third division covers the stringers with galvanized iron. A fourth division covers the deck from guard rail to guard rail with galvanized iron, thus making the sheeting over the guard rail and 3 in. or 4 in. outside. These sheets do not run under the rail, but lap over the flanges. They have also fireproofed one bridge by covering the tops and sides of each tie between the guard rails and tbe guard rails themselves with galvanized iron sheeting.

Where only the stringers and caps are protected, tbe protection of the stringers only applies to wooden bridges. The caps of bents supporting steel bridges are protected. On divisions where the entire deck has been fireproofed, this fireproofing has been done on both timber and steel bridges. We have not suffered any severe fire losses in the decks of bridges fireroofed, but one dangerous fire is reported with several small fires originating in jolting.

Reports from the four divisions on whicb some fireproofing has been applied show tbc tote lengtb of bridge so protected to be about one mile, or a small proportion of the total number of bridges on these divisions.

The division on which the tops of caps and stringers are covered witb galvanized iron, projecting 1 in. over tbc sides, reports 75 per cent. decrease in the number of fires on bridges so protected. The other divisions report that, on account of the recent adoption of self-cleaning ash pans, wblch have largely increased the number of fires, statistics cannot be furnished.

The cost of protecting the tops of stringers between the ties and tops of caps with galvanized iron, projecting 1 in. over the sides of each, is reported as 22 cents per linear foot of track. The cost of protecting the deck with old Winslow car roofing is reported at 10¼ cents per linear foot of track, for labor only. The cost of protecting the entire deck with galvanized iron sheeting to line 3 in. or 4 in. beyond the outside wooden guard rails varies from 79½ cents to $1.88 per linear foot, depending upon the location and size of bridge. This fireproofing was applied by a contract tinner and roofer.

(Conclusions 4 and 5 were referred back to the Committee.)

Discussion on Wooden Bridges and Trestles.

I. L. Simmons, Committee Chairman: I move that conclusion 1 be adopted as good practice.

J. L. Campbell: is this report intended to cover the wooden guard rail outside of the track rail only?

Mr. Simmons: This is for the guard timber, and the guard timber is considered as the guard rail on the outside of the bridge.

(Conclusion was adopted.)

Mr. Rose: Is it the recommendation of conclusion 2 to have guard rails on all bridges?

Mr. Simmons: Yes.

Mr. Rose: I think that is going a little too far. Extending that reason a little bit, you will want a guard rail on every fill, and you will have the railroad with a guard rail from one end to the other.

C. E. Lindsay: I suggested the use of the words "guide rail" for this inner rail. Its purpose is to guide derailing wheels past the point of danger. When you look in the Manual for a definition of guard rail you will find it is a longitudinal member, usually a metal rail secured on top of the ties inside the track rail to guide derailed wheels. Our understanding of guard rail is to prevent wheels from being derailed, and I think there should be a definite term to show that the terms "guard timber" and "guard rail" are used indiscriminately and improperly. I am certainly opposed to the using of guard rails at all bridges. The use of a guide rail is to minimize the effect of a derailment in that particular locality. I think that the Dominion of Canada has done a very sensible thing in confining the use of guard rails to openings more than 50 ft., but I think it is necessary to go further. The object of the guide rail is to minimize the effect of derailments at points where there is a structure which might be damaged by the derailed car or where the curvature is excessive, or the speed grade, or where the height of an opening into which a vehicle might fall would be so great as to make a terrible calamity, or where the clearances are close and the speed excessive.

There is no sense in putting in an inner guard rail where there are turnouts at both ends. That would not minimize the result of derailment. Take a point at slow speed where a derailed wheel would do no harm, a guide rail is of no use and I hope the committee will reconsider this action and seriously consider a definition of the term "guide rail."

Mr. Loweth: I am opposed to any recommendation that we should put guide rails or guard rails, whatever they may be termed, on all bridges. It is an unnecessary expense and is not in accordance with the facts or practice as indicated in the tabulation of the statement of the various roads in the committee's report.

Mr. Campbell: I agree with Mr. Loweth and Mr. Lindsay that the requirement for guard rails on all bridges Many bridges are only 14 ft. long. Referring to page 664, I think the committee bas shown what it intended to say in the recommendation. I raise a question about the necessity—in fact I am of the opinion that the guard rail on the outside of the bridge is a source of danger. I think that any guard rail outside of a rail has a tendency to aggravate the position of tbe derailed truck and to slew it across the track. I believe the guard rail at the end of the bridge should be removed and that we should depend entirely on the guide rails instead of the running rails.

R. C. Sattley (C. R. I. & P.): As superintendent of bridges and buildings for some 11 years on a railroad, it is my opinion that it is necessary to protect truss bridges with an inner guard rail, and we always advocate the putting of the inner guard rail 150 ft. from the end of the bridge. We have always followed this practice.

C. E. Smith (M. P.): The Missouri Pacific has about $60,000 lineal feet of bridges, and about 10,000 bridges. If guard rails were put across these bridges, and for 50 ft. from each end of each bridge, there would be about 1,800,000 ft. of track to protect, which, at a cost of 75 cents per lineal foot, would be something over $1,250,000, which at 6 per cent would be somewhere around $80,000 a year increased interest charged to the railroad for so protecting the bridges. There have been some derailments that have caused wrecks on bridges and trestles on railroads, but I do not know of a case where an inner guard would have prevented derailments or, if the guard rails had been there, would have eliminated the damage caused by these wrecks. The railroad company would still be away behind on the investment.

Mr. Simmons: I do not see that the recommendations carry the same effect that a state law would. It is not a question whether a railroad can afford to do it or not, but a question whether the damage to the structures in the past has warranted putting them on. So far as the short length of bridge is concerned, you can bave as disastrous a wreck on a 15-ft. bridge as on a 500-ft. bridge. The length does not make any difference; the location might make some difference. That is to bé determined by the man who has the matter in charge.

Mr. Rose: I think the question of guide rails is pretty largely a matter of sentiment. I have known of some derail-

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ments where there was a guide rail and it had on effect. The outer timber did the work. I hope this convention will not rule that guide rails are necessary. I do not believe they are necessary, judged by the amount of good they serve.

Geo. W. Andrews (B. & O.): I take exception to what Mr. Rose has said. I know from practical experience that the inner guard rail is of decided benefit. We have had a number of derailments, and if it had not been for the inner guard rail the engine and possibly a large number of cars would have gone down the embankment.

Mr. Loweth: It seems absurd, on a deck bridge, where the deck girder bridge or deck pile and trestle bridge, that we should put in 10, 30 or 40 ft. long, over a shallow opening, that we should put in guard rails and extend them out 30 to 50 ft. at each end. It seems that the question is the put in at the ends is more than the protection on the bridge. If it is necessary to put in protection of that kind on short, shallow bridges, why don't we put it in over the miles of high embankment that we have, where the consequences of derailment would be much more serious than would be the case in many shallow bridges?

H. T. Porter (B. & L. E.): The inside guard rail was for the purpose of guiding a derailed wheel when the cars were 60,000 lbs. capacity. By putting in guard rails successfully, we did have some confidence in their being able to guide a derailed wheel, but since we have reached an axle-load on cars of from 35,000 to 40,000 lbs., the condition has changed. We have had cases where a derailed truck on an ore car has followed the track over 2 miles and missed but very few spikes and bolts. We have had other cases where the derailed car crossed the track and went down the bank in less than 60 ft. We have had cases where the car tore ont a guard rail that was thoroughly spiked, and when the matter was under investigation I told our people that I believed that a black stripe painted along the ties would have done as much good as the guard rail. When your wheel is derailed and comes up against the guard rail, the situation is different from having the weight of the wheel on the rail. Any fastenings that I have been able to use were insignificant when they would have to resist the pressure of a derailed truck, when the load on the axle is 35,000 to 40,000 lbs., and where the truck has a tendency to cross the track.

(The conclusion was referred back to the committee.)

Mr. Loweth: In conclusion 3, I would like to suggest that the committee add after the words "guard rail," in the first line, "when used," so that it will read: "It is recommended that the guard timber or guard rail, when used, be so spaced," etc.

The President: The committee accept that.

(The motion to adopt Conclusion No. 3 was then carried.)

J. B. Jenkins (B. & O.): I move to amend conclusion 4 by inserting "inside guard rail must not be higher, or over one inch lower than the running rail."

The President: The committee accepts that.

(Conclusion 4 was then adopted as amended and the committee was excused.)

UNIFORM GENERAL CONTRACT FORMS.

The Committee was instructed to complete its report and submit the General Construction Contract. In accordance with the suggestions made at the convention in 1912, the secretary of the Association had a draft of the proposed form printed and sent a copy to the senior officer of each railway having membership in the Association with a request for a criticism of the contract by the Legal department. Seventy replies were received, which may be classed as follows:

Number of Replies.	*Nature of Replies.*
One.	Thought it impractical to draw a uniform contract form.
Six.	Preferred their own forms and made no other comments.
Thirty-five.	Approved of form, except in a few cases, where the lien clause was criticised.
Three.	Did not criticise, two of these being Canadian roads.
Twenty-five.	Made more or less extended criticisms.

The secretary tabulated the replies, including both the criticisms and the corresponding clauses of other contracts. This information was used by the committee in revising the forms submitted for criticism. Many of these criticisms concerned the detailed wording of the various clauses, and but few of them disapproved of any of the provisions as a whole.

The plan of having an agreement form of two pages to be used by itself for unimportant work and to act as a hinder for the "General Conditions, Specifications and Plans," was approved by the convention of 1912. This agreement form as presented was also approved. As the result of legal criticisms received the committee desires to recommend three amendments to this form, as follows:

In the third paragraph insert the words "except as hereinafter specified," making this paragraph read: "The Contractor shall furnish all necessary transportation, except as hereinafter specified, materials, superintendence, etc."

In the first line below the blanks left for the description of the work, insert after the word "attached," the words "identified by the signatures of the parties hereto" and eliminate the word, "as," making this paragraph read: "In accordance with the plans hereto attached, identified by the signatures of the parties hereto, or herein described, and the following general conditions, etc."

Add to the next paragraph the words "time being of the essence of this contract," making this paragraph read: "The work covered by this contract shall be commenced.....and be completed on or before the.....day of....., 191.., time being of the essence of this contract....."

The committee presents for approval:

(1) Amendments to form "A" as above.

(2) Form "B" as presented.

RECOMMENDATIONS.

(1) That standing committees which have prepared specifications be instructed to harmonize them with the approved

W. G. ATWOOD,
Chairman Committee on Uniform General Contract Forms.

contract form by the elimination of provisions which duplicate or nullify clauses of the contract form.

(2) That the special committee on uniform general contract forms be discharged on account of the completion of the work assigned to it.

W. G. Atwood (L. E. & W.), chairman; J. C. Irwin, vice-chairman; C. Frank Allen (Mass. Inst. of Tech.), E. F. Ackerman (L. V.), Thos. Earle (Penn. Steel Co.), John P. Congdon (Cons. Engr.), R. G. Kenly (M. & St. L.), E. H. Lee (C. & W. I.), C. A. Paquette (C. C. C. & St. L.), H. C. Phillips (A. T. & S. F.), J. H. Roach, (L. S. & M. S.), C. A. Wilson (Cons. Engr.), H. A. Woods (G. T. P.), committee.

CONSTRUCTION CONTRACT.

A—AGREEMENT.

THIS AGREEMENT, made this.....day of..... in the year.....by and between.....party of the first part, hereinafter called the Contractor, and .....party of the second part, hereinafter called the Company.

WITNESSETH, That, in consideration of the covenants and agreements hereinafter mentioned, to be performed by the parties hereto, and of the payments hereinafter agreed to be made, it is mutually agreed as follows:

The Contractor shall furnish all the necessary transportation, except as hereinafter specified, materials, superintendence, labor and equipment, and shall execute, construct and finish, in an expeditious, substantial and workmanlike man-

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ner, to the satisfaction and acceptance of the Chief Engineer of the Company.....
.....
in accordance with the plans hereto attached, identified by the signatures of the parties hereto, or herein described, and the following general conditions, requirements and specifications, forming part of this contract.

The work covered by this contract shall be commenced.....
.....and be completed on or before the .....day of.....191...., time being of the essence of this contract.....
.....

And in consideration of the completion of the work described herein, and the fulfillment of all stipulations of this agreement to the satisfaction and acceptance of the Chief Engineer of the Company, the said Company shall pay, or cause to be paid, to said Contractor the amount due the Contractor, based on the following prices: .....
.....

This agreement shall inure to the benefit of and be binding upon the legal representatives and successors of the parties respectively.

IN WITNESS WHEREOF, The parties hereto have executed this agreement in.....the day and year first above written.

WITNESS:

B—GENERAL CONDITIONS.

Bond.

1. The Contractor agrees, at the time of the execution and delivery of this contract and before the taking effect of the same, to furnish and deliver to the Company a good and sufficient bond of indemnity in the penal sum of.....dollars, as security for the faithful performance, by the Contractor, of all the covenants and agreements on the part of the Contractor contained in this contract. The security in such bond of indemnity must be satisfactory and acceptable to the Company.

This bond shall remain in force and effect in such amount, not greater than that specified, as shall be determined by the Chief Engineer, until the final completion and acceptance of the work.

Contractor's Understanding.

2. It is understood and agreed that the Contractor has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under this contract. No verbal agreement or conversation with any officer, agent or employe of the Company, either before or after the execution of this contract, shall affect or modify any of the terms or obligations herein contained.

Intent of Plans and Specifications.

3. All work that may be called for in the specifications and not shown on the plans, or shown on the plans and not called for in the specifications, shall be executed and furnished by the Contractor as if described in both these ways; and should any work or material be required which is not denoted in the specifications or plans, either directly or indirectly, but which is nevertheless necessary for the proper carrying out of the intent thereof, the Contractor is to understand the same to be implied and required and shall perform all such work and furnish any such material as fully as if they were particularly delineated or described.

Permits.

4. Permits of a temporary nature necessary for the prosecution of the work shall be secured by the Contractor. Permits for permanent structures or permanent changes in existing facilities shall be secured by the Company.

Protection.

5. Whenever the local conditions, laws or ordinances require, the Contractor shall furnish and maintain, at his own cost and expense, necessary passageways, guard fences and lights and such other facilities and means of protection as may be required.

Rights of Various Interests.

6. Wherever work being done by Company forces or by other Contractors is contiguous to work covered by this contract the respective rights of the various interests involved shall be established by the Engineer, to secure the completion of the various portions of the work in general harmony.

Consent to Transfer.

7. The Contractor shall not let or transfer this contract, or any part thereof (except for the delivery of material), without consent of the Chief Engineer, given in writing. Such consent does not release or relieve the Contractor from any of his obligations and liabilities under the contract.

Superintendence.

8. The Contractor shall constantly superintend all the work embraced in this contract, in person or by a duly authorized manager acceptable to the Company.

Timely Demand for Points and Instructions.

9. The Contractor shall not proceed until he has made timely demand upon the Engineer for, and has received from him, such points and instructions as may be necessary as the work progresses. The work shall be done in strict conformity with such points and instructions.

Report Errors and Discrepancies.

10. If the Contractor, in the course of the work, finds any discrepancy between the plans and the physical conditions of the locality, or any errors in plans or in the layout as given by said points and instructions, it shall be his duty to immediately inform the Engineer in writing and the Engineer shall promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk.

Preservation of Stakes.

11. The Contractor must carefully preserve bench marks, reference points and stakes, and in case of wilful or careless destruction, he will be charged with the resulting expense, and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

Inspection.

12. All work and materials shall be at all times open to the inspection, acceptance or rejection of the Engineer or his duly authorized representative. The Contractor shall provide reasonable and necessary facilities for such inspection.

Defective Work or Material.

13. Any omission or failure on the part of the Engineer to disapprove or reject any work or material shall not be construed to be an acceptance of any defective work or material. The Contractor shall remove, at his own expense, any work or material condemned by the Engineer, and shall rebuild and replace the same without extra charge, and in default thereof the same may be done by the Company at the Contractor's expense, or, in case the Chief Engineer should not consider the defect of sufficient importance to require the Contractor to rebuild or replace any imperfect work or material, he shall have power, and is hereby authorized, to make an equitable deduction from the stipulated price.

Insurance.

14. The Contractor shall secure in the name of the Company and for its benefit policies of fire insurance on such structures and in such amounts as shall be specified by the Chief Engineer not exceeding.....

Indemnity.

15. The Contractor shall indemnify and save harmless the Company from and against all claims, demands, payments, suits, actions, recoveries and judgments of every nature and description brought or recovered against it, by reason of any act or omission of the said Contractor, his agents or employes, in the execution of the work by or in consequence of any negligence or carelessness in guarding the same.

Settlement for Wages.

16. Whenever, in the opinion of the Chief Engineer, it may be necessary for the progress of the work to secure to any of the employes of the Contractor any wages which may then be due them, the Company is hereby authorized to pay said employes the amount due them or any lesser amount, and any sum so paid them, as shown by their receipts, shall be deducted from any moneys that may be or become payable to said Contractor.

Liens.

17. If at any time there shall be evidence of any lien or claim for which the Company might become liable and which is chargeable to the Contractor, the Company shall have the right to retain out of any payment then due or thereafter to become due, an amount sufficient to completely indemnify the Company against such lien or claim, and if such lien or

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claim be valid, the Company may pay and discharge the same, and deduct the amount so paid from any moneys which may be or become due and payable to the Contractor.

Work Adjacent to Railroad.

18. Whenever the work embraced in this contract is near the tracks, structures or buildings of this Company or of other railroads, the Contractor shall use proper care and vigilance to avoid injury to persons or property. The work must be so conducted as not to interfere with the movement of trains or other operations of the railroad; or, if in any case such interference be necessary, the Contractor shall not proceed until he has first obtained specific authority and directions therefor from the proper designated officer of the Company and has the approval of the Engineer.

Risk.

19. The work in every respect shall be at the risk of the Contractor until finished and accepted except damage or injury caused directly by Company's agents or employes.

Order and Discipline.

20. The Contractor shall at all times enforce strict discipline and good order among his employes, and any employe of the Contractor who shall appear to be incompetent, disorderly or intemperate, or in any other way disqualified for or unfaithful to the work entrusted to him, shall be discharged immediately on the request of the Engineer, and he shall not again be employed on the work without the Engineer's written consent.

Contractor Not to Hire Company's Employes.

21. The Contractor shall not employ or hire any of the Company's employes without the permission of the Engineer.

Intoxicating Liquors Prohibited.

22. The Contractor, in so far as his authority extends, shall not permit the sale, distribution or use of any intoxicating liquors upon or adjacent to the work, or allow any such to be brought upon, to or near the line of the railway of the Company.

Cleaning Up.

23. The Contractor shall, as directed by the Engineer, remove from the Company's property and from all public and private property, at his own expense, all temporary structures, rubbish and waste materials resulting from his operations.

Engineer and Chief Engineer Defined.

24. Wherever, in this contract, the word Engineer is used, it shall be understood as referring to the Chief Engineer of the Company, acting personally, or through an assistant, duly authorized, in writing, for such act by the Chief Engineer, and wherever the words Chief Engineer are used it shall be understood as referring to the Chief Engineer in person and not to any assistant engineer.

Power of Engineer.

25. The Engineer shall have power to reject or condemn all work or material which does not conform to this contract; to direct the application of forces to any portion of the work which, in his judgment, requires it; to order the force increased or diminished, and to decide questions which arise between the parties relative to the execution of the work.

Adjustment of Dispute.

26. All questions or controversies which may arise between the Contractor and the Company, under or in reference to this contract, shall be subject to the decision of the Chief Engineer, and his decision shall be final and conclusive upon both parties.

Order of Completion; Use of Completed Portions.

27. The Contractor shall complete any portion or portions of the work in such order of time as the Engineer may require. The Company shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding the time for completing the entire work or such portions may not have expired; but such taking possession and use shall not be deemed an acceptance of the work as taken or used, or any part thereof. If such prior use increases the cost of or delays the work, the Contractor will be entitled to such extra compensation or extension of time, or both, as the Chief Engineer may determine.

Changes.

28. The Company shall have the right to make any changes that may be hereafter determined upon in the nature or dimensions of the work, either before or after its commencement, and such changes shall in no way affect or void this contract. If such changes make any change in the cost of the work, an equitable adjustment shall be made by the Chief Engineer to cover the same.

Extra Work.

29. No bill or claim for extra work or material shall be allowed or paid unless the doing of such extra work or the furnishing of such extra material shall have been authorized in writing by the Engineer.

Such work or such extra shall be determined by the Chief Engineer, who may either fix a unit price or a lump-sum price, or may, if he so elects, provide that the price shall be determined by the actual cost, to which shall be added ..... per cent. to cover general expense and superintendence, profits, contingencies, use of tools, Contractor's risk and liability. If the Contractor shall perform any work or furnish any material which is not provided for in this contract, or which was not authorized in writing by the Engineer, said Contractor shall receive no compensation for such work or material so furnished, and does hereby release and discharge the Company from any liability therefor.

If the Contractor shall proceed with such extra work or the furnishing of such extra material after receiving the written authority therefor, as hereinbefore provided, then such work or material, stated in the written authority of the Engineer, shall be covered, governed and controlled by all the terms and provisions of this contract, subject to such prices as may be agreed upon or fixed by the Chief Engineer.

If the Contractor shall decline or fail to perform such work or furnish such extra material as authorized by the Engineer in writing, as aforesaid, the Company may then arrange for the performance of the work in any manner it may see fit, the same as if this contract had not been executed, and the Contractor shall not interfere with such performance of the work.

Property and Right of Entry.

30. The Company shall provide the lands upon which the work under this contract is to be done, except that the Contractor shall provide land required for the erection of temporary construction facilities and storage of his material, together with right of access to the same.

The Contractor shall not ship any material or equipment until he has received written notice from the Engineer that he may proceed with said work or any part thereof.

Unavoidable Delays; Extension of Time on Parts of Work.

31. If the Contractor shall be delayed in the performance of the work from any cause for which the Company is responsible, he shall, upon written application to the Chief Engineer at the time of such delay, be granted such extension of time as the Chief Engineer shall deem equitable and just.

Suspension of Work.

32. The Company may at any time stop the work, or any part thereof, by giving ten days' notice to the Contractor in writing. The work shall be resumed by the Contractor in ten days after the date fixed in the written notice from the Company to the Contractor so to do. The Company shall not be held liable for any damages or anticipated profits on account of the work being stopped, or for any work done during the interval of suspension. It will, however, pay the Contractor for expense of men and teams necessarily retained during the intervals of suspension, provided the Contractor can show that it was not reasonably practicable to move these men and teams to other points at which they could have been employed. The Company will further pay the Contractor for time necessarily lost during such suspension at the rate of ..... per cent. per annum on the estimated value of all equipment and fixtures owned by the Contractor and employed on the work which are necessarily idle during such suspension, said rate of ..... per cent. per annum being understood to include depreciation, interest and insurance. But if the work, or any part thereof, shall be stopped by the notice in writing aforesaid, and if the Company does not give notice in writing to the Contractor to resume work at a date within ..... of the date fixed in the written notice to suspend, then the Contractor may abandon that portion of the work so suspended, and he will be entitled to the estimates and payments for such work so abandoned, as provided in Section Thirty-eight (38) of this contract.

Expediting Work, Correcting Imperfections.

33. If the Chief Engineer of the Company shall at any time be of the opinion that the Contractor is neglecting to remedy any imperfections in the work or is not progressing with the work as fast as necessary to insure its completion within the time and as required by the contract or is other-

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wise violating any of the provisions of this contract, said Engineer, in behalf of the Company, shall have the power, and it shall be his duty, to notify the Contractor to remedy such imperfections, proceed more rapidly with said work or otherwise comply with the provisions of this contract.

Annulment.

The Company, if not at fault, may give the Contractor ten days' written notice, and at the end of that time if the Contractor continues to neglect the work, the Company may provide labor and materials and deduct the cost from any money due the Contractor under this agreement; and may terminate the employment of the Contractor under this agreement and take possession of the premises and of all materials, tools and appliances thereon, and employ such forces as may be necessary to finish the work. In such cease the Contractor shall receive no further payment until the work shall be finished, when, if the unpaid balance that would be due under this contract exceeds the cost to the Company of finishing the work, such excess shall be paid to the Contractor, but if such cost exceeds such unpaid balance, the Contractor shall pay the difference to the Company.

Company May Do Part of Work.

Upon failure of the Contractor to comply with any notice given in accordance with the provisions hereof, the Company shall have the alternative right, instead of assuming charge of the entire work, to place additional forces, tools, equipment and materials on parts of the work for the purpose of carrying on such parts of the work, and the cost incurred by the Company in carrying on such parts of the work shall be payable by the Contractor and such work shall be deemed to be carried on by the Company on account of the Contractor, and the Contractor shall be allowed therefor the contract price. The Company may retain the amount of the cost of such work, with.....per cent. added, from any sum or sums due or to become due the Contractor under this agreement.

Annulment Without Fault of Contractor.

34. (a) The Company shall have the right at any time, for reasons which appear good to it, to annul this contract upon giving thirty (30) days' notice in writing to the Contractor, in which event the Contractor shall be entitled to the full amount of the estimate for the work done by him under the terms and conditions of this contract up to the time of such annulment, including the retained percentage. The Contractor shall be reimbursed by the Company for such expenditures as in the judgment of the Chief Engineer are not otherwise compensated for, and as are required in preparing for and moving to and from the work; the intent being that an equitable settlement shall be made with the Contractor.

Notice; How Served.

(b) Any notice to be given by the Company to the Contractor under this contract shall be deemed to be served if the same be delivered to the man in charge of any office used by the Contractor, or to his foreman or agent at or near the work, or deposited in the postoffice, postpaid, addressed to the Contractor at his last known place of business.

Removal of Equipment.

(c) In case of annulment of this contract before completion from any cause whatever, the Contractor, if notified to do so by the Company, shall promptly remove any part or all of his equipment and supplies from the property of the Company, failing which the Company shall have the right to remove such equipment and supplies at the expense of the Contractor.

Failure to Make Payments.

35. Failure by the Company to make payments at the times provided in this agreement shall give the Contractor the right to suspend work until payment is made, or at his option, after 30 days' notice in writing, should the Company continue to default, to terminate this contract and recover the price of all work done and materials provided and all damages sustained, and such failure to make payments at the times provided shall be a bar to any claim by the Company against the Contractor for delay in completion of the work.

Monthly Estimate.

36. So long as the work herein contracted for is prosecuted in accordance with the provisions of this contract, and with such progress as may be satisfactory to the Chief Engineer, the said Chief Engineer will, on or about the first day of each month, make an approximate estimate of the proportionate value of the work done and of material furnished or delivered upon the Company's property at the site of the work, up to and including the last day of the previous month. The amount of said estimate, after deducting ..... per cent., and all previous payments, shall be due and payable to the Contractor at the office of the Treasurer of the Company on or about the 20th day of the current month.

Acceptance.

37. The work shall be inspected for acceptance by the Company promptly upon receipt of notice that the work is ready for such inspection.

Final Estimates.

38. Upon the completion and acceptance of the work the Chief Engineer shall execute a certificate over his signature that the whole work provided for in this agreement has been completed and accepted by him under the terms and conditions thereof, whereupon the entire balance found to be due to the Contractor, including said retained percentage, shall be paid to the Contractor at the office of the Treasurer of the Company within ..... days after the date of said final certificate. Before the time of payment of said final estimate the Contractor shall submit evidence satisfactory to the Chief Engineer that all payrolls, materials, bills and outstanding indebtedness in connection with this work have been paid.

Discussion on Contract Forms.

W. G. Atwood (Committee Chairman): The statement of the committee covers about everything that they have to say. Thirty-five legal departments approved the form as it stands, except for the lien clause. That lien clause we changed as a result of their criticism.

Y. K. Hendricks (St. L. & S. F.): I would like to ask, as a matter of information, how the blank space after "time being of the essence of this contract" in Form *A* is to be filled in.

Mr. Atwood: That is for qualification or specification and description that will fit in the different cases, and the blank is left to be used for any of those purposes.

Mr. Fritch: I believe it would be an improvement if "all the necessary transportation, except as hereinafter specified," would follow after equipment. Then it would be sure to cover everything—labor, material and equipment.

Mr. Atwood: The committee will accept that change.

Mr. Rose: I do not quite understand that permit arrangement in paragraph 4, Form *B*. I think in many cases it would be better for the company to get the permit than the contractor.

Mr. Fritch: This refers simply to temporary permits. Any permanent permit should be secured by the company.

Mr. Rose: I would like to know if it is possible to carry out this section 14, taking out insurance in the name of the company for property the company does not own and has not accepted? I think it would be necessary to assign that portion of the work that is covered by insurance to the company in order to collect the insurance.

Mr. Atwood: It is the opinion of the committee that structures erected or material furnished to the company on the right-of-way under this contract, which provides for certain definite payments, is the company's property when it is so erected and furnished. And that the contractor has a lien on it, but the material or structure is the property of the company.

L. C. Fritch: Referring to paragraph 26, one thing that has not been quite satisfactory to me is the arbitration clause, the chief engineer representing the railroad company alone being the judge of the disputes between the company and the contractor. I do not believe that that would be sustained in the courts.

Hunter McDonald: My experience with respect to the matter of arbitration clauses is that they are entirely useless. You can go into court and get your controversy settled by a judge in a much more expeditious manner and with much more fairness and with about the same expense that you can by arbitration.

C. A. Wilson (C. E.): I was retained in a case where there was a suit brought for damages by a contractor. The suit was a jury case. The attorneys for the railway contended that this was not a suit in damages; that by the contract the engineer had been constituted the arbitrator between the two parties, and he had rendered his decision as arbitrator, and that therefore it was an appeal case from the arbitration of the engineer.

C. P. Howard (I. C.): I have been in some law suits in which these questions have been brought up. I don't remember the courts having passed on it, but my recollection of comment of eminent attorneys on the subject is that the

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decision of the chief engineer in authority as an arbitrator would stand, unless it could be clearly proven that he had acted from fraudulent motives or had clearly made a mistake.

Mr. Atwood: An appeal can be carried either to a court or to an arbitration board after the completion of the work by agreement; but we feel it is necessary that the chief engineer have this power during the progress of the work to see that it is carried on.

L. C. Fritch: I would like to have a blank left in the third line, paragraph 29, before "engineer," so that if any company wishes to have the extra work controlled entirely by the chief engineer, that might be inserted.

The President: The committee will accept that.

Robt. Ferriday (Big Four): I would recommend that the time of giving notice be left blank in paragraph 32. A little job of grading would not amount to anything, but if a man has a one million dollar building, ten days would be pretty short notice.

L. C. Fritch: It does not seem to me that the clause is quite consistent. In one place it refers to equipment and fixtures; in another place to men and teams.

Mr. Gifford: The word "Owned" might be changed to "equipment and fixtures owned by the contractor." Frequently the contractor rents the equipment. We might change the word owned or leave it out entirely and make it read, "The value of all fixtures and equipment furnished by the contractor on the work."

The President: The committee will accept that.

The President: The committee will insert a blank instead of the figures "10" in paragraph 33 under the title of annniment, to agree with the other cause.

Mr. Rose: I move that "20th" be left blank in paragraph 36.

The President: The committee accepts that.

Edward Gray, Jr. (C. & O.): It seems to me there might be some ambiguity in the last clause of paragraph 15 "Negligence in guarding the same," seems to exclude everything outside of it, as now written and punctuated. If that was intended it seems to me we would have to use "guarding" in a too general sense. I would suggest that it read "By reason of any act or omission of said contractor, or in consequence of any negligence or carelessness in guarding same."

Mr. Atwood: The committee will accept that.

Mr. Rose: This will not save the company from suits for patents. I do not think that is covered.

Mr. Atwood: That has been referred to the legal departments of several of the roads represented on the committee, and they have all ruled that it did cover patents.

Mr. Hendricks: I move that the last line of paragraph 1, reading "The final completion and acceptance of the work" be stricken out, and that it read "After the expiration of the time in which liens can be filed."

Mr. Atwood: The committee would suggest as a substitute for that, the words "Until the final completion or acceptance of the work" be struck out, and that it be replaced by blank, to be filled in as desired.

Mr. Hendricks: I will accept that.

Mr. Lloyd: Clause 36 says the materials shall be paid for. I do not understand why he should get additional compensation for the materials.

Mr. Atwood: Materials delivered prior to the first of the month during which the suspension might take place, would be paid for under the estimate. If we add the word "materials" in this clause it would cover interest on materials after that time and during suspension.

(The committee was discharged, their work having been completed.)

WOOD PRESERVATION.

The board of direction assigned the following subjects:

(1) Continue investigation of proper grouping of different timbers for antiseptic treatment.

(2) Investigate the merits of various preservatives, giving special attention to oil from water-gas tar, and to the use of refined coal-tar in creosote oil.

In addition to the subjects specifically assigned, the committee continued investigations on the following two subjects assigned in previous years, but on which no final report was made:

(3) The advisability of revising the specifications for fractionation of creosote oil.

(4) Recommend forms for the inspection of preservative processes.

GROUPING OF TIMBERS FOR ANTISEPTIC TREATMENT.

In the report last year the committee stated the fundamental principles governing the grouping of timbers for treatment, which were adopted by the association for publication in the manual. It was the consensus of opinion that further recommendations could not be made until an extensive series of experiments had been conducted, which would indicate the proper practice at stated locations, and with timber from specific regions. An outline of the points to be covered by experimental work in different regions was prepared and sent out to the members of the sub-committee on grouping, and some investigative work has been in progress during the year. However, owing to the long time required to reach definite conclusions and because of the difficulty of arranging for sustained experimental work along uniform lines, no data are available which would justify changing or adding to the fundamental principles outlined last year.

Some of the best authorities express the opinion that, owing to the variations in the character of the same kind of wood in different regions, the problems of grouping must be worked out at each individual treating plant, and that statements regarding detail practice which would have general application cannot be made. Another view of the matter, which has been expressed, is that the next step is to determine the laws governing the penetration of creosote, from which the grouping of timbers according to natural resistance may be made. As the committee has no facilities for studies of this kind,

EARL STIMSON,
Chairman Committee on Wood Preservation.

and since the wood-preserving industry looks to the U. S. Forest Products Laboratory and other institutions devoted to technical investigations for reports along this line, it is recommended that the attention of the United States Forest Products Laboratory be called to the desirability of a study of the regional variation in wood structure by species, in reference to the absorption of preservatives.

The committee will continue its investigations along these lines during the coming year.

THE MERITS OF PRESERVATIVES.

The Use of Refined Coal Tar in Creosote Oil.

The sub-committee to which this subject was assigned made an exhaustive research for facts pertaining thereto upon which the committee might base a report and definite recommendations. The result was such that the committee was not able to reach a conclusion and is not in position at this time to present a report with recommendations to the association. The committee, therefore, reports progress, and will continue the consideration of this subject.

The Use of Oil from Water-Gas Tar.

So far as the committee has been able to learn, water-gas creosote has not been extensively used under its own name as a wood preservative, and there is very little information to be found as to its efficacy. A few piles treated with it are driven in the harbor at Norfolk, Va. These waters are badly infested with Teredo, and the piles are said not to have been attacked, although they have been there about three years. Professor Alleman has a tie at Swarthmore which was treated

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with water-gas creosote and was in service nine years at Porto Rico. This tie is still sound. The Public Service Corporation of New Jersey has been using water-gas creosote for several years for treating ties. These ties should show in about two years whether the treatment is good or not. They are now treating a large number of pine ties with straight water-gas creosote furnished by the United Gas Improvement Company of Philadelphia. One of the large creosoting companies has recently obtained a patent for treating wood with a mixture of water-gas creosote and coal-tar creosote, and one of the large railroad companies is contemplating the use of a mixture of water-gas creosote and coal-tar creosote for ties. The United States Forest Service has some specimens treated with water-gas creosote placed at West Pascagoula and Gulfport, Miss.; the latter put in the water in March, 1912. None of the specimens has been there long enough to give any results. It seems that the principal objection to water-gas creosote has been to its unauthorized use as an adulterant in coal-tar creosote. Its use, however, is now increasing in legitimate mixtures, and, while it is too early to get any results, it seems that a number of people favor using at least a mixture of this oil with coal-tar creosote.

It is recommended that the investigations of this subject be continued for another year.

CONSIDERATION OF THE SPECIFICATIONS FOR FRACTIONATION OF CREOSOTE OIL.

For some years past the committee has had under consideration the relative merits of the flask and retort for the fractionation of creosote oil. For the purpose of obtaining information on this point, and on which to base consideration of further revisions in the specifications for fractionation, the committee sent samples of various creosote oils to different railroads for fractionation by the various methods. Based on these examinations, the committee recommends that no change be made in the adopted specifications for fractionation of creosote oil.

FORMS FOR REPORTING INSPECTION.

Two forms for reporting inspection of treatment are submitted. Form "A" provides a record of the treatment and the determination of the absorption of the preservative by gage readings. Form "B" provides a record of the determination of the absorption by weighing. These forms are intended as a general guide for reporting and keeping records of the inspection of treatment of timbers, and may be varied to suit any special kind of treatment.

The following is explanatory of the gage readings, designated by letter on Form "A":

Reading "A"—Is the reading of the measuring tank gage before the oil is put into the cylinder.

Reading "B"—Is the tank gage reading when the cylinder is completely filled.

Reading "C"—Is the tank gage reading when the pumping of the oil into the cylinder is stopped.

Reading "D"—Is the tank gage reading after all the oil from the charge is returned to the measuring tank.

Reading "A" minus "D," corrected for temperatures, gives the number of gallons used in the charge.

Reading "B" minus "C" gives the number of gallons pumped into the timber after the cylinder is filled and is used to give the gross absorption for light processes where oil is taken out of the timber by an initial air pressure, or by a final vacuum, or both. There will be a discrepancy in this gross absorption, due to the amount of oil absorbed by the timber while cylinder is being filled.

RECORDS FROM SERVICE TESTS.

In Appendix "B" to this report was given the record from service tests, brought up to date and extended to include a number of additional tests not shown on the records submitted with the report of last year.

CONCLUSIONS.

It is recommended:

(1) That no change be made in the adopted Specifications for the Fractionation of Creosote Oil.

(2) That the forms "A" and "B" for reporting the Inspection of Treatment of Timbers, and the notes explanatory of the gage readings on Form "A," as given under the subhead "Forms for Reporting Inspection," be adopted for insertion in the manual.

OUTLINE OF WORK FOR 1913.

The committee recommends:

(1) Continue investigations of the merits as a preservative of oil from water-gas and the use of refined coal-tar in creosote oil.

(2) Continue the compilation of available information from service tests.

(3) Continue the investigation of the proper grouping of the different timbers for antiseptic treatment.

(4) Report on methods of accurately determining the absorption of creosote oil.

(5) That the board of direction assign the work of drawing up a standard specification for timber for treatment to a joint committee of the committee on wood preservation and the committee on grading of lumber.

Earl Stimson, chairman (B. & O.), E. H. Bowser, vice-chairman (I. C.), G. M. Davidson (C. & N.-W.), H. B. Dick (B. & O. S. W.), C. F. Ford (C. R. I. & P.), Dr. W. K. Hatt (Purdue Univ.), V. K. Hendricks (S. A. L. & S. F.), George E. Rex (A. T. & S. F.), E. A. Sterling (Cons. Engr.), C. M. Taylor (P. & R.), Dr. H. von Schrenk (Cons. Engr.), T. G. Townsend (Southern), Committee.

Discussion on Wood Preservation.

Earl Stimson, Committee Chairman: Under the heading "Consideration of the specifications" for fractionation of creosote oil," I will ask Dr. Von Schrenk to present the subject.

Dr. H. von Schrenk: The experiments to which the chairman refers were made as a result of a number of inquiries which came to the committee last year, as to whether the standard practice now printed in the Manual for fractionating coal-tar creosote was the best method for conducting this operation, and in order to secure fuller data on the subject, two separate creosoted oils were sent out, by the sub-committee to a number of railroads, with the request that they analyze or fractionize these samples according to the standard methods now printed in the Manual, and according to a suggested method of using a flask instead of a retort which had been presented by a sub-committee of this committee two years ago. The oils were labeled respectively A and B. The samples all come from the same cans, and the methods prescribed by the Manual and by the recommendation made to the committee two years ago were followed by various operators for various companies. The results have been tabulated in the report this year. A careful study was made. First as to the variations in results between the two methods per se and then a study of the variations due to the fact that different individuals were using one and the same method. After a careful tabulation of these variations, the committee came to the conclusion that the present method as printed in the Manual, showed a variation which was slightly less from the personal standard than that obtained in the fractions made with the suggested method, and we could find no evidence of any improvement which could be obtained by the suggested method, over the one which we have standing in the Manual at the present time, and in order that these results might once and for all be available to those interested in the subject, we have presented in full the actual results submitted by the individual operators.

Mr. Stimson: I will say in explanation of Form "A" that it provides a record of the treatment and the determination of the absorption by gage readings. Form "B" provides a record for the determination of the absorption by weighing. Form "B" provides a check against Form "A." I move that this be adopted for insertion in the Manual. (The motion was seconded and carried.)

TIES.

The board of direction assigned the following subjects to the committee:

(1) Report on the effect of design of tie-plates and track spikes on durability of ties.

(2) Continue study of the stresses to which cross-ties are subjected, and determine size required.

(3) Report on economy in labor and material effected through use of treated ties compared with untreated ties.

(4) Continue the compilation of information as to the use of metal, composite and concrete ties.

The report on the effect of the design of tie-plates and spikes on the durability of ties is given in appendix A, and is submitted as information.

The report on the subject of stresses to which cross-ties are subjected is given in appendix B.

The committee also reports progress on the subject of economy in labor and material effected through use of treated ties compared with untreated ties.

In appendix C was given a compilation as to the use of metal, composite and concrete ties.

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CONCLUSIONS.

The committee has given the subject of stresses to which cross-ties are subjected an exhaustive study, covering a period of two years, and after conferences with a number of leading members of the Association, finds no reason to change its conclusions submitted in 1912, and given on page 331 of Volume 13, and resubmits them for adoption:

The conclusions of the committee are as follows:

(1) It is impracticable to perform experiments to determine size of cross-ties, for the following reasons:

The character of the subgrade varies radically on the same road and in different parts of the country. The kind of ballast varies widely. The necessary depth of ballast varies with the weight of axle loads as well as density of traffic. The necessary distance between face of ties varies with the weight of axle load, as well the density of traffic. The kinds of timber used for ties vary in different sections of the country. The width of base of rail (or weight of rail) and use of tie-plates. Treated or untreated ties, crushing stress and durability. Amount of labor spent on track maintenance and drainage.

(2) It is recommended that the report on the effect of design of tie-plates and track spikes on durability of ties be received as information.

(3) It is recommended that the report on metal, composite and concrete ties be received as information.

L. A. Downs (I. C.), Chairman; G. W. Merrell (H. & W.), Vice-Chairman; H. W. Brown (Pa. Lines), W. J. Burtin (M.

L. A. DOWNS,
Chairman Committee on Ties.

P.), L. C. Hartley (C. & E. I.), E. D. Jackson (B. & O.), H. C. Landon (Watauga R. R.), F. R. Layng (B. & D. E.), E. R. Lewis (D. SS. & A.), R. J. Parker (A. T. & S. F.), L. M. Perkins (H. P.), J. G. Shillinger (Rutland), G. D. Swingly (B. & O.), D. W. Thrower (I. C.), H. S. Wilgus (P. S. & H.), Louis Yager (M. P.), E. C. Young (N. Y., P. & H.), Committee.

APPENDIX A.

The Effect of the Design of Tie-Plates and Spikes on the Durability of Ties.

A circular letter requesting information relative to this subject was sent to members of the Association. The following is a list of the questions asked:

(1) Do you use flat, longitudinal flange, transverse flange, pronged or corrugated tie-plates?

(2) Please send plan of your standard tie-plate, and give method of applying.

(3) Do you use screw or cut spikes?

(4) In your opinion, how far should tie-plate extend outside base of rail to overcome side thrust, and what should be total bearing area? Give reasons for your conclusions.

Replies were received from 61 railroads. The number of roads using only one design of tie-plate and the kind of plate used, are:

Longitudinal flange	16
Transverse flange	8
Flat	5
Pronged	4
Corrugated	11

The number of roads using two designs of tie-plates and kind of plates used, are:

Longitudinal flange and flat	3
Longitudinal flange and pronged	1
Longitudinal flange and corrugated	1
Transverse flange and pronged	1
Transverse flange and corrugated	1
Flat and pronged	1
Pronged and corrugated	1

The number of roads using three designs of tie-plates and kind of plates used, are

Longitudinal flange, transverse and flat	1
Longitudinal flange, transverse and corrugated	2
Longitudinal flange, flat and corrugated	1
Longitudinal flange, pronged and corrugated	1
Transverse flange, flat and pronged	1

The number of roads using four designs of tie-plates and kind of plates used, are:

Longitudinal flange, transverse, pronged and corrugated	1

The committee was unable to obtain any definite information bearing on the relative effect of the different designs of tie-plates and spikes on the life of ties, but it is thought that experiments, which are now being conducted, will throw some light on this subject in the near future.

APPENDIX C.

Study of the Stresses to Which Cross-Ties are Subjected.

The assigned topic resolves itself into two parts:

Continue the study of the stresses to which cross-ties are subjected, and determine the size required.

In order to have an expression of opinion as to the best method for handling the topic, a letter was sent to 27 members of the Association and 15 replies were received which show quite a divergence of opinion. "Track Deformation," by Cuenot, covers very well many of the suggested methods mentioned in said letters for solving the second half of the topic.

The first part of the assigned topic may be touched upon to the extent of spacing of the ties. The preponderance of the mileage voting is in favor of twelve-inch face to face; the next in favor is ten-inch; the next thirteen-inch. The recommendation of this committee for 1912 was ten to twelve-inch, and the above table substantiates its recommendation.

The Ballast committee published a translation of "Gravel as Ballast," by C. Bräuning in the proceedings for 1912, Vol. 13. Mr. Bräuning's conclusions, which are in accord with the committee's recommendations, are as follows:

"Of greater importance than the width of the tie is the spacing of the ties. As the spacing is decreased two advantages are derived: first, the unit pressure is decreased; secondly, the carrying capacity of the roadbed is increased. It is just within the limits of tie spacing usually considered that the relation a-b (a = distance face to face to tie; b = depth of tie) ranging from 3½ to 2 (spacing 35-inch and 19½-inch center to center) that the carrying capacity increases at a high rate. The limiting feature of decreasing tie spacing is the ability to tamp the ties properly. Ties 6½ in. in height can still be tamped with convenience when separated 13½ in. But this 23-inch from center to center is the lowest limit. This is the one most effective and simplest means of increasing the strength of the roadbed and to utilize it to the fullest advantage, especially on roadbeds which are fully loaded, is urgently recommended."

Mr. Byers, Vol. 1, 1911, International Railway Association, says "20-inch center to center of ties small as practicable." With an 8-inch tie the spacing face to face is 12 in. Therefore the committee feels that its conclusions are fully in line with Mr. Bräuning's recommendations, though prepared without knowledge of either Messrs. Bräuning's or Byers' conclusions.

TABLE 1.

Spacing Face to Face. Inches.	Recommending. Name of Company	Mileage of Each Railroad.	Mileage for Each Spacing.	Per-centage.
6	American Creosoting Co.	.....	.....	..
7	N. Y. C.—G. W. Kittredge	.....	2,829	5
8	C. & E. I.	.....	966	2
10	B. & A.	626	.....	..
10	G. T.—Burton & Allen	1,757	.....	..
10	I. C.	2,245	.....	..
10	K. & M.	175	.....	..
10	N. & W. (G. W. Merrell—See 11")	1,951	.....	..
10	P. & R. (F. S. Stevens—See 13")	1,509	.....	..
10	P. & L. E. (J. A. Atwood—See 12")	215	11,480	20
11	E. P. & S. W.	902	.....	..

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11	N. & W. (C. S. Churchill—See 10")	1,951	.....	..
11	Q. M. & S.	192	3,045	5
12	C., R. & Q.	8,966	.....	..
12	A., T. & S. F.	10,205	.....	..
12	C., R. I. & P. (J. M. Brown—See 12")	8,020	.....	..
12	P. & L. E. (E. F. Wendt—See 10")	215		
12	W. P. T.	64	27,473	47
13	C., R. I. & P. (Garrett Davis —See 12")	8,020	.....	..
13	P. & R. (R. B. Abbott—See 10")	1,509	9,529	16
13½	L. V. (as a maximum)		1,432	2
15	W. M.		543	1
10 to 15	L. S. & M. S.		1,663	2
			58,960	100
	Total mileage of Association		261,000	..
	Percentage here represented, 23.			

Vol. 13, pp. 306 and 307 of the Proceedings for 1912 give a table of the different number of ties per 30-ft. rail, the percentage of roads using 6 x 8 x 8 and a table giving the different sizes of cross-ties in current use. The divergence of practice is undoubtedly largely due to varying conditions in different localities and to a tendency to "follow the leader." The latter is probably nearer the mark, as the tendency in American railroading has been in the past, and only now is being broken away from, for the railroad heads always to compare the engineering department recommendations with practice on other roads, with the result that in many lines our progress has been slow.

Report was received as information without discussion.

SIGNS, FENCES AND CROSSINGS.

The following subjects were assigned for consideration:

(1) Report on the relative advantages of the different kinds of fence posts, with definite recommendations.

C. H. STEIN,
Chairman Committee on Signs, Fences and Crossings.

(2) Report on the best form of track construction and flangeways at paved street crossings and in paved streets, with definite recommendations.

(3) Continue the investigation of ways and means for securing a proper quality of fence wire to resist corrosion and secure durability.

RELATIVE ADVANTAGES OF THE DIFFERENT KINDS OF FENCE POSTS.

Replies were received from 44 railroads, with the following information as to kind of post used, cost, life of same, etc.:

It will be observed from the foregoing that the various roads use the different kinds of timber indigenous to their geographical position as follows:

Cedar	32	Oregon Fir	1
Chestnut	7	Juniper	1
Locust	9	Tamarack	1
Oak	9	Burnettized Pine	1
Bois D'Arc	5	Mulberry	1
Catalpa	1		

There are certain species of each of the above woods that are not suitable for fence posts, but doubtless must be used because they are cheap and native to the locality. This is indicated by the following summary:

Life of Posts.

Red Cedar	7 to 25 years	Black Locust	10 to 25 years
Cedar	10 " 30 "	White Oak	7 " 15 "
White Cedar	12 " 17 "	Bois D'Arc	15 " 45 "
Chestnut	10 " 15 "	Catalpa	10 " 25 "
Locust	7 " 20 "	Juniper	15 "
Yellow Locust	15 " 30 "	Mulberry	15 " 20 "

Doubtless some give little heed to the particular species of such timber that they use, and assume that any species of that genus has about the same life. This is manifestly incorrect, as is demonstrated by the oak family. The inferior grades of oak have only a life of from two to four years, while a good white oak has a life in our northern climates of from 10 to 12 years at least. Certain classes of oak last much longer in their native regions than in other localities to which they are transported for use. This principle applies with equal force to every other class of timber.

In reviewing the replies of the various roads, we find that the consensus of opinion, based upon the experience of the users, is that the different classes of timber have an average life as indicated below:

Red Cedar	18 years	White Oak	10 years
White Cedar	15 "	Bois D'Arc	25 "
Chestnut	12 "	Catalpa	15 "
Yellow Locust	20 "	Juniper	15 "
Black Locust	20 "	Mulberry	15 "

Climatic influences have an important bearing upon this phase of the case, and may lengthen or shorten the life of a particular kind of wood, dependent upon locality in which used. It is not feasible in most cases to recommend any particular kind of timber for a given territory, as the source of supply may be so distant as to preclude its use economically. According to information received, the cost of the various kinds of wood posts is:

	Range.	Average.
Red Cedar	15c to 25c	22c
Cedar	7c " 20c	14c
White Cedar	12c " 15c	14c
Chestnut	10c " 27c	20c
Locust	15c " 40c	25c
Yellow Locust	20c " 38c	30c
Black Locust	15c " 25c	20c
White Oak	11c " 40c	20c
Bois D'Arc	13c " 17c	15c
Catalpa	15c " 25c	20c
Juniper	6c " 10c	8c
Mulberry	13c " 17c	15c

It will be observed that the relative cost to life of post ranges from one-half cent to two cents per year of life, the Bois D'Arc and the Juniper being the cheapest posts, but so rare that a more general use is impossible.

It was of interest to know to what extent wooden posts were subject to destruction by fire. Replies received indicated that this varied by from 1 per cent. to 5 per cent., with the exception of one road which reported a loss of 30 per cent. from this cause. We think it fair to assume that the average loss by fire is around 3 per cent.

Only two roads so far as we can learn make mention of having used any metal posts, and then only to a limited extent. In the one case bar iron ¼ in. x 2 in. was used, and in the other, old boiler tubes. We have reason to believe, however, that quite a number of roads, not replying to our circular, are trying out a proprietary metal post. Several styles of steel right-of-way fence posts are on the market. Their exploitation has just begun in the last year or two, and any statement as to their efficiency and economy could be but vague and from the manufacturers' standpoint alone. Greater experience may demonstrate their utility, but thus far we have to rely upon them, and can only give some computations from one of the manufacturers, which might be of interest for study from the viewpoint of railroad economy. These figures, while prepared for a certain style of post only, if reliable, will no doubt be equally accurate for any other style of metal post, built along similar lines, and others are generally so designed. In order that the membership may have the manufacturers' explanation of the merits of the steel post for their further consideration, we give the statement of the case in substance according to one with whom we have had the matter under discussion:

Steel posts cost	23.03 cents
Cost of setting	1.30 "
Total	24.33 "
Estimated life	30 years

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Based upon above figures, steel posts set one rod apart cost .81 cent per year.

The cost of setting wood posts is estimated at 5.8 cents each. The following table is based on wood posts costing from nothing up to 20 cents each, and is intended to show what the life of wooden posts must be at different first costs to be as cheap as the steel post:

Cost of post.	Cost of setting.	Total cost.	Years it must last to be as cheap as steel.
0 cents	5.8 cents	5.8 cents	7.1 years
5 "	5.8 "	10.8 "	13.3 "
8 "	5.8 "	13.8 "	17. "
10 "	5.8 "	15.8 "	19.5 "
12 "	5.8 "	17.8 "	21.9 "
15 "	5.8 "	20.8 "	25.6 "
17 "	5.8 "	22.8 "	28.1 "
18.53"	5.8 "	24.33 "	30. "
20 "	5.8 "	25.8 "	31.2 "

The above figures would indicate that wood posts costing 15 cents would have to have a life of 35.6 years and those costing 20 cents a life of 31.8 years to be as cheap as steel.

The first steel posts are said to have been manufactured about fifteen years ago at Bloomfield, Ind. Others, doubtless, of different design unknown to the committee were manufactured as long ago and perhaps longer, but only during the past 12 years have they been given any serious study with a view to placing them on the market for ordinary right-of-way fencing. Hundreds were taken up and examined to discover signs of rust, and deterioration at the ground line or elsewhere. They have been in use at Spencer, Worthington, Bloomfield, Ind., and elsewhere in all kinds of soil and under all conditions. The investigations have resulted in placing them on the market during the past year or so. .

To be of economic worth for right-of-way protection, a fence post must possess the following qualities: durability, practicability, efficiency, and the price must be right. Inquiry develops that one man can set in a day from 15 to 35 wooden line posts. To be conservative, 25 posts per day per man is assumed as the unit of work. Estimating wages at $1.75 per day places the cost of setting a wood post at 5.8 cents. The cost of post is estimated at 12 cents, resulting in an entire outlay of 17.8 cents. Experience is said to have demonstrated that three men can readily set from 250 to 640 steel posts per day, or 130 to 213 per man—130 posts per man is taken as the basis of calculation with wages at $1.75 per day. This places the cost for setting a steel post at 1.3 cents. Cost of steel post 22.02 cents, plus cost of setting 1.3 cents, resulting in entire outlay, 24.33 cents.

Comparative Cost of Steel and Wood.

Entire cost of steel post 24.33c; estimated life 30 years. Money worth 6 per cent.	
Entire cost of wood post 17.80c; estimated life 12 years.	
Expenditure for steel posts	24.33 cents
Expenditure for wood posts	17.80 "
Difference	6.26 "

Compound interest on 6.26 cents for 12 years amounts to 13.06 cents. At the expiration of 12 years wood posts have failed and need renewal. 13.06 cents has been saved over cost of steel posts. This is equivalent to purchasing 8.8 years more protection with wood. In other words, 24.33 cents expended for steel give 30 years of protection, while same amount expended for wood gives 12 years original life, plus 8.8 years interest on investment, or 20.8 years, a balance in favor of steel of 9.2 years. Viewing the matter from another angle, assuming that posts are set one rod apart, track protection costs per year as follows:

Steel Posts.		Wood Posts.	
Per rod	$ .0061	Per rod	$ .0117
Per mile	2.59	Per mile	3.74
Per 100 miles	259.00	Per 100 miles	374.00

Balance in favor of steel posts of

$ .0036	per rod per year.
1.15	per mile per year.
115.00	per 100 miles per year.

Other advantages claimed are no staples used; right-of-way may be burned over from time to time without injury to posts. No loss from accidental fires and no renewal on that account. Special end, corner and gate posts must be used in connection with the steel line post. No means are provided for bracing them so as to use them as end or corner posts. There is not enough steel in them to stand the strain of stretching a heavy wire fence. The minimum amount of steel necessary is used to meet the requirements of a right-of-way fence. The line and end posts are treated as distinct problems. In this they are not unlike posts made of other materials.

Comparative Cost of Steel and Wood End and Corner Posts.

Cost of End Post	$1.62
Cost of Corner Post	2.30

Assuming it fair to say that twice as many end posts will be needed as corner posts, it places the average of the stretching post at $1.84 each. If $1.84, the cost of the steel corner post, bears the same relation to the cost of a good wooden corner post that the price of the steel line post bears to the price of the wooden post, then the economy is demonstrated. In order to determine whether or not the steel relation maintains, we resort to the following equation:

$$\frac{12c \text{ (cost of wood line post)}}{23.03c \text{ (cost of steel line post)}} = \frac{\$1.84 \text{ (cost of steel corner post)}}{\times \text{ (cost of wood corner post)}}$$

We find $\times = 96$ cents, cost of wooden corner post, which appears to be a conservative estimate of the cost of a good wooden corner post. From a mathematical and perspective point of view, the manufacturer of the steel fence post appears to have made out a case that is worthy of continued and further close investigation. Time alone, under practical service conditions, can demonstrate if the figures are based upon substantial premises, and subject to corroboration. To be efficient and adequate, the steel posts must resist corrosion, must be sufficiently strong to withstand ordinary and accidental hard usage, must not heave from the ground in winter, must remain firm and not loosen up, permitting the fence to get out of proper alignment. The speedy extinction of steel posts lands and the failure on the part of all concerned to encourage the practice of reforestation, caused the users of wooden fence posts to seek some efficient substitute. The steel fence post has not yet proved its merit in practice and at this time concrete with suitable reinforcement seems to offer the only solution to the problem.

It is recognised as a primary proposition in the design of a concrete fence post that in order to secure a post of such weight that it can be readily handled, it must not be too heavy; hence, reinforcement is necessary to reduce the bulk of concrete. This reinforcement must bear a co-ordinate relation to the concrete and act in harmong with it. To produce this result it must be properly placed, and make a proper mechanical bond with it. It has been demonstrated that while concrete posts are not as strong as wooden ones, they are sufficiently strong to meet all practical conditions.

The committee has gotten into touch with the various manufacturers of concrete fence posts as well as with the various railroads that are experimenting with them, so far as has been possible, and will endeavor to present some data relating to them. Not more than a dozen railroads are using concrete posts in large quantities at this time, but a large number are pursuing the subject with a view to their extensive use.

In reviewing the methods employed by the various manufacturers and railroad companies who have given this subject careful investigation, we find that they accord very closely with practices recommended by the United States Department of Agriculture in Bulletin 403, and we, therefore, present certain extracts from that bulletin with some additional matters.

On account of the variations in the size of the sand grains and in the unfilled spaces between, the particles of sand, stone and gravel, the quantities of concrete made, according to certain proportions may vary. For the same reasons the quantity of water may or may not be sufficient to make the concrete wet enough. Water should always be measured by the bucket to have uniform results.

Different pockets of sand and of gravel and different crusher-run rock vary in size and consequently in the unfilled spaces or voids between the grains or pieces. If unscreened bank run gravel is decided upon, it should be used in the proportion of one part of cement to four parts of gravel. For crushed rock or screened gravel (which is much better than bank run gravel) the concrete should be used in the proportion of one part of cement, two parts sand and four parts of rock or gravel. Also one part cement to four parts chats makes good concrete. All measurements should be made with the material poured loosely into the measuring box and the box when full should be leveled smooth.

The amount of moisture in sand, gravel and stone varies so much with weather conditions that the quantity of water for a cubic foot of concrete cannot be fixed exactly. During the mixing of the cement with the sand and rock sufficient water should be used for the concrete to be wet enough when the mixing is complete to tremble under a blow from the shovel. This amount of water causes a rich mortar to flow to the outside of the post and insures a smooth finish.

In general, where crushed rock or screened gravel is used, the full amount of sand is spread out upon the board and

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upon it the necessary cement is evenly distributed. The whole is turned dry until the cement no longer shows in streaks, and the color of the batch is uniform. The mixture is then spread out flat, just as the sand was, and upon it the crushed rock or screened gravel is distributed evenly. Three-fourths of the water required is added and the mixing is continued. In dry, hot weather it is a good plan to throw water on the pile of crushed rock before mixing.

Concrete has a tendency to stick to either steel or wood. In order to yield a smooth finish to the post, it is customary to give the inside of the molds a coating of oil. Soft soap or crude oils used sparingly serve the purpose well. Too much oil will destroy the setting qualities of the cement and will give a face roughened with pockmarks. A small amount of oil, poured into a bucket of water and applied with a mop or stiff broom in scrubbing out the molds after they have been used five or ten times, or as often as necessary, will prevent the concrete from sticking.

After the molds, which, as a rule, lie flat, have been oiled or soaked, the concrete should be placed in them at once. If for any reason the concrete stands thirty minutes after mixing, it should be thrown away and a new batch mixed, for cement, if it has once partially set, makes weak, dangerous concrete, even though it is worked by turning or adding water. If wooden molds are used, they should be well soaked in water so that the concrete post will not cause them to swell and thus crack the post.

Reinforcing should be placed near the outside wall, where it is reasonable to expect that cracks will open. For reinforcement, metal slightly rusted is as good if not better than metal that is not rusted. In placing the reinforcing rods in position it is a wise precaution to bend them back at the ends. This takes only a little more time, but, if it is done, the reinforcement must be two in. longer to allow the metal to be turned back one in. at each end of the post. New barbed wire should not be purchased for reinforcement, for while it costs more than plain reinforcement, the bond between it and the concrete is no stronger than between smooth wire and concrete. The danger section, or the point where posts are liable to break, is at the surface of the ground. For fences for lots and other places where posts may be subject to rubbing and crowding, short extra reinforcing pieces two ft. long are sometimes placed in the post to lap this danger section.

It is a great mistake to believe that, when the molding is done, a concrete post is finished. The quality of the post must be determined by curing. The green post should be left in the mold until thoroughly hardened; usually for two or three days. During the first two days of the life of a post it must be kept wet and covered with canvas, burlap, carpet, or any clean material. Sand will serve after the concrete has become hard, but manure will stain green concrete and otherwise affect it. The sprinkling should be continued up to the eighth day. After the tenth day, if the space is needed, the post may, with care, be placed on end in the same manner that wooden fence rails were formerly piled. A drop of only 6 in. often breaks a green post. The jar in hauling to the field over rough, frozen roads or in a wagon bed with a very uneven bottom has seriously injured posts which were not well seasoned. Concrete posts gain rapidly in strength for the period of one year; they should, therefore, be made as long as possible before it is necessary to set them in the fence. No post should be used until it is at least 3 months old, and, to meet any contingency, a supply of well-seasoned posts should be kept on hand.

There are numerous methods of attaching wire fencing to concrete posts. Some makers place staples or wire loops in the green concrete; others make holes in the posts. The former method is not desirable, because the fastener cannot be located exactly where the wire of the fencing will come when the post is set in the ground; then, too, the fastener will eventually rust or break off and will thus injure the looks of the post. On the other hand, holes through the posts weaken them and therefore this method is, in general, unsatisfactory.

The simplest, easiest and cheapest way of fastening a wire fence to a concrete post is to encircle the post with a wire one size less than the corresponding wire in the fence proper, and to twist this wire around the strand of the fence. This is done in two ways. The fastening wire is placed around the post, twisted upon itself and then to the fence wire; or one end of the fastening wire is twisted around the fence wire, and the free end is then carried around the post and twisted on the other side to the same wire. Either plan is good, but care must be taken to draw the fastening wire tight, or else stock trying to get through the fence may raise or crush down the fencing with their heads. If any trouble is experienced, the post should be roughened at the fastening point with a cold chisel.

Expansion and contraction of the fence, due to heat and cold, are cared for by the tension curves of "kinks" in the woven wire fencing, and no fear may be felt in drawing the fastening wires as tight as necessary. Wooden nailing strips should never be embedded in the posts, for moisture will swell the wood and crack the concrete.

In the early stages of concrete post making it was the opinion of some that posts need not be tapered from base to top, but it has now become the almost unanimous judgment that taper is necessary for many good and essential reasons. It has been definitely demonstrated that it almost entirely if not absolutely prevents heaving in winter. A fence post acts as a cantilever and the post is therefore largest toward the ground line, where it is the most severely stressed. It also reduces the amount of concrete required, lessening the quantity toward the top of the post, where the full section, as at the base, is not required. The tapered post lends itself most naturally to the fastening of the fencing wire by means of the loop around the post, the taper preventing displacement of the loop.

Conclusions.

(1) Concrete posts are practical, economical and a suitable substitute for wood.

(2) Reinforcement should be placed as near to surface of post as possible; ½ in. from surface is best location.

(3) Post should taper from base to top.

(4) Post should not be less than 5½ in. at base and 4 in. at top.

(5) Concrete mixture should consist of one part cement to four of run of pit gravel; or one part cement, two parts sand and four parts crushed rock or screened gravel. Gravel or crushed rock not to be smaller than ¼ in. in size, nor larger than ½ in. Concrete should be of a quaking consistency.

(6) Molds should have a jogger or vibratory motion while the concrete is being introduced to compact it and smooth up the surface of post.

(7) Posts should not be made out of doors in the freezing weather. They should not be exposed to sun, and should be sprinkled with water the first eight or ten days after being made to aid curing.

(8) Molds should be carefully oiled or soaped to provide a smooth finish and to prevent concrete sticking to mold.

(9) Posts should be cured for not less than 90 days before being set or shipped.

(10) Posts should be carefully handled and be packed in straw, sawdust or other suitable material for shipment.

Recommendations.

(1) We recommend the adoption of conclusions 1 to 10 relative to concrete fence posts.

(2) We recommend that the foregoing conclusions be substituted for those in the 1911 manual, page 210, upon the subject of concrete fence posts.

We recommend to the board of direction that the committee be directed to endeavor to have a series of tests conducted to determine the comparative strengths of the different forms of concrete fence posts and method of reinforcing, with a view to ascertaining the most suitable form, these tests to be performed, if possible, at one or more of the university or government laboratories.

TRACK CONSTRUCTION AND FLANGEWAYS AT PAVED STREET CROSSINGS AND IN PAVED STREETS.

This subject has been under consideration for several years past, and the committee has studied the practice in European countries as well as our own.

In both this and foreign countries, asphalt, bitulithic, wood block, brick, granite and trap rock paving have been tried. It has been exceedingly difficult to keep the paving along the rails in good condition where asphalt, asphalt blocks or bitulithic was used. In most cases where tried, these materials were removed from between the tracks, and for a distance of 2 ft. outside of rails, and replaced with wood or stone blocks. This has not only resulted in economy, but has also reduced the long interruptions to traffic due to the frequent repairs. The substance of our investigations would seem to indicate that granite or trap rock specification blocks make the most suitable material for this purpose.

It seems from plans sent us to have been accepted, as a matter of fact, beyond the pale of argument, by most of the steam and street railway lines, that a concrete bed of thickness varying from 4 in. to 12 in. is the proper form of construction for the track substructure. The committee, however, believes that this is not conclusive and that it is still open to question, particularly in the case of steam roads with extremely heavy cars and heavy axle loads of motive power, whether a concrete base will not have a train of evils

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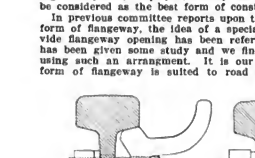
to follow in its course, even more serious than those to be met with in using a foundation of hard rock ballast, or other suitable material, with proper drainage provisions.

In a consideration of the various types of construction thus far tried, it is thought that the same design should be used at paved street crossings as through paved streets. The 141-lb., 9-in. girder rail appears to meet the general conditions of each case in the most satisfactory manner. It will not permit of widening gage on curves, however. Ordinary tee rails (on chairs of various designs if necessary to obtain depth for paving), have been used; a special rolled form of flangeway or an old rail laid on its side for flangeway opening is frequently employed, usually the latter, but this cannot be considered as the best form of construction.

In previous committee reports upon the subject of the best form of flangeway, the idea of a special rolled filler to provide flangeway opening has been referred to. This feature has been given some study and we find two or three roads using such an arrangment. It is our opinion that such a form of flangeway is suited to road crossing construction



Rolled Flangeway for Paved Streets.

where paving is not required, but is not well adapted to street crossings where rigid laws are in effect in regard to paving requirements, or through paved streets. The steel companies can roll these special forms, but they are very expensive because of the little tonnage that would be used. They are not mill stock, because a different section is needed for each weight of rail, and because of frequent changes in rail section.

The 9-in. girder rail can be very readily compromised to the ordinary tee rail with which the track is generally laid on each side of the crossing or at the end of the paved street. It is not the intention of the committee to state that there are not other styles of construction that will give, or do give, good results; nor is it of the opinion that a more permanent form will not be devised in the future, but it believes that for the amount of money expended that the design submitted already tried out under heavy service will be best adapted to meet the most general requirements from the standpoint of durability, high standard and economy of maintenance.

Conclusions.

(1) Specifications for best form of track construction and flangeways at paved street crossings and in paved streets:

Treated ties should be used, laid on a bed of crushed rock gravel or other suitable material, not less than 8 in. nor more than 12 in. in depth, placed in about 3-in. layers, each to be thoroughly rammed to compact it.

Vitrified tile drains not less than 6 in. in diameter, with open joints, leading to the nearest point from which efficient drainage may be obtained, or with sufficient outlets to reach sewers or drainage basins, should be laid on either side of and between tracks, parallel with the ballast line and outside of ties.

One hundred and forty-one-lb., nine-in. depth girder rail, or similar section, with suitable tie plates and screw spikes should be used. Track should be filled in with crushed rock, gravel or other suitable material, allowing for a 2-in. cushion of sand under finished pavement.

The ballast should be thoroughly rammed as it is installed for paving foundation to settle it. Two-in. of good sharp sand should be placed on top of the ballast.

Paving must conform with municipal requirements, granite or trap rock blocks preferred. Hot tar and gravel should be poured into the joints as a binder.

(2) The inclusion in the Manual of the plan for flangeway.

Recommendations.

We recommend the adoption of conclusions 1 and 2. Specifications and Plan of Best Form of Track Construction and Flangeways at Paved Street Crossings and in Paved Streets.

WAYS AND MEANS FOR SECURING A PROPER QUALITY OF FENCE WIRE TO RESIST CORROSION AND SECURE DURABILITY.

The committee has been continuing its investigations into this subject during the past year and has endeavored to obtain all available information as to the most recent practice, but it is compelled to state that the developments have been very few.

It is the opinion of one of the large manufacturers that the most practical solution of the problem of securing greater durability is by what is known as the "special galvanizing" process. The fence is made from wiped wire which will withstand four one-minute immersions in the standard copper sulphate solution for both the horizontals and stays. It is claimed that such a wire should compare favorably with unwiped wire, which will pass the same test. The committee thinks, however, that this is open to question, although we understand that large tonnages of this special galvanized wire is being supplied according to specifications of foreign railway companies.

We believe that the method of weaving the wire is one of supreme importance and that the brutal treatment that the wire receives during the course of weaving at some plants might be responsible for the quick deterioration of the wire. So far no satisfactory method has been devised of galvanizing the fence fabric after it has been woven, although many attempts have been made, but the exposure appears thus far to be practically prohibitive from a commercial standpoint.

It is open to doubt in our minds whether the asbestos process of wiping the wire is as productive of good results as that of the old form of charcoal wiping. The asbestos wipers cannot at all times be adjusted with care and accuracy, so that one strand may carry a fair coating, while another will be wiped so closely as to almost entirely denude the steel.

In taking the matter of fence fabrication up with an expert in wire making, he stated that there were two accepted methods of fabricating the wire fencing. The ordinary and most generally used is the custom of selecting a very soft wire as the cross wire, first winding it on a bobbin so that it can be handled properly in wrapping it about the line wire of the fence. This process is extremely hard on the galvanizing, and there is practically no wire that will stand the treatment without showing material injury to the coating. A modification of this practice is to feed the cross wire in short lengths, and where the ends of the sections pass one another at the crossing of the line wire of the fencing, they are seized by a twister and wound together about the lateral strand.

The other method is that of applying a straight single piece cross bar the full width of the fabric and attaching it to the line wires by a separate and distinct section of wire known as a tie. This process undoubtedly results in the least injury to the wire used in the fabric, although it is impossible to get away from the wrapping of the ends about the selvage wires when using the straight stiff stay.

There is another process of electric welding, but it is an open question whether this does not change the structure of the steel and destroy the coating at the point of contact.

The committee is not prepared at this time to offer any additional information on this subject, nor is it warranted in reaching any conclusions. It believes that it is incumbent upon the railroad companies, in the light of past experience and with the information that has been imparted from time to time by the Association, to pursue their own investigations, and that investigation of this subject by the Association should be discontinued for the present.

Recommendations.

(1) We recommend to the Board of Direction the discontinuance for the present of the instructions to investigate ways and means for securing a proper quality of fence wire to resist corrosion and secure durability.

(2) We recommend to the Board of Direction that they assign to the committee the investigation of the various kinds of signs for railroad purposes as applicable to both employe and the public.

C. H. Stein (C. R. R. of N. J.), chairman; G. E. Boyd (D. L. & W.), vice-chairman; R. B. Abbott (P. & R.), H. E. Bliffman (M. P.), E. T. Brown (B. & O.), J. T. Frame (C. G. W.), C. M. James (A. C. L.), L. C. Lawton (A. T. & S. F.), G. L. Moore (L. V.), J. B. Myers (B. & O.), F. M. Patterson (C. B. & Q.), C. H. Spilistone (Erie), W. F. Stronse (B. & O.), W. D. Williams (Cin. Nor.), committee.

Discussion on Signs, Fences and Crossings.

Richard L. Humphrey: The committee recommends that the reinforcement be about one-half inch from the surface, and also recommends, not the mixed gravel, which is excellent, but says "gravel or crushed rock." I think it will be

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found where the crushed stone is rather soft or is a stone with high absorptive qualities, that there may be trouble encountered by having that material in a fence post. The gravel or crushed rock used in the post should be a hard, dense material with slight absorptive qualities, or it will cause the destruction of the post.

Mr. Stein: I move the adoption of conclusions 1 to 10 under Fence posts and that the conclusions and recommendations be substituted for those in the 1911 Manual of Recommended Practice.

Mr. Humphrey: I suggest that we put in the fifth conclusion "gravel or crushed rock of low absorption."

The President: The committee will accept that.

S. A. Jordan (B. & O.): I ask that, in conclusion 9, the posts should be cured for not less than 90 days before being sent or shipped?

Mr. Stein: It is the opinion of manufacturers of concrete posts, and I say this with the support, I believe, of every manufacturer of concrete posts, that under all circumstances they should be cured for not less than 60 days. That means a seasoning process, and while it would appear that a small mass of concrete like a post would dry out or season and cure within a comparatively short period of time, it has been found by experience that is not the fact and that it really requires at least 60 days, and the statement is made that 90 days is preferable in every case before the concrete post reaches its full strength, and even after that it continues to grow in strength, and that is the experience with respect to other forms of concrete. We thought we would be on the safe side and specified 90 days. If the users desire to cure the concrete for only 60 days, that is a matter within their own control and they can substitute 60 days for the 90 days.

Mr. Humphrey: The committee might consider the question of steam curing, which is a matter of accelerating the interval between the making and use of the post. With the use of a proper system of steam curing the time can be reduced.

E. V. Smith (B. & O.): In conclusion 7 the committee say that the posts should not be exposed to sun. Why should that not read, "should not be exposed to sun or artificial heat"? Why not have that apply to artificial heat also, in extreme weather.

Mr. Stein: Some manufacturers of concrete posts cure their posts by steam—that would be the application of artificial heat. The committee thought it would not be well to make any change in that conclusion at this time. The object of not exposing the posts to the sun is to prevent the cracking or alligatoring of the posts. There is also a provision in conclusion 7 that the posts should be sprinkled. That is to allow for the complete absorption of the moisture and the compacting of the material and the seasoning of it.

Mr. Humphrey: I think conclusion 9 should have some explanatory note. That 90 days applies to natural curing. Where steam curing is used the time should be less. As this is to go into the Manual there should be some explanatory note.

The President: What would you suggest, Mr. Humphrey?

Mr. Humphrey: I would suggest a note be added reading, "90 days when cured naturally."

The President: The committee will accept that.

(The motion to adopt the recommendations of the committee, covering conclusions 1 to 10 and also the publication of the conclusions in the Manual, was adopted.)

Mr. Stein: The second subject referred to the committee was, "Track Construction and Flangeways at Paved Street Crossings and in Paved Streets." We secured all available data and it was our conclusion that the form of track construction and flangeway at paved street crossings and in paved streets should be as given here.

E. V. Smith: Why should we specify, in the first paragraph, a maximum depth of not "more than 12 in."? I think that should be omitted.

Mr. Stein: There may be some remote cases where more than 12 in. are necessary, but where you have fairly good supporting ground and you put in more than 12 in. you may have to resurface the track more frequently on account of the gradual settlement or compacting of the ballance. I realize that the investigations of the Ballast Committee have shown that the greater the depth of ballast the more evenly the load is distributed, but this is the result of the experience of those roads which have tried it, and we have felt that from 8 to 12 in. was a proper margin.

J. S. Campbell: I am surprised that even 8 in. of ballast will properly support a railroad track across a paved street, without a degree of settlement which will interfere with the traffic on the track. I ask if the committee has any information as to what extent the city will permit that form of construction. In El Paso they require a solid concrete foundation and on our own account, we have found it very desirable, at least, if not absolutely necessary, to have the track in perfect surface, so that they will not have to repair the crossing frequently, and for that reason we make a solid concrete foundation.

F. P. Patenall (B. & O.): I would suggest that the note specifying the "concrete packing" be left blank, and another note put there "as specified."

Mr. Stein: One of the members of the committee calls attention to the fact that one of the points we have been talking about is covered in the text of the paper. If members had read this paper they would have learned something about it in better form than I can express it.

Mr. Patenall: Under "Recommendations" we are asked to have this included in the Manual, and I suggest that if there are other parts of the report which refer to concrete packing that the matter should be cleared up.

Mr. Stein: The committee will withdraw the note "Concrete packing" and just say "form of packing."

Mr. Ferriday: It seems to me that it is unnecessary and contrary to what we know about ballast to specify that there shall not be more than 12 in. of ballast. The Pennsylvania Railroad made tests, and I think the committee on Ballast made some report, in which they showed that an increase of the ballast section, from perhaps 18 to 24 in., reduced the cost of maintenance. In explanation of why that is given as a maximum of 12 in. in the specifications before us it is said that some of the New York Central track settled where they had 12 in., but did not settle where they had 4 in. I think in the case of any fresh track put down we would have to wait some time until it settled and that might possibly take longer time with a deeper ballast than 12 in., but it does not seem to me that it is desirable to go on record and put in the Manual that 12 in. should be the maximum. I therefore make a motion to omit the words "not more than 12 in." in the second paragraph.

The President: The committee will accept that.

Mr. Jenkins: I suggest changing the plan to conform. There is a note, "8 to 12 in. for ballast." That should not be less than 8 in.

(Motion to adopt the specifications as read was carried.)

Mr. Stein: The third subject to be considered is "Continue the investigation of ways and means for securing a proper quality of fence wire to resist corrosion and secure durability." Unfortunately, the tests which were being conducted at Carnegie Institute, at Pittsburgh, were abandoned some time ago. We, therefore, recommend to the Board of Direction the discontinuance of this subject.

MASONRY.

The work assigned by the board of direction was as follows:

(1) Report on waterproofing of masonry and bridge floors, including methods, cost and results, with definite recommendations.

(2) Report on the effect on concrete structures of rusting of the reinforcing material.

(3) Report on the principles of design of plain and reinforced concrete retaining walls, abutments and trestles.

As the subject of waterproofing is a large one, in which materials and new methods are coming into use all the time, it has been found impossible to submit a satisfactory report at this time.

The sub-committee has done a great deal of work during the summer and fall on the principles of design of plain and reinforced concrete walls, abutments and trestles in the way of investigation and gathering together information as to their design. They also made some effort to get some money from the board of direction and individual subscriptions in order to make a test of a section of a large size retaining wall, but were unable to obtain the necessary money to make this test. It is hoped the board of direction will see their way clear to authorize this test in the coming year. Other than this, the committee has no report to make.

During 1912 the joint committee on concrete and reinforced concrete has revised its previous report, to which has been added some new matter and the whole brought up to date. The report will be available to the various societies represented, including the American Railway Engineering Association, in the near future.

During the year meetings of the joint committee on Standard Specifications for Cement were held in an effort to harmonize the differences between the American Society for Testing Materials and the Government Engineers, and acting upon a resolution, representatives from the American So-

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ciety of Civil Engineers, the United States Government, and the Society for Testing Materials were requested to confer relative to these differences. This conference had its initial meeting October 24, 1912, organized, and has been carrying on such investigation work as may lead to an agreement on Uniform Methods of Tests and Standard Specifications for Cement.

G. H. TINKER,
Chairman Committee on Masonry.

G. H. Tinker, chairman (N. Y. C. & St. L.), F. L. Thompson, vice-chairman (I. C.), Robert Armour (G. T.), G. J. Bell (A. T. & S. F.), C. W. Boynton (Univ. Port. Cem. Co.), T. L. Condron (Cons. Engr.), J. K. Conner (L. E. & W.), L. D. Crear (Erie), L. N. Edwards (G. T.), A. H. Griffith (B. & O.), G. W. Hegel (C. J.), L. J. Hotchkiss (Found. Co.), Richard L. Humphrey (Cons. Engr.), W. H. Peterson (C. R. I. & P.), Philip Petri (B. & O.), J. H. Prior (C. M. & St. P.), F. E. Schall (L. V.), G. H. Scribner, Jr. (Contr. Engr.), A. N. Talbot (Univ. of Ill.), Joh Tuthill (K. C. Term.), J. J. Yates (C. R. R. of N. J.), Committee.

APPENDIX A.

Disintegration of Concrete and Corrosion of Reinforcing Metal.

In cases where disintegration of concrete and corrosion of reinforcing metal are under investigation attention should be directed to the quality of the concrete, to the concrete materials, and to the workmanship before any conclusions can be drawn as to the effect upon good concrete of the deteriorating agencies present. In deciding upon preventive measures again due, attention to materials and workmanship will usually prove to be the most effective.

The failures of concrete structures most commonly reported are those due to faulty design, including details, use of improper materials, poor workmanship and neglect of proper precautions in removing forms and applying loads and otherwise overstressing new concrete structures.

While the subject of failures due to these causes is not considered to be included under the committee's assignment, they are sometimes wrongly supposed to be due to the disintegration of concrete. Failure to properly provide for abrinkage of concrete due to hardening in air, and for expansion and contraction due to temperature changes, is a common cause of cracks which may lead to failures.

The requirements for good materials have been described in numerous texts, specifications and reports, together with the methods of determining whether or not the materials meet the requirements. However, the proper precautions are not usually observed in choosing materials, especially aggregates. Although good concrete can be made with crushed stone screenings as fine aggregate, the results of laboratory tests on this material are likely to be misleading, and tests on specimens made to reproduce as nearly as possible field conditions of mixing, placing and hardening are especially desirable when screenings are used.

To obtain good work, competent and ample supervision is necessary, and no expedient can be resorted to that lessens the requirements for workmanship. In practically all cases where failures have been investigated, it has been found that the workmanship could have been improved with profit. Probably the most common cause of failures of concrete structures has been the premature removal of forms. It has been definitely established that low temperature retards the hardening of concrete, and in work done during cold weather, precautions should be taken accordingly.

Investigations concerning the effect of sea water on concrete immersed for periods up to fifty years or more; of the relative merits of standard Portland cement and Portland cement made with varying contents of SO_3, MgO, CaO, Fe_2O_3, Al_2O_3, SiO_2, etc., in resisting the disintegrating effects of sea water; of the effect of varying the proportions of cement in the mortar and concrete; of the addition of various finely ground materials to the cement after burning; of the relative durability of concrete cast in place as compared with concrete blocks allowed to harden before placing in the sea; and of the effect of various materials added to the concrete mixture to produce impermeability and consequent increased durability have been made in various European countries and in America.

Regarding the chemical composition of the cement, the following conclusions are presented: Cement containing up to 2½ per cent. of SO_3 resist the action of sea water fully as well as cement with lower SO_3 content. While all the hydraulic cements now in use are liable to decomposition in sea water, Portland cement is the one to be preferred in every respect. High iron Portland cement and puzzolan cement have failed to show superiority over standard Portland cement in resisting the disintegrating effect of sea water.

Regarding the effect of varying the proportions of cement in the mortar and concrete, in general the richer mixtures have been found to offer better resistance to the attack of sea water. Proportions recommended for mortars are those with one part cement to one part of sand up to one part cement up to two parts sand. The bad condition of mortars leaner than the above, after exposure in sea water, stands out prominently. In the use of reinforced concrete for maritime works, it is advisable to employ larger proportions of cement than are usual for similar works in fresh water.

Concerning the addition of finely ground material to the cement after burning, it has been found that the addition of ground puzzolan or furnace slag to Portland cement increases the resistance of the resulting mortar or concrete to the disintegrating effect of sea water. Allowing the concrete to harden under favorable conditions before exposure to the action of sea water greatly increases its resistance to attack by the sea water and is recommended wherever possible.

When concrete is deposited under sea water such precautions should be observed as will prevent the washing of the cement from the mixture. Forms should be so tight as to prevent the entrance of sea water after depositing the concrete in order that a smooth surface may be obtained sufficiently rich in cement to be impermeable after properly hardening, and with the forms removed.

Where the effect of sea water on concrete has been other than mechanical, it is believed that disintegration is caused by the substitution of MgO from the sea water in the place of the CaO of the cement, as well as to the decrease in the proportion of silica and the increase in SO_3.

The making of a dense, impermeable concrete by the use of a well graded aggregate, rich mixture, proper consistency, and good workmanship, and allowing the concrete to harden under favorable conditions before being exposed to the action of sea water, are generally conceded to be efficient means of satisfactorily insuring the preservation of concrete in maritime works.

Investigations concerning the effect of ground waters which contain acids or alkalies on concrete drain tile, sewers, tunnel linings, etc., and of the effect of sewage on concrete used in sewers and disposal works, have disclosed several instances of apparent disintegration. The following points have been demonstrated in regard to the resistance of concrete to these agencies. Drain tile which, due to the use of poor aggregates, improper methods of manufacture or the use of lean mixtures are porous, may be affected by the soil acids found in some localities or when required to carry strong alkali seepage common in many irrigated sections of the western United States. The aggregate should be composed of materials inert to the acids or alkalies present in the water. A chemical examination of the sand from country known to contain alkaline soils is to be recommended.

Water containing substances known to react with the elements of the cement should be kept from coming in contact with concrete until the latter has thoroughly hardened. Care should be taken to provide a smooth surface and sufficient slope to the extrados of the arch of tunnel linings and sewers when the ground water level lies below the tunnel grade to facilitate the flow of seepage water to the sides. It is believed that the back filling over the arch ring should consist of porous material, such as coarse, crushed stone, for the same reason. It is also believed that side drains should be

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provided where necessary and connected with an under drain, which should be provided in all cases. The alkalies which are most active in causing disintegration of concrete when allowed to penetrate into the interior of the mass are the sulphates of sodium, magnesium and calcium.

The measures to be used in making concrete which is to be exposed to the action of these deteriorating agencies in order to prevent disintegration are the same as recommended for sea water construction. Impermeability is the prime requisite and the results of experiments and practical tests indicate that plain concrete, carefully prepared, is just as resistant, if not more so, than concrete mixed with foreign materials or special preparations.

Disintegration of concrete in sewers and sewage disposal works, whether due to the use of poor materials, poor workmanship, or insufficiently rich mixtures, has been found to take place above the normal surface of the liquid contained. The following explanation is advanced for this action. Quantities of hydrogen sulfid are evolved from the sewage. This sulfid is produced in two ways: (a) By the bacterial decomposition of sulphur-containing-proteins and related compounds, and (b) the reduction of sulphates which are contained in unusual amounts in water supplies. Of the two, the second seems to be the more important. The hydrogen sulfid which escapes as gas from the sewage is partially dissolved in the moisture on the under side of the roof and concrete walls. Here it is oxidized to sulphuric acid partly by atmospheric oxidation and partly by bacterial action. The sulphuric acid acts upon the calcium compounds in the concrete forming calcium sulphate and breaking down the concrete.

Cinders with much sulphur are likely to give unsatisfactory results in concrete, especially if there is much coke or porous material present. Such cinders may be improved if allowed to weather, with occasional washing, until the ferrous iron and sulphur have been oxidized and bleached out. Porous cinder concrete in roofing slabs exposed to the action of locomotive gases does not form an efficient protection for reinforcing metal, which has been found to corrode and cause the disintegration of the slab. Freshly made concrete surfaces in contact with smoke gases at temperatures below 45 deg. F. have failed to harden properly, and experiments indicate that under such conditions the cement is acted upon by some of the gases. It has therefore been recommended that when heating is done by means of open fires, higher temperatures should be maintained.

Laboratory experiments furnish most of the information which exists concerning the effect of electrical currents on concrete and reinforcing metal. The discrepancy between the conditions in these experiments and field conditions seems to be greater than is the case in other laboratory tests on structural materials, and the information obtained up to this time is difficult of application to field conditions. It has not been shown that the strength of plain concrete is affected by the passage of an electric current through it. It is generally accepted that if an electric current passes into concrete through steel which is tightly embedded in it, the steel is corroded and the expansion of the metal, due to corrosion, disrupts the concrete. Corrosion takes place at the anode. The cathode is not affected by oxidation.

Results of experience up to date have shown no reason for changing the conclusions presented in the progress report of the joint committee on concrete and reinforced concrete, 1908: "Tests and experience have proved that steel embedded in good concrete will not corrode, no matter whether located above or below fresh or sea water level. If the concrete is porous, so as to be readily permeable to water, the metal may be corroded in the presence of moisture."

Discussion on Masonry.

Mr. Thomson: The chairman of the committee, Mr. Tinkar, has been ill practically all of the year, and the work of the committee has been handicapped on this account, and the report of the committee, while it is in good shape, is not in proper condition for publication, and the committee expects to get the matter in better shape by the next meeting. The committee also desires to state that the Appendix A has been printed without the consent of the committee and requests that it be withdrawn.

(The report of the committee was received as a report of progress.)

FOUND.

A Masonic emblem was found yesterday at the Coliseum. It is now in the office of the secretary of the N. R. A. A. at the Coliseum, where it can be claimed by the owner.

THE ANNUAL DINNER.

The fourteenth annual dinner of the American Railway Engineering Association was given last night in the gold room of the Congress hotel. President Charles S. Churchill was toastmaster and the speakers and their subjects were: B. A. Worthington, president of the Chicago & Alton, "Looking Into the Future"; Rev. R. W. Dickie of Montreal, Canada, "Internationalism"; George A. Post, president of the Railway Business Association, "The Effect of Music Upon Railways," and P. G. Rennick of Peoria, Ill., "The Twentieth Century Pattern." Mr. Rennick is connected with the Colombia Bureau of Lyceum Talent.

The dinner was one of the most successful in the history of the association. The attendance was unusually large. The addresses of Messrs. Worthington and Post both dealt with the public relations of the railways. Mr. Worthington's was a serious discussion of the situation, and Mr. Post's was a mixture of the facetious with the serious, and both were listened to with great attention and enthusiastically received. Rev. Mr. Dickie talked on "Internationalism." He discussed the relations between Canada and the United States, indicating his belief that annexation would never come, but that the two countries could draw closer and closer together with advantages to both.

The addresses of Messrs. Worthington, Dickie and Post were as follows:

Mr. Worthington on "Looking into the Future."

It is needless for me to say that I fully appreciate the high honor of addressing your association at its annual banquet; but it is with some degree of hesitancy that I assume to appear before a body of professional men whose fundamental requirement in order to qualify in their calling is a most liberal technical education; gentlemen who, I might say, represent the culture and aristocracy of the railroad profession; and I might also say with sincere candor, gentlemen who, as we all know, represent the only branch of railroad service where the rules and practices are based upon exact science. Of course, I will admit that sometimes a premise may be wrong, but the conclusions of our engineers are always based upon sound formulæ—or empirical deduction.

With the permission of the chairman of your entertainment committee, I have selected for the subject of my address "Looking into the Future," and with your kind indulgence, I shall take as my text an article appearing in the March issue of the World's Work, entitled "What I Am Trying to Do," by the Honorable Franklin K. Lane, late chairman of the Interstate Commerce Commission, recently appointed Secretary of the Interior, in which article Mr. Lane says: "We are seven, but we work as one."

In the concluding paragraph he states:

"The men who actually operate our railroads, who keep the intricate wheels of this mighty machine constantly in motion and always at our service, receive too little public acknowledgment for the work they perform. They are among the most skilled, capable and honest of our business and professional men. They have an enthusiasm in their work and a loyalty to their companies that is a constant satisfaction, and their delinquencies too often may be traced to policies which purely as railroad men they would not countenance. With these men we can work, and through them we may hope for the realization of a national system of railroads that will be fair as to rates, profitable as to income, and adequate as to service."

As many of you know, I am a native son of the Golden West, having been born and raised in California, and I have had the honor of a personal acquaintance with Mr. Lane for over a quarter of a century. While he was once an earnest advocate of government ownership of the railroads, in the fifth paragraph of the article above mentioned he says:

"Our primary object must be to prove the efficacy of the machinery devised by law for bringing the policy of our railroads into conformity with the policy of the law—to make private capital serve public need and yet conserve the interest of the railroad owner. The public wish the best of service at the lowest possible rates; the owners desire the highest return consonant with the fulfillment of their undertaken duties. This may be an *impasse*—a situation so impossible of resolution that we are destined to join *those nations who are experimenting with governmental ownership*

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and operation. That stage of despair, or of resolution—dependent upon the viewpoint—we, however, have not yet reached. In fact, I believe we are far from it, for we have only entered upon the experiment of regulation by commission, and students of this subject from other lands have said that their countries would not have sought refuge in governmental ownership had they in time discovered the American method of dealing with the railroad problem."

Briefly reviewing the situation, taking a back sight into the past to establish a foresight into the future, let us summarize the known quantities with which we have to deal, formulate our equations and theories and project them into the future as best we may.

Commerce is defined as the taking of things from the place where they are plentiful to the place where they are needed, and it has been well said that the degree of civilization enjoyed by a nation may be measured by the character of its transportation facilities. This is true not only of modern nations, but of all nations of which we have authentic history. The most advanced nation has always excelled in commerce and wealth, and the economic measures adopted for the furtherance of these interests have evolved civilization, which in itself is merely improvement in arts and learning.

B. A. WORTHINGTON.

COMMERCE THE FORERUNNER OF CIVILIZATION.

Among the first great nations of which we have positive knowledge were the Phoenicians, who for nearly two thousand years enjoyed the commercial supremacy of the world. Out of the necessities of their expanding commerce they invented numerous devices, many of which, withstanding the severe test of time, have been preserved for us, indispensable to modern civilization. They invented, for instance, an alphabet of their own representing sounds, because the picture writing of their neighboring nations could not be adapted to the needs of commerce, and their alphabet has been handed down to us of today as the greatest of all inventions. Before the Phoenician alphabet came into general use, history is dark, save for the flickering sparks of civilization commemorated by representations of visible objects, the meaning of which so often is conjectural.

Each subsequent nation which has risen to prominence has contributed its share to civilization, but only because of the exigencies of commerce and that indispensable factor of commerce—transportation. Wherever we may look, we shall find that commerce is the hand that shapes the destiny of nations, the agency which most needs and best utilizes the factors of civilization—art and learning.

China, with her yet primitive transportation facilities and necessarily restricted commerce, is an up-to-date object lesson in this respect. The accredited inventors of printing and explosives, those wonderful agencies of progress and defense, the principles of which have been known to the Chinese for over one thousand years, yet in all that long period not one Chinaman out of a total of three hundred million living population had even the faintest conception of the value of their inventions—because the spurs of commerce were unknown to them, and their simple defenses were best accomplished by stone walls of commercial isolation. It is of peculiar interest that the Chinese worship a fabled dragon, an object of terror, while our own forefathers worshipped their sacred bull, the carrier of their burdens, an emblem of progress.

Within the past few years, however, China has been awakened by the shrieking locomotive and the rumbling wheels of commerce, the introduction of modern business facilities marking the end of long centuries of domestic slavery, appalling pauperism, and thieving hordes which for generations have thrived upon their depredations—the theory of the ancient Chinese government being exploded with the gun powder of their own making.

NEW THEORIES OF GOVERNMENT.

In America, independence, having its birth in the memorable events which led up to the activities of the Boston tea party—an open rebellion against the restraints which England sought to impose upon American commerce—has advanced new theories of government. In the application

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of these theories many new conditions have been encountered and many perplexities have arisen to tax the wisdom and the courage of our most learned and capable men. In the past we have surmounted all these obstacles because we have always been able to find amongst us somewhere a man of the hour with conviction and courage of conviction equal to the occasion—and we have passed through some crucial tests. The nation has been torn asunder, the North and the South have faced each other with dripping swords, but we have never before encountered a situation so insidious of growth and so seriously affecting the bone and sinew of our strength, yet so full of promise, as the railroad situation of today. We are again wintering Valley Forge, internal discontent and conflicting elements adding to the difficulties of a seemingly impossible task. Let us hope that Mr. Lane that has the men who will unsnarl the rail final results may be realized which will be fair and adequate for all.

REBATING INEVITABLE UNDER KEENLY COMPETITIVE CONDITIONS.

During the past half century the railroads have been developing the resources of this country in a perfectly natural way. That certain abuses have crept into their methods is not at all surprising, for wherever active competition exists we shall always find abuses of a more or less serious nature; and when the apparently ideal methods of small business are applied by a sensitive, active, alert organization to a business having a net capitalization of $14,000,000,-00, relatively unimportant shortcomings are wonderfully magnified and assume unusual significance. Yet during this period of rebating, discrimination and kindred evils, the wealth of the United States increased from $7,000,000,000 in 1850 to $107,000,000,000 in 1904, $65,000,000,000, or over half of this enormous wealth, having been developed during the last twenty-four years of this period, while the pernicious practices so often referred to were under full sway. From this point of view the matter of rebating, etc., dwindles to relative insignificance, but it must be borne in mind that this enormous wealth is *substantial* wealth, invested in the gilt-edged securities of farm lands, city property, industrials and public utilities, all enhancing in value dependent entirely upon future development of railroads.

But I hold no brief for the rebating system or discriminatory practices. No right-thinking railroad man in the country is but thankful that these days of extortion are passed forever. Nor do I claim that railroad business methods or conditions are yet perfected, but in justice to the sensitive economic features involved, I do plead for the most careful premeditation, and that should doubt arise in regard to any features, it should be carefully hedged in with all the proper safeguards of public welfare, bearing in mind the all-important lessons of history, and that economic and natural laws are always superior to statutory enactments and must not be disregarded.

MEETING CONDITIONS OF THE FUTURE.

The railroad situation at the present time is as delicate as it is complex. In the decade 1890 to 1900 the volume of freight traffic handled by the railroads was doubled, and in the following decade it was doubled again—and still the end is not in sight. Our farms are yielding but a small proportion of the crops that are possible by intensive cultivation. The density of our population is less than 31 persons to the square mile, while the population of the United Kingdom is 373 and that of Belgium 660 to the square mile; and if we project a line into the future from the point which we have established in the past, we cannot misapprehend the further development which lies directly before us.

But whether the volume of business increases or whether it decreases are speculative conditions, alike threatening to the railroad situation. An increase in the volume of business is an absolute necessity under present conditions of reduced net earnings per unit of service, but to provide facilities to handle an increased volume of business is a financial impossibility unless new capital can be induced to enter the field of railroad investment.

In referring to this phase of the question, Howard Elliott, president of the Northern Pacific railway, a man who has fought his own way from the humbiest ranks to this position of eminence, stated in a recent address that there should be $1,700,000,000 new capital put into the transportation business of the United States each year for the next five years—a total of $8,500,000,000, or 60 per cent of the present calculated value of all our railroad property. This practically amounts to reconstruction throughout in order to handle the business now offered and make suitable provision for what we *know* is ahead of us. This means the replacement of obsolete equipment, the elimination of grades, double-tracking, safety appliances, also innumerable non-productive improvements, such as the elimination of grade crossings, modern station facilities, etc., demanded by the public—in short, better and safer transportation throughout.

The expenditure of $1,700,000,000 new capital each year for the next five years would not mean that the wealth of this country would be decreased to this extent. Far from that! It would mean that this amount of money would be spent for labor and materials right here at home, and every cent of it would revert to the people in the most satisfactory forms acceptable to them. What a glorious vision of prosperity this presents!

GOVERNMENT REGULATION NOT OBJECTIONABLE.

The original founders of our railroad systems, visionary though they may have been and doubtless were, could never have thought possible the wonderful development and the amazing prosperity of the past twenty years. History presents no precedent, simply because the possibilities of transportation have never before been so thoroughly exploited. Neither could this development have been possible, save for the acute business instincts of private ownership of railroads and the widest freedom of individual initiative, neither of which could survive government ownership or government operation.

Government control is not at all objectionable to the railroads; in fact, it is a necessity; and its restraining influences are entirely wholesome. In many respects the government has already produced results which the railroads could never hope to accomplish—such, for instance, as the elimination of rebating and other discriminatory practices inherent to active competition, all of which practically have been abolished from the sphere of railroad operation.

But in paring down the claws of this alleged monster, the railroads—a regular Chinese dragon to those less familiar with their economic and strategic uses, still the same sacred carrier of burdens and the emblems of progress that our ancestors worshipped forty centuries ago—they have cut into the quick, and until the wound heals by natural processes, progress will be crippled. In taking away from the railroads the prerogative of rate making and by prescribing numerous restrictive conditions of operation which tend to reduce revenue and increase expenses, they have taken away from the railroads their natural weapons of offense and defense, and have left the railroads apparently at the mercy of an unsympathetic public, which, laboring under grave misapprehension, sees nothing but misdeeds, naturally, artificially and oftentimes maliciously, magnified.

RAILROAD FACILITIES INADEQUATE TO MEET REQUIREMENTS.

Owing to this unfortunate state of affairs, the railroads of the United States have now reached a stage where they are unable to provide adequate terminal facilities where they are most urgently required, and where congestions recur annually, lasting for months at a time, regardless of the extreme shortage of equipment. The steadily decreasing margin of safety in railroad operation, amounting to substantially 28 per cent in the past ten years, has made it compulsory upon the part of the railroads to cut maintenance charges, and accordingly the physical property—roadway and rolling stock—has in many instances been sacrificed to produce even these results, and visions of the future here become obscured by the run-down conditions of today.

RAILROAD VS. INDUSTRIAL RETURN ON INVESTMENT.

Turning from this unpleasant aspect, in the shadow of gloom which has fallen upon the railroad situation the investing public looks askance at the red figures in income account, like fire destroying property in its path, and reluctantly to industrials, where obscurity seems to promise security, where the net return upon capital invested is more than twice as great as in railroads, where the public is not a factor to consult, and where the government is in no wise sponsor for results.

That the railroads should expect to share in the general prosperity of their own making is not surprising—excepting that the railroads yield by 6.7 upon investments, while manufactured yield over 12 per cent, and the value of farm land and city property is appreciating in value so rapidly that comprehensive data is not available. In view of the risks assumed in railroad undertakings, the developments which they have always encouraged, and the excellent service which they are rendering to the public even under the present restrictive conditions, it would appear that more encouraging results should be possible along this line of investment, as a more substantial guaranty of public safety, financially and commercially. The suggestion that railroad investments should earn as much as investments in manufactures, for instance, is not out of order, because the right to earn a reasonable profit upon legitimate investment is

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all that is asked for, and the improvement of railroad property and the enlargement of its facilities is a matter of urgent public necessity. This menace of financial impossibilities thrust upon the railroads should be speedily removed as a restraint to commerce, which, in fact, it is, and in no small measure.

DIVIDENDS ON RAILROAD STOCKS.

In the matter of dividends on railroad stocks, the impression seems to prevail that a dividend of, say, 7 or 8 per cent stock would be equivalent to throwing that much wealth into the sea, when, in fact, it merely means to many people—to the widows, orphans, business men, financial and endowed public institutions, where it would be reinvested immediately in one highly desirable form or another. Certainly this would be no crime. It would be an economic condition much to be preferred to the closed shop, with roundhouses standing full of crippled locomotives, yards filled with bad-order cars, roadway neglected because of financial stringency, and wasteful congestions prevailing—all resulting in unsatisfactory service to patrons, unsatisfactory results for the railroad managers, and a passing of dividends for the shareholders. The question is who *does* get any benefit from this condition of affairs?

RAILROAD SECURITIES HELD ABROAD.

Another phase of this question, one which should cause the deepest reflection, is the fact that from 20 to 25 per cent of our railroad securities are held abroad. With private ownership of railroads as it exists today, it is useless for the government to attempt to evade the responsibility for the depreciating values of these securities, which are being returned to us under protest. Our "commerce laws" originally were enacted for the protection of bona fide investors in railroad securities and to prevent practices that could not be measured by a strict code of business justice, and if we would avert national dishonor, more undesirable than anything else that could happen, we should be ever conscious of this delicate situation and leave nothing whatever undone to satisfy in the fullest measure our pledges of faith held abroad.

The armies and navies of the world have always existed primarily for the protection of commerce. Relentless wars have been waged, and shall yet be waged, because of conditions that affect national wealth and national welfare, and nothing affects national wealth and national welfare as do conditions of commerce.

No individual has ever knowingly sought to destroy a source of his income, but he will fight, and fight to the death, to preserve it. Nations are merely groups of individuals, none the less sensitive and responsive to these same conditions, and as long as foreign capital invested in American railroads yields just and satisfactory returns to the strong financial institutions of Europe, their dogs of war will ever remain chained up at home. American railroad securities will be our national security—not the misnomer they seem to be today—and the International Peace Conferences at The Hague will be merely a waste of effort so far as America is concerned.

This condition of affairs is peculiar to America alone. It is one of our most valuable assets, the most formidable defense that any nation has ever erected. Let us not tear it down with our own hands.

Moreover, we are now approaching the time when it will be possible to materially strengthen this position, when securities must be floated for the $8,500,000,000 which should, and must, be put in our transportation system within the next five years, and we cannot afford to ignore the opportunity that is now knocking at our door.

JUDGE KNAPP AND COMMISSIONERS LANE AND PROUTY AGREE.

In this tangled web of conflicting conditions now lying before us, I believe that the ends have finally been gotten together. I believe the crisis is passed—even perhaps as our eminent authority, Mr. Lane, expresses the thought respecting government ownership: "That stage of despair, or resolution, we have not yet reached."

In his fine, deliberate, cautious manner, possibly the question of government ownership and operation of our railroads may have slipped by unobserved and into oblivion with the changing of his own attitude upon this point. Let us hope that it has.

In the beginning of his article to which I have referred, Mr. Lane states in regard to the personnel of the Commission: "It would be hard to find seven men who differ more in temperament, in training, or in type of mind, than the present commissioners. We differ as one leaf from another in our political sympathies. Often we do not arrive at our conclusions from the same strategic angle."

Yet it is worthy of note that Mr. Lane's predecessor, the Honorable Charles A. Prouty, ex-chairman of the Interstate Commerce Commission, a man who, like Mr. Lane, has made a life-long study of the perplexing railroad problems, has stated:

"If the time does come when railroad property is sacrified to public clamor, when the public demands its confiscation and the regulating tribunal concedes that demand, no property will be of much value. The day will have come when the obligation of private rights is no longer observed."

The Honorable Martin A. Knapp, likewise an ex-chairman of the Interstate Commerce Commission, a tireless student of the railroad situation, and one of the most profound thinkers in this country, expresses his thoughts as follows:

"I should regret to see the government take up the business of owning and operating our railroad lines."

It would, therefore, seem that these three able analysts, individually and by different methods, have arrived at about the same conclusion—that the square of commercial condition cannot be made to fit satisfactorily into a theoretically perfect circle of public ownership.

When this question is finally and definitely disposed of, we may proceed more understandingly and along more scientific lines to pursue the cause of higher civilization.

RAILROAD MEN MAY BE RELIED UPON TO AID COMMISSION.

The clarifying of the railroad situation may yet take years to accomplish, for it must necessarily be a slow and careful procedure; and in the efforts of the commission to untangle this web of misunderstanding and misdirected efforts no right-thinking railroad man, no public-spirited man, whatever may be his calling, should withhold his fullest support and his warmest encouragement. The railroads, having nothing to fear, I am sure will, as a unit, welcome and enthusiastically embrace the opportunity to work in full harmony with the commission and for the common cause of the people, including not only patrons of railroads and railroad employes, but also the holders of railroad securities and the public generally—a happy solution which in itself will contain all that is desirable in government ownership or operation, and yet will maintain the constitutional rights of private property and preserve the spirit of industrial freedom and the incentive for individual initiative which in the past twenty-four years have wrought a stupendous wealth, regardless of all our shortcomings.

LOOKING INTO THE FUTURE.

That we are nearing a satisfactory solution of this entire railroad problem, I am convinced. The fact is clearly demonstrated by the three opinions herein cited, those of the three ex-chairmen of the Interstate Commerce Commission, each arrived at entirely independently of the others and very probably from entirely different strategic angles.

Furthermore, in stating his views before the Traffic Club of Pittsburgh less than a year ago, the Honorable Charles A. Prouty used the following language:

"No form of investment today is, and no form of investment in the future will be, more certain than railroad stocks and bonds. . . . The worst that could happen to the stockholder of any of our great railway systems would be a temporary suspension of dividends, and even this could occur only under very unusual circumstances."

In view of the unanimity of opinion and the unqualified assurances emanating from an undisputed authority, the Interstate Commerce Commission, I feel confident that the reins of the situation are in careful hands and that we will yet be able to demonstrate the truth of the assertion that "the degree of civilization enjoyed by a nation is measured by the character of its transportation facilities."

Therefore, with a full knowledge of what we are trying to do, conscious of the tremendous task before us, and the wonderful possibilities that are contingent upon the *correct* solution of the present-day railroad problem, now is not the time to lament what has happened, or what may have happened in the past, but with unwavering faith in the wisdom and integrity of our able Interstate Commerce Commissioners, generals of the greatest army that ever entered a field of conquest, let us set about to build our bridges into the future—bridges big enough to span any depression which we might encounter in the commercial conditions before us, bridges strong enough to withstand the test of prosperity which we have already sighted over the established points of the past.

"Internationalism," by Rev. Robert W. Dickie.

I suppose I shall have to note this as the great day of my life so far—my first visit to Chicago. I don't see how I have managed to live an long on this continent without seeing Chicago and tasting its life. I assure you, gentlemen, now

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it has come to pass, I like it very much. I suppose I have to thank your ex-president, Mr. McNab, for this pleasant experience. For the past few years Mr. McNab has been bringing you over a series of distinguished Canadians. I think you have had the Hon. G. W. Ross, ex-premier of Ontario; the Hon. Geo. P. Graham, ex-minister of railways, and the Hon. F. D. Monk, ex-minister of public works. They are a fair sample of our distinguished men. Now that you may know that we are not all distinguished over the line, he has brought me along. I may also add I am acting in the capacity of chaplain to your worthy ex-president.

I have been announced to speak on the question of "Internationalism," a question which I know you are all interested in in a practical way, for it is your work to build and maintain these great steel highways that bind people together. The highways of a nation make possible a common interest and a community of life in the nation. They conquer sectionalism and provincialism as nothing else can, and in the

REV. R. W. DICKIE.

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great world movement of bringing the nations of the world closer together, of integrating them into a greater solidarity of life, the railways must play an important part. Without them the thing is impossible.

In both Canada and the United States we have abundant evidence of the work that railways can do in bringing people together with a real community of life. In the United States at the beginning of your history you were a string of states along the Atlantic coast. The great highway between them was the sea. That natural highway made possible that intermingling of life and interest which is the ground of national life. The history of the development of the American nation has been the history of her railways. From a fringe of small communities along the seaboard, you have grown to almost a hundred million, stretching from the Atlantic to the Pacific, and from Mexico on the south to the Land of Promise in the north. Of course, your railways opened up the country to settlers. But I rather suspect they would have come anyway though not in such great numbers. Even if you had not had railways, the people of Europe would have been drawn by your rich lands and free institutions as by a great world magnet. Instead of the railroad train, the prairie schooner would have carried the people westward. But how would you have preserved the Union? The interests of communities, such as California and New England, Texas and Dakota, without communication, would inevitably have grown apart. I am afraid the "just consent of the governed" would not have been maintained. But the railways bound these diverse states together in a community of life and interest. They are the arteries through which the life of a nation pulsates back and forth. Such free inter-communication of different communities standardizes life and inter-relates interests. If your union is one and indissoluble, it is because your railways have made a real solidarity of life possible. Even the work of Lincoln could not have insured its perpetuity had it not been for the great builders of highways who have laid 200,000 miles of railway since his day.

What the railways have done for the nation on the south of the line they have done for the nation on the north. We date our national history in Canada from the year 1867, which we call the year of confederation. Before that date there had been in Canada a number of Canadian provinces or colonies, as they were then called, each independent of the other, under the British Crown. They got together and after a while they got the British North America Act, the charter of our nation, establishing a Federal government for the Dominion. But we could not make a nation out of these isolated communities by act of Parliament and royal charter. The great desideratum was to get the life and interests of these communities mixed up. So one of the first acts of the government of the Dominion was to build the Intercolonial Railroad, connecting Ontario and Quebec with the Maritime Provinces. The road has never paid its way in cash earnings, but it has done better—it has mixed the life of Ontario and Quebec with the life of the Maritime Provinces. And then we got wise to the fact that these provinces were but a fraction of our great country. We commenced to realize that we had an immensely extensive and immensely rich country on our western plains, to which

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people were already going, and also the Province of British Columbia on the Pacific Coast. Then the Canadian Pacific Railway was projected—one of the greatest railway enterprises ever undertaken, if you remember the difficulties of the task and the fact that then Canada only had 5,000,000 people. Unlike the Intercolonial, it has paid fairly good dividends on its investment, but it, too, has made a united Canada possible. It bound together this string of communities stretching across a continent and made them one people. Two other transcontinental railways will soon be helping in the great work of mixing Canadian life and standardizing it throughout the length and breadth of the land. In Canada we honor the Fathers of Confederation who drew up the plan and constitution of the nation, but we honor even more whit less our railway engineers, these builders of highways which have become the arteries of our national life.

Now, sir, we are two nations on this continent—two independent nations. We in Canada are bound to Britain by many ties—ties of blood, of affection, of interest which we all want to see maintained. This solidarity of interest and affection we designate by that high-sounding word, "imperialism"—a sort of a charmed word with us these days. But Canada has long since passed the stage of a colony or a vassal state. We have absolute control of our own domestic affairs. Another charmed word with us is "national autonomy," and we have the reality. Britain has not meddled in our domestic affairs since confederation. We have power to make commercial treaties with other nations—we were going to make one with you two years ago—and it was not Britain that upset our apple cart, but it was from another source that the trick of jolting the cart was done, that furthered a vassal state. A few years ago we made a commercial treaty with France. Well, with our internal affairs in our own hands and our foreign relations, there we have the substance of our independence, if not the name. But what of the power of the crown? We own the same thing as Britain does, just as Scotland did before the union. But our King has not a tithe of the power of your President. He is a constitutional monarch, who acts only on the advice of ministers directly responsible to the people. To all intents and purposes the nation to the north is as independent as the republic to the south.

Like you, too, we in Canada are very proud of our country and its institutions. We have unbounded confidence in the future of our country. We are but a small people yet—only about eight millions—but we believe that our great national wealth will bring the peoples. That whose field of ours in itself—900 miles by 300 miles in area—will bring people, to say nothing of the wealth of forest and mine, and we have a larger potential water power than any other country—about twice that of the United States—and the people are coming to us just as fast as we want them—as fast as we can assimilate them into our national life. As to the proportion to our population, they are coming faster than they ever came to your shores. Last year we received over 350,000, 75 per cent English-speaking and 25 per cent foreign-speaking. You sent us about the same number as Great Britain. Send us more. These men from the Middle West states are the equal of the best that we get in our west. There are some timid souls among us who fear what they call the American invasion of our west. I am not at all afraid of it; I will trust the average American citizen to be loyal to the institutions of the land where he is making money, and I am glad to say most of them are making money out on our plains.

And we are proud of our institutions.

Your republic has been spoken of as the great experiment in democracy. You are past the experimental stage long since and have abundantly justified the experiment. But we, too, are making an experiment in democracy, and we hope to profit by your great experiment. We are laying the foundations of our national life under the most favorable circumstances. We are comparatively unhampered by old-world traditions and we learn both from America and Europe. In a word, our experiment in the Canadian democracy is to secure the freedom of a republic and the stability of a monarchy, and up to date I think we are succeeding.

Gentlemen, we are two peoples on this continent. Our histories, our traditions, our institutions are not the same. The destinies of the two are not yet manifest. But one thing is certain, annexation is out of the question. The thing is as dead as a door nail. So far as I know, there are only two annexationists on this continent. One in the United States and one in the Province of Quebec. But, honestly, I think he of the United States was only joking, and I believe the Province of Quebec man has recently gone back on the idea. Goldwin Smith, Erastus Wiman and Elgin Myers and Edward Farrar have no successors and we might as well give the thing a decent burial.

Two nations, but two nations at peace as brethren laboring for the advancement of civilization on this continent and in the world, is our ideal. The signs are favorable. Next to the loyalty of our two countries to their respective traditions and institutions, I admire their international relations. Three thousand miles without a gun or fort or soldier—that is splendid. Next year we are taking steps to celebrate one hundred years of peace. That, too, is splendid. Let us make it a thousand. I contrast this with the unfortunate conditions obtaining among the European nations. How different the boundary between France and Germany and that between us. Guns, fortresses, marching men everywhere there; here on either side of our unguarded boundaries citizens plying the useful arts of peace, each so busy with his own tasks that he has no time or inclination to prepare for the brutal trial by combat.

Our happy international relations on this continent are due, I think, chiefly to two things. First, we have no old scores to wipe out. We have a hundred years of peace behind us. That is our international tradition. And then both belong to the industrial type of civilization. Herbert Spencer used to say that we move naturally in the course of social evolution from a military to an industrial type of society. We in these two countries have, I think, gone further than the European countries. At any rate, the military temper is not so strong among us. I know that you have the school of General Homer Lea in the states that are always expecting some terrible power to drop down upon your country with destruction, and hysterically calling for more military and naval preparation. We have some of the same kind in Canada—military jingoes, we call them over there. But the men do not represent the genius either Canada or the United States. Our genius here is to attend to business and play fair and believe that industry and fair play don't need big guns and dreadnoughts to back them up.

If we are to extend this hundred years of peace to a thousand, the railways and the railway builders must play an important part. I have said the railways are the arteries of the great social fabrics. They have bound the states together, and they have bound the Canadian provinces together. Let them continue the work of social integration and bind together these two nations with bands of steel. Let them run north and south, as well as east and west. These highways of the people have mixed up life from east to west; let them mix it up from north to south. There is no reason why the life of Ontario should not mix as freely with the life of Michigan as with the life of Quebec, or why the life of Manitoba should not mix as freely with the life of Dakota as with Saskatchewan. We are of one stock; we breathe the same American air; our institutions are largely the same. There is no reason why we should stand apart. The mixing of life and interest among our people makes for peace. These 130,000 men you sent over to our plains last year are a pledge of good feeling, and so are the 75,000 Canadians living in Chicago. Every business connection between the two binds us closer together.

It is a great blessing to have a boundary line without a gun. The only thing we have on these boundaries is tariff walls. They are great hindrances to the mixing of life and interest. But, happily, we seem to have seen the worst of them. I do not bear any voices crying to build them higher, and I hear from both sides of the border a cry rising in volume and strength each year to have them lowered. Of course, an economic life which has been nourished behind tariff walls cannot at once throw them down without serious complications. But the encouraging thing is that both peoples are looking that way. Then again your interest is our interest, and our interest is your interest. Even tariff walls can not keep the prosperity of one country from being felt by the other or hold back the hard times of one country from stalking forth into the other. You want things that we have, and we want things that you have. Why should not the exchange of them be without let or hindrance?

You are road builders, and roads are for the freest and easiest possible communication. If you are to build roads north and south and transcontinental lines as you have these states with a real solidarity of life, more important for your purposes than tunneling the St. Clair river or spanning the Niagara, is the lowering, and eventually the destruction, of these tariff walls which are separating into two parts an economic life which naturally is one and indivisible. I have no desire to go beyond the hundred mark, yet I hope to see the day when not only shall there be no warships on our lakes, but no tariff walls on our boundaries, when the life of these two peoples shall move freely back and forth over the great highways which you and your successors shall construct.

Gentlemen, we are two separate nations, but we are sprung of the same stock. Your interests are our interests, and our interests are your interests. Carry on your noble work of

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making railways and highways, breaking down the spirit of provincialism and sectionalism, integrating these two nations into a greater solidarity of life and interest, until we become among the nations of the earth an example of international common sense and good will.

Mr. Post on "The Effect of Music Upon the Railways."

Does anyone doubt that there has been "music in the air" surrounding our railroads for the past several years? If our railway officials have not for a long time been pupils in the music which portrays public emotion, it would be difficult to understand what they have been doing. But there is not any doubt about it, and they have been apt pupils, too. They know the difference between a solo and a chorus. They have heard them. And the way they have been waltzed around by legislative "Willies" until they were out of breath and dizzy, has been a caution.

Our railways have become practiced listeners to the orchestration of popular desire. Before the regulatory conservatory of music was opened it might be truly said that apparently railway men did not know one note from another. But they do now. Their ears have become skilled to discern whether the theme is dignified or important or trivial. They have become honest and earnest listeners. They can now quickly perceive the skill of the performer in building up an orchestra so convey to the public the idea of a wrathful composer. They appreciate how effectively the feelings of the public may be played upon when the composer of the theme has recognized the force of the law of "distribution of repetition." The master musician knows that the subject matter of a movement must be repeated again and again in order that it may be firmly fixed in the mind. That is why so many composers of anti-railway movements constantly play up the "wrongs" they want made right, paying no attention to the magnificent line of "rights" that are observed by the railways and which the public really enjoy. In a movement dedicated to woe there is no room for the rapturous note of joy.

The music of railway regulation may be said to be both classic and romantic. The classic has come from the soul of the public in deep tones, registering the flat of the people that wrongs in morals and economics must be righted. The romantic has not been so lofty in impulse, but querulous as to details. The romantic is aimed at the intensity of passion rather than the depths of emotion.

There has been in the composition of regulatory music a strong tracing of the fine Italian hand. If we can depend upon musical writers who tell us that "Italian composers were given to resorting to the easy processes of tickling the ear without regard to the fitting of the melody to the text." There certainly has been a great deal of "ear tickling" done in the scheme of regulation.

It must be admitted in fairness that a very large proportion of the regulatory music to which our railways have listened has adhered closely to the fundamental requisites of proper musical form, as it has contained propositions of themes suitable for development. Chief among these has been the idea of the establishment of railway commissions. As a matter of fact, the railways have become accustomed to this movement by its frequent repetition that they have entirely overcome their original aversion for it and have come to enjoy many of its harmonic advantages. It is true that they still cannot be said to be enraptured of the drum beats and loud trumpets, which suggest war, and to which they are forced to march, not as volunteers, but as conscripts. But they are marching right along and they keep step with remarkable precision, considering that they were so recently members of the awkward squad. Besides, the histories of the world's wars tell us that many a conscript became a valuable soldier and won encomiums as a patriot.

We all of us know when at the theater a tune is played and words are sung by a masterful singer, we unconsciously begin to hum the tune and then to softly whistle it, and finally when we have packed the words into our memory, we burst forth and sing it ourselves. Well, that is just what has happened to our railway managers. They are now humming the tune of railway regulation. There are some of the notes that bother them because they are so fearfully high in register as to strain their throats; some that are so syncopated that they cause them to stumble, while some of the bass notes are so low that in their efforts to reach them they make a noise like a grouch. There are staccato measures so abrupt, detached and disconnected as to cause them bewilderment in keeping to the tune. Regulatory composition ought to be made more simple for universal rendition, and it is hoped that the theme will be simplified by wise composers who will see that the interpolated bars and movements that really impair the harmony and are not truly germaine to the general theme, are useless and confusing and ought to be cut out.

One of the most important requisites of musical form has been utterly neglected by the composers of regulatory music, and that is the interpolation of needed points of repose. There is too much of the clarion blast of the reveille; the waves of tumultuous fervor lash too high and continuously and the delirium of power is too rampant. There is too little of the sweetened accents of peace as delineated by the flute; not enough of the nerve quieting legato during which the railroads can take their bearings, find out where they are, and what they can do about it, and whether they understand the motif of the composer.

People cannot stand it to be worked up to the pitch of frenzy all the time. The loud pedal was not intended for constant use. There is nothing so exhaustive and wearisome as the continuous exhibition of sheer power.

I was deeply impressed a few nights since by an incident that occurred in a theater in New York. The bill of the play had provided a series of performances varied in scope. Thrilling feats by acrobats caused the audience to be breathless in amazement at the terrible risks of life and limb taken by the performers and elicited salvos of applause as in safety they concluded their perilous undertakings. Prima donnas electrified their hearers by touching high notes that seemed beyond the reach of human throat. Giants with a muscular development super-human gave startling exhibition of what strength can endure and accomplish. Magicians mystified by their legerdemain and won the resounding plaudits. Comedians convulsed us with their drollery. But it was not until a couple who were billed as man and wife, who must live together day after day, gave a skit in which connubial felicity was the keynote, that the audience rose to its highest point of enthusiasm. The voices of the couple were not remarkable, but they sang of love. Their actions were those of intense mutual admiration and their asseverations were that they could not live without each other. They embraced with an ardor that was infectious, and as they billed and cooed and hugged and kissed with sympathetic unction and sincerity, with the air of those who were thoroughly enjoying themselves and meant every word they were singing, the audience seemingly forgot that they were simply doing a theatrical turn and simply went wild over them. Compared with their appeal to the heart side of the people there assembled all the tricks, skill, daring, fun and art of those who had preceded them was as nothing. All the world loves a lover. The world is at its best when manifesting appreciation, consideration and tenderness. The sweetest, most inspiring, most ennobling music of all the ages is the harmony of the heart.

Within the proper limitations of an after-dinner speech I cannot do more than warble a few notes of all the emotions that well up from my heart to my lips as I am stirred by the contemplation of the effects of harmony when it shall resound throughout the corridors of human endeavor.

I have touched lightly, and I fear not impressively, upon the effect that the music of regulation has had upon our railways. With all its false notes, strident bars, crashing of brass and impulses of unrestrained fervor, the railways are better for it, and they have learned to make responses thereto—hesitatingly at first—but increasing in strength and in appreciation of its underlying motive.

The point I wish to make by my incursion into the field of musical metaphor is that, having realized how it has been impressed by the concert of the public voice making clear to them the emotions of those who have composed the statutory measures, conceived the movements that have carried conviction of the necessity for governmental supervision of railway operation, the railway managers have shown a disposition to bestir themselves to compose the "music of the rails." Many of our railway executives are appearing in public and upon social occasions to tell the story of the railroads. This is what must be done, and done continuously and effectively. Those who have sung of what they want have had too much of a monopoly of the stage center. It is up to the railroad men to sing to them of what they have. The railway managers have been too long the audience and it behooves them to become performers themselves. Those who do not exercise their vocal chords by framing language are seldom understood. True, there is a lot of talk that nobody can understand, and that perhaps does not mean much, if anything, but the fact remains that it is the fellow who talks who gets an audience. Some who bear bim think they understand and act accordingly. There must be borne home to the consciousness of the public the story of the wonderful things that railroads are doing for them. Place in juxtaposition the blessings that railroads confer upon our land and what the public wants them to do in addition, and the blessings are as a mountain of joy overshadowing a molehill of discontent.

Once get the people of the United States to cease brooding

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over their few real ills and many imaginary ones and hold up to them (they cannot be exaggerated) their manifold advantages vouchsafed by their marvelously equipped and managed transportation facilities; show them by your daily walk, conversation and achievements that their real ills are the subject of your serious thought for their proper remedy, and their frowns will be changed to smiles; their imprecations will be changed to words of praise.

So I say to you, my friends of the railways, SING! Sing to the public of mountains tunneled to reduce grades and distances. Sing to them of the waters spanned by steel and of embankments upheld by granite eternal. Sing of the luxury of modern travel and of the sleepless vigils kept for the safety of those who must absent themselves from their home firesides. Sing of the annihilation of distance by the celerity of train movement. Sing of the spacious and majestic terminals in our great cities, with every heed for their creature comfort and convenience. Sing of the doubling and quadrupling of tracks for the handling of our nation's traffic.

EDWIN F. WENDT, President-Elect.

Sing of the higher wages and lower rates of American railroads when compared with other countries. Sing to the populace of your comprehension of their needs, and when from the choir of the people you hear the prayer, "Oh, Promise Me!" in answering song tell them that the vow is made and will be kept.

Thus shall we as a people move steadily up the mountainside which leads to the great Plain of Amity, where athwart the vaulted heaven above shall be displayed in letters of living light the memorable words of Grant, "Let us have peace."

Then as the multitude of those who must be served by the railways approach the hosts of those who serve them, who are moving with radiant faces to meet them, the air will be vibrant with a song from the people:

> "Our railroads are our joy and pride;
> No more their conduct we deride.
> We're boastful of their usefulness,
> And they our rights do not transgress."

And with a zest, bespeaking a glee that maketh the heart glad, shall come the response from those who carry:

> "See, our patrons, an army great,
> Our service they appreciate!
> Our dealings square, from wrath we're clear,
> And they are now our friends sincere."

Having come within close touch, when hands may be clasped in cordial grip, in splendid unison, making the welkin ring with the melody of friendship, all will join in singing:

> "Together we, in harmony,
> Will weave our country's destiny,
> In field and mart, in mine and mill,
> And, on the rails, there'll be good will."

NEW OFFICERS OF THE A. R. E. A.

The result of the election of officers of the American Railway Engineering Association for the ensuing year was announced by President Churchill just before the close of the afternoon session yesterday. The new officers are:

President—E. F. Wendt, assistant engineer, Pittsburgh & Lake Erie, Pittsburgh, Pa.

First Vice-President—W. B. Storey, Jr., vice-president, Santa Fe System, Chicago, Ill.

Second Vice-President—Robt. Trimble, chief engineer maintenance of way, Northwest System, Pennsylvania Lines, Pittsburgh, Pa.

Treasurer—Geo. H. Bremner, engineer Illinois District, Chicago, Burlington & Quincy, Chicago, Ill.

Secretary—E. H. Fritch.

Directors for Three Years—

A. K. Shurtleff, office engineer, Chicago, Rock Island & Pacific, Chicago, Ill.

C. A. Morse, chief engineer, Santa Fe System, Topeka, Kans.

John G. Sullivan, chief engineer, Western Lines, Canadian Pacific, Winnipeg, Man.

Members of the Nominating Committee—

H. R. Safford, chief engineer, Grand Trunk System, Montreal, Que.

A. O. Cunningham, chief engineer, Wabash, St. Louis, Mo.

R. L. Huntley, chief engineer, Union Pacific, Omaha, Neb.

R. N. Begien, assistant general superintendent, Baltimore & Ohio, Baltimore, Md.

A. F. Robinson, bridge engineer, Santa Fe System, Chicago, Ill.

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Palley, A. R., Instructor Surveying, Univ. of Mich., Ann Arbor, Mich.
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Batcheller, F. D., Asst. to Gen. Supt., B. & O. S. W. R. R., Cincinnati.
Bates, Onward, Con. Eng., Chicago.
Beahan, Willard, Assistant Engineer, L. S. & M. S. Ry., Cleveland.
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Chandler, Charles, Bridge Engineer, C. G. W. R. R., Chicago, Ill.
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Condron, T. L., Consulting Engineer, Monadnock Block, Chicago.
Coon, C. J., Eng., Grand Cent. Ter., N. Y. C. & H. R. R., New York.
Cowper, J. W., Vice-Prest., Lack. Br. Co., New York.
Cronican, W. P., Asst. Eng., Illinois Central R. R., Chicago, Ill.
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Darling, F. S., Eng. M. W., B. & M. R. R., Boston, Mass.
Davis, C. S., Con. Eng., Toledo, Ohio.
Delo, C. G., Eng. M. W., C. G. W. R. R., Chicago, Ill.
Denney, C. E., Signal Eng., L. S. & M. S. Ry., Cleveland, O.
Edmondson, G. N., Div. Eng., N. Y. C. & H. R. R., Rochester, N. Y.
Ferriday, Robert, E. M. W., Big Four Ry., Indianapolis, Ind.
Flora, G., Roadmaster, C. R. I. & P. Ry., Estherville, Iowa.
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Garrett, R. H., Asst. Eng., Seaboard Air Line, Portsmouth, Va.
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Morey, Richard, R. R. Contr., St. Louis, Mo.
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Brooke, Richard, Asst. Div. Eng., B. & O., Pittsburgh, Pa.
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Teal, J. E., Asst. Eng., Operating Dept., B. & O., Baltimore, Md.
Burke, Frank, Trav. Agt., D., M. & N., Proctor, Minn.
White, F. H., D., M. & N., Duluth, Minn.
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Lynch, H. C., Univ. of Wisconsin, Madison, Wis.
Keaney, Charles F., Asst. Chief Eng., W. C. F. & N., Waterloo, Iowa.
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Irving, T. T., Div. Eng., Grand Trunk, Chicago, Ill.
Lacy, L. D., Asst. Eng., Rock Island Lines, Chicago, Ill.
Simons, P. T., Asst. Eng., Mo. Pac., St. Louis, Mo.
Congdon, C. O., Gen. Roadmaster, Mo. Pac., Coffeyville, Kan.

SUPERVISORS AT THE CONVENTION.

The Bessemer & Lake Erie is well represented at the convention and the exhibition. All five of this company's track supervisors and both of its supervisors of structures are spending two days each in the sessions of the convention and at the Coliseum.

The three supervisors of the St. Louis division of the Vandalia are visiting the convention and the exhibition to-day.

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APPLICATION OF B. & O. DYNAMOMETER TESTS TO TONNAGE RATING.*

BY R. N. BEGIEN,
Assistant General Superintendent, Baltimore & Ohio.

Many miles have been run with dynamometer cars, but few real results have been obtained which give reliable data concerning train resistance. The number of formulæ in use only serves to inspire a serious doubt as to the accuracy of any of them. It is true that some dynamometer charts have not been properly studied, but there are many unknown factors which make the interpretation of the charts difficult. Facilities for making these tests properly are rarely had. It is an expensive matter to make the tests and an equally expensive one to analyze the charts. The results obtained seldom agree with the preconceived notions of those who use them, causing modifications and amplifications of a more or less "practical" nature. The verdict is, generally, that the only way to make a rating is to try different loadings until the correct one is found, and then use it.

This method would be all right if the loading adopted as the result of such trials was a proper one for all conditions of cars and condition of track and weather. There is also a difference of opinion as to what constitutes a correct rating. It is a mistake to suppose that proper ratings depend entirely on the power of the locomotive and the grade; yet the ideal condition is realized when such facilities for handling trains are supplied that those two factors control the rating. The tests described below have demonstrated that with the wide variation of working conditions on a railroad, there is no such thing as an absolute value to train resistance. It is, however, possible to establish a practical base which is on the safe side and will give good working results. Since the object of tonnage rating is to establish a standard by which performance may be measured, it is better to predetermine that standard than to allow each one to make its own. The inevitable result of the establishment of standards is good, since uniformity of performance approximating a proper standard always yields a higher average than a mixture of high and low grade performance. In other words, good results may be obtained by doing well all the time.

DYNAMOMETER TESTS.

During the months of October, November and December, 1910, and January, 1911, dynamometer tests were made on the Baltimore & Ohio, with trains made up as naturally resulted from traffic conditions. The tests extended over all the main lines and more important branches of the road, thus embracing a wide variety of conditions. The profiles of many of the divisions were specially run for these tests. The dynamometer used was of the direct pull oil cylinder type, with piston rod connected to the drawbar of the car. The recording apparatus of the car was described in the *Railway Age* of April 13, 1906, page 655.

Graphical charts were made by the recording apparatus showing continuous records of the following items of information: (a) Location of the test car upon the road; (b) time elapsed since beginning of test (½-min. intervals); (c) mile posts; (d) speed in miles per hour; (e) drawbar pull of locomotive; (f) injector in use or shut-off; (g) coal fired (number of scoops); (h) boiler pressure; (i) train line (air) pressure. Notations of temperature and weather conditions were made as often as change occurred. Data of train consist, weight and length were entered on the charts. On the engine, "log books" were kept preserving tabulated records of: Position of reversing lever, position of throttle lever, use of injector, boiler pressure, scoops of coal fired, water consumed, and other data relating to the tests.

CALCULATING RESULTS.

The purpose of the calculation was to determine the total frictional train resistance at intervals of one-half minute throughout each test run. To do this, it was necessary to calculate the resistances due to grade, curvature and acceleration at each half-minute interval, and to subtract the sum of these resistances at each such point from the total drawbar pull developed by the engine at that point. The remainder, being the total frictional train resistance, was divided by the weight of the train in tons, thus obtaining the frictional train resistance in pounds per ton. This method gives the momentary values of "train resistance" at the points considered.

The speed of the paper travel used on the recording machine throughout the tests was such as to make the graphical charts on a scale of three inches to the mile. A distinctive mark on the time record line shown on the charts was made to indicate the expiration of each half-minute interval. The points so indicated will hereinafter be spoken of as "half-minute points." It was necessary to determine for each half-minute point the speed of the train, the difference in feet of elevation between the rear of the tender and the rear of the caboose, and the degree of curvature of the section of track on which the train was located at that instant.

To determine the speed at each half-minute point, the average speed during the half-minute interval preceding was added to the average speed during the half-minute interval succeeding and the sum having been divided by two, the result was considered as the speed at the point under consideration.

The average speed during each half-minute interval was determined as follows: Through each half-minute point a vertical line was drawn, cutting the drawbar pull record line, the distance record line and the location record line. Having selected on the chart some well-established point such as a signal tower, it was given the mileage designation corresponding to its mileage on the track profile. The distance from this point to each half-minute interval was scaled and the resulting mileage figure assigned. This mileage was then reduced to terms of hundred foot stations, corresponding to the stations on the track profile by multiplying by 52.8. The difference between the mileage figures at two adjacent half-minute points multiplied by 120 was then the average speed for the interval between these points. This speed was checked by scaling between the half-minute points with a 40 parts to the inch scale, reading one "mile per hour" for each 1/40 inch.

The calculations were tabulated in columns headed, "Time"; "Miles from Starting"; "Hundred Foot Stations"; "Grade Factor" (i. e., difference in feet of elevation between rear of tender and rear of caboose); "Speed"; "Speed Difference" (i. e., increase in speed during the half-minute interval); "Speed Force" (i. e., pounds of available drawbar pull consumed in acceleration); "Grade Force" (i. e., pounds of available drawbar pull consumed in overcoming the resistance due to grade and curvature), and "Speed Force plus Grade Force" (i. e., the sum of the two items next preceding and the total amount to be subtracted from total drawbar pull, leaving as remainder total "Train Resistance"). The "Speed Difference" was deduced from the "Speeds" by subtraction, and shows the average acceleration in miles per hour for half-minute intervals. The "Speed Force" was obtained by use of the formula giv n by G. R. Henderson, in his "Locomotive Operation:"

(1) $Pt = C\frac{V_2^2 - V_1^2}{S}$, where Pt = energy in lbs. per ton, C = constant, V_1 = and V_2 = velocities considered in miles

*Abstract of Appendix B to the Report of the Committee on Economics of Railway Location.

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per hour. S = distance in feet. For a constant time interval of 30 seconds.

$$(2)\quad S = \frac{5280}{120}\cdot\frac{V_2 + V_1}{2} = 22\ (V_2 + V_1) = \text{feet per half minute.}$$

Substituting (2) in (1).

$$Pt = \frac{C\ (V_2^2 - V_1^2)}{22\ (V_2 + V_1)} = \frac{C}{22}\ (V_2 - V_1).$$

The revolving wheels tend to increase the effective inertia in a horizontal direction in a loaded car by three per cent., and in an empty car by eight per cent.

Applying these percentages to 66.76 (given by Henderson):

$C = 1.03 \times 66.76 = 68.76$ for loaded cars.
$C = 1.03 \times 66.76 = 68.65$ for loaded cars.

Then $Pt = \frac{68.65}{22}\ (V_2 - V_1) = 3.12\ (V_2 - V_1)$ for loaded cars.

$= \frac{72.1}{22}\ (V_2 - V_1) = 3.28\ (V_2 - V_1)$ for empty cars.

$= 3.20\ (V_2 - V_1)$ for partly loaded.

The total force of acceleration for a train, for an interval of 30 seconds, is:

$P = KT\ (V_2 - V_1)$,

when P = total force of acceleration (+ when speed is increasing, and — when decreasing).

K = constant varying from 3.12 to 3.28 as above.

T = actual tonnage of train behind tender.

$V_2 - V_1$ = change of velocity in miles per hour.

$V_2 - V_1$ was taken to the nearest tenth mile and tables prepared for each train consist to show P for any change of velocity appearing in the speed difference column.

The "Grade Factor" was scaled from the profile and shows the difference in elevation in feet between the rear of the tender and the rear of the caboose at the half-minute point, the length of the train having been computed from the train consist, and laid down to scale on the track profile, according to the position of the head end of train, shown in the "Station" column. A (+) "Grade Factor" indicates an ascending grade, and a (—) "Grade Factor" indicates a descending grade in the direction in which the train is moving.

Curvature was allowed for in the "Grade Factor" by adding a (+) quantity to the difference in elevation between the ends of the train, at the rate of .04 ft. for each degree of central angle occupied by the train for curves of over 1,000 ft. in length, and shorter curves when the tangent track between them was so small that the train may be taken to be entirely on curve. For curves less than 1,000 ft. in length, the compensation was taken at .03 ft. per degree of central angle.

The force consumed in overcoming the resistance due to grade and curvature is:

$$F' = \frac{G \times 20}{L}, \text{ where F = force in lbs. per ton (+ when}$$

grade is ascending, and — when descending). G = "Grade Factor" in feet, L = length of train behind tender expressed in "Stations" (units of 100 feet).

$$F' = T\ \frac{G \times 20}{L} = \text{Total "Grade Force" for train of (T) tons (L) 100-ft. stations in length.}$$

T — is a constant for each train consist and F was tabulated for different values of G to tenths of a foot.

"Speed Force + Grade Force" at each half-minute point was subtracted from the drawbar pull shown on the chart at that point, leaving as remainder the total train resistance, which divided by the total tonnage of the train gave the momentary resistance in pounds per ton at that point.

Record books were used to preserve a tabulated record of the half-minute readings for each run, classifying the readings by speed ranges (1-5, 5-10, 10-15, 15-20, 20-30, 30-40 and 40-50 miles per hour), temperature ranges (20 to 35 deg. and 35 deg. up) and ranges of car weight (below 20, 20 to 30, 30 to 40, 40 to 50, 50 to 60, 60 to 70, and over 70 tons). A chart was made for each run, plotting "resistance" and "time" vertically against "distance from start" horizontally. The legend showed "average car weight," "temperature ranges" and "speed ranges" and for each point plotted a note was made of the number of half-minute readings averaged to give the value plotted. Each value plotted was the average of ten or less half-minute readings. From the "ran charts" were selected all stops of sufficient length to cause an increase of 2 lbs. per ton in resistance, the increase in resistance caused by a stop being determined by averaging all half-minute readings for 15 minutes before the stop and subtracting from the average of all half-minute readings for 15 minutes after the stop. These selected stops were plotted on the charts as "zero distance." Resistance was plotted vertically against "distance from stop" horizontally. For each R value plotted, the number of half-minute readings averaged to secure the value was indicated.

The "final charts" were obtained by classifying the "stop charts" by "average car weight" and "temperature range" groups. The points on charts which could be so classified into one group were replotted into a series of charts varying from each other only in the "speed range" covered by each. A curve was then drawn on each chart so classified and replotted, which indicated the "resistance" value for that particular "average car weight," "temperature range" and "speed range."

"Final charts" from fourteen test runs have been worked up according to the preceding outline. These test runs have been grouped into three sets as follows:

Group No. 1.
(Temperature Range, 20 to 35 deg.) (Average Car Weight, 30 to 40 tons.)

	Temperatnre.	Average Car Weight.	Total Tons.
Run No. 1	32-35 deg.	46 tons	1,693
Run No. 2	32-35 deg.	35.3 tons	954
Run No. 3	29-35 deg.	30.1 tons	1,084
Run No. 4	22-35 deg.	39.0 tons	1,246
Run No. 5	23-35 deg.	33.5 tons	1,071
Run No. 6	31-35 deg.	37.1 tons	1,235
Run No. 7	27-35 deg.	38.6 tons	1,159

Group No. 2.
(Average Car Weight, 10 to 30 tons.) (Temperature Range, 20 to 35 deg.)

	Temperature.	Average Car Weight.	Total Tons.
Run No. 8	26-35 deg.	18.6 tons	874
Run No. 9	27-35 deg.	24.7 tons	839

Group No. 3.
(Average Car Weight, 30 to 50 tons.) (Temperature Range, 20 to 35 deg.)

	Temperature.	Average Car Weight.	Total Tons.
Run No. 10	50-60 deg.	27.6 tons	382
Run No. 11	36-40 deg.	50.7 tons	1,370
Run No. 12	35-38 deg.	35.6 tons	1,244
Run No. 13	48-56 deg.	35.2 tons	914
Run No. 14	35-47 deg.	34.6 tons	1,108

It will be observed that in each of the three groups the range of average car weight, and in Group No. 3 the temperature range, is greater than contemplated in the outline. This modification of the outline was adopted in order to get as many points as possible in each set, from which to draw curves, it having found that if the original outline were strictly adhered to there would not be enough points in each group to indicate any definite results. Even under the modified plan the results are meager, Groups Nos. 2 and 3 not having enough points to give satisfactory indications. Group No. 1 is fairly satisfactory.

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Study of the final charts shows that the plotting points fall at widely varying distances above and below the curve of average value, and, while the curve may readily be drawn, there is no close aggregation of points immediately along the curve. Although other investigators have exhibited charts, resulting from studies of similar tests, which do show the points all practically falling on the curves, the conclusion reached in the present instance is that under service conditions the different items entering into train resistance are continually varying through such wide ranges that the total resistance, even under conditions considered constant, cannot be determined to be any very constant quantity. Nor can it be concluded that a curve may be drawn which will represent more than an average of widely varying values.

In the Manual of Recommended Practice of the American Railway Engineering Association is given the adopted formula for train resistance on a level grade: $R = 2.2\,T + 122\,C$. The tests made do not show any results which would change that formula. It is probably as practical as necessary, and will give results which are close enough for service conditions. Absolute accuracy is not essential, since the train resistance must be equated with the engine tractive power, and the latter must have a large factor of safety to make up for the varying capacity of the crew, the differences in fuel and the condition of the machine.

DEVELOPMENT OF FORMULÆ FOR OTHER TEMPERATURES.

Using the charts in Groups Nos. 1 and 2, a formula for resistance in pounds per ton has been derived for "B" rating at temperatures from 20 to 35 deg. Averaging all readings shown at more than 10 miles from start, on charts in Group No. 2, in which the average car weight is 21 tons, gives $R = 9.5$ lbs. per ton. Averaging all readings shown at more than 10 miles from start, on charts in Group No. 1, in which the average car weight is 37 tons, gives $R = 6.7$ lbs. per ton.

In the resistance formula $R = K\,(T) + K'\,(C)$, in which $T =$ tons per car, $C =$ number of cars, and K and K' are constants solve for the value of K, as follows:

21-ton car: 21×9.5 lbs. $= 199.5 = K\,(21) + K'\,(1)$ (1)

37-ton car: 37×6.7 lbs. $= 247.9 = K\,(37) + K'\,(1)$ (2)

Substituting (1) from (2), $48.4 = K\ 16$

$K = 3.0$

Substituting K in (1) and solving for K',

$199.5 = 3.0 \times 21 + K'$

$K' = 136.5$.

Substituting these values of K and K' in the resistance formula, $R = 3.0\,T + 136.5\,C$.

Investigations made from data not as good as the preceding have enabled the completion of formulæ for other temperatures. It is arbitrarily assumed that the ratings are called A, B, C and D, as follows: A rating for temperatures over 35 deg. F., B rating for temperatures between 20 and 35 deg. F., C rating for temperatures between 0 and 20 deg. F. and D rating below 0 deg. F. Without going into detail, the formulæ deduced are:

A rating: $R = 2.2\,T + 122\,C$.

B rating: $R = 3.0\,T + 137\,C$.

C rating: $R = 4.0\,T + 153\,C$.

D rating: $R = 5.4\,T + 171\,C$.

Ratings made on the basis of these formulæ have stood the test of practice. They should be used as a basis to work on and should be tempered by the judgment of the operating officer in charge on the ground.

In practice, the drop from A to B is usually made by giving trains A rating minus 50 tons or minus 100 tons, and gradually following the temperature rather than by changing suddenly. It should be understood that decreased ratings are used for other conditions of weather than those caused by temperature, high wind being a frequent cause of reduction. When the frost comes in the fall, its effect begins to show up in increased transportation expense. The slow freights catch it first. For a while an effort is made to hold up the ratings, but the frost gets into the journals and the time of the run drags out until the items "Crews relieved" and "Exceeded 16 hours" cause a cut in the ratings. Fast freights which make almost continuous runs without stops are not much affected by cold weather unless it is very severe. High winds, however, are very hard on both fast freights and passenger trains. The combination of high winds and cold weather should be amply compensated by reduced ratings, as not only is the train resistance increased, but the loss of power on the engine affects its hauling capacity.

It is difficult to always "size up" the conditions a train is going to meet throughout its run so as to give it the proper tonnage. The following items should be considered: Trains leaving terminal in the afternoon will have the lower night temperatures to meet. Trains starting at night under severe cold may often pick up tonnage after the sun is up. Trains starting a run in the low altitudes will find colder weather in the mountains. Trains starting in the mountains may often take on tonnage in the low lands. Trains having many stops and starts will be affected by cold more than trains running continuously. Trains starting up-grade leaving terminal may haul larger ratings if helped leaving terminal for at least 20 minutes until the journals become warmed. Position of passing sidings plays an important part in rating trains in winter. If sidings are in such positions that a train starts out of siding on a down-grade or on a grade substantially less than the ruling grade, larger ratings may be handled than is the case where sidings are located on ruling grades. If trains can get out of terminals promptly and put in the time on the road instead of standing in yards, better rating may be handled than when a large part of the allowable time is consumed in doing nothing.

The temperature has the following effects on expense and on the revenue train load: Increased overtime, increased yard expense, increased enginehouse expense, increased fuel for locomotives and for heating, increased damage to equipment on road, increased snow and ice account, increased other expense, and decreased train load. As the revenue train load decreases, all of the expenses which vary with the train load increase. Since from 25 to 30 per cent of all transportation expense varies directly with the train load (depending on the proportion of the road expense to all expense), it is evident that the effect of temperature is heavy.

Of all the tonnage hauled on a railroad whose train load is above 300 revenue tons, only the slow freight maintains a train load constantly above the average. Manifest trains rarely carry more than 50 cars, and do not average that much. The car load is light—five tons is fair—and 250 revenue tons is a high revenue train load. Local freights make very low train load and haul freight at high expense for wages. They are often back hauls in local freight, which are a loss as far as revenue train load is concerned. The effect of both local freights and fast freights, therefore, is to hold down the revenue train load. Since temperature ratings affect slow freights principally, and fast freights and local freights up to a lesser degree, it is evident that its effect on the revenue train load is quickly apparent.

In Middle Atlantic states the train load will decrease from 15 to 20 per cent, in winter, depending on conditions. When the proportion of heavy slow freight to the total business decreases, the drop in the train load is especially great. On account of cold weather troubles at engine terminals, steam failures on the road, and for other reasons, locomotives make less mileage in winter than in summer. There is always trouble on long grades, where the fireman has to work continuously for more than an hour. Firemen do not like to perspire in the winter and they usually wear more clothes than necessary if they are exerting themselves. The en-

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gineer on his seat box is dressed for sitting still and not for helping out a fireman with a dying fire. So a drag engine with a heavy tonnage train often fails in the winter when it would be all right in summer.

The freezing of coal and ore in cars is a cause of great delay to the movement of cars, which often means light trains to get faster movement. The ordinary method of building fires under cars to thaw them out and pounding the hoppers with hammers results in increased expense apart from the delay to the cars. It takes men to build fires under cars and it costs money to furnish fuel to burn. It also takes extra force to beat hoppers.

If cold weather comes at a time when business is brisk as in the winter of 1911-12, the expense in all departments is bound to be heavy. It pays, therefore, to know something about effect of temperature on train haul. In practice there are two ways of allowing for variations of temperature: (1) Keep the rating constant and vary the adjustment for each temperature, and (2) keep the adjustment constant and vary the rating for each temperature. They both amount to the same thing in determining the actual tons hauled, but in practice it is probably better to follow the second plan. By so doing, train crews readily see that a reduction in tonnage has been made, whereas, if the "Wheel Report" shows full tonnage and merely a change in the adjustment, they often think they are hauling "A" ratings in "C" weather.

The formulæ developed above for B, C and D rating on level grade should be used to represent the resistance of a train that has been in motion at least 15 minutes. It is practical to assume that the resistance will be constant up to 30 miles per hour. With reasonable ratings of the power, starting resistances are negligible in warm weather. The engine must have a greater margin in cold weather, and when starts have to be made on ruling grades (especially when they follow long stops) extra allowance should be made.

TONNAGE RATINGS.

Proper tonnage rating is that load which can be hauled by the engine under consideration over the road at an economical speed. Owing to factors which are, in a measure, indeterminate, it is not an exact science. Strictly economical tonnage rating would be different for every train. This can readily be seen, since no two engines are in the same condition. In a like manner, some cars are in a better condition to be hauled than others. Road conditions differ on different parts of the same division and some men are better and more uniform performers than others. Perfect uniformity of mechanical and roadway conditions would result in large economies in the way of a decreased number of trains due to increased tonnage per train. Where it is impossible to secure perfection, uniformity pays well, even if it costs money to get it.

The object of adjusted tonnage rating is to give an engine the same amount of work to do regardless of whether a train is made up of heavy loads, light loads, empties, or any combination of them. If all cars of the same weight had an equal resistance to traction, this would be possible. Different kinds of cars and varying conditions of track, weather and wind make it possible only to approximate the desired result. The adjustment is an arbitrary amount added to the weight of each car, whether loaded or empty, to qualize the pull on the engine under conditions of hauling loaded, empty or mixed trains. Adjustments are functions of the rate of grade and the resistances of the train. Practically they vary only with the rate of grade.

Most operating divisions have broken profiles and different rates of grade, so that the ruling grade should be first determined, the ruling grade being the grade which governs the train load. The adjustment for that grade should be used. If train loads are adjusted correctly for limiting conditions, there will be no trouble with the other parts of the railroad as far as tractive power is concerned. When helpers are in use, the adjustment should be for the single engine ruling grade. This procedure will establish an adjustment which will be too large for helper grades, but the error is on the safe side.

When possible, the grades should be established from recent profiles. If there are none, it is a good plan to run them. Railroad profiles change in the course of years. It is a well-known fact that fills settle, causing deep sags in the grade line. The raising of tracks through cuts is cheaper than ditching, but is responsible for summits in the cuts. On some lines, where the profile has been checked, it has been found that stretches of 0.3 per cent. grade have become 1 per cent. If places of this character occur near a point of heavy resistance, an immediate effect on the tonnage of a train is the result. When an engine is working with its bar well forward, with the fireman tired out, the fire dirty, and the steam pressure dropping, such places will cause the stalling of a train, and in a short time the frequent delays will result in decreased tonnage rating.

Raising tracks is not as economical as the section foreman and supervisor would lead us to believe. While better drainage is undoubtedly secured, it is generally better practice to clean the ballast, and widen cuts to secure a ditch, and to raise track only when it becomes necessary to put roadbed to a proper line and surface. On such occasions, grade stakes should be used to establish the grades. On many railroads an effort has been made to place permanent monuments, so that the track could be kept at a constant elevation. The difficulty of maintaining monuments along a roadbed is well known. They are likely not only to be a menace to the lives of the trainment, but they are constantly settling, and being knocked by sectionmen, and occasionally by derailments. However, the importance of placing permanent monuments cannot be overestimated.

In the early days of railroading, compensating for curvature was practically unknown. For many years it was probably unnecessary. Compensation for curvature is not vital to small trains running at speed. The resistance due to curvature is principally felt by heavy tonnage trains on ruling grades where the engine is rated at a high percentage of its cylinder tractive power. Various experiments have been made to determine how much reduction in grade would compensate for the added resistance of curvature. It has generally been the practice to compensate this at a stated amount, and, while this method is not as accurate as could be desired, it is very much better than no compensation at all. From considerable observation of the influence of curvature and an examination of numerous tests of its effects, it is felt that the following rules would improve the present practice.

Conclusions: Compensate .03 per degree: When the length of curve is less than half the length of the longest train, when a curve occurs within the first 20 ft. of rise of a grade, or when curvature is in no sense limiting. Compensate .035 per degree: When curves are between ½ and ¾ as long as the longest train, and when the curve occurs between 20 ft. and 40 ft. of rise from the bottom of the grade. Compensate .04 per degree: When the curve is habitually operated at low speed, when the length of the curve is longer than ¾ of the length of the longest train, when super-elevation is excessive for freight trains, and at all places where curvature is likely to be limiting. Compensate .05 per degree wherever the loss of elevation can be spared.

The effect of curvature on low grades is generally greater than on heavy grades, provided the length of train is what would be justified by the low grade. In speaking of low grades, levels, 0.1 per cent, 0.2 per cent and 0.3 per cent grades are referred to. On double track railroads, particular attention should be paid to curves, whether uphill, downhill, or level, at places where steam is being taken by the engine in

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moving in either direction. On virtual level grades each track should have its tangents slightly raised and its curves slightly sloping down hill, so that the pull by the engine may be uniform, and the resistance of the line constant. The value of keeping the line resistance constant becomes more important as the length of the train increases. One of the prime objections to hauling a long train is the danger of parting, and in this danger curvature plays an important part. If the line is crooked, having many short curves, it is usual for the slack of the train to be constantly taken up and let out. If the engine runs out on a bit of straight track, when the rear of the train is bunched on the curves, it will accelerate faster than the other end of the train. Unless the engineer is watching, and using the brakes slightly, he may pull out a drawbar. If, on the other hand, the front end of the train is on a curve, and the rear end on straight track, the tendency is for the rear end to run in on the front end, and break a knuckle. It should not be supposed that it is impossible to have different classes of compensation on each track of a double track railroad.

From a scientific standpoint, although not always from a financial view, it is evident that a six-track railroad is the most desirable for a road that handles a three-speed service. This will give a passenger track, a fast freight track, and a slow freight track in each direction. Without attempting to discuss what will be gained by the operation of a six-track railroad, it should be said that as many tracks as possible are justified if a standpoint of super-elevation alone is considered. Of course, it becomes necessary for a train to stop occasionally on a curve, and for that particular case the super-elevation is always wrong. Inasmuch as no super-elevation at all is necessary at very low speeds, it may be eliminated entirely on tracks that are used exclusively for standing cars, and very low super-elevation, if any, should be used for yard tracks.

On a single-track railroad carrying more than one class of traffic, there are two ways to treat super-elevation: (1) Make the freight tonnage rating as great as possible, and in accordance with the ruling grade. In this case, it will be necessary to elevate the curves for freight speed, and run the passenger trains slowly over ruling grades. (2) Use a higher super-elevation for passenger speeds, and decrease the tonnage rating to make up for the increased resistance caused by the wheels of the freight trains binding against the lower rail.

Single-track railroads which are crooked can rarely haul as high a percentage of rating as double-track railroads, on account of the super-elevation being wrong. It is easy to see that every down-grade becomes an up-grade for movements in the opposite direction on a single-track road. Inasmuch as the movement downhill is likely to be faster than it is uphill, the super-elevation must be made for the downhill movement or introduce speed limits on downhill trains. On single lines that are exclusively for freight, super-elevation on ruling grades should be made for not over 15 miles per hour. It is less expensive to slow down the descending movement than to reduce tonnage rating on account of excessive super-elevation.

Without discussing the theory of the spiral as affecting railway grades, it should be said that the object of the spiral is twofold: To afford a run-off and a run-on from a level cross-section to a super-elevation cross-section, and to ease the horizontal passage from a straight line to a curve. It is evident that in passing from a level position to a super-elevated position, when the inner rail of the curve is laid at grade, the center of gravity of the mass of the train must be raised through a distance equal to one-half the super-elevation. This is generally a minor rise, but in order to haul uniform tonnage this minor point should be carefully observed, especially where limiting conditions are found, such as places near the end of a long-continued effort. It has been proposed in the past that the inner rail be depressed a distance equal to one-half of the super-elevation, and the outer rail be raised the same amount. While this has been objected to by some railroad men, it can certainly be done and so maintained, and from a tonnage standpoint it is desirable. It is submitted that the railway of the future, which is scientifically operated, will find conditions such as these limiting their tonnage unless care is taken. While it might be said that refinements in the track are unimportant, it should be borne in mind that, in order to realize the full value of improvements, these matters must be taken into consideration. A combination of correct conditions results in the most effective operation.

Curves that reverse without any tangent between them mean operating expense. Not only must the super-elevation change abruptly, but the trucks must change their position in the same manner. It is considered good practice to leave room between the points of spiral for four freight cars to straighten up after they change direction. On most new construction, provision is made for at least 1,000 ft. between curves, and this practice is recommended unless great expense is involved.

In exactly the same way that a horse can haul a wagon better on an asphalt pavement than on a cobble stone road, so can a locomotive haul tonnage more easily on a good track than on a poor track. Without going very far into the discussion of track maintenance, it may be stated that from a tonnage standpoint good track consists of the following things: Mathematical alinement, super-elevation conforming to the speed, an unyielding sub-grade, heavy enough rail so that the depression under the ruling grade is small, enough ties beneath the rail to transmit the load uniformly to the sub-grade, deep enough ballast to secure good drainage and distribution of loading, and as much strength as is necessary. It is easy to see that if a train is hauled along a roadway that is constantly pressing down the rails, it is literally climbing a hill all the time.

Many railroads are suffering today on account of the fact that during the early days of construction it was not thoroughly realized that a tunnel might be a limiting factor in tonnage rating. The following are the causes of the limiting effect of tunnels: A tunnel is dark, making the engine crew less confident; a derailment in a tunnel is almost sure to result in serious damage and loss; the heat in long tunnels, especially if of small section, is intense; the track conditions, such as line and surface, are never as good as on the outside; the rail is generally damp, causing either the excessive use of sand, or the slipping of drivers; drainage in tunnels is usually bad, and difficult to improve; there are usually speed restrictions in tunnels. It was formerly the practice to carry maximum grades through tunnels in order to shorten them. This serious defect in many cases makes tunnels the ruling points. In tunnels of small section the use of helper engines is undesirable on account of the heat; the smoke and gas add to discomfort of operation; the impracticability of firing in long tunnels causes a drop in steam pressure.

There have been many plans devised for tunnel ventilation. Most of them are successful under some circumstances, but none is successful under all conditions. Long tunnels are generally built by means of shafts, and these shafts are sometimes left open to aid the ventilation. If the heat in the tunnel is greater than that outside, shafts will help when the atmosphere is low in humidity. When the humidity is high, shafts make but little difference in tunnel conditions. This is unfortunate, as tunnels at such times are very foul. Disc fans used in the shaft will operate satisfactorily sometimes, but their efficiency seems to vary about the same as the open shaft. Pure air blown down shafts is successful at times, but if the shaft is near the center it generally happens that

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only one end of the tunnel is cleared out, the air remaining stationary at the other.

The Churchill system of ventilation, by which pure air is blown through the tunnel from one end through nozzles fitted at the sides of the tunnel, is successful, if the engineman operate the locomotive so that the smoke is blown ahead of the engine. If two engines are used ahead on a train, and it is necessary to work the second engine, the position of the front engineer is unbearable. If one engine is used in the rear and one in front, and the smoke and gas from the second engine reaches the first one, the front engine crew are in the same position as in the case of the double-header, but if the train is skilfully handled, the smoke and gas of the rear engine will not reach the head engine. In tunnels where the grade inside is considerably less than the ruling grade, it is sometimes found possible to shut off one engine entirely, and in that case there is no difficulty, provided that the train does not move faster than the air current.

The natural tendency is to drive the engine as hard as possible through the tunnel on a heavy grade in order to get through quickly. The speed of the air currents in the Churchill system of ventilation in a tunnel a mile long usually averages about 8½ miles an hour over the whole distance. If the tunnel is being worked to anywhere near its capacity, the additional time in the tunnel may seriously limit the number of trains that may be put through it. It has been found, however, that if the tunnel is cleaned out by the ventilating apparatus before the passage of each train, there is little difficulty in getting through. As a rule, the engine crews prefer this method.

Double-track tunnels are of sufficient section so that there is little discomfort in a tunnel a mile long, even if the locomotive is fired all the way through. The practice in Europe has always been much better than that in the United States in that even with single-track tunnels their section has been large enough so that they are less uncomfortable than those in this country. Tunnel ventilation in Europe is largely restricted to the dilution of locomotive gas with plenty of fresh air, rather than driving the smoke and gas ahead of the engine.

In the construction of new tunnels, an effort should always be made to reduce the grade in the tunnel considerably below the ruling grade, so that there may be no need of touching the fire during the passage through the tunnel. Ample section to secure good conditions is essential. In this connection it should be noted that the effect of long single-track tunnels of narrow section on the ruling grade is to reduce the tonnage rating in the tunnel by 10 per cent at least.

Primarily it should be said that the effect of the length of a ruling grade depends entirely on what speed it is necessary to make up that grade. Hardly any operating division has more than 40 per cent of ruling grade in either direction. It is generally computed that a train must average ten miles an hour over a division of 100 miles in order to secure the best economy.

Assume a division with 40 miles of ruling grade, and 60 miles of either downhill or less than ruling grade. If eight miles per hour is averaged on the ruling grades, and 12 miles per hour on the down grades and less than ruling grades, the run may be made in ten hours. If a grade is very short, following a stretch of either downhill or less than ruling grade, sufficient speed may be had at the bottom to carry the train over the top, even though the ascending grade be considerably more than the ruling grade. As the train goes up the hill, its speed will constantly decrease. The speed at the top of the hill must be such that the engine still has some margin between its maximum tractive effort and what is required of it. This result depends entirely on the speed of the train at the foot of the grade. Such a grade is called a "momentum grade," and, while most railroad men will say it is not safe to depend on momentum, it is probable that there is not an important railroad in the country where the locomotive engineers cannot tell of portions of the line that are operated in that manner, even though the officers of the railroad do not know it. Were it not for momentum, it is likely that many curves would prove to be stalling points that are now passed around with little, if any, trouble. We are learning more every day about handling trains and power at low speeds, but it must be understood that these low speeds are only for use for short periods of time, and not for general practice over a whole run. When the grade is long enough for the train to become stretched out fully upon it, or, in other words, when the engine settles down to a constant speed with its maximum tonnage, the rating speed for that particular train becomes fixed. Without a rise in the steam pressure, the train cannot accelerate as long as the grade remains the same. If there is a large percentage of this character of line on the division, the rating speed must be considerably higher than if there are only one or two places. For instance, it may be possible to average seven miles per hour over one piece of grade, if that is the only piece on the division, because the difference in time should be made up on the rest of the division, but it would be manifestly improper to load an engine so that such a low speed would be made over the whole run. Not only the low speed, but the constant demand on the engine would be such that the fireman would play out, and a failure would be the result.

PROPER PERCENTAGE OF RATING.

It has been stated that a locomotive standing on a dry steel rail should be capable of exerting a pull on a spring balance equal to approximately ¼ its weight on drivers. This amount can be increased by the application of some medium to increase the co-efficient of friction, such as sand, to about 35 per cent. (for momentary purposes only). This same pulling power can be used to haul a train, including, of course, the engine and the tender itself.

Ratings in use are never as great as could be pulled by the locomotive utilizing a tractive power of ¼ the weight on drivers. The reason is apparent. Time is the essence of rating, just as it is the prime factor in all railroading. The governing question is: For how long a time must the locomotive be required to exert its maximum pull during any particular run? If it is required to exert a maximum effort for only about five minutes at a time, the rating might be established for a maximum effort, provided that time for rest of man and recuperation of fire elapses between the periods of maximum effort.

If maximum ratings were established for divisions where the ruling grades were long enough to require maximum effort for some time, the following conditions would have to be combated: Poor draft, owing to slow exhaust; poor fire on account of poor and intermittent draft; dirty fire on account of imperfect combustion; tired fireman on account of heavy work for a long time; steam failure, and stalling. It will be understood that, if an engine is adjusted to working under such conditions, an improvement may be had compared with an engine which is utilized on general service. The practical problem then is: How long can the ordinary fireman keep his fire in shape to deliver steam at full stroke? At what rate does his capacity deteriorate? At what rate can he maintain a steady and consistent performance for long periods of time?

In order to secure as uniform working conditions as possible, it is necessary to assign values as closely as possible to the rates mentioned. The accompanying plat will represent about what is considered fair practice. In order to apply the chart, find out how long a time it is feasible and practical for the locomotive to consume in ascending the ruling grade, and taking that time on the chart, follow up the line and see what percentage of full rating may be given the engine. It

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is evident that when the percentage of rating gets as low as 60, it would pay to keep a full rating for the ruling grade with an assisting engine to avoid penalizing all the rest of the run improperly.

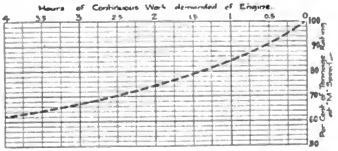

Diagram Showing Amount Rating Should Be Reduced on Account of Continued Work.

When the ruling factor in the operation is to conserve power, the greatest number of ton miles per engine mile is the figure to work for. This, however, will not always pro-

Rate of Grade, Per Cent.	Adjustment	Ratio of Car Wgts., Per Cent.	Resistance of		Ratio of Resistance, Per Cent.
			20-ton Car	70-ton Car	
Level	54	60	166	276	60
0.1	79	58	266	476	56
0.2	104	44	366	836	44
0.3	129	31	466	1496	31
0.4	154	29	566	1956	29
0.5	179	27	666	2476	27
0.6	204	26	766	2936	26
0.7	229	25	866	3456	25
0.8	254	24	966	3916	24
0.9	279	23	1066	4436	23
1.0	304	22	1166	4896	22
1.1	329	21	1266	5416	21
1.2	354	20	1366	5876	20
1.3	379	19	1466	6396	19
1.4	404	18	1566	6856	18
1.5	429	17	1666	7376	17
1.6	454	16	1766	7836	16
1.7	479	15	1866	8356	15
1.8	504	14	1966	8816	14
1.9	529	13	2066	9336	13
2.0	554	12	2166	9796	12
2.1	579	11	2266	10316	11
2.2	604	10	2366	10776	10
2.3	629	9	2466	11296	9
2.4	654	8	2566	11756	8
2.5	679	7	2666	12276	7
2.6	704	6	2766	12736	6
2.7	729	5	2866	13256	5
2.8	754	4	2966	13716	4
2.9	779	3	3066	14236	3
3.0	804	2	3166	14696	2

Ratios of Resistance and Car Weights Not Including Adjustments.

duce the lowest cost per ton mile. At times there is a shortage of train crews and a surplus of power. In this case it becomes imperative to make the greatest number of ton miles

Rate of Grade, Per Cent.	Resistance of		Ratio of Resistance, Per Cent.	Ratio of Car Weights, Per Cent.
	20-ton Car, Pounds	70-ton Car, Pounds		
Level	166	276	60	20.5
.1	266	416	58	20.5
.2	366	556	44	20.5
.3	466	696	41	20.5
.4	566	836	29	20.5
.5	666	976	27	20.5
.6	766	1116	26	20.5
.7	866	1256	25	20.5
.8	966	1396	25	20.5
.9	1066	1536	24	20.5
1.0	1166	1676	24	20.5
1.1	1266	1816	23	20.5
1.2	1366	1956	23	20.5
1.3	1466	2096	23	20.5
1.4	1566	2236	23	20.5
1.5	1666	2376	23	20.5
1.6	1766	2516	23	20.5
1.7	1866	2656	23	20.5
1.8	1966	2796	23	20.5
1.9	2066	2936	23	20.5
2.0	2166	3076	23	20.5
2.1	2266	3216	23	20.5
2.2	2366	3356	23	20.5
2.3	2466	3496	23	20.5
2.4	2566	3636	23	20.5
2.5	2666	3776	23	20.5
2.6	2766	3916	23	20.5
2.7	2866	4056	23	20.5
2.8	2966	4196	23	20.5
2.9	3066	4336	23	20.5
3.0	3166	4476	23	20.5

Ratios of Resistance and Car Weights Including Adjustment.

per train mile. This nearly always shows the greatest economy of movement.

An engine cannot do work and overcome train resistance unless it can transmit its cylinder work to the rail by means of adhesion due to the weight of the engine and the friction between wheel and rail. The adhesion of the wheels to the rails may be reduced by a number of circumstances as follows: Moisture acting as a lubricator, frost, grease, poor rail surface, manganese or other metals in the steel, excessive super-elevation, throwing too much weight on one side, and inability to use sand.

Assuming that, for rating purposes, the resistance formula, $R = 2.2\ T + 122\ C$, is correct, the resistance of a 20-ton car and a 70-ton car on different grades is shown in the accompanying table. Without a knowledge of train resistance under different conditions of car weight, it might be supposed that gross tonnage multiplied by the distance hauled would form the most accurate measure of work accomplished. The cost per gross ton mile would then be a measure of efficiency of operation. However, this is not true since it takes 60 per cent of the power to haul a 20-ton empty car on a level that it does to haul a 70-ton loaded car, while the empty car is less than 30 per cent of the weight of the loaded car. It, therefore, follows that as a measure of the cost of performed work the gross ton mileage alone is not an adequate basis of comparison. If, however, the adjustment figures are added to the weight of the car, the results become comparative at once, as shown in the second table.

ATTENDANCE AT THE COLISEUM.

There were more railway men at the Coliseum yesterday afternoon than at any previous time since the exhibition was opened last Saturday. The rules governing admission, by excluding those who were not directly interested in railways and have heretofore attended the show more as sightseers than anything else, resulted in confining the attendance practically altogether to railway officers and employees. The wisdom of this method of handling the attendance was demonstrated on several occasions when the crowds of railway men became so large that if they had been swelled by hundreds of mere sightseers there would not have been room enough for such a comfortable opportunity to inspect exhibits as the members of the Appliances Association have a right to expect and as railway officers enjoy. In a word, the exhibits have undoubtedly been more thoroughly inspected by railway men this year than ever before, principally because these men could take their time and were not crowded.

NEW SIGNAL INSTALLATIONS.

The Nashville & Gallatin Electric Railway (Tenn.) has installed a new signal system on its entire line, covering 25 miles of single track, which will be put in service before the end of this month. The Indianapolis & Cincinnati Traction Company has extended its signaling system to 45 miles of its lines in Indiana and Ohio. The new installation provides for complete switch protection and several new features of separate directional control of train movements are embodied in the dispatching apparatus. The Mesaba Railway Company has contracted for an installation of signals on 36 miles of line. Work will be commenced immediately. All of these installations will use the Simmen signal system.

RAILWAY BUSINESS ASSOCIATION DIRECTORS MEET.

The quarterly meeting of the directors of the Railway Business Association was held in Chicago yesterday. There were in attendance the president, George A. Post, president Standard Coupler Company; Col. H. G. Prout, vice-president and general manager Union Switch & Signal Co.; A. M.

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Kittredge, president Kay & Ess Company; George W. Simmons, vice-president Simmons Hardware Company; F. T. Heffelfinger, president Peavey Grain Co.; Irving T. Hartz, president Morden Frog & Crossing Co.; J. C. Bradley, president Pratt & Letchworth Co.; James S. Stevenson, vice-president Berry Brothers, Ltd.; W. G. Pearce, vice-president American Brake Shoe & Foundry Co.; E. B. Leigh, president Chicago Railway Equipment Company; W. W. Salmon, president General Railway Signal Co. W. E. Clow, president James B. Clow & Sons; and F. W. Noxon, secretary of the Association.

The principal speeches made at the Association's last annual dinner in New York on December 19 were James J. Hill and W. L. McKenzie King, former Minister of Public Works of Canada. There has been such a demand for their addresses that the Association has sent out 56,000 copies of Mr. Hill's address and 55,000 of Mr. King's. The Association has also ascertained that these speeches were reported in newspapers and other publications having a total circulation of 9,000,000.

SIGNAL COMPANY SOLD.

The Federal Signal Company, Albany, N. Y., has completed negotiations for the purchase of the American Railway Signal Company of Cleveland, O.

ARRANGEMENTS COMMITTEE OF THE RAILWAY SIGNAL APPLIANCES ASSOCIATION.

The arrangements committee of the Railway Signal Appliance Association will hold a meeting at the Congress Hotel at 1 o'clock this afternoon, to make further arrangements for the annual convention to be held at Nashville, Tenn., next October.

STEEL RAILS FOR CONCRETE REINFORCEMENT.

W. K. Hatt, professor of civil engineering, Purdue University, will deliver an illustrated lecture in the Florentine room, Congress Hotel, at 7:30 o'clock tonight in which he will present the results of tests on rolled steel rails for concrete reinforcing bars. As this lecture is to be informal and will be withheld from publication, the officers of the association are anxious to have a good representation of the members present to hear Dr. Hatt.

ALL-STEEL COALING STATION.

The accompanying cut illustrates an all-steel locomotive coaling station of 300 tons capacity arranged to coal on two tracks. While many of the mechanical devices for controlling and operating these stations are covered by patents, the type of bin with supports is made to suit the individual choice of the railway engineer in each case. The more common materials of construction—wood, concrete and steel—are all used, but wood is being abandoned in most of the newer structures where permanency is considered most important. In the all-steel structures the bottom is curved or conical, which causes all of the coal to move whenever the spouts are opened. This prevents spontaneous combustion. The roofs are also of conical steel. This form of bottom is not so easily made of wood or concrete as with steel because the curved and conical steel bottom is suspended and not supported except at its connection to the cylinder. It is probably the cheapest construction in many cases and is certainly more permanent than wood. It also occupies a minimum space, and has a very handsome appearance. The tank is tightly enclosed and objectionable dust or waste can be reduced to a minimum.

The structure here illustrated was built by the Des Moines Bridge and Iron Co., Pittsburgh, Pa., for Roberts & Shaefer.

All-Steel Coaling Station.

contracting engineers, Chicago. It is located on the Elgin, Joliet & Eastern at Rossville, Ill.

SCHERZER ROLLING LIFT BRIDGES.

The first Scherzer rolling lift bridge built for the Metropolitan West Side Elevated Railway across the Chicago river nearly 20 years ago has been and is now carrying continuously a traffic of more than 1,500 trains daily, which is thought to be a record for movable bridges. Although it is operated frequently to allow river vessels to pass, the maintenance charges have been small and the bridge is still in excellent condition. The structure consists of two double track bridges side by side.

The accompanying cut shows the double leaf cantilever Scherzer rolling lift bridge under construction across Pamban Channel, on the extension of the South Indian Railway lines from Southern India toward the island of Ceylon. This structure will consist of a number of deck plate girder spans in combination with the through Scherzer rolling lift bridge across the navigable channel. The cantilever trusses of the movable span are similar to the double leaf bridge of this type constructed in 1908 for the Burma Railways across the Ngawun river, Burma.

The movable span of the South Indian Railway bridge is 225 ft., center to center of bearings, being 5 ft. longer than the Burma bridge. The clear channel for navigation is 200 ft. wide. When the bridge is open, it provides an unlimited vertical clearance, so as not to obstruct the highest

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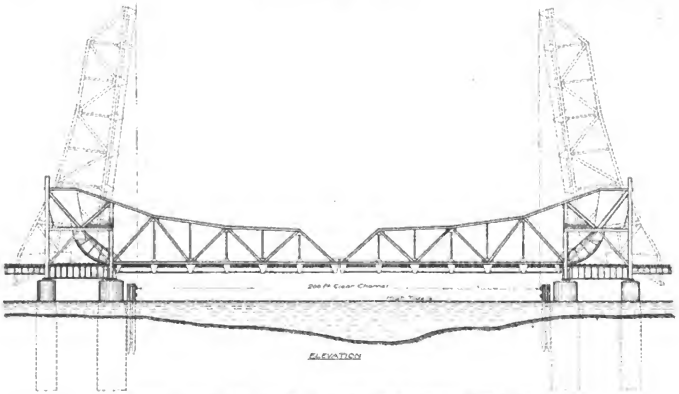


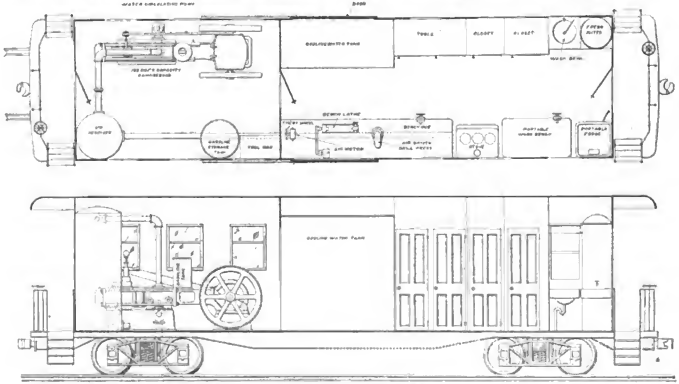
Scherzer Double Leaf Rolling Lift Bridge Across Pamban Channel, India.

masted vessels. Each bridge leaf is operated by one 25 h. p. motor. The foundations have been completed, and the approaches to the lift bridge are now nearing completion. This Scherzer bridge was fabricated in England, and erection will be completed within three or four months.

The Scherzer Rolling Lift Bridge Co., Chicago, prepared the designs, plans and specifications for the superstructure, operating machinery and power equipment and is acting in a consulting engineering capacity on the bridge, in cooperation with the engineers of the South Indian Railway.

RAILWAY REPAIR CAR.

The accompanying cut illustrates an installation of stationary and portable air tools operated by a gasoline engine driven compressor. The tools include drills, riveting and chipping hammers, painting machines and an air hoist. The arrangement of the car is such that it can be very conveniently used for bridge work either on new construction or repair work. The complete equipment for this car is furnished by the Chicago Pneumatic Tool Co., Chicago.



Chicago Pneumatic Tool Company's Railway Repair Car.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$6.00
Canada	8.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,250 copies were printed; that of these 1,250 copies, 6,796 were mailed to regular paid subscribers and 146 were provided for counter and news companies' sales; that the total copies printed this year to date were 100,480 copies—an average of 7,758 copies a week.

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*Illustrated.

THE time is ripe for the adoption by the railways of the United States of a standard box car. This type of car, designated by the commission on car service which was recently appointed by the American Railway Association as "legal tender equipment," is so generally interchanged and the practice of the home route is so wasteful that the commission has made the suggestion that all box cars be placed in a pool which can be governed by regulations that will insure the best service being obtained from such cars by the railroads generally. Such a movement, which would naturally lead to the adoption of a general standard box car, if suggested a few years ago, would have had little chance of being put through—and it is possibly just as well that it was not attempted. At the present time, however, sufficient experience has been gained from the different types and designs of box cars to enable a standard box car to be decided upon which should give excellent results from the construction, maintenance and service standpoints, and should thus receive the support of the mechanical and operating officers. The splendid returns which have been received from the publication of the car balances and performances by the American Railway Association and the results which have already been accomplished by the commission on car service and the recommendations which it has made would seem to insure the hearty support of the executive officers to such a movement. It would not be surprising if the American Railway Association should ask the Master Car Builders' Association to present its recommendations for a standard box car in the very near future.

THE twenty-sixth annual report of the Interstate Commerce Commission for the fiscal year ending June 30, 1912, contains a number of tables relating to the causes of accidents, and among them is a special compilation of those that have been caused by wheel failures. In 1912, for example, there were 3,847 accidents due to defective equipment, of which 984 were caused by broken wheels, and of these 627 were broken flanges. The report contains a tabulation of such wheel failures for eleven years, 1902 to 1912 inclusive. Comparing the first two years of this period with the last two, we find that for 1902 and 1903 there were 1,011 accidents caused by wheel failures as against 1,800 for 1911 and 1912, showing an increase of 78 per cent. in the total number. These figures cannot be taken, by themselves, to present an accurate statement of the case, because they take no account of the increase in traffic that has occurred between the two dates. In 1902 and 1903 the total ton-mileage of the United States was nearly 331 billion; in 1910 and 1911 it was nearly 509 billion. (The figures for 1912 have not yet been compiled.) This shows an increase of 54 per cent. in tonnage carried, or 24 per cent. less than the increase of wheel failures. If the comparison is to be made on the basis of car mileage, figures for the whole country are not available for later than 1910; but taking those from four representative railways, the Pennsylvania, Union Pacific, Illinois Central and Chicago, Rock Island & Pacific, we find that the empty car mileage increased 44 per cent. and the loaded car mileage 58 per cent. in the eleven years covered by the report. At the same time, the car loads increased 9 per cent. From the operating standpoint, then, wheel failures have increased faster than ton mileage, car mileage or car loading. If wheel failures had increased at the same rate as loaded car mileage the failures for 1911 and 1912 would have been 1,597 instead of 1,800, which is an increase of 12.7 per cent. above what would have been a normal increase; and it seems fair to attribute a part, at least, of this to the 9 per cent. increase of average wheel loads.

THE Pennsylvania Railroad has decided to electrify its line from Broad street, Philadelphia, west, 20 miles, to Paoli—a beginning which probably means, ultimately, a very extensive change, for the company's lines centering at Broad street extend in five different directions; to New York, to Reading, to Pittsburgh, to West Chester and to Washington. It is about two years since a committee was appointed from among the officers of the several departments of the road to consider the subject of the enlargement of the facilities in Philadelphia and some of the preliminary details were decided on some months ago, including the remodeling and enlargement of the North Philadelphia station, and the construction of eight main tracks at that point, a "detail" which will cost $1,000,000. Now, the board of directors has authorized the electrification of the main line, as above noted, for suburban passenger traffic. No further

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details than the mere fact of the decision have been given out, because none have been decided. The problem is an exceedingly complicated one, involving, as it does, as great a provision for future growth and traffic as possible, in which even an outlook of twenty years ahead is too short a time to be considered. The question must be viewed not only in the light of the immediate and coming needs of the twenty miles to be converted, but as to its influence on and inter-relationship with the other developments suggested. For these reasons the system to be used has not yet been decided. While it is expected that this particular improvement may be completed in 1914, it is, to a great extent, dependent upon the expedition with which negotiations can be carried on with the city as to the land that will be required and the acquisition of the property on Filbert street, which bounds the present terminal on the north, all of which will take considerable time. Involved in the scheme is some six-track improvement work, which, with the widening of the Broad street station, will afford the much needed terminal relief. Of all of this work, the first step to be undertaken will be, as previously announced, the construction of an eight track station at North Philadelphia coupled with the increased tracking of that section of the road, the Connecting Railway, which includes a new arch bridge across the Schuylkill river at Girard avenue.

SCIENTIFIC MANAGEMENT.

MORE meetings or forums should be held throughout the country like that of the Western Economic Society at Chicago last week, when for two days the subject of scientific management was discussed from the standpoints of the employer, the employee, the engineer and the social worker. As we have said repeatedly in the past, there is undoubtedly much merit in the principles of scientific management, but the application of these principles is so little understood, and their introduction requires so much careful and painstaking investigation, as well as a radical change in the relation of employer and employee, and their attitude toward each other, that it will require years—possibly a generation or two—before they can with success be generally introduced; and this is particularly true in those fields where they are not so susceptible of application as in certain classes of manufacturing establishments and machine shops. Meanwhile it will be necessary to conduct a vigorous and systematic campaign of education to bring both the employer and employee to see their value and to co-operate with each other in their introduction. And this is a most vital point, for unless the principles are rightly applied, much harm may be done, and in the words of one of the speakers at the conference, "Scientific management may become a nuisance."

One of the most effective addresses was that by Morris L. Cooke, director of public works of Philadelphia—and it was effective because of the big-hearted, broad-minded conception of scientific management which he is striving to work out as a public officer. He spoke of scientific management as a means of ameliorating the condition of the toiling classes, and this thought was emphasized time and time again during the conference by those who have been notably successful in using it. Attention was directed to the fact that although F. W. Taylor has developed and used the principles of scientific management for many years, and has presented papers on his work before our great engineering societies, still, until two years ago, he was hardly known, even in his own city. At that time the awakening of the public to the necessity of the conservation of energy and material had made the time ripe for an announcement concerning it. Louis D. Brandeis, in the hearing of the freight rate advance cases, startled the country with it, and in a way made unfair use of it, for industrial organizations, schools, the management of the home, and almost everything else done by human agency was just as inefficient from the standpoint of scientific management as were the railways—and in many cases probably more so.

It was, therefore, of special interest to hear a man like Mr. Cooke, who had worked with Mr. Taylor, say that in spite of the fact that many thousand men were working under scientific management the number was so relatively small that it might truthfully be said that almost 100 per cent. were not working under it, and that probably as much as two generations would be required to educate the public to adopt it generally.

From the statements of the representatives of the labor interests who were present, and especially of John P. Frey, editor of the *International Moulders Journal*, whose arguments and personality made a strong impression on those in attendance, it is evident that organized labor is bitterly opposed to the new methods and that much hard and patient work must be done to bring its representatives to see that the men will not be imposed upon, but that as one speaker said: "There is a vast difference between strenuosity and efficiency." And it must be apparent to any close observer that just as piece-work and bonus systems have failed of securing the best results where they have been abused by the employer, so any other system must fail if the men are not given a square deal.

One thing is going to delay the general introduction of the new principles for many years, and that is that so few men are actually fitted to introduce them and that so many fakirs have rushed into the field. Carl Barth expressed it well when he said that it often made him so heartsick that he sometimes felt like giving the whole thing up. To develop a trained leader in this field should require at least as much time as to train a first class physician, and yet look at the number of so-called "efficiency experts" who have sprung up like mushrooms in a night! Near the close of the session one factory manager who had introduced scientific management with good results asked if there was no way in which these fakirs could be driven from the field; no one could suggest a solution of the problem.

The last session on Saturday afternoon was in the nature of a summary and a questionaire, and in the absence of F. W. Taylor, who was detained because of illness, F. B. Gilbreth and Morris L. Cooke answered the questions which had been presented. It proved to be a most interesting session and because of the ability and thorough training of these two gentlemen and the evident sincerity of their efforts in trying to better the condition of the laboring classes, produced a profound impression on those present which was not even dissipated by a fiery and equally sincere attack on scientific management by the well-known anarchist, Emma Goldman, which, by the way, gave a good idea of the patient effort which it will be necessary to exert in dealing with organized labor along these lines. In this connection it may be of interest to know that Mr. Gilbreth has published a book* entitled "Primer of Scientific Management" which is based on answers to questions and objections which have been made by workmen in criticizing scientific management.

Another notable incident during the meetings was an address on "The Selection of Employees" by Dr. Katherine M. Blackford, which briefly sketched the study that is made of each man's personality before he is hired by the Rumely Company, in order that he may be assigned to the work for which he is best suited. Among the nine characteristics which are examined is that of color. As an illustration Dr. Blackford noted that on the Pittsburgh & Lake Erie the chief despatcher was a brunette, and upon inquiry found that blondes were seldom employed in that capacity, the present staff on that road being composed entirely of brunettes, except for one red head. Other characteristics examined are size; shape of profile of head; structure; consistency; expression as shown by voice, gesture, walk, clothing, etc.; proportion as to energy, vitality and endurance; experience; and texture or quality, i. e., fine or coarse. Men should be so selected as to harmonize with the job and the characteristics of the boss. Necessarily Dr. Blackford could only cover the subject superficially, although a speaker at a later session mentioned a book on the subject by Dr. Blackford which may shortly be issued. Altogether the meeting proved to be a great success, and the example of the Western Economic Society should be followed by similar organizations in other parts of the country.

*Published by D. Van Nostrand Company, New York.

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GOVERNMENT REGULATION AND RAILROAD STANDARDS.

STATE regulation, as related to railroad service, implies an improvement of that service. It is on the expectation of more completely satisfying the reasonable demands of the public that legislators are induced to adopt regulating laws. Even the grafting legislator, when he prepares a "strike" bill, means to recommend something that will at least seem to better the service. If railroad service had always been first class, everywhere, the legislatures, no doubt, would have turned their attention to other things.

When the federal government, in 1893, by an Act which only clumsily fitted the situation, standardized the Janney car coupler and the Westinghouse air brake it improved railroad service; this by compelling dilatory companies to catch up with the more enterprising. The standardizing was accomplished indirectly, for the statute did not specify either of those two devices; but it was effective standardization, nevertheless. That law was justified only because it aimed to make the best practice the universal practice. The same may be said of the boiler inspection law of 1911. We are not prepared to say that the boiler inspectors are worth what they are costing—$300,000 a year—but no one can find fault with the fundamental principle of the law.

But a government, in following railroad standards, is not always so sure of doing the right thing. The question of what is the best railroad practice is not always found to be so clearly settled in advance. In Connecticut, last week, the engineer of the State Public Utilities Commission, reporting on a collision which occurred at Warehouse Point, January 10, recommended that enclosed disk signals be superseded by semaphores. This officer of the state would be able, no doubt, to quote the opinion of competent railway officers in support of this view. It would not be the first time that a state commission has gone too far, justifying itself in that way. But what we wish to point out is that the trouble at Warehouse Point was not ascribed to the type of signal. The report makes no suggestion that a semaphore would have been any better. The collision occurred at night, and at night semaphores and disks, for every practical purpose, are all the same. It may be admitted that semaphores are very generally favored by signal engineers; but this opinion is not universal, and large numbers of disk signals still give satisfactory service; why should the state lend its influence in favor of throwing away all the automatic signals on 60 miles of road? Quite likely the New Haven company could spend its money to better advantage on some section of road which has no block signals at all. No good purpose would be served, probably, by requiring state officers, reporting on accidents, to refrain entirely from making general observations concerning safety; but, surely, in going outside the subject in hand it is desirable to keep on very solid ground. (The real causes of this collision are given in another column.)

Another case where a government officer has acted on railroad officers' standards and in so doing has missed his point, is that of the collision at Dresden, Ohio, December 3, last, when 11 persons were killed. The inspector of the Interstate Commerce Commission, reporting on this case, says that the time interval between trains (passenger trains) should be more than five minutes. A passenger train was unexpectedly stopped, because of trouble with air brakes, and the flagman did not have time to get back far. This view is correct, if the time interval is to be used. If the interval were to be made 10 minutes or more, the government could get the indorsement of many railroad rule books. If it were made 20 or 30 minutes, universally, it could be plausibly recommended as a safe rule, with some exceptions. (The present recommendation does not say how much greater the time interval should be.) But the best railroad standard demands the use of the space interval; the time interval has been proved inadequate. Governmental authorities cannot fairly approve the time interval, simply because it has railroad approval. To merely lengthen the time interval is not making rational use of the lesson of those eleven deaths. The Interstate Commerce Commission has repeatedly recommended the use of the space interval system, because no other system is adequate; in issuing this report the commission ignores its own former declarations. The justification of governmental action in the matter of air brakes was that the railroads did not properly live up to their own best standards; the same consideration applies in the case of the block system.

In passing, it may be noted that the inspector follows another bad example, set by some railroad men, when he refers to the failure of the air pipe on the engine as one of the chief causes of the Dresden collision. That failure was not a cause at all; it was only the occasion. It caused the stoppage of the train; but what kind of a theory is that which makes it unsafe to stop a train? Where is the superintendent who is willing to ride over his own division unless he can feel perfectly safe in stopping at any place, at any time?

In one of these two reports, we see, the inspector went too far, and in the other not far enough; and with reputable railroad backing in both cases. In a third case, a collision at Bowerston, Ohio, December 13, the inspector of the Interstate Commerce Commission, attacking the flagging rule of the Pennsylvania Lines, sets out to say what a perfect flagging rule should be; but he stops at the end of the sixth line! (We shall not complain at brevity, *per se*, for those who go farther may fare worse.) The form criticised is that of the well known Rule 99, of the American Railway Association, which leaves everything to the judgment of the flagman. Says the report: "When considered in connection with safety in the movement of trains, the flagging rule is of paramount importance, and its requirements should be as absolute as it is possible to make them. It should be incapable of more than one construction, entirely free from uncertainty or indefiniteness, leaving no room for error of judgment by a flagman when such error may prove disastrous."

Here is a case where a state officer may well pause, for the rules of the railroad companies are of all sorts. If the United States government, or any power on earth, could frame a workable flagging rule, railroad officers surely would hail it with joy. But everybody knows that the beautiful ideal here outlined by Mr. Belnap has been striven after by innumerable committees, during the past 30 years, and that they have all given up in despair. A rule entirely free from indefiniteness, leaving no room for error of judgment, would either be (*a*) so long that half the brakemen could not be taught to comprehend it, or (*b*) would necessitate the employment of a half dozen flagmen on every train, and cause very frequent delays, to say nothing of the cost and the uncertainties of constant dependence on torpedoes and fusees. The conclusion of the American Railway Association, after years of discussion, that the flagman must be trusted to use his judgment, is a virtual confession that a complete and workable flagging rule cannot be made. The Association leaves every road free to amplify the rule to any extent desired, and many books do still specify distances and other details; but where is the superintendent who is satisfied with his rule, except under favorable circumstances and light traffic? This is not the first time that governmental authorities have attempted to give us a satisfactory flagging rule. The Louisiana State Railroad Commission recently prescribed a long one. But with the best rule ever written, the railroad officer who aims at a reasonable degree of safety—we will not say perfect safety—still finds himself left with many conditions not satisfactorily provided against; and he turns to the block system as the only escape from an impossible situation.

As we have already intimated, government can sometimes promote good railroading by prescribing the best standards of practice. This last report contains some salutary truths, forcibly expressed. But experience has taught that there is danger both of going too far and of not going far enough. When it comes to formulating a satisfactory flagging rule for general adoption there is a thirty years' history that cannot be ignored.

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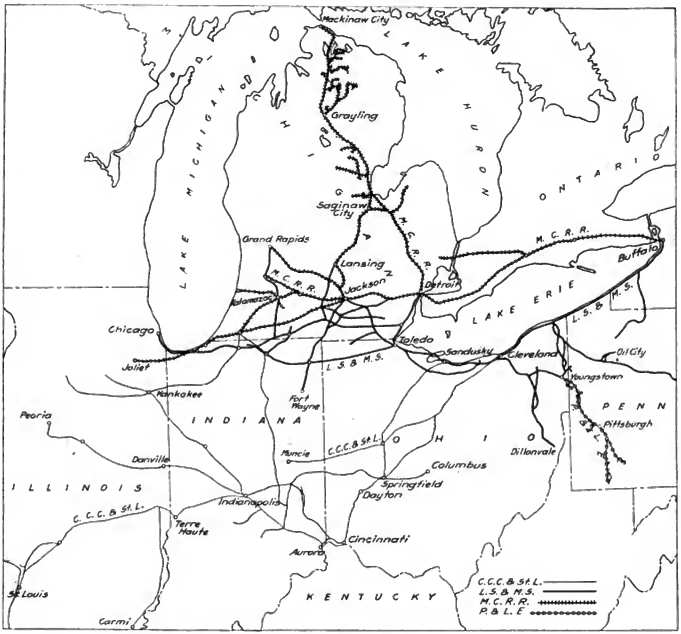
LAKE SHORE AND MICHIGAN SOUTHERN.

THE results of operation of the Lake Shore & Michigan Southern in 1912 are like a renewed pledge that earnings wisely turned back into a railroad property will, under good management, bear fruit in a reduction in *transportation* costs. In 1912 the cost of transportation, exclusive of any expenditures on the maintenance of property or equipment, per revenue ton mile moved was less by over 7 per cent. than in 1911. The Lake Shore carried the greatest amount of traffic in its history and earned a total from operation of $54,284,060, or 12.25 per cent. more than in 1911. Despite liberal increases in maintenance expenditures, the company had an operating income of $17,093,000 in 1912, as against $14,212,000 in 1911.

In a good many ways the Lake Shore & Michigan Southern is comparable to no other railroad in the United States. In natural advantages it is second to none. The company operates 1,872 miles of road, by far the greater part of which is main line, with almost no grades, through a territory in which fuel is cheap and where the nature of the traffic permits of very heavy car and train loading and of a comparatively small percentage of empty car mileage. These natural advantages account in part for the heavy train load, low operating ratio and great earning capacity of the Lake Shore when compared with other roads; but a decrease of 7 per cent. in transportation costs in 1912 as compared with 1911, in the face of an increase in labor costs, is the result of a policy of betterment from earnings that has been one of the characteristics of the management of the Lake Shore for a good many years.

A heavy expenditure for betterment of railroad property will often appear to have little, if any, direct effect in reducing transportation costs as long as the volume of traffic remains the same. When, however, the volume of traffic shows a material increase, as was the case in 1912 on the Lake Shore, the real advantages of former expenditures become apparent. In 1912 the Lake Shore carried 41,081,000 tons of revenue freight, which is more by 6,194,000 than was carried in 1911. The average haul was 167 miles in each year, so that the ton mileage totaled 6,874,000,000 in 1912, as against 5,841,000,000 in 1911. The Lake Shore has a freight traffic density of 3,813,000 tons carried one mile per mile of road. In addition to this quite remarkable freight density, the road



The Three Principal New York Central Lines West of Buffalo.

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carried 402,000 revenue passengers one mile per mile of road.

Of the total 41,082,000 tons of freight, bituminous coal furnished 10,807,000 tons; ores, 5,621,000 tons; and stone, sand and like articles, 4,048,000 tons. The increase in the tonnage of these three commodities was for bituminous coal, 1,695,000 tons; for ores, 917,000 tons; and for stone, etc., 890,000 tons. The Lake Shore furnishes a good example of how profitable it is on most roads to carry a large proportion of low grade freight which, although it takes a low ton mile rate, permits of large economies in cost of handling. The Lake Shore can almost be compared with the Delaware, Lackawanna & Western as a net revenue earner; but whereas the Lackawanna gets an average ton mile rate of well over 7 mills per ton per mile, the Lake Shore gets but 5.29 mills. This was the average in 1912 and was only slightly lower than the 1911 average.

The operating ratio in 1912 was 65.46 per cent. as compared with 67.09 per cent. in 1911. There was spent for maintenance of way and structures 12 per cent. of total operating revenues in 1912 and 12.79 per cent. in 1911; for maintenance of equipment, 17.11 per cent. in 1912 and 16.69 per cent. in 1911; for traffic expenses, 1.77 per cent. in 1912 and 2.12 per cent. in 1911; and for general expenses, 1.29 per cent. in 1912 and 1.91 per cent. in 1911. Transportation expenses consumed but 32.79 per cent. of total operating revenues in 1912, as against 33.58 per cent. in 1911.

A good indication of how the company was able to reduce its transportation costs by 7 per cent. is afforded by a comparison of equipment mileage and car and train loading figures. The train load of revenue freight in 1912 was 693 tons, as against 635 tons in 1911, and the total train load, including company freight, which is an even better criterion of operating conditions, was 731 tons in 1912, as against 666 tons in 1911. Another way of stating the same thing is that while ton mileage increased by over 17 per cent., freight train mileage increased only 7.81 per cent., and freight locomotive mileage increased less than 7 per cent. With an increase in passengers carried one mile of a little over 1 per cent., the mileage of passenger locomotives showed a decrease, which although slight in itself is remarkable, in that the majority of other roads showed increases in 1912 in passenger train mileage quite out of proportion to the increases in passengers carried one mile.

Nearly all of the common stock of the Lake Shore & Michigan Southern is owned by the New York Central & Hudson River and deposited under Lake Shore collateral trust bonds. The 18 per cent. dividend, amounting to $8,904,000, which was paid by the Lake Shore both in 1912 and 1911, figures as "other income" on the New York Central's income statement. Whereas, however, the parent company had less than 2 per cent. surplus on its stock after paying 6 per cent. dividends to its stockholders, the Lake Shore had a surplus in 1912 of $7,584,000, or 15 per cent., on its own stock, and this surplus is properly an equity for New York Central stockholders.

In 1912 the Lake Shore spent $3,239,000 for additions and betterments and added net to its equipment $2,178,000, although as a matter of bookkeeping it credited road and equipment account with $1,506,000 for equipment trust installments paid in 1907, 1910 and 1912. The Lake Shore's balance sheet makes a very strong showing. With working liabilities amounting to $18,916,000, there are working assets of $134,332,000. The very strength of the showing possibly indicates that at no very distant future time the company hopes and expects to do some permanent financing. Included in working liabilities are $11,648,000 one-year notes, part of which fell due on February 24 of this year and part on March 2. The notes were temporarily refinanced by the sale last week to J. P. Morgan & Company of $12,000,000 one-year 4½ per cent. notes. The Lake Shore's credit is so high that it can get short term loans on very reasonable terms and can therefore well afford to wait for permanent financing until the bond market is to the liking of its bankers. One-year notes, however, are probably only a temporary expedient even for a road with credit like the Lake Shore. Included in working assets are $107,119,000 marketable securities and $9,329,000 loans and bills receivable from subsidiary or affiliated companies. Cash on hand at the end of 1912 amounted to $6,235,000.

The following table shows the principal figures of operation in 1912 as compared with 1911:

	1912.	1911.
Average mileage operated	1,872	1,775
Freight revenue	$36,371,244	$31,101,335
Passenger revenue	11,835,199	11,350,096
Total operating revenues	54,283,617	48,360,997
Maint. of way and structures	6,516,217	6,178,623
Maint. of equipment	9,281,833	8,069,393
Traffic expenses	961,762	1,026,317
Transportation expenses	17,797,334	16,245,052
General expenses	975,504	924,489
Total operating expenses	35,534,644	32,443,875
Taxes	1,771,098	1,673,940
Operating income	17,093,279	14,212,103
Gross income	27,442,055	24,496,694
Net income	16,584,384	14,268,365
Dividends	9,000,000	9,000,000
Surplus	7,584,384	5,269,365

MICHIGAN CENTRAL.

LIKE the Lake Shore & Michigan Southern, although, of course, on a smaller scale, the Michigan Central had a substantially larger surplus after the payment of dividends in 1912 than in 1911. After the payment of 6 per cent. dividends in 1912 there was a surplus of $1,602,000, or $610,000 more than the surplus in 1911 after the payment of the same dividends. As in the case of the Lake Shore, this surplus forms in large part an equity for stockholders of the New York Central & Hudson River.

The Michigan Central operates 1,817 miles of road. The greater part of its stock is owned by the New York Central & Hudson River, and its lines form the northern part of the New York Central Lines west of Buffalo. While its main line between Buffalo and Chicago has a heavy density of both passengers and freight, a considerable portion of its mileage runs up into the State of Michigan, where traffic is comparatively light. The average ton miles per mile of road amounted to 1,794,000 in 1912, and to 1,701,000 in 1911, and passenger miles per mile of road amounted to 233,000 in 1912, and 220,000 in 1911. No such large preponderances of total tonnage carried is bituminous coal, ores and stone on the Michigan Central as on the Lake Shore. The total tonnage of revenue freight carried in 1912 was 21,100,000, as against 18,729,000 in 1911, and of this total tonnage in 1912, 3,893,000 tons were bituminous coal and 2,105,000 tons were stone, sand and like articles. The bituminous coal tonnage showed an increase over 1911 of 601,000 tons, and the stone of 318,000 tons.

The M. C. carries a quite large tonnage of products of agriculture, grain alone furnishing, in 1912, 1,235,000 tons. A large tonnage of manufactures is carried consisting of a great variety of articles, the movement of the greater number of which is, of course, intimately connected with the prosperity of the country served. Manufactures other than those usually listed separately, such as petroleum, sugar, iron, agricultural implements, household goods, etc., amounted to 2,672,000 tons in 1912, an increase over 1911 of 356,000 tons. The generally prosperous condition of the country is not reflected, however, in increased local passenger business. The total number of interline passengers amounted to 1,214,000, an increase of 150,000 over 1911; but local passengers decreased in number, as did also commutation passengers, so that the total number of revenue passengers carried amounted in 1912 to 6,000,000, or only about 1 per cent. more than was carried in 1911.

Total operating revenues amounted to $32,912,000 in 1912, an increase of $2,747,000 over 1911. Operating expenses did not mount up in quite the same proportion as revenues, so that the operating ratio in 1912 was 69.91, as compared with 70.76 in 1911. Total expenses amounted to $23,009,000, an increase over the

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previous year of $1,663,000. The following table shows the ratio of each class of expenses to total operating revenue:

	1912.	1911.
Maintenance of way and structures	11.03	11.77
Maintenance of equipment	14.32	14.58
Traffic expenses	2.32	2.60
Transportation expenses	40.45	39.94
General expenses	1.79	1.87

Only very slightly more was spent for maintenance of way in 1912 than in 1911, and this increase was entirely accounted for by larger track forces at higher wages. Total maintenance of way cost $3,630,000 in 1912, which is $81,000 more than was spent in 1911. This includes the expenditure for roadway and track, which is largely made up of the cost of track labor, and amounted in 1912 to $1,411,000, as against $1,177,000 in 1911. The annual report does not make it entirely clear as to why so much smaller sums are shown as having been spent for ties and rails. In 1912 the expenditure for ties was $595,000, or $234,000 less than in 1911, and the expenditure for rails was $86,000, or $133,000 less than in 1911. President Brown, in his comments, mentions the decreased prices in rails and ties. The detailed figures accompanying Mr. Brown's report show that a greater tonnage of 100-lb. rail was laid in 1912 than in 1911, and that more ties were put in track in 1912 than in 1911. The average price per ton of rail is given at 31.17 in 1912 and at 30.22 in 1911, and the average price of ties at distributing points at 71 cents in 1912 and 68 cents in 1911.

Maintenance of equipment cost $4,712,000 in 1912, or $312,000 more than in 1911; and although steam locomotives averaged 34,152 miles apiece in 1912, as against 32,588 miles in 1911, repairs per locomotive mile cost 7.08 cents in 1912 and 6.11 cents in 1911.

The Michigan Central, with its higher grade traffic, has no such heavy train load as the Lake Shore, but with the increases in tonnage of various commodities was able to show a revenue train load of 455 tons in 1912, as compared with 424 tons in 1911. The gain in train loading was entirely in revenue freight, company freight averaging one ton less per train. Not only did car loading increase (from 15.71 tons per loaded car in 1911 to 16.52 tons in 1912), but there was a notable reduction in empty car mileage. Total freight car mileage amounted to 271,478,000 miles in 1912, and of this total mileage, 194,513,000 was made by loaded cars, an increase over 1911 of 692,000 car miles, and 70,302,000 was made by empty cars, a decrease of 10,513,000 car miles. The very considerably heavier ton mileage was handled with 8,127,000 freight locomotive miles, which is less by 69,000 than the locomotive mileage in 1911.

The balance sheet of the Michigan Central at the end of 1912 showed cash on hand of $3,201,000, comparing with $3,311,000 at the end of 1911. Loans and bills payable remained the same throughout the year, namely, $4,500,000. The Michigan Central is not a heavily capitalized property, and although it used its credit to help finance the Detroit river tunnels and to guarantee the principal and interest of Canada Southern 50-year 5 per cent. bonds, of which $22,500,000 have been issued, it should under favorable bond market conditions not have any trouble in permanently financing its loans and bills payable.

The following table shows the principal figures for operation in 1912, as compared with 1911:

	1912.	1911.
Average mileage operated	1,817	1,817
Freight revenue	$21,218,205	$19,538,604
Passenger revenue	8,250,336	7,602,082
Total operating revenues	32,580,883	29,872,366
Maint. of way and structures	3,629,732	3,549,205
Maint. of equipment	4,711,843	4,469,291
Traffic expenses	764,733	783,599
Transportation expenses	13,313,059	12,049,163
General expenses	5,859,388	563,352
Total operating expenses	23,068,756	21,343,755
Taxes	1,366,985	1,322,621
Operating income	8,564,111	7,505,023
Gross income	9,624,774	8,675,980
Net income	2,726,333	2,116,364
Dividends	1,124,280	1,124,280
Surplus	1,602,053	992,084

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.

COINCIDING as it does with the demands of the firemen for higher wages now being heard before the arbitration committee, the publication of the annual report of the Cleveland, Cincinnati, Chicago & St. Louis for the calendar year 1912 gives a bit of unpremeditated evidence that is rather interesting. Total expenses on the Big Four were $1,674,000 more in 1912 than in 1911. Of this increase, $1,049,000 was due to increases in the payrolls in the maintenance and transportation departments.

The Big Four did a record business in 1912. Its total earnings amounted to $32,714,000, an increase over 1911 of $2,262,000. The road (2,012 miles operated) carried 4,084,231,000 revenue ton miles, an increase over 1911 of 458,864,000. Passenger revenue and business were somewhat smaller in 1912 than in 1911, but only about a quarter of the total operating revenues of the C. C. C. & St. L. are furnished by passenger revenue. With the increases in traffic handled, an increase of $1,674,000 in expenses is not excessive. The operating ratio on the Big Four is high, but was slightly less in 1912 than in 1911. It was 74.46 per cent. last year and 74.55 per cent. the year before. The increase in expenses, due to larger payments to employees, seems out of proportion to the total increase in expenses.

The C. C. C. & St. L. is controlled by the New York Central & Hudson River. It competes with the Pennsylvania Lines West and, as will be seen from the map published with the comments on the Lake Shore & Michigan Southern's annual report, its lines have somewhat the characteristics of a network. It is probably largely due to the fact that it has so much larger proportion of what may be called branch line mileage that its operating ratio is so much higher than that of the Lake Shore.

The Big Four carries a large proportion of low grade traffic, and while it gets a low average ton mile rate—5.43 mills in 1912—this is true also of the Lake Shore. Of the total tonnage carried, which amounted in 1912 to 25,817,000 tons, 11,139,000 tons were bituminous coal and 1,548,000 tons were stone, sand and like articles.

The class of expenses that seems high when compared with the Lake Shore transportation expenses. The following table shows the per cent. of total operating revenue that was consumed by each class of operating expense in the years 1912 and 1911:

	1912.	1911.
Maintenance of way and structures	11.97	11.07
Maintenance of equipment	17.95	17.81
Traffic expenses	2.61	2.40
Transportation expenses	39.84	40.40
General expenses	2.07	2.27

The revenue trainload on the Big Four increased from an average of 445 tons in 1911 to 474 tons in 1912. Car loading was better by about 5 per cent. The average number of tons of all freight per loaded car was 21.3 in 1912, and 20.2 in 1911. While there was a large decrease in empty mileage, there was an even larger increase in loaded car mileage, so that notwithstanding the heavier train load, the mileage of freight trains increased from 8,105,000 in 1911 to 8,580,000 in 1912. Loaded freight car mileage last year totaled 201,578,000, an increase over 1911 of 11,877,000; and empty freight car mileage amounted to 79,329,000 in 1912, a decrease from 1911 of 10,714,000.

The Big Four is not a heavily capitalized road. The total stock and bonds outstanding average about $72,400 per mile of road operated; but it is paying dividends only on its preferred stock, which totals $10,000,000, calling for $500,000 in dividends. There is $47,056,000 common stock outstanding which is receiving no dividends. After the payment of 5 per cent. on its preferred, the C. C. C. & St. L. had a surplus in 1912 of $1,844,000, as against $1,302,000, the corresponding surplus in 1911. The company readjusted through its profit and loss account its general balance sheet statement so as to correspond to the requirements of the Interstate Commerce Commission, and in so doing debited profit and loss with $1,385,000 for property abandoned from 1905 to 1912 inclusive. The company spent and charged

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to capital account $1,365,000 for additions and betterments to roadway and structures and $2,782,000 for new equipment, crediting the equipment account, however, with $1,129,000 for equipment trust instalments paid in 1907, 1910 and 1912, and for the balance in the equipment replacement fund. At the end of 1912 the company had on hand $3,537,000 cash, with total working assets of $10,573,000, and working liabilities of $8,235,000, of which $2,745,000 was loans and bills payable.

The following table shows the principal figures for operation in 1911 and 1912:

	1912.	1911.
Average mileage operated	2,012	2,012
Freight revenue	$22,168,002	$19,933,296
Passenger revenue	7,778,136	7,519,255
Total operating revenues	32,714,238	30,431,915
Maint. of way and structures	3,915,421	3,370,476
Maint. of equipment	5,872,422	5,418,645
Traffic expenses	860,666	912,751
Transportation expenses	13,031,333	12,293,691
General expenses	677,902	690,144
Total operating expenses	24,359,745	22,685,708
Taxes	1,190,243	1,062,512
Operating income	7,135,769	6,637,608
Gross income	7,892,577	7,345,340
Net income	2,344,352	1,801,616
Dividends	500,000	500,000
Surplus	1,844,352	1,301,616

NEW BOOKS.

Car Builders' Dictionary. 1912 (Seventh) Edition. Compiled and edited for the Master Car Builders' Association by Roy V. Wright, managing editor of the *Railway Age Gazette* and editor of the *American Engineer*, assisted by Andrew C. Loudon. Illustrated. 933 pages, 9 in. x 12 in. Published by the Simmons-Boardman Publishing Company, New York, and distributed by the McGraw-Hill Book Company, 239 West 39th street, New York. Price, leather bound, $6; cloth bound, $4.

This dictionary is too well known to require any description. The new edition cannot be properly designated as a revision of the last edition, since it is to all intents and purposes an entirely new book. The progress in car design and construction has been so great during the past three years that a large part of the illustrated section of the 1909 edition was found to be obsolete.

The designs illustrated in the present edition have been most carefully selected and represent approved modern practice in every particular. The smaller and lighter equipment has by no means been overlooked, but recent improved designs have been chosen as examples. The utmost care has been used to make the book complete and to cover the full range of rolling stock. This has resulted in a material increase in the size of the volume, in spite of the fact that the machine tool section given in the previous edition has been eliminated. The drawings are fully dimensioned, and all of the more important details are shown separately. Cross references giving the location of the drawings of associated parts accompany many of the captions and are one of the new features which will be fully appreciated. One of the most valuable parts of the book is that containing the standards of the Master Car Builders' Association, which are given complete, and in each case have been redrawn on a larger scale, making them much more legible than those furnished by the association.

In the definition section, all of the new terms that have come in general use during the past few years have been included, and their meaning made clear. Definitions of other terms have been completely revised, and in many cases entirely reworded. Among the new features are the complete details and specifications for postal cars as required by the United States government. The section on electric motor cars has been greatly extended, and an entirely new section on wrecking equipment and tools has been added. Typographically the book presents a much more pleasing appearance than former editions, and the reproduction of the photographs in the book is particularly well executed.

Letters to the Editor.

JAMES J. HILL'S STATISTICS.

BALTIMORE, Md., March 15, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Will you give me space to correct a momentary aberration?

In a letter which you were good enough to publish for me in your issue of March 14, in relation to Mr. Cunningham's criticism of James J. Hill's statistics, I made the statement that "all incomes are from 50 to more than 100 per cent. lower in Europe than here." Obviously this is an incorrect statement. What I intended to say was that "all incomes are from 50 to 75 per cent. lower in Europe than here." I may add that the statement has received very recent confirmation in so far as it applies to Germany in a statement by Dr. Gustav Stresemann in the *Manufacturers Record* of February 27. Dr. Stresemann says "the purchasing power of the dollar is scarce more than 2 to 2½ marks." This would make the scale for Germany from about 40 to 53 per cent. lower than income and prices in the United States. As Germany pays higher wages than the majority of the countries on the continent of Europe, it will be seen that my statement, as I intended to make it, is fully supported by quite recent evidence from Germany.

M. B. WILD,
Statistician, Baltimore & Ohio.

DEFLECTABLE HEADLIGHT.

CHICAGO, Ill., March 3, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In your issue of February 28, 1913, W. F. Schlaphorst sets forth the need of a deflectable headlight to illuminate the right of way on curves. Such a device was developed on the Missouri, Kansas & Texas, two years ago by J. R. Pratt, electrician, in which the parabolic reflector is revolved through a slight angle about a vertical axis passing through the focal center of the reflector. The reflector is operated by the engineer in the cab pulling a small lever which connects through a system of rods to the headlight. The headlight casing itself is in no way affected, the parabolic reflector shell alone moving. Since the reflector is revolved about its own focal center, there will be no change in the effectiveness of the beam of light as deflected on rounding a curve.

This design has been used to some extent on the M. K. & T., and is very popular with the locomotive engineers themselves.

EDWARD WRAY,
Publisher, *Railway Electrical Engineer.*

MORE PUBLICITY.

CHICAGO, March 8, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Railroad men quite generally appreciate the value of the right sort of publicity. It has often seemed to me that they have long overlooked an opportunity for effective publicity, especially in the smaller communities. Any traveler who has had occasion to wait for a train in a station situated in a town of 5,000 people or less has probably read and reread the few flyspecked and age-worn public notices that adorn the walls of the waiting room. Occasionally a picture may be found in the better class of stations, and at rare intervals some special advertising matter may be in evidence. As a general proposition, however, the traveler who has no book or paper to read is confronted with the necessity of passing the time before the arrival of his train, in idleness.

There are four classes of people that may be found in the waiting room at such a time, the loafer down to see the train go through; the townspeople who are there to meet friends; the professional traveler, and the casual traveler. At a time such as this in a station of the character previously indicated, an oppor-

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tunity is presented to the railroad company to make a specific advertising appeal to at least three of the four groups previously suggested. The value of such an opportunity has been recognized in other lines of business. The practice of calling the attention of the customer to particular features that may be of mutual interest is universally followed in the better classes of merchandising establishments. Particularly, increasing emphasis is placed upon the character of the service offered.

It would seem that a weekly bulletin service would constitute a comparatively inexpensive, but entirely adequate, method of utilizing this opportunity. An attractively designed and printed bulletin placed upon the wall of the waiting room upon which appeared a number of items of general interest pointedly stated could be made a most effective factor in the interest of the right kind of publicity. Upon this bulletin attention could be called to improvements in service, records in safety, traffic handled, expenditures to make facilities more adequate and other features pertaining to the railroad company which would be of interest and a matter of local pride to the people of each community. Such a bulletin service could also be made of value in calling attention to sectional needs in an agricultural, commercial and industrial way. It would also afford an opportunity for pressing home to the reader each week that the business of the company was to serve his interests in every possible manner. A high standard of service is, of course, the first and most essential factor in the relation of the railroad to the public. A persistent policy of tactfully calling attention to various features of the service is equally important. Persistent repetition of even self-evident facts has a definite advertising value. A bulletin service of the type suggested would afford a convenient and comparatively inexpensive method of accomplishing this result.

The expense connected with such a service would be very nominal as compared with many forms of advertising which are very commonly employed. The three items of expense would be, a writer to produce the copy—this is not office boy work—the expense of printing the bulletins and the expense incident to the distribution of them.

In summary there are three essential considerations with reference to this suggestion: (1) a large number of people in a receptive mood. (2) an abundance of interest and valuable data for company customers, (3) an advertising medium that has the merit of comparatively slight expense.

Such a service would be welcome to at least one casual traveler.

GEORGE A. CLARK.

PRIZES FOR ALERTNESS.

BUFFALO, N. Y., March 18, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have read with much interest your article, in the last issue, on the order which has been promulgated on the Pennsylvania Railroad instructing passenger trainmen to freely convey information to passengers; and particularly with your suggestion that where this information has to come through the office of the despatcher everybody interested ought to be on the alert to receive and give out information in the shortest possible time.

Why would it not be a good plan to give "merits" for quick action in matters of this kind? This could be done in the same way that some of the roads, where the Brown system of discipline is in effect, give station men and others commendatory notices when they discover a broken wheel or a loose brake-beam. Or, to make the matter more business-like, why not offer a definite prize, perhaps only a small one, to be awarded every six months to the despatcher or station agent or conductor, who makes the best showing of alertness in this matter?

I recall that on some road in Indiana, I think it was the Wabash, some time ago, mention was made of how, by a little friendly rivalry between crews, the time taken to gather a wrecking crew and start out a derrick car had been very greatly reduced. If men take pride in thus clearing the road when it is obstructed, why can we not also school ourselves to take pride in clearing up passengers' troubles, when they are anxious because of a blockade on the line?

G. H. M.

SEE AMERICA FIRST?

PHILADELPHIA, January 20, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Your request, some time since, for my views on the subject of "See America First," has not been overlooked, but this is my first opportunity.

Undoubtedly the novelty of a sea voyage and the sight of foreign lands is a strong attraction to the would-be traveler, with money to spend, for his first trip; and it is not so strange that his patriotism should succumb, especially after hearing what his more experienced friends can tell him of comparative costs. But just at this point patriotism succumbs a second and many more times. Europe affords many districts where one can find more than enough to interest him for all summer, with but a few miles of railroading, and almost every night one may rest comfortably in a clean bed, after a well cooked and carefully served dinner, and all for a very modest price. Great hotels in great cities are much the same the world over; but rarely in this country can one find real comfort devoid of extravagant elegance, or for a moderate price.

And the question of railroad comfort is not so one-sided as is often asserted. The American is quite likely to look with scorn on European railroads and their methods, but let him learn those methods, fit his ways to them, and he will find an ease and comfort of travel which cannot be surpassed in this country, if it is often equaled.

Another point of no little moment in the life in Europe is the generally greater respect shown for law and order. (I have always been most deeply impressed, on my return to this country, by its absence.) I have never found even German police regulations oppressive, but on the other hand, have felt a calm comfort in joining in the uniform obedience, for the common good. City street traffic affords an ample field for observation on this point. After all, there is little difference in the habit of mind which sends the careless teamster past the traffic officer's raised arm at a crowded crossing, and that which sends a locomotive engineer past a stop signal. Both are more frequent in this country than in Europe.

The difficulty lies deeper than the individual; it lies in the laxity of public opinion, which is ready to excuse and condone the invitation provided disaster does not accept it.

Another element which affords much comfort and pleasure to the traveler in Europe, and the frequent lack of which causes much discomfort here, is the cheapest thing in the world—courtesy. That it is often superficial makes it no less effective, and the film, however thin, is vastly better than none at all. The hotel manager who, at our departure, came to our cab door, bowing his thanks for our patronage, and presenting Mrs. Busch with a bouquet of roses, left with us a sense of pleasure and a desire to return, which I have never experienced on leaving any hotel in this country. Many Americans will laugh at this excess, but it is very pleasant; and it pays, as the transatlantic passenger lists will show.

A German gentleman whom I met last summer, said one morning, as we were steaming up a Norwegian fjord: "Tell me why I should go to your country; what more can I see there? My home is in Mannheim. In two hours and for a few marks I can be in Switzerland; or, it is not so much further to this northern country, where I can live well for six kröner ($1.27) a day. I know you will tell of your great cities, but I mean apart from them; I am thinking of a place to spend my vacation pleasantly. The Yellowstone? How far? What would it cost? Five hundred marks and more for railroad alone from New York there and back. Think what I can do for that sum here. Why should I go? What can I see there? Tell me."

I was at a loss. What answer would convince him that he should see America at all?

HENRY PAUL BUSCH.

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STUDIES OF OPERATION—THE B. R. & P.

Increased Transportation Costs Per Gross Ton Mile Offset by Moving Traffic in Such a Way as to Get Competitive Business.

By William E. Hooper.
Associate Editor *Railway Age Gazette.*

The Buffalo, Rochester & Pittsburgh is an independent road in highly competitive territory with an excellent credit, operating about 569 miles, with a heavy freight traffic density and a fairly large passenger business. The fact that it is independent, in highly competitive territory, and being very successfully managed, indicates that a highly efficient organization must have been developed and most progressive policies must have been adopted.

If we study any large railroad system like the Chicago, Rock Island & Pacific, or the Pennsylvania as a whole, we get a great number of averages which are the result of any number of variables, each variable being in many cases itself an unweighted average. Weather conditions, material costs, labor costs, traffic conditions, standards of operation, all are radically different in Minnesota and in Texas. The Buffalo, Rochester & Pittsburgh is, in respect to operating conditions, a unit, and a study of these conditions has the further advantage that the B. R. & P. does not have its problems and its conditions of traffic forced on it by some outside considerations which have little, if anything, to do with that particular property. Its problems and conditions are those of an individual, not of some incomplete part of an individual.

The road is divided into four main line divisions, the Rochester division from Rochester to Ashford, the Buffalo division from Buffalo to Salamanca, the Middle Division from Salamanca to DuBois, and the Pittsburgh Division from DuBois to Butler Junction, including joint tracks to Pittsburgh and New Castle, at each of which points independent freight terminals are maintained.

Until eight or ten years ago the road depended almost entirely on coal tonnage, but notwithstanding the fact that the B. R. & P. has to meet competition of strong lines both for through and local business on nearly the entire length of its line, a very good business in general freight traffic other than coal has been built up. At the end of 1912 more than 50 per cent. of its earnings was from sources other than the transportation of coal, and more than 50,000,000 passengers were carried one mile, the passenger revenues alone amounting to over 11 per cent. of the total revenue from all sources. The B. R. & P. has had to depend, for its development of passenger and general freight traffic, largely on the quality of service which it can offer to shippers and travelers. Under circumstances such as these, the efficiency of operation cannot be judged solely, or in fact primarily, on the reduction in operating costs. The B. R. & P. itself figures that it loses 5.42 mills per mile on each passenger that it carries. As a matter of fact it probably makes money on its passenger business as well as on its freight business, but in both branches if the B. R. & P. is to handle the business at all, quality of service must be the first consideration. The study of operation of this road then divides itself into an exposition of operating methods and an analysis of costs.

To develop service that will be satisfactory to both the shipper and the traveler, and to perform this service economically, it is first of all necessary that all departments of the road act in close conjunction with each other. In other words an organization must be developed which will act as a unit. The word unit has become associated with divisional organizations; the B. R. & P., however, is organized on a strictly departmental basis.

All of the general officers report directly to the president, and acting as a board of management, it results in a compact, thoroughly competent and thoroughly loyal unit whose energies have been directed with extraordinarily good results toward the solution of a rather difficult problem. It is not intended to go into a discussion here of the financial results that have been obtained on the Buffalo, Rochester & Pittsburgh. It is sufficient to say that in the fiscal year ended June 30, 1912, the company earned $1,770,895 after the payment of all fixed charges, and was able to increase its dividend from an annual 5 per cent. to 6 per cent. A study of how these results have been obtained is a study of innumerable details; each detail, however, attacked along certain definite lines. It is impossible to *define* the principle that has governed this development. It is possible, however, to suggest these principles by describing the way certain particular problems are handled.

Coal and coke traffic originates on branch lines joining the main line near Indiana Junction and DuBois. The greater part of this traffic moves north to Rochester, where it is either shipped to Canada and St. Lawrence river territory via Lake Ontario or turned over to connecting eastern lines. Trains are moved solid from these junctions to Salamanca yards, and since the B. R. & P. is not a low grade line, a great deal of double-heading is necessary. The greater part of the coal and coke equipment sent north loaded returns south empty, and of course, it is necessary for power used in double-heading to be sent south under light rating. Furthermore, the empty cars must be distributed to the mines promptly and on the proper basis. Since almost the entire merchandise and manufacturers' business is highly competitive, this business must be moved promptly; but here again the most important factor in getting the business lies in having equipment available at once at the points where it is wanted.

It will be seen, therefore, that there are two factors which must be considered in determining expenditures for power, schedules for freight trains, etc. The nature of traffic permits of heavy loading, while the exigencies of the traffic and of competition necessitate prompt movement. Furthermore, it is not considered as expensive to send power south that is able to maintain a fairly high speed with light rating as it would be to send heavier power south with a light rating that would not permit of as rapid movement. In other words, the Buffalo, Rochester & Pittsburgh has a traffic and a profile northbound that would suggest the use of Mallet locomotives, but other conditions modify the situation to such an extent that Mikado locomotives are being used on the heavier grades and in pusher service, displacing lighter power. On the heavier grades, where a Mikado is used in pusher service, it is taking the place of two consolidation locomotives, so that now a consolidation and a Mikado are used where previously three consolidations were used.

The object aimed at in passenger traffic development is to afford comfort rather than speed, this same tendency is consistently carried out in all expenditures made on account of the passenger department. It is safe to say that little, if any, additional expenditure is put into maintenance of roadbed to provide for high speed passenger trains, while on the other hand a considerable amount of money is being spent for passenger stations that are comfortable and attractive for the towns in which they are built. In this regard a detail of passenger operation is worth mentioning. Cafe cars are being operated on local passenger trains. It is a rather interesting experiment, and is mentioned here because it is an indication of how particular

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operating problems are being met and because the fact that a cafe car is being carried on local trains has a decided effect on the cost of operation.

It has already been suggested that the measure of the efficiency of operation in the freight department is the promptness and adequacy of car distribution. The method of keeping track of this car distribution and of the movement of loaded and empty cars on the line is not different materially from that in use on quite a number of other lines. On its face it is the ways in which the ordinary methods of operation are used rather than the methods themselves that are of special interest. A situation report, such as is made up at 6 a. m. and 6 p. m. on the B. R. & P., is shown herewith. The situation report, of course, goes to the general manager, superintendents, superintendent of car service, trainmasters and despatchers, and also goes to the president. In addition to this situation report, there are six other important reports that are used by the despatchers, trainmasters and superintendent of car service.

It may be said that these six other reports are elaborations of the report on the situation. This report tells what has been done the day before and what has to be done during the next succeeding 12 hours. The other reports show what cars are available to do this work, and it is through the manipulation of these cars that the despatchers and the superintendents do their most important work. The situation is further complicated by the fact that the B. R. & P. is an originating road, nearly 90 per cent. of the total traffic carried originating on its own lines and a very large percentage of this traffic being shipped off the lines.

Since 1908, up to and including the entire calendar year 1912, the B. R. & P. has supplied its coal shippers with 100 per cent. of their requirements for cars. This is not an average situation; that is, the shipper has not received eventually 100 per cent. of his requirements—he has received it day by day, even during the period of rather severe car shortage in the latter part of 1912. In 1909 1,244,946,097 ton miles and 44,914,997 passenger miles were carried, and in 1912 1,704,307,001 ton miles and 51,101,188 passenger miles were carried. To obtain this result, one or both of two things must have taken place. Facilities have been increased or the organization has been perfected so as to make materially greater use of the same facilities, or—and this is what has actually happened—there has been some increase of facilities with a marked increase in the efficiency of their use.

In 1909 $560,630 was spent for additions and betterments to roadway, and all of these may properly be charged to additional facilities for use of the transportation department; in 1910 $906,456 was spent for additions and betterments, of which $824,081 may properly be charged for new facilities for the transportation department; in 1911 $1,117,282 was spent for additions and betterments, of which $1,045,724 was properly chargeable to improved facilities for the transportation department; and in 1912 $633,664 was spent for additions and betterments, of which $556,111 was properly chargeable to increased facilities for the transportation department. It has been the practice of the B. R. & P. to make special appropriations each year from income to the sinking fund under equipment agreements, a portion of which is used for the purchase of new rolling stock, and the balance to retire a part of the equipment trusts bonds falling due each year. These appropriations amounted to $315,000 in 1910, $371,300 in 1911 and $375,000 in 1912. Further there was a net addition of $2,820,438 to the equipment account provided for from current assets and the issuance of equipment bonds. This is a total of $2,986,546 spent on roadway and track and $3,195,438 spent on new equipment.

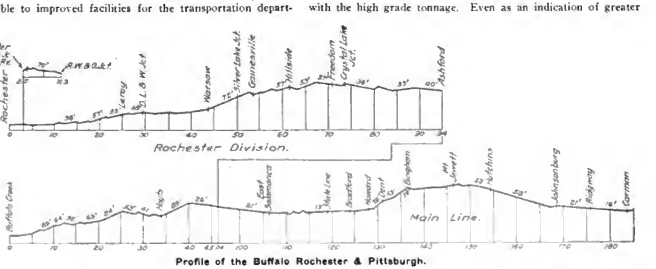
It is interesting to note that by far the larger proportion of the sums spent for additions and betterments, other than equipment and double tracking, was spent to avoid waste of material and labor, such, for instance, as water storage reservoirs, mechanical coal and ash handling facilities, and creosoting plant where ties, piles, bridge timber and other structural lumber is creosoted.

In 1909 the company's locomotives had an average tractive effort of 30,995 lbs., in 1912 this had been increased to an average tractive effort of 33,180 lbs. Freight service cars had an average capacity in 1909 of 36.62 tons, and in 1912 an average capacity of 40.23 tons, with less than 1 per cent. out of a total of more than 16,000 cars out of service for repairs, and 90.69 per cent. of locomotives out of a total of 300 in service in good condition.

The provisions for water supply are very important as an added asset of the company, but, for the purpose of our study, are only one of the many details that go to explain the results that the operating department has obtained, and their importance is more a question of farsighted investment for the future than immediate moment to the operating department, although the latter advantage should not be overlooked.

The total ton mileage moved behind the drawbar, including passengers and freight and weight of equipment in 1909, was 2,202,-189,301. In 1912 this ton mileage was 2,994,457,899. Car loading per loaded car was 12 per cent. greater in 1912 than in 1908.

Trainload is often taken as a measure of the efficiency of *operation* as between different railroads. As a matter of fact trainload is often more nearly a criterion of traffic conditions than of operating conditions. Take an extreme example; a road having freight mainly made up of merchandise and bulky commodities, such as dry-goods and furniture, may show a trainload of 300 tons, while a road with a large proportion of its tonnage furnished by products of mines and heavy manufactures, such as originate in the Pittsburgh district, may show an average trainload of 600 tons, and yet the road with the low grade tonnage may not actually be operated with as great economy as the road with the high grade tonnage. Even as an indication of greater



Profile of the Buffalo Rochester & Pittsburgh.

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or less efficiency from year to year, on the same road the trainload is not a sure guide to conditions of operation. Too much emphasis cannot be laid on this consideration because it is seldom given due weight in discussions of operating efficiency.

Total empty car mileage is largely a matter that is a concern of the traffic department rather than of the operating department. A gain of 50 per cent. in operating efficiency on a road like the B. R. & P. would reduce empty car mileage to an almost negligible degree. It is true that with heavier power, elimination of grades, etc., the average trainload can be increased, but these things are only two of numerous handles by which the management of a railroad grasps the problem of reducing operating costs and of increasing operating efficiency. The B. R. & P. has in use tonnage rating machines at important terminal yards that have helped materially in giving engines their full rating. Operation is a continual game in which new conditions have to be met, and in the last analysis the best measure of whether or not the operating department is working to the best advantage lies in the answer to the question: Is the shipper receiving the service which will induce him to use this particular road, rather than another, at a cost that leaves the railroad a gainer from his traffic and not a loser?

This means in the first place that the road must have sufficient equipment to handle the business which it can under the most favorable operating conditions originate. This equipment must be utilized to its fullest possible capacity under the conditions that occur from month to month. Train despatching, car loading, motive power, organization, all play their part, and organization is not the least important of these factors.

The conclusion from all this is that it is not so much increased facilities that have enabled the B. R. & P. to obtain the results that have been obtained as increased efficiency in the use of these facilities. Now comes a question as to what has been the trend of costs of performing this additional service. We know that the scale of wages paid employees has materially increased during the four years 1909 to 1912. Has the cost of doing business on the B. R. & P. increased in anything like the proportion that the business done has increased? In other words, making full allowance for the increased scale of wages, has the management been able to show anywhere near the same increases in efficiency as has been shown in the use of the physical plant? The B. R. & P., like every other road in the country, has shown materially larger labor costs.

Reducing this cost to a gross ton mileage* basis, transportation expenses in 1909 per gross ton passenger mile cost 0.2837 cents and in freight service transportation cost 0.0810 cents per gross ton mile. In 1912 the cost in passenger service for transportation expenses was 0.3135 cents and in freight service, 0.0906 cents. This is an increase in cost of moving passenger business of 10.5 per cent. and in cost of moving freight business of 11.9 per cent.

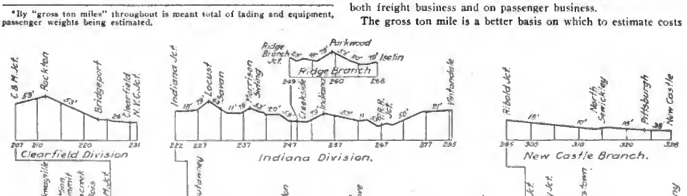
*By "gross ton miles" throughout is meant total of lading and equipment, passenger weights being estimated.

During these four years the scale of wages on the Buffalo, Rochester & Pittsburgh for all classes of employees in train service has increased approximately 12 per cent.

While transportation expenses can be so accurately divided as between passenger and freight, it is not possible to divide maintenance of way expenses except on some arbitrary basis. Maintenance of way, however, can be fairly accurately divided. The question of dividing these expenses as between passenger and freight is not one which can be solved in any general way. Each road is a different problem. On the Buffalo, Rochester & Pittsburgh there is no very fast passenger service. It is strictly accurate to say that the roadbed, bridges, etc., would be kept in just as high a state of repair and the standard of upkeep would be the same whether or not there were any passenger trains running. Rails, ties and ballast wear out on such a road in proportion to the tonnage hauled over them where there is no complicating factor of high speed. If we divide, therefore, all the maintenance of way expenses on a ton mileage basis, with the exception of those expenses such as freight and passenger station maintenance, which can be divided directly, we would get for the B. R. & P. a fairly accurate apportionment of these expenses as between the two classes of service. Maintenance of equipment can largely be charged directly either to freight or passenger equipment, according to the object of the expenditure, and it is fair to divide the other expenses under the head of maintenance of equipment on the same ratio as between freight and passenger as are the expenses under this head that can be charged direct.

General expenses must be divided on some arbitrary basis. On a road like the B. R. & P. a ton mileage basis seems a fairer basis than a train mileage basis. Using this method, namely, to divide transportation expenses on the basis on which they are actually made and the remainder on a train mile basis; to divide maintenance of way expenses on a ton mileage basis, with certain exceptions; maintenance of equipment on the basis of actual expenditure or on this proportion; and general expenses on a ton mileage basis, we find that the cost per gross ton mile for all expenses for freight in 1909 was 0.194 cents and in 1912, 0.199 cents. For passenger business the cost was 0.445 cents in 1909 and 0.464 cents in 1912. Since the receipts for freight are on a net ton mileage basis and for passengers on a passenger mile basis, it is interesting to divide costs on this same basis. The cost per revenue ton mile in 1909 was 0.320 cents and in 1912, 0.328 cents. The receipts per revenue ton mile, including receipts for switching service, were 0.488 cents in 1909 and 0.486 cents in 1912. The cost per passenger mile in 1909 was 1.526 cents and in 1912, 1.534 cents, while the receipts per passenger mile in 1909 were 2.225 cents and in 1912, 2.387 cents. The company figures its expenses on a train mile basis and shows a loss on passenger business and a profit on freight business; but, as was previously suggested, on the basis on which expenses are divided here, there is a profit shown on both freight business and on passenger business.

The gross ton mile is a better basis on which to estimate costs



Profile of B. R. & P. (Continued).

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of repairs of locomotives than any other that the writer knows of, when the object to be attained is the comparison of cost as between different years on the same road. Of course, where one road is to be compared with another the effect of grades is so great that this unit of comparison loses much of its meaning; but over a period of four years on the same road where the grades have not been materially changed, the cost of repairs of locomotives per gross ton mile is an accurate measure of the efficiency of the motive power department. Increases in labor cost have affected the cost of repairs of locomotives so that if we were to find no higher cost in 1912 than in 1909 it would be fair to assume that there has been an increased efficiency in this department. As a matter of fact, however, the repairs of passenger locomotives cost 0.0466 cents per gross ton mile in 1909 and 0.0457 cents in 1912, and the repairs of freight locomotives per gross ton mile cost 0.0181 cents in 1909 and 0.0138 cents in 1912. This is a remarkably good showing.

It should be borne in mind that this study of cost was for the years 1909 to 1912, inclusive. The Mikado locomotives, which have been put into freight service, and the Pacific type locomotives, which have been put into passenger service, were not in use in the fiscal year 1912, so that the effect of their use cannot be shown in this discussion. This is true of other improvements which the B. R. & P. has made or is making in the present fiscal year. Telephone train despatching, which has been in use on the Rochester division for some time, is being extended to the Middle and Pittsburgh divisions. Automatic block signals are being installed this year on the Rochester division, but none of these things had an effect on the cost or in the quality of service in the four years 1909 to 1912.

The B. R. & P. has recently put into effect a new system of applying discipline, and while this new system, of course, did not affect costs of service in the four years we are studying, it is one of numerous indications of the policy which has been pursued in perfecting the organization during these four years. Discipline on the B. R. & P. is decided on by a court presided over in the case of trainmen either by the trainmaster or the superintendent. Heretofore a man was disciplined by being suspended for a certain number of days. Under the new system, discipline is decided on in the same manner as before, but its application is withheld unless there should be cause for further discipline within a specified period of probation. A man who has committed some fault which the court decides should be visited with a suspension is put on probation for six months, a decree of suspension of over ten days and less than 30 days makes the period of probation nine months, and a decree of suspension of 30 days or over calls for a period of probation of one year. If an employee keeps a clear record during this period of probation, at the end of that time his slate is wiped clean and he starts over again. Should, however, the employee get into trouble during his period of probation, he must at once serve the suspended sentence which the court found him liable for, and in addition a new period of probation is started. This system has been in effect since October 1 and is working satisfactorily. It is saving money both to the company and to the employees and is saving a very considerable hardship on the part of the employee's family.

The spirit that lies behind this form of discipline is the spirit that has been the key-note of the management of the property during the four years under review. This is the spirit of co-operation. Co-operation to be successful must assume on the part of all those who participate in it a degree of intelligence and a desire for fair play that will make it possible to eliminate to a certain extent hard and fast rules.

It is this spirit of co-operation that more than anything else explains the results that have been obtained in the last four years. It explains the effectiveness of the methods that are used to run the service and in so doing meet competition. It explains the elimination of red tape and correspondence that is one of the noticeable features in the conduct of business on the B. R. & P., and it explains the remarkable lack of friction between the different departments. We can point to specific instances and tell how co-operation was secured, but under different circumstances

BUFFALO, ROCHESTER & PITTSBURGH RAILWAY CO.
SITUATION REPORT

6 A. M. _____ 191..
6 P. M. _____ 191..

NORTH BOUND — LOCATION	EXHIBITS	FORWARDED SINCE LAST REPORT: Through	Thro. Empties	Loaded Thro. Cars	Loaded Local Cars	READY TO GO FORWARD: Empty Thro. Cars	Empty Thro. Empties	Empty Local Cars	Empty Local Empties	Coal for Short-ville Docks	Coal for Genesee Docks	Coal for Dunn Street	Coal for Eastern and Connellsport	SOUTH BOUND — LOCATION	EXHIBITS	FORWARDED SINCE LAST REPORT: Through	Thro. Empties	Loaded Thro. Cars	Loaded Local Cars	TO BE FORWARD: Empty Thro. Cars	Empty Thro. Empties	Empty Local Cars
PITTSBURGH DIVISION	A	B	C	D	F	G	H	I	J	K	M	N	O	Q	R	S	PITTSBURGH DIVISION	U	V	W	X	Y	Z
Allegheny and Willow Grove	AB																DuBois	DI						
New Castle Jct.	AC																Clearfield	DJ						
Butler Jct.	AD																C. & M. Jct.	DK						
Kelso via DuBois	AF																Cummings	DM						
" " Clearfield	AG																Laverne	DN						
On B. V. R. R. for delivery	AH																Tarbis	DO						
Dayton	AI																Tarbis No. 2	DP						
Punxsutawney via DuBois	AJ																Punxsutawney	DQ						
Weights at NK for Light Repairs	BH																	FO						
Totals	BI																Totals	FP						
Trains, Engines & Cars Enroute	BJ																Trains, Engines & Cars Enroute	FQ						
MIDDLE DIVISION		A	B	C	D	F	G	H	I	J	K	M	N	O	Q	R	S	MIDDLE DIVISION	U	V	W	X	Y	Z
DuBois	BK																	East Salamanca	FR						
Falls Creek	BM																	Rockford	FS						
On B. & P. C. for Delivery	BN																	Clarion Jct.	FU						
Laney Mills	BQ																	Other Points	FW						
Engines at DU for Light Repairs	BS																		GB						
Totals	BT																	Totals	GC						
Trains, Engines & Cars Enroute	BW																	Trains, Engines & Cars Enroute	GE						
BUFFALO DIVISION		A	B	C	D	F	G	H	I	J	K	M	N	O	Q	R	S	BUFFALO DIVISION	U	V	W	X	Y	Z
East Salamanca via Bliss. Div	BX																	Buffalo Creek	GP						
" " Rock "	BV																	Ashford	GK						
Other Points	CA																	Other Points	GI						
Buffalo Creek	CB																	Engines at BC for Light Repairs	GJ						

NA NB NC ND

Form of Situation Report.

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the method of securing this co-operation would be different, although the final result might be the same. The nearest that one can come to a definition is to say that the treatment of officers and men alike is based on the assumption that they will recognize fair treatment, and that they are at heart working for the best interests of the service as a whole.

One of the best ways to eliminate misunderstanding is to avoid unnecessary correspondence. This fact is recognized on nearly every railroad in the country. It is one of the underlying principles of the Hine system of unit organization. It is on the Buffalo, Rochester & Pittsburgh an accomplished fact, and it is an accomplished fact because each department is made an intelligent part of a complete organization. Not only are a few heads of departments permitted to come together in discussion of common problems, but all the officers of each department are made to understand that the great majority of their problems are problems common to other departments. This co-operation is not attained in a mechanical way and therefore does not lend itself easily to description or analysis. The fact that discipline is administered by a joint court, composed of officers from different departments; the fact that there are frequent and informal meetings between officers of different departments for discussion, or that every three months an inspection trip is made of the entire road, in which the heads of all the departments join and during which there is absolutely free discussion, does not do more than tell part of the story. All of these things are aids to the development of this spirit of intelligent co-operation. All of them together would be comparatively weak aids were they not backed up by faith founded on experience. This faith is more effectually engendered by the fact that to the common knowledge of employees and officers, an employee who has met with misfortune through no fault of his own is treated by the company not as a tool which is no longer useful, but in a spirit of real generosity, better than by any elaborate merit system that has yet been devised.

There are certain conclusions that may be drawn from this study of operation on the Buffalo, Rochester & Pittsburgh. Passenger business, even on a road handling a heavy density of freight traffic, can be made a profitable branch of operation. Despite increased costs of operation, competitive business can be profitably developed if enough attention is paid to the development of the service. A loyal and efficient organization can be built up despite competition in the labor market and despite the modern tendency to regard the interests of labor and employer as antagonistic, without endangering the financial results which the management owes to the stockholders of a railroad.

TICKET ISSUING MACHINES ON THE LONG ISLAND.

The Long Island Railroad has in use in Brooklyn, N. Y., a number of machines for simultaneously printing and issuing tickets, and recording the number and value of the tickets issued, and they are working in a very satisfactory manner. The machines look somewhat like the familiar cash registers, seen in retail stores, and were made by the National Cash Register Company, Dayton, Ohio.

Machinery is provided in the metallic case for printing tickets of denominations from 5 cents to 35 cents, inclusive; they are for use only on the local electric trains. The printing mechanism is synchronized with the recording mechanism which shows the number and value of all tickets issued. Four different men can sell from the same machine, the tickets themselves and the automatic recording apparatus indicating by a designating letter the identity of the person making each sale. Each seller may look the machine so that none of the others can disturb his tickets or his records. A mechanical counter shows the opening and the closing numbers of the tickets issued each day. The counting apparatus also shows the total sales for any given period; and the agent has no reports to make, except a brief statement of the totals. The machines are operated by an electric motor and are capable of printing 100 tickets a minute.

ARBITRATION OF THE FIREMEN'S WAGE CONTROVERSY.

The entire first week of the arbitration proceedings in the Eastern firemen's wage demands was devoted to taking the testimony on the firemen's side and in cross-examination by Elisha Lee, representing the railroads. On Thursday, March 13, W. S. Carter, president of the firemen's brotherhood, called to the witness stand A. H. Hawley, secretary of the organization. Mr. Hawley, whose testimony followed that reported in the *Railway Age Gazette*, March 14, page 479, gave statistics of firemen killed and injured and figures pertaining to the insurance features of the brotherhood. He said that the membership had grown from 48,500 in 1903 to 85,300 at the end of the last fiscal year; that in 1911 and 1912 about 20,000 members had resigned or been dropped and 250 had died. Of the 20,000, less than 5,000, he claimed, joined the Brotherhood of Locomotive Engineers, the others entering other employment. From 1904 to 1912 there were 4,437 deaths, of which 2,124 were from railroad accidents.

Dr. Walter B. Cory, general medical examiner of the brotherhood, the next witness, gave it as his opinion that a fireman's work is extra hazardous and that exposure, heat, and other things weaken the men so that they are more subject to disease. He gave insurance companies' regulations to show that firemen are not considered good risks.

James Kirby, president of a carpenters' union, gave testimony regarding the wages paid in the building trades as compared with those paid firemen. Mr. Carter asked him if it was contrary to rules for a building-trades man to take a drink, either on or off duty, and Mr. Kirby replied that it was not. Mr. Lee interrupted to ask Mr. Carter if he was in favor of a fireman taking a drink while on duty, and the latter replied that he was not. In cross-examining, Mr. Lee brought out that carpenters and other artisans lost considerable time, due to bad weather, and that they furnished their own tools. Mr. Kirby had stated that no examination as to sight, hearing, etc., is required of a building trades man, and Mr. Lee asked him if he thought a color-blind painter would be much of a success. Mr. Kirby thought not.

S. T. Steinberger, of the brotherhood's general offices, gave statistics regarding the number of times firemen had worked over 16 hours, as shown in reports made by the railroads under the law, to the Interstate Commerce Commission. Mr. Carter was careful to bring out that he considered these as unavoidable and not infringements of the law. In cross-examining, Mr. Lee showed that, although a fireman gets paid overtime for time worked in excess of ten hours, the railroads get no increase in ton-miles.

D. B. Robertson, Youngstown, Ohio, a locomotive engineer on the Erie, followed with statistics purporting to show that a fireman's wages will buy much less of the necessaries of life now than in 1907.

Mr. Lee informed the board on Thursday that he had a communication from the Toledo, St. Louis & Western, asking to be permitted to withdraw from the proceedings. Judge Chambers, chairman of the board of arbitrators, refused permission, and when, on Friday, the matter was again brought up Judge Chambers said that the board had power to punish for contempt by certifying to the circuit court for the district, and he believed the Toledo, St. Louis & Western would be in contempt in withdrawing from the arbitration without the board's consent.

W. J. Lauck, a statistician of Washington, D. C., was the next witness. He had prepared tables, which, Mr. Carter stated, had cost the brotherhood $18,000. They dealt with the capitalization, train loads, revenue, etc., of the roads concerned in the arbitration and tended to show that the stockholders were receiving much more benefit from the increases in revenue than the firemen. Tables and statements were given for individual roads and a number of these were dealt with in considerable detail. In dealing with the Baltimore & Ohio, Judge Chambers

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calculated that wages had been increased about 48 per cent. in 11 years. Mr. Carter said this was misleading, as Mr. Lauck had been compelled to accept the figures filed by the railroads with the Interstate Commerce Commission, and that these were "absolutely erroneous." Mr. Lee immediately objected to Mr. Lauck's giving any further testimony if the figures were based on erroneous information. Mr. Carter then objected to any testimony along the same lines being introduced by the railroads. He claimed that members of the Interstate Commerce Commission had informed him that the railroads falsified their reports as to employees, and said that if they would falsify under oath to the Interstate Commerce Commission they would falsify to the arbitration board. He claimed that the enginemen got themselves into trouble in their arbitration by using the railroads' reports. Mr. Lee said he did not admit that the figures were false, but as Mr. Carter contended they were, he must persist in objecting to the admission of the tables based on them. Judge Chambers ruled that such a condition did not entirely invalidate the testimony. In the case of the New York, New Haven & Hartford, Judge Chambers asked why, in the face of the figures given, it should be necessary to reduce the dividend rate, which, according to press reports, Mr. Mellen, president of the New Haven, says will have to be done. Mr. Lauck replied that if the financial management had been as efficient as the transportation management, there would be no such necessity.

In cross-examining Mr. Lauck, Mr. Lee made it plain that he disagreed with a great many of his conclusions. One of Mr. Lauck's tables, using as a basis the revenue train mile, showed that operating revenue on the roads concerned had increased from $1.90 to $2.46, while the cost of firemen has increased only from 3.89 cents to 5.64 cents. Mr. Lee, calculating percentages, showed that this meant an increase in revenue of 29 per cent., while the cost of firemen had increased 45 per cent. Judge Chambers asked whether, if some roads could afford to pay more than others, the firemen would ask an increase only on those roads that could afford to pay it. Mr. Carter said if they were doing the work they certainly would ask an increase; and he compared the case with that of two buildings being erected, one by a wealthy contracting firm, and the other by a firm that had difficulties in making ends meet. He contended the workmen should get the same wages on both buildings; but Mr. Lee disagreed, saying that it is a question of demand and supply; that one family would pay a servant seven dollars a week while another paid $10; they paid according to their means.

Mr. Carter was very much afraid that by some of his replies Mr. Lauck was giving the impression that he repudiated some of his previous statements, but Mr. Lauck said he did not; that whatever objections he admitted as being fair, his general conclusions, that the firemen were doing more work, were correct. He admitted to Mr. Atterbury that he was not a practical railroad men and was competent only to pass on the question from the standpoint of an accountant. Mr. Lee again brought in the fact that in comparing the amount of coal handled, etc., for 1902 and 1912, Mr. Lauck had used percentages, and contended that the same method should have been used in other comparisons. Mr. Lauck said that revenue had increased 40 times as much as the cost of firemen, but Mr. Lee stated that increased operating expenses had absorbed a very large percentage of the increase. Mr. Lauck thought the firemen should be paid the same on two similar competing roads, even if one had a surplus and the other a deficit. Mr. Carter here brought in the question of weight on drivers, saying that payment on that basis meant payment according to productive capacity. He made a comparison between firemen and steel rail manufacturers, saying that if the railroads are prosperous the rail makers make a profit, and that when the mills cannot make a profit they stop making rails. Mr. Lee replied that, unfortunately, when the railroads do not make a profit they have to go on operating just the same. Mr. Carter again brought up the question of falsified reports made to the Interstate Commerce Commission, and repeated his previous statement regarding them. Mr. Lee replied that they were not false and that they were made according to the commission's requirements. He read from a statement of the commission in the railroad rate case, which said that railroad labor was paid as well as, and sometimes better than other forms; and that an increase in rates could not be permitted for the purpose of paying extravagant wages.

REPORT ON COLLISION AT BOWERSTON, OHIO.

The Interstate Commerce Commission has issued a report by Chief Inspector H. W. Belnap, on a rear collision of freight trains, causing the death of one employee, which occurred on the Pittsburgh, Cincinnati, Chicago & St. Louis, near Bowerston, Ohio, December 13, last. The line at this point is worked by the manual block system. A west bound freight, Extra, No. 8020, unexpectedly stopped when its rear car was about 1,500 ft. west of O B tower, and 1,000 ft. west of the home signal connected with this tower, was run into by a following freight, Extra, No. 8188. The collision occurred at 5:12 p. m., and the second train had been running at about 31 miles an hour from the last preceding station. Engineman Stocker, of this train, was killed. The flagman of the standing train had gone back and placed a red fusee on the track immediately in front of the tower, 1,500 ft. in the rear of his train. He was called in and had got back to his train a few minutes before the collision.

Freight trains are run under permissive block signals, and after the passage of train 8060 the signalman at O B had set his home signal at 45 degrees, indicating that the block section was occupied. With the signal thus set, he was able to give a clear distant signal, and this he did; this being the usual custom. As train 8060 had passed out of sight, the signalman acted in accordance with the prescribed methods, in displaying a clear distant signal to No. 8188. This, says the inspector, is not adequate protection. Moreover, the spectacles on the distant signal are so arranged that when the signal arm stands at 45 degrees, as it might if the connections were out of adjustment, a passing train would find no light at the distant signal, and might easily miss it; and thus would approach the home signal at an unsafe speed. Although the freight was running at about 50 miles an hour, there is a rule limiting the speed on this part of the road to 40 miles an hour. This rule had been in effect only 19 days. The inspector finds that it has been habitually disregarded, the train sheets showing many violations between November 24 and December 31.

Though the signalman did not disobey any rule, he is criticized for using bad judgment, especially when there was a red fusee burning directly in front of his cabin. The traffic on this division, says the inspector, is heavy enough to justify the use of block signals its entire length. A number of short sections are already thus equipped. Concerning the excessive speed of the freight train, the inspector says: "That the enginemen on this division pay no attention to the established speed restriction is a matter of daily record, and their failure to observe the rule must have been known and acquiesced in by the operating officers. Such dereliction of duty by those who are charged with the enforcement of regulations cannot fail to weaken respect for all rules and render nugatory all efforts to maintain really effective discipline. Rules that are not intended to be enforced have no proper place in a railroad company's code of regulations, and when the operating officers of a railroad permit rules that have been enacted to secure safety to be violated with impunity, they cannot reasonably expect to escape responsibility for the consequences of such violation." The inspector calls for a flagging rule entirely free from uncertainty or indefiniteness; one which would leave no room for error of judgment by a flagman.

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POSTAL CAR ILLUMINATION TESTS.

Results of Extensive Tests Made by the Baltimore & Ohio, and Used as a Basis of the New Government Specifications.

The character of the visual work performed in the railway postal car requires a high quality of illumination, and the long hours during which artificial light is required, make the problem of furnishing a reliable and economical supply a difficult one. For the purpose of obtaining more adequate data on this subject the Baltimore & Ohio, through its electrical department, made an extensive series of tests during the fall of 1912 in Washington, D. C., on one of its latest types of steel postal cars. The standardization of the construction and of the arrangement of this type of car makes it possible to draw conclusions from these tests that will generally apply to cars built under the present government specifications.

Although the tests were carried out on a broad engineering basis, covering all practicable methods of car illumination available at the present time, the investigation was confined solely to the question of providing proper and adequate illumination. The questions of maintenance, of the most desirable kind of illuminants, and of the operating problems connected with the generation of light were not considered further than with respect to their influence upon the quality of illumination provided. In detail, the phases of the subject covered were the relative suitability of: first; Pintsch gas and electricity, representing the most important types of primary illuminants, as far as their influence upon the quality of illumination produced was concerned; second, the different types of reflectors and diffusers; and third, the different types and arrangements of lighting units. The investigation consisted of illumination tests to ascertain efficiency and uniformity data as well as shadow effects obtained with the various types of lighting units and spacing arrangements; also, visual intensity tests to ascertain the intensities of illumination required in the different sections of the car by the character of the visual work performed in those sections.

Two important features brought out by the investigation were; that adequate illumination may be provided with the amount of light that is at present generally provided by most railroads, the unsatisfactory illumination frequently obtained being largely due to the improper arrangement of the light units and unsatisfactory types of reflectors; and that the amount of illumination required for the work in the postal service has been considerably over-estimated.

In the direct system of illumination the correct location of the light is determined by absence of the shadows. In the bag rack section of the car the light units should be located along the center line of the car and the mounting height should be 7 ft. 7 in. from the floor to the center of the lamp filament or gas mantle in order to produce the least objectionable shadow effects as well as to eliminate shadows on the rear bag rack label. At the letter cases adequate illumination can be provided for only by light units independent of those used for illumination of the body of the car, and such light units should be located as far in front of the case as possible without shadows being thrown on the work by the body of the mail distributor. With the standard design of letter case having a 17 in. table this distance is 20 in. from the front of the letter case.

In determining the best types of reflectors for postal car service four qualities were considered; the effect of the resultant illumination upon the eye; the relative efficiency; the cleaning consideration; and the liability to breakage. As these are not of equal importance the following relative values of these qualities were chosen after considering the question from several different points of view. Out of a total of 100 points an importance represented by the following figures was assigned to each of the qualities under consideration:

Effect on the eye	44
Efficiency	30
Cleaning	18
Breakage	8
Total	100

On this basis the relative suitability of the various types of reflectors for postal car lighting was found to be as follows:

Class of Reflector.	Make of Reflector Represented in Tests.
Aluminumized metal	Holophane D'Olier No. 18460 body of car; Holophane D'Olier No. 18470 at letter case.
Heavy density opal glazed reflecting surface (specially designed for car lighting service)	Holophane No. 18626 redesigned.
Medium density opal glazed reflecting surface	Phoenix CL-50.
Porcelain enameled metal	Holophane D'Olier No. 18461.

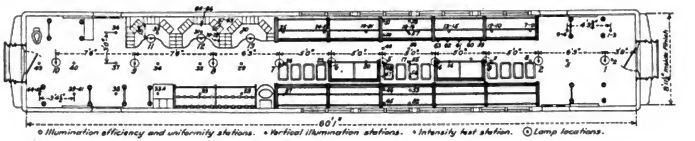

Fig. 1—Location of Stations and Lamps with 5-ft. Spacing.

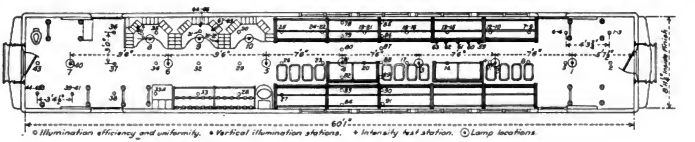

Fig. 2—Location of Stations and Lamps with 7½-ft. Spacing.

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Class of Reflector.	Make of Reflector Represented in Tests.
Medium density opal depolished reflecting surface	Macbeth-Evans Alada No. SF-1623.
Indirect lighting with enameled reflectors for gas lighting	Experimental enameled reflector.
Mirrored glass (direct lighting)	X-Ray 535.
Prismatic clear	Holophane No. 18226.
Prismatic satin finish	Holophane No. 18226-SF.
Reflecting and diffusing globes	Safety Corona No. 8026.

Extensive tests to determine the amount of illumination required for comfortable reading indicated that there was an appreciable difference in the character of the illumination afforded by different types of equipment. Certain types gave an illumination of such a character as to leave the eye in a less satisfactory condition for vision, thus requiring an increased intensity of illumination for adequate vision. For practical purposes it was found that with direct lighting systems the equipment could be divided into two classes relative to the character of illumination produced; one in which the specular element was considerable, such as was obtained from direct lighting systems employing mirrored glass, porcelain enameled, heavy density opal reflectors with glazed reflecting surface; and one in which the illumination was largely diffused, such as was obtained from direct lighting systems using diffusing globes, opal reflectors of all classes ex-

A SUMMARY OF THE BALTIMORE & OHIO ILLUMINATION TESTS.

Installation.	Entire Car. Nature of Value.	Entire Car. Foot candles.	Entire Car. Per Cent. Useful Lumens.	Bag Rack Section. Ft. C. Center of car.	Bag Rack Section. Ft. C. Mouth Bags.	Bag Rack Section. Ft. C. Vertical on Pap. Bk.	Letter Case Section. Horizontal Ft. C.	Letter Case Section. Vertical Ft. C.	Storage Section. Foot candles.
Mirrored glass, X-Ray 696, 5 ft. spacing, 1 3/16 in. position	Avg.	6.03	62.3	12.04	3.77	3.74	10.75	4.67	3.84
	Max.	17.60	....	17.90	3.98	4.74	12.70	12.04	8.90
	Min.	2.12	....	7.28	3.37	2.16	8.80	2.72	2.12
Prismatic clear, Holophane 18226, 5 ft. spacing, 1¾ in. position	Avg.	5.29	54.6	8.38	3.45	1.95	7.87	4.48	3.65
	Max.	14.65	....	9.86	3.69	2.46	9.52	6.67	6.76
	Min.	2.02	....	7.72	3.20	1.59	6.42	2.01	2.02
Prismatic clear, Holophane 18226, 7½ ft. spacing, 1¾ in. position	Avg.	3.97	53.4	6.13	2.47	1.17	6.94	4.48	2.92
	Max.	11.30	....	8.39	3.40	1.69	7.67	6.67	8.00
	Min.	.89	....	4.79	1.97	.97	6.14	2.01	.89
Heavy density opal, Holophane 18626, 5 ft. spacing, 1¾ in. position	Avg.	5.09	51.8	8.33	3.59	2.75	7.69	5.05	3.42
	Max.	11.55	....	10.38	3.93	4.06	9.03	8.54	6.46
	Min.	2.09	....	7.66	3.26	1.91	6.17	2.27	2.09
Heavy density opal, Holophane 18626, 7½ ft. spacing, 1¾ in. position	Avg.	4.09	56.4	5.87	2.76	1.74	7.83	....	3.04
	Max.	12.52	....	9.49	3.76	3.35	9.79	....	8.83
	Min.	1.03	....	4.63	2.38	.98	6.51	....	1.03
Medium density opal, Phoenix 10456, 5 ft. spacing, 1¾ in. position	Avg.	3.14	42.8	5.21	2.43	1.01	5.36	3.01	2.66
	Max.	8.45	....	7.62	3.72	4.65	5.72	5.09	5.50
	Min.	2.14	....	5.21	2.91	3.19	4.78	1.22	2.14
Prismatic satin finish, Holophane 18226 SF, 5 ft. spacing, 1¾ in. position	Avg.	3.78	39.0	6.07	2.89	2.52	5.51	3.26	2.74
	Max.	7.95	....	6.87	3.13	3.08	6.14	5.10	4.73
	Min.	2.09	....	5.26	2.51	1.59	4.95	1.46	2.09
Aluminumized metal, Holophane D'Olier 18460 and 18470, 5 ft. spacing, 1¾ in position	Avg.	4.28	44.2	5.86	3.35	2.66	8.42	3.95	3.03
	Max.	9.51	....	6.14	3.57	3.69	9.51	5.86	5.19
	Min.	2.39	....	5.88	2.96	1.35	7.13	2.23	2.39
Aluminumized metal, Holophane D'Olier 18460 and 18470, 7½ ft. spacing, 1¾ in. position	Avg.	3.38	45.3	4.37	2.50	1.46	7.64	3.95	2.43
	Max.	8.84	....	5.21	2.83	3.38	8.84	5.86	4.50
	Min.	1.41	....	4.02	2.23	.58	6.87	2.23	1.15
Medium density opal, Macbeth-Evans SF-1623, 5 ft. spacing, 1¾ in. position	Avg.	3.98	41.1	5.84	3.39	3.34	5.19	3.21	2.96
	Max.	7.65	....	6.65	3.68	4.20	5.54	5.90	4.90
	Min.	2.38	....	5.43	2.86	2.51	4.71	1.45	2.38
Medium density opal, Macbeth-Evans SF-1623, 7½ ft. spacing, 1¾ in. position	Avg.	3.10	43.0	4.26	2.45	1.89	4.46	3.31	2.36
	Max.	6.29	....	6.02	3.12	3.18	4.82	5.90	4.46
	Min.	1.32	....	3.65	2.25	1.25	4.04	1.45	1.32
Enameled metal, Holophane D'Olier 18461, 5 ft. spacing, 1¾ in. position	Avg.	3.86	39.9	5.78	3.12	2.85	5.62	4.09	2.74
	Max.	8.17	....	6.80	3.26	4.04	6.21	7.17	5.32
	Min.	1.67	....	5.48	2.76	1.75	4.77	1.56	1.67
Enameled metal, Holophane D'Olier 18461, 7½ in. spacing, 1¾ in. position	Avg.	3.23	43.4	4.39	2.38	1.47	5.44	4.09	2.52
	Max.	7.00	....	6.70	3.00	3.97	6.31	7.17	5.42
	Min.	1.26	....	3.68	2.08	.80	4.67	1.56	1.26
Heavy density opal, Opalux 123, 5 ft. spacing, 1 3/16 in. position	Avg.	3.73	38.5	5.31	3.14	4.27	4.98	3.63	2.84
	Max.	7.00	....	6.15	3.36	5.52	5.26	6.60	5.33
	Min.	2.11	....	5.07	2.58	2.83	4.65	1.34	2.11
Medium density opal, Phoenix CL-50, 5 ft. spacing, 1¾ in. position	Avg.	3.81	39.4	5.54	3.12	2.63	5.11	3.46	2.87
	Max.	7.92	....	6.30	3.29	3.14	5.68	.58	5.11
	Min.	1.75	....	5.13	2.57	2.13	4.45	1.46	1.75
Reflecting and diffusing, Adams & Westlake 15050, 5 ft. spacing	Avg.	3.06	31.6	4.79	2.45	4.14	4.34	....	2.18
	Max.	5.63	....	5.42	2.85	4.51	5.28	....	4.56
	Min.	1.21	....	4.32	2.16	3.63	3.82	....	1.21
Bare lamps, 5 ft. spacing	Avg.	5.21	28.0	8.29	2.46	4.36	2.72	1.94	2.30
	Max.	5.20	....	4.11	2.84	4.59	2.93	3.86	3.69
	Min.	1.65	....	3.42	2.00	4.14	2.56	.59	1.65
Aluminumized metal, Holophane D'Olier 18440, 5 ft. spacing, "O" position, 15 watt lamps	Avg.	4.28	44.6	5.63	2.10	2.24	2.28	1.69	1.62
	Max.	4.15	....	3.96	2.23	3.54	2.71	3.05	2.77
	Min.	.38	....	3.32	1.99	.08	1.50	.57	.38
Mirrored glass (indirect lighting), X-Ray E-100, 50 watt lamps, 10 ft. spacing	Avg.	2.37	26.1	3.14	1.82	1.46	1.90	1.49	2.05
	Max.	4.26	....	3.87	2.24	1.28	2.18	1.98	4.26
	Min.	.84	....	2.89	.84	1.14	1.58	.95	.93
Gas Lighting.									
Aluminumized metal, Holophane D'Olier 18418 and 18490, mantle 3044, 7½ ft. spacing	Avg.	5.98	44.5	7.74	4.07	2.30	15.4	6.08	4.78
	Max.	17.10	....	7.96	4.59	5.16	17.10	8.90	8.33
	Min.	2.42	....	6.51	3.65	.93	12.35	3.69	2.97
Enameled metal, Holophane D'Olier 18417 and 18479, mantle 3044, 7½ ft. spacing	Avg.	4.91	37.2	6.66	3.72	3.78	9.40	6.32	4.24
	Max.	11.88	....	7.37	4.06	8.90	11.88	11.80	7.78
	Min.	2.29	....	5.60	3.13	1.60	7.12	2.59	2.74
Aluminumized metal, Holophane D'Olier 18410 and 18490, mantle 3044 and 2640, 7½ ft. spacing	Avg.	4.88	45.0	5.61	4.01	4.54	11.22	5.15	3.92
	Max.	13.50	....	6.26	4.47	9.18	13.50	7.51	5.48
	Min.	2.78	....	4.52	3.09	2.03	9.63	3.05	2.92
Reflecting and diffusing globe, Safety Corona 3425, mantle 3044, 7½ ft. spacing	Avg.	4.10	30.7	5.47	3.47	5.26	5.20	5.04	3.46
	Max.	7.80	....	6.79	6.00	6.26	5.83	8.85	6.23
	Min.	2.04	....	4.39	2.63	4.60	4.67	1.89	2.04
Reflecting and diffusing globe, Safety Corona 8026, mantle 3044, 7½ ft. spacing	Avg.	3.86	28.9	5.18	2.85	4.56	5.56	4.05	3.37
	Max.	8.23	....	5.95	3.23	6.05	6.23	6.60	6.20
	Min.	2.00	....	4.35	2.42	3.72	4.82	1.93	2.00
Diffusing globe (opal), Safety 3116, mantle 3044, 7½ ft. spacing	Avg.	3.27	24.0	4.58	2.19	3.48	5.59	3.20	2.79
	Max.	6.81	....	5.63	2.63	4.23	5.84	4.94	5.29
	Min.	1.50	....	3.52	1.84	2.80	5.41	1.69	1.50
Enameled metal (indirect lighting), Safety mantle, "125 C. P." 10 ft. spacing	Avg.	2.06	15.9	3.13	1.70	1.36	1.38	.77	1.95
	Max.	3.35	....	3.34	2.20	1.56	2.02	1.03	3.14
	Min.	.90	....	2.88	1.13	1.19	1.04	.51	.90

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cept heavy density opal with a glazed reflecting surface, aluminumized metal, and prismatic reflectors. This class of reflectors required approximately 80 per cent. of the illumination of the first class. Extensive tests made to ascertain the intensities of illumination required, showed that 2.25 foot candles on the reading plane was a safe value for minimum satisfactory intensity for continuous close visual work under illumination derived from lighting units of the second class. On the same basis it was found that 3.5 ft. candles was ample illumination and that higher values were unnecessary for adequate service. It was further found that about one-half or slightly less of this minimum intensity value was required at the mouth of mail bags in the bag rack portion of the car, on the face of the letter cases and in the storage section. The results of the illumination tests with the principal types of electric and gas units tested are given in the accompanying table. Figs. 1 and 2 show the plans of the test car giving the location of the lighting units and of the test stations. The table gives the average, maximum and minimum foot candle values obtained in the car as a whole, the bag rack section, the letter case section and the storage section. The efficiency of the system is given as the ratio of light falling on the working plane to the total light generated by the lamps.

The importance of using proper types of reflectors in car lighting service for all classes of cars is shown in the comparison of the illumination obtained with the most efficient type of reflector tested, the mirrored glass, with the bare lamps, in which the illumination obtained on the working plane where the reflector was used was practically 220 per cent. of that obtained with the bare lamps, the number of lamps installed being the same in each case. The ceiling of the car had been freshly painted a dead white, which gave more favorable conditions for the bare lamps than would generally be obtained in service. Further, the glare effect obtained from the bare lamps is such as to render the eye much less efficient as well as more susceptible to severe eye strain than where reflectors are used.

The minimum and maximum initial illumination values, as well as the service illumination values required under the Post Office Department specifications, revised to December 28, 1912, were determined upon as a result of these tests in this connection, and they constitute the only authentic data thus far available on this subject.

So far as the question of illumination is concerned the investigation showed that when proper location of lamps and proper types of reflectors are provided, equally satisfactory results may be obtained with Pintsch mantle gas lighting and electric lighting. In conducting the tests the assistance of illuminating experts of the leading reflector, car lighting fixture, and incandescent lamp manufacturers was obtained, and in order to insure the greatest accuracy of the test results the National Bureau of Standards extended its co-operation by calibrating the instruments, rating the lamps used, and making photometric curves of all the light units tested.

Acknowledgment is made by the railway company to the Holophane Works of General Electric Company, Safety Car Heating & Lighting Company, Adams & Westlake Company, National Electric Lamp Association, General Electric Company, Westinghouse Lamp Company, Macbeth-Evans Glass Company, National X-Ray Reflector Company, Phoenix Glass Company, Opalux Company, and the National Bureau of Standards for their co-operation in conducting this research.

PROPOSED SPANISH RAILROAD.—The *Gaceta de Madrid* of a recent date contains a notice inviting plans for the construction of a secondary 17-mile railway from Haro to Ezcaray, province of Logrono. The minimum rolling stock of the company will consist of 4 locomotives, 5 mixed first and second class cars, 5 third-class cars, 3 mail cars, 4 baggage cars, 12 box cars, and 23 flat cars. The capital necessary for the construction is calculated at $542,833. The Spanish government will guarantee 5 per cent. per annum on the capital invested.

WHAT I AM TRYING TO DO.*

BY FRANKLIN K. LANE.

What are we of the Interstate Commerce Commission trying to do? We are seven, but we work as one. It would be hard to find seven men who differ more in temperament, in training, or in type of mind than Mr. Clements of Georgia, Mr. Prouty of Vermont, Mr. Clark of Iowa, Mr. Harlan of Illinois, Mr. McChord of Kentucky, Mr. Meyer of Wisconsin, and the writer. Yet I believe that no other group of men labors for the Government with more singleness of purpose than does this commission. There is, of course, a flat-footed way of stating our purpose—one transcribed from the letter of the statute: We are attempting to regulate and control the rates, rules, and practices of our railroads, and of other public utilities engaged in interstate commerce. (Hercin, however, I shall deal only with railroads.) I recognize that such a statement is about as luminous as to say that the President of the United States is trying to enforce obedience to the nation's laws and give direction to its policies. Succinctly and suggestively put, it may be said that the object of each day's work—the investigations made, the rulings and orders issued—is to insure fair play as between the public who need transportation service and the carriers who furnish it.

In a very real, though not perhaps a strictly legal, sense we legislate within fixed limitations. The effectiveness of our work has been made possible only by the liberality of the Supreme Court in the construction of this law and of the powers of the commission.

It is entirely within the truth to say that this commission has no policy other than that which is expressed from day to day in the rulings that it makes. At the same time it would be idle to say that we are without consciousness of direction.

Our primary object must be to prove the efficacy of the machinery devised by law for bringing the policy of our railroads into conformity with the policy of the law—to make private capital serve public need and yet conserve the interest of the railroad owner. The public wish the best of service at the lowest possible rates; the owners desire the highest return consonant with the fulfilment of their undertaken duties. This may be an *impasse*—a situation so impossible of resolution that we are destined to join those nations who are experimenting with governmental ownership and operation. The stage of despair, or of resolution—dependent upon the viewpoint—we, however, have not yet reached. In fact, I believe we are far from it, for we have only entered upon the experiment of regulation by commission, and students of this subject from other lands have said that their countries would not have sought refuge in governmental ownership had they in time discovered the American method of dealing with the railroad problem.

In this experiment we are trying above all to be practical; to work with facts. If wise we are not to be terrorized by our own precedents or those of the railroads themselves; less than a century of experience is too short a time within which to say the final word upon any problem of railway economics. And constantly there is this all-important factor to be safeguarded; the self-respecting, self-asserting, risk-taking, personal initiative of the railroad man whose imagination and experience must be sympathetically brought into public service if the whole scheme of regulation is to become more than a flat code of lifeless rules.

In earlier days railroad men accepted uniformly the current law of competition as a full code for the government of their conduct. It was their business as practical men to make their properties as profitable as possible. They did not understand the philosophy which distinguished their properties from other business enterprises. Regarded from this standpoint, their practices became entirely reasonable.

To be sure, railroad policies differed. This was because railroad men differed. Some had larger imaginations than others

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*From an article in the March issue of *World's Work*. This abstract is reprinted by kind permission.

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and comprehended more perfectly the import of their conduct. But railroading was to all an industry. Its product was tons of freight hauled or passenger miles made. To cut a rate to secure traffic was thought to be no more offensive to good morals or fair dealing than for one contractor to underbid another in the selling price of a house.

In superimposing restraint upon these carriers—a restraint which the law had always recognized as possible—and in attempting to enforce the regulations now imposed, it is not to be overlooked that our railroads were built in large part upon this private industry theory. As a nation we took no more concern as to where a railroad was to be built or how it was built than we did as to where a man should live or how he lived. It was any one's privilege to build a railroad. Given a financier of underwriting reputation, a road could be projected from Dan to Beersheba without any one knowing the location or the traffic-producing possibilities of either place. The result was as pretty a system of unscientifically planned railroads as might well be imagined, and not only unscientifically planned, but illy and uneconomically built. Originally they were erected to serve local needs. Many of them were later connected into nation-serving carriers by the strength and synthetic genius of a few men But as a whole they were without large plan, built upon a speculative and competitive basis, and operated as rival industries. Logically, therefore, and perhaps inevitably, they fought their way to the edge of bankruptcy, or beyond. Then, to save themselves, they took refuge in combinations, pools, and agreements under which they raised rates and reduced service.

It would be difficult, I think, to find a self-respecting railroad man who would presume to say to the American people that he would prefer to return to the order of things that prevailed before the government undertook regulation of railroads.

It is said that railroad regulation restricts railroad building. No doubt this is true in part. This commission has no power to permit a railroad to be built or to deny it that right. Nevertheless, the powers that we do exercise doubtless have an influence in limiting the building of certain types of roads, notably those whose primary purpose is not public service but a species of blackmail upon other roads or those whose rails are laid as a foundation for wildcat speculation. Let us be frank, however, and inquire why, the country over, we are not building railroads with that same feverish activity that characterized the '70's and '80's. Manifestly one reason is that there is not the opportunity. The railroad map of the United States in 1861 showed about 35 000 miles of railroad; that of 1910 nearly 250,000 miles. The greater part of this development took place in the two decades following the Civil War. There are now few large spaces on that map which remain unsupplied with the major transportation facilities. Nor have the people so much to give by way of bounty as they had in earlier days when they donated to the railroads of the country a tract of land amounting in the aggregate to seven times the superficial area of the State of Pennsylvania. Naturally this condition could not continue indefinitely. There followed a period of reaction in which many lost all that they had ventured in these properties, and now, out of this welter of building, organizing, and reorganizing, we have come upon a period of greater stability in which we are making fuller use of the utilities we have, placing them upon a sounder basis and in fitter condition.

There is to my mind another, perhaps a minor, reason for the comparative decrease in railroad building during later years The promoter has been engaged in other business. The industrial corporation has been the great speculation of the last few years. Our financiers had fairly well saturated the market with railroad securities, but industrial corporations had never felt the buoyant effect of an aggressive policy of exploitation for speculative or investment purposes. The industry of selling securities is applied psychology. It depends upon impression and suggestion. The big boy does not throw two ideas into the mind of the same subject at the same time. And so for some years we have found the energy of the interested press and of the "street" put into suggesting this most profitable single thought: "Industrials are the things now." With the result that in ten years we have uttered and sold more industrial securities than had been sold upon all the bourses of the world—perhaps more than were ever issued before. But while we know that the wise promoter plays upon a harp of a single string we also know that he sometimes changes that string. So it may come to pass that upon the slightest provocation or excuse his present sad song as to railroad securities may yet turn into a gladsome outburst whenever this shall become advisable.

It is probably true that as a speculative industry railroading in the United States will not flourish in the future as it has in the past. As a basis for sound investment, however, the hope of the American railroad rests in successful regulation.

And because of the very protection now granted under the law there are some who would urge, with reckless disregard of their own history and experience, an increasing rate of toll with every new rise in value. These unwise and too precipitate gentlemen ask that the government shall by force of law do for them what they could not have done for themselves under the private industry theory, and do it possibly to the demoralization of industry. Wisdom would seem to teach that the transition from the one theory to the other must, for the very welfare of the roads themselves, carry with it no conditions that are onerous and not plainly justifiable before the court of public opinion.

What that future shall be is one of those great problems which must necessarily engage the minds of those who think at all upon this most perplexing and many-sided question, and it is one that turns to no slight extent upon the policy which the government adopts toward the railroads, and upon the policy which they adopt toward the government. This country can not grow without adequate transportation facilities. The railroad is our common highroad; it is not a luxury; it is not a concern in which the farmer and the manufacturer alone are interested; it is an essential to the commercial life of our people, almost as necessary as the land itself. The freight rate determines where we shall mine and how we shall mine; where we shall manufacture and how we shall manufacture; where we shall plant and what we shall plant; what we shall eat and wherewithal we shall be clothed.

Should rates be made merely to meet the needs of the day and every new investment come from a new increment of capital, or should the shipper of today be taxed in some part for the benefit of the shipper tomorrow? To whom belongs the broad margin of profit arising out of superior efficiency, and what should be the standard from which to measure up or down? What share should the community itself have in the growth of values which it in part creates? Questions like these are hidden in the often ingenuous inquiry, "What is a reasonable rate?" And their answer cannot be found in the books but must come from a prescient study of the whole railroad problem.

To make regulation a success we must have co-operation—a sympathetic understanding of the direction that must be taken by the shipper, the government, and the railroad man. With the new theory we may hope to see an increasing number of railroad directors who represent the money of the real investor and who give their time to its protection, and of railroad presidents who live at least part of their time upon the line of their own railroads and know the needs of the country they serve and are in touch with its people. In all charitableness it can be said that there has been too close an identity between railroad policies and Wall Street policies. The men who actually operate our railroads, who keep the intricate wheels of this mighty machine constantly in motion and always at our service, receive too little public acknowledgment for the work they perform. They are among the most skilled, capable, and honest of our business and professional men. They have an enthusiasm in their work and a loyalty to their companies that is a constant satisfaction, and their delinquencies too often may be traced to policies which purely as railroad men they would not countenance. With these men we can work and through them we may hope for the realization of a national system of railroads that will be fair as to rates, profitable as to income, and adequate as to service.

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IMPORTANT IMPROVEMENT WORK ON C. M. & ST. P.

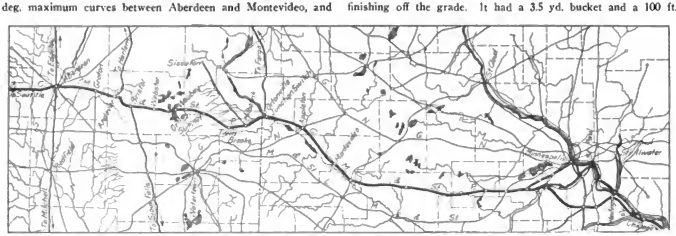
Second Track and Grade Revision Between Aberdeen, S. D., and Montevideo, Minn.—Drag Line Excavators Used Extensively.

In line with the policy of the Chicago, Milwaukee & St. Paul of getting its line in readiness for the heavy traffic which the Puget Sound extension and the western feeders are producing in rapidly increasing volume, double tracking and grade and line revision have been undertaken at a number of points on the main line west from St. Paul. On the Hastings and Dakota division about 96 miles of double track east from Aberdeen, S. Dak., have been built during the past season. Work is still under way on other sections between Aberdeen and Montevideo and a short section west of Montevideo was placed in service last year. Between Minneapolis and Montevideo considerable work is under contract. Plans have been made for double tracking the entire distance between Montevideo and Aberdeen. This line was handling during the past summer from 40 to 50 trains per day over single track, and there are abundant indications that the traffic this year will be much heavier than this.

The grades and curves on the old line limited the rating eastbound on this division to 1,600 or 1,700 tons, and only slightly higher than this westbound. The new double track line will be operated with .5 per cent. maximum grades and 1 deg. maximum curves between Aberdeen and Montevideo, and .4 per cent. between Montevideo and Minneapolis. The old line on the hill between Twin Brooks and Summit had 34 curves, some of which were as sharp as 3 deg. 30 min. In the reconstruction work 29 of these curves have been eliminated and the maximum curvature of 1 deg. has been held to. In most cases the new line follows the old very closely, the revisions being confined principally to substituting long tangents for a number of curves. At one point, however, just east of Andover, the new eastbound track has been built on a long loop in order to secure the desired grade. This rather unusual arrangement for a line in a prairie country is shown in the accompanying sketch.

borrow pit within easy reach where steam shovels could be operated, and also because the material along the line under the top soil was too hard to be handled with elevating graders. The material for the first 4 to 6 ft. consisted of prairie soil, but below this there was an extremely hard grade of shale and hard pan. When the shale was first excavated it was so hard that when struck with a hammer it gave out a ringing tone, but after a few days exposure to the elements it rapidly deteriorated and formed a sticky mud when wet.

The fill was 37 ft. wide at subgrade and varied in height up to 32 ft. As it was necessary that the work be hurried as much as possible, an elevating grader was used to remove the top soil in the side borrow pits which extended 200 ft. from the slope stakes on either side of the fill. The material excavated by these graders was hauled in wagons to the fill and used for building the base to a depth of 10 ft. The smaller drag line then followed on one side of the fill, building up the near slope and filling in the center. This machine was equipped with a 3 yd. bucket and an 85 ft. boom. The larger drag line followed on the other side of the fill, building the other slope and finishing off the grade. It had a 3.5 yd. bucket and a 100 ft.



Portion of the C. M. & S. P. Between Aberdeen and Minneapolis Which Is Being Double Tracked and Otherwise Improved.

USE OF DRAG LINE EXCAVATORS IN GRADING.

The grading on the section between Aberdeen and Milbank was not exceptionally heavy, amounting to about 4,000,000 yds. The principal interest in this portion of the work is in the fact that the contracts which were handled by drag line excavators were in the aggregate probably the most extensive ever undertaken with these machines in railway construction. The heaviest piece of drag line work was a continuous fill about 4.5 miles long requiring about 900,000 yds., located between Groton and Andover. This work was handled by the general contractors, Morris, Shepard & Dougherty, of St. Paul, using a class 24 and a class 20 Bucyrus drag line. These machines were chosen for this work principally because there was no boom, which was long enough to reach the opposite slope of the fill without difficulty.

A small grader, which is ordinarily used for highway work, was kept on top of the fill for leveling and crowning the subgrade. This little machine, which cost only $75, and could be operated with four horses, proved very effective and economical for handling this work. The grader could be set at any height and any angle so that the top of the fill could be very accuratcly finished. The fills so made were about as clean cut and accurate as are ever seen on railway construction work in this class of material. Both drag lines were required to leave a 5 ft. berm between the toe of the fill and the top of the borrow pit slope. The borrow pits had an average depth of 15 ft. The surface of the ground was level and hard enough to allow the machines to be moved very easily and the width of the pits made it unnecessary to move ahead very far each day; conditions which were very favorable to the economical handling of material by these machines. The only trouble experienced in the moving of the machines was in crossing a 500 ft. ravine which had been filled in with vegetable matter leaving a very soft and boggy surface. To make this unstable foundation safe for the machines, they first filled in about 2 ft. of dry earth as far as they were able to reach, and on this surface was placed a cribbing of ties and 6 in. x 8 in. skidway timbers 14 ft. long. To move the machines ahead the bucket was anchored at an angle of 45 deg. from the direction of

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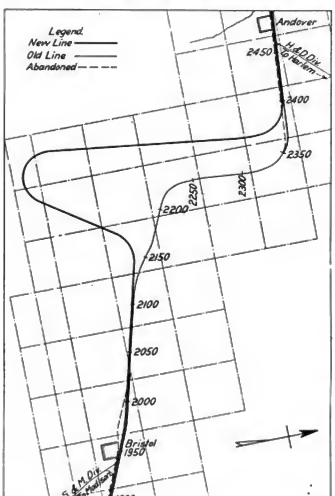
travel in order to prevent cutting up and softening the foundation. By properly placing the rollers the travel of the machine was maintained in a straight line.

When the work was first started the machines were operated with two 10 hour shifts, but later the smaller one was put on three 8 hour shifts. During the early stages of the work the two machines averaged about 1,000 yds. each per shift, but this output was materially increased later. During the month of July, which contained 26 working days, the small machine moved 73,000 yds., and the large machine moved 84,000 yds. During the 18 working days in August, the two machines together handled 130,000 yds. The larger machine averaged 65 swings per hour for an entire month, and for the month of July it made a total of 33,480 swings, the smaller machine



Loop Line Between Bristol and Andover Adopted to Secure 0.5 per cent. Grade East Bound.

making 29,800 swings in the same time. The 900,000 yds. in this fill were handled between June 10 and August 21, about 10 days of that time being lost in getting the machines into operation.

In addition to the engineer and fireman on each machine, there were required from two to six laborers, but there were rarely over ten men employed on both machines. Each machine burned about 6.5 tons of coal in 24 hours, the coal being hauled from a siding near the middle of the section and piled along the line of the work. Water was obtained from artesian wells ranging from 1,000 to 1,200 ft. deep, which delivered it at a head of 30 ft. Considerable trouble was experienced with foaming in the boilers, which an examination showed was due to the large amount of citrate of magnesia contained in this artesian water. The trouble was overcome by mixing crude oil with the water. For introducing this crude oil into the boiler a Detroit lubricator was attached to the boiler in the rear of and below the dome. The steam line leading out of the dome was tapped for the lubricator pipe and the boiler was tapped just above the water line. The condensed steam thus served to force the oil into the boiler. About 3 qts. of oil were used every 24 hours.

Both drag lines were equipped with 3,400 c. p. regenerative arc lights suspended from the boom and eleven 16 c. p. incan-

Class 24 Bucyrus Drag Line Making Fill from Side Borrow.

descent lights on the machine. The power for these lights was supplied by a 2.5 k. w. 110 volt generator direct connected to a reciprocating engine mounted over the main engine.

Paget buckets were used on both machines, but it was found that they worked better when the stiff bails were removed and chains substituted. The loose chain seemed to allow the bucket to adjust itself more easily to the surface of the material in which it was working, and it was possible to handle the buckets fuller than with the stiff bail

Near Waubay another large piece of drag line work was handled by the Callahan Construction Company with a 90 ton drag line equipped with a 90 ft. boom. Most of this work was in a slough, and in order to get rid of the water ahead of the drag pan a ditch ¾ of a mile long, 80 ft. wide and 15 ft. deep

Filling Cars from Hopper Which Was Fed by the Drag Line.

was dug. An 8 in. centrifugal pump was installed to handle the water that collected. Hoy & Elzy handled a sub-contract near Summit with a drag line excavator which dumped the material into cars. Their machine was of their own make, being entirely of wood, and was equipped with a 45 ft. boom and 1.5 yd. bucket. The engine had 7 in. x 10 in. cylinders and the circle on which the machine swung was 12 ft. in diameter. The material was dumped into a wooden hopper holding about 4 yds., from which it could be dropped to horse-drawn cars of one yard capacity. The bottom of the hopper was just high

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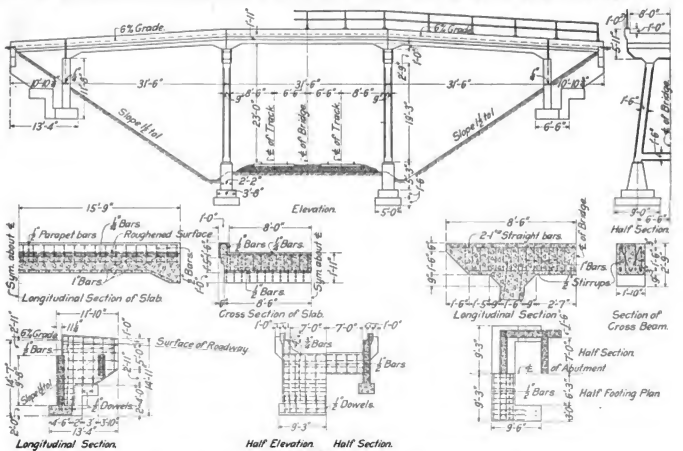
enough to allow a team of horses to walk under it. During the progress of the work it was desired to change the horses for dinky engines pulling longer trains. The clearance of the hopper was not sufficient to operate an engine under it, and on account of the extremely high lift that would have been required to raise the material into a hopper which would clear the engines, it was decided to drop the material directly into the cars. This practice proved very satisfactory, and it was found that the buckets could be dumped closer to the top of the cars than is usual with steam shovels, thereby reducing the drop of the material and lessening the damage to the equipment. Cars of 1.5 yd. capacity were substituted for the 1 yd. cars when the use of the engines was decided upon.

Drag Line Excavator Dumping Directly Into Cars.

This machine was handling a very hard cemented gravel which was overlaid with about 2 ft. of loam. Similar material in a steam shovel cut near Ortley was handled without blasting, but it was found necessary in the drag line work to loosen the material with light charges. This drag line worked two 10 hour shifts, using only seven men. One of the best records made was the handling of 68,000 yds. in 30 days. The same contractor operated a Bucyrus drag line of steel construction with a 26 ft. circle, 76 ft. boom and 2.5 yd. bucket, which handled material from a side borrow directly to the fill.

Considerable Light Grading Was Handled by Grading Machines, in this Case Pulled by a Traction Engine.

There were a number of steam shovels used on the work, and the rest of the material was handled by grading machines and team outfits. No unusual features were developed in the handling of these plants.



Details of Reinforced Concrete Highway Bridge Used on the C. M. & St. P.

BRIDGE AND TRACK WORK.

There was no unusual bridge work to be handled, the principal structures being a plate girder bridge over the James

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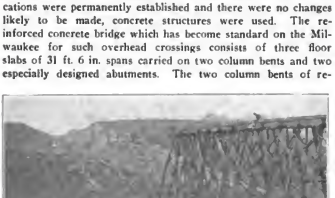
river and a concrete trestle bridge to take care of the overflow of the James river. This trestle is of the standard type used on the Milwaukee lines, having four 16 ft. spans carried on bents of 10 hexagonal concrete piles capped with a reinforced concrete cap 2 ft. 10 in. wide and 3 ft. 6 in. deep. The slabs had a uniform thickness of 3 ft. 6 in. Cast iron or concrete pipe was used for culverts in sizes up to 48 in. Concrete box culverts were used for larger drainage openings. All of the concrete work was handled by company forces under the engineering department. One typical 6 ft. x 8 ft. box culvert, 80 ft. long contained 200 yds. of concrete. Although most of the concrete was mixed and placed by machinery, this particular concrete was hand mixed, being placed in four working days by a foreman and 15 men. The labor cost for the structure was $700.

Wherever possible, separate grades for highways were provided. In most of these cases the road is carried under the tracks in slab top concrete structures varying in size from 20 ft. x 13 ft. to 28 ft. x 16 ft., the barrels being limited in length to 35 to 40 ft. When overhead structures were required they were usually built of timber, but in some cases where the locations were permanently established and there were no changes likely to be made, concrete structures were used. The reinforced concrete bridge which has become standard on the Milwaukee for such overhead crossings consists of three floor slabs of 31 ft. 6 in. spans carried on two column bents and two especially designed abutments. The two column bents of re-



Trestling for One of the Highest Fills.

inforced concrete have 1 ft. 6 in. square columns battered about 1 to 7.5 and tied together just above the footings by a reinforced concrete tie 1 ft. 6 in. square. The floor slabs have a minimum depth of 1 ft. 11 in., and can be used on grades up to 6 per cent.

At Andover, Bristol and Summit, small yards to care for 200 or 300 cars each, are being provided. Andover and Bristol are junction points with branch lines, and Summit is at the top of the grade where it will still be necessary to store a considerable number of cars at times. A new terminal yard is being built at Montevideo, with a capacity of about 1,000 cars and a yard with fifteen 3,500 ft. tracks; a 30-stall roundhouse, and shops are already in service at Aberdeen. Passing tracks 4,000 ft. long are being provided for both eastbound and westbound trains at about every other station, or at intervals of 15 to 20 miles.

The standard roadbed width for fills is 35 ft., for heights up to 20 ft., and 37 ft. for greater heights. The corresponding widths in cuts are 39 and 43 ft., using 1.5 to 1 slopes in both cases. The new tracks will be laid with 90 lb. rail on fir ties with tie plates. Gravel ballast, obtained from a pit near Wauby is being used.

This construction work is being handled under the direction of C. F. Loweth, chief engineer, W. H. Penfield, assistant to the vice-president and formerly assistant chief engineer, and T. H. Strate, construction engineer in direct charge of the work, to all of whom we are indebted for courtesies extended in connection with the securing of the above information.

REPORT ON WAREHOUSE POINT COLLISION.

The Public Utilities Commission of Connecticut has issued a report dated February 8, giving the conclusions of C. C. Elwell, chief engineer of the commission, on the causes of a collision which occurred on the New York, New Haven & Hartford, at Warehouse Point, January 10, about 8 p. m. A north-bound express train was flagged near Windsor Locks. The flagman belonged to extra freight No. 368; and when he reached the next side track and saw a freight standing there, he got off from the engine of the express, and then signalled to the engineman that all was clear. But this proved to be another train, No. 368 having gone forward to the next station. At that station, before it could be set off, the freight was run into by the passenger. One person was injured slightly. The conductor of the freight ran back to stop the passenger train but was not soon enough, there being a sharp curve in the line. The immediate cause of the collision was the failure of the engineman of the express to watch carefully for an automatic block signal which stood on this curve. There is no distant signal for this block signal, and as the curve turns to the left it is customary to depend on the fireman to read the signal. It is visible to him for only a few seconds. A switch, quite near the signal, is visible about the same time. The fireman in this case thinks that he must have mistaken the switch light for the signal light. The inspector says that neither of the two freight trains had lights burning in the cabooses to illuminate the indicator showing the number of the train, and this he calls the primary cause of the accident. The block signal so near the switch is declared to be blindly located. He recommends more careful attention to the indicators in the cabooses; that a distant signal be provided for the home signal referred to, and that prompt consideration be given by the railroad to the removal of all banjo signals on the main line.

REPORT ON DRESDEN COLLISION.

The Interstate Commerce Commission has issued a report made by Chief Inspector Belnap, dated February 18, on the rear collision at Dresden, Ohio, on the Pennsylvania Lines, December 3, last, when passenger train No. 43 ran into the rear of passenger train No. 125 which had been unexpectedly stopped; and 9 passengers and two employees were killed and seven persons injured. The collision occurred about 6 p. m., when it was quite dark, but clear. The trains had left the last preceding station five minutes apart, which is the minimum time interval prescribed by rule 91. The flagman of No. 125 is said to have gone back promptly, walking a part of the time, and part of the time running; and he probably reached a point about 1,000 ft. to 1,200 ft. back of his train when he was passed by train 43. The engineman of train No. 43 could see but a short distance, but the fireman could have seen the tail lights of the standing train about 1,500 ft. off, had he been looking out, but he had been putting coal into the fire just then. Train 43 was running about 50 miles an hour, or faster, though a rule on the time table limits the speed of trains on this part of the road to 40 miles an hour.

The inspector calls the inability of the flagman to get back a sufficient distance the direct cause of this collision, and he says that the time interval should be greater than five minutes. The brakeman is held responsible, however, for not taking fusees with him. These he keeps in his train box, in the smoking compartment of the car, instead of having them at the rear end of the car, where they would be quickly available. Had he put down a fusee the engineman of No. 43 might have seen its reflection in time. The conductor is blamed for not seeing that the flagman had all of his stop signals ready for use in case of emergency. The engineman of No. 43 is held responsible for running too fast, but on evidence of employees it is decided that this speed limit rule is not generally observed. The trouble on the leading train was the breaking of the pipe which supplies air to the air whistle signal. This pipe had been reported, the day before, as needing repairs, and the inspector censures the road for not keeping the engine in proper condition.

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IMPRESSIONS OF EUROPEAN RAILWAY PRACTICE.

Training of Employees and Careful Selection and Design of Material Are Given More Attention Than in This Country.

By Henry W. Jacobs.

To the motive power man the railroad systems of Europe present an aggregate of about 100,000 locomotives of all sizes and kinds, compared with 60,000 in the United States, and operating over a railroad mileage somewhat less than the mileage of the United States. Railroads have been in existence in Europe even longer than in this country, and, naturally, in the development in each country, the special genius of each people has developed particular excellence in one respect or another; many of these features are pregnant with examples that America might well follow, or at least study and consider most carefully.

The superiority of European railroad mechanical methods generally may be classed into divisions, training of personnel, and selection and design of materials.

In the treatment of the employees in the shops and in locomotive running service, the training is longer and more thorough and careful than it is with us; and this training has as its objective a more definite preparation for the predetermined vocation of the man.

APPRENTICE TRAINING.

For the service of the locomotive and car shops, for instance, apprentice courses and schools in connection with the works or shops are established in all of the countries, with the result that each succeeding generation of mechanics finds men not less skilled than their fathers, but on the contrary, equally as well trained in practical work and with a far better understanding of the technical aspects of the continued improvement in mechanical methods.

The apprenticeship courses are almost equivalent to some of our institutes of technology in the technical groundwork of instruction imparted; and at the same time, by having the young men devote the majority of their time to practical shop work, often in shops especially set aside for the purpose where certain classes of material, such as small locomotive parts and shop tools are made requiring the most accurate workmanship, they become practical skilled mechanics. Such pioneers as George M. Basford in this country, who gave much time and effort in trying to awaken a similar interest in our shops, cannot be too highly commended.

In America we cannot be said to train men that they may be fitted as mechanics. The young man does not set out consecrated, as it were, to the high calling of producing work mechanically and beautifully without flaws. He sets out rather with the desire to get through his journeyman and mechanic days as hastily as possible that he may the sooner be an inventor or a shop superintendent, instead of the consummation of his ambition being the perfection of his skill; such skill as he might acquire is consumed by his ambition. This is a price we are paying for democracy, and our industrial efficiency is footing the bill. We must admit that in this aspect they do things better abroad, where the devotion of a life to the service of a (mechanical) calling is still a live and honored tradition.

The enginemen receive similar careful training for their posts, having to go through a certain amount of shop experience, which gives them a knowledge of the machine they are to run and influences their attitude toward the careful nursing and treatment of that machine when it is entrusted to their care. The result of this attitude is on the one hand to keep the engine at all times in the best working condition, and on the other hand to get from it the maximum possible efficiency. By these methods of training, and also by the provident welfare and benevolent institutions, which find their highest development in Germany, the men fit naturally into a life work and position, and in these positions they are given opportunity to remain.

When the men are in the service their moral welfare continues to be the subject of a kindly paternalistic administration. The soda fountain established in the Budapest shops has been mentioned and furnishes the germ of an idea which may well be adapted to our uses in America. Whether we belong to a prohibition or total abstinence movement or not, we are all agreed as to the evil effects of alcoholism, as to the benefits of temperateness, and it is interesting to note in this connection that American railroads have probably done more (by stern discipline in enforcing Rule G) in the cause of practical temperance than have the political movements to this end. In the extirpation of an evil, we should seek its root. Why is a saloon? The saloonkeeper long recognized that he could not alone draw his trade by selling alcoholic drinks, but to keep and hold his customers he would have to give them good service. For that reason he gives the whole and hearty cheer, the wayside warmth and companionship to the lonely shop or workmen, as in the inn of old, and with practical concession to modern business needs, uses, etc. In the saloon the quickest and cheapest of lunches may be had. Every saloon is (for men) a public comfort station. The barkeeper is the working shopmen's banker, in many instances where his pay-check is cashed without inconvenient red tape, and if the workman is his customer in good standing and needs a dollar or five, he gets it. The saloon in America has made itself a public service institution—not confined to the hours 10 to 3.

How different might our workmen's life here be if the soda fountains had set themselves to give the same service as the bars—if they were such representative servic institutions. In this we have the idea of our R. R. Y. M. C. A.'s—the true way, as the writer has already elaborated in an earlier book, to confirm men in moral habits; and when we add to the moral influences the growing utility of these Y. M. C. A.'s and recreation clubs such as Mr. Ripley of the Santa Fe has instituted, the railroads are developing a public service of the highest order, one deserving even of being fostered by government support, as is done in similar instances abroad.

Not only are the employees carefully prepared for their respective trades, but the engineers who are to design the locomotives, machinery and other paraphernalia of railroad operation are trained with a view to close working limits of the materials employed. Attention is paid to the quality of the material—that it should be of the best for the purpose in view, and that all parts, for instance of a locomotive, shall be as light and small as is consistent with strength because of the limitations as to wheel loads and clearances. For these reasons greater attention is paid to the nature of the metal entering into cylinder and other castings, into rod and other forgings, and to the reduction of the thickness of the walls and other sections to a minimum; and also to the most careful heat treatment and subsequent testing of all parts so as to eliminate internal stresses in the material.

In view of this great care both in design and in selection of material, the locomotive parts are not generally subject to such heavy working stresses and fewer engine failures take place due to breakages of frames, rods, blowing out of cylinder heads, etc.

FISCAL POLICY.

The fiscal policy of the roads abroad with respect to the personnel, particularly of the shops, is such as to provide an

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even average of working hours and working output. The necessary financial reserves are maintained for this purpose irrespective of the current high or low tide of traffic receipts. The general policy of a great many of our railroads is to curtail the shop forces and hours whenever a business depression sets in, which has unfortunate results in the disorganization of the working forces, bringing about the loss of many good workmen, and tending to make our mechanics unsettled and causing them to drift from one branch of work to another.

None realize the drawbacks of this policy better than our operating officials themselves, and the necessary financial support should be given to the changes in this procedure that they would be only too eager to bring about. The annual result would increase the net earnings of the roads as compared with the losses entailed by the present practice, as well as give better service and operating conditions. I have been told by men in charge that in the last two years the policy of retrenchment which is very frequently followed to curtail expenses at the close of the fiscal year, had the same effect on the momentum of the work in progress as the continual stopping and starting of a flywheel would have on the even running of a steam engine.

CONSERVATISM OF EUROPEANS.

I had often heard of the ultra-conservatism of Europeans in adopting changes, but I must confess that my personal observations inclined me rather to the opposite view. I found European engineers and shop officers only too ready to accept changes in existing practice that could be shown to be an improvement. For instance, their new shop layouts are well designed and the most modern machinery is installed, some of it, as stated, coming from America. Roundhouses are modern in construction, such details as power driven turntables (even with the smaller locomotives used abroad), efficient ventilation, etc., being given attention. In modern improvements in locomotive design, we must give Europe credit for making the fullest practical use of superheaters, compound and multi-compound engines, tank engines for all classes of service except the heaviest long-distance through express and freight trains; and we should not ignore the practical conservation resulting from the general use of briquetted fuel.

MANUFACTURE OF MATERIALS AND EQUIPMENT.

In another respect, however, a tendency that was not so good, considered economically, either with reference to the railroad operation or the welfare of the industrial community, impressed me very strongly. I refer particularly to conditions obtaining in England. This tendency was towards the manufacture of all kinds of material used in railroad construction and operation at the company's shops, turning the railroad into a very large manufacturing concern. The result of this policy on the part of the English roads is that the locomotive building industry there has received so little encouragement that it is placed at a great disadvantage in maintaining plants for the supplying of engines for the British colonies and for export to other countries in competition with some of the great continental locomotive works. The same condition holds true with regard to the rolling of steel rails, the building of cars, etc. This is a policy we should avoid following to too great an extent in America, as railroads are, and should primarily confine themselves to being a transportation enterprise.

The manufacturing business presents entirely independent and different problems, and can be handled quite as well, if not better, by individuals or companies devoted to the special kind of manufacture in question than is feasible by the large organization of a railroad whose directors and principal officers are primarily concerned with the securing and handling of traffic and the financial problems involved.

A manufacturer of an individual article, such as a bolt for example, has to devote the greatest attention to that article to see that both its quality and its price enables it to survive as a product under competitive conditions. The manufacturer of bolts must make each bolt produce its share of profits or dividends; a railroad company, on the other hand, being organized for the production of transportation and not for the manufacture of materials, has no direct or competitive incentive to make each bolt pay a dividend or be of such design and quality that it may compete (in its efficiency as a bolt) with the kinds of bolts used by other railroads. Marked and indirect advantages accrue from leaving manufacture to concerns especially equipped therefor, since not only can the work be produced as cheaply or more cheaply, with all the overhead charges included, and as well or better than can be done by the railroad shops; but also the employees' families, and the financial supporters of these factories, are drawn into an attitude sympathetic with the railroad enterprises instead of being indifferent as to its welfare. Also the labor position of the railroads is much improved, since an association of employees, that can make a simultaneous demand for an entire railroad system, will be split up among the different manufacturers and trades supplying railway materials, leaving to each industry the handling of its own special labor problems and requirements.

It is well recognized in America that some of our stupendous organizations, employing tens or hundreds of thousands of men, have become unwieldy in their handling of questions relating to the personnel, owing to the physical impossibility of a single man at the head deciding upon all matters; and on the other hand a tendency to take away the power of decision from subordinate officers and officers in direct relation with the men and the questions concerning them. In the past, in smaller concerns, where the employer was in direct touch with his men and with the conditions of the industry, the working condition of the men and the attention given to the character of the product was more satisfactory and gave rise to less discontent, both on the part of the workers and on the part of the users of the materials, than is wont to be the case where the activities are carried on as part of a vast corporation.

Our Railway Business Association has done much to calm popular clamor for the unreasonable in railroad legislation and to counteract a tendency toward drastic rate cutting by government commissions. This organization, although unasked, took the side of the railroads in the recent period of stress, and by its makeup was able to accomplish much that the railroads themselves could not do. Its membership is made up of the largest and strongest, as well as numerous minor concerns, scattered over the land from coast to coast. All members are active allies of the railroads. Their influence through their thousands of employees, permeates and affects public opinion in a way impossible for any other organization. When one considers what this one organization, friendly to the railroads, has done, the advisability of taking work from such concerns and performing it in railroad shops becomes questionable; in fact it seems as if railroad friendships should be built up even more among outsiders by increasing the list of those from whom we purchase and the list of articles purchased. Some roads, however, seem to be going in the other direction and are inclining toward the English practice in this matter.

OPERATION OF EQUIPMENT.

Besides the conditions under which the equipment and other materials of a railroad are produced, there is much that is instructive to us in Europe's example in the operation of this equipment. Reference has already been made to the few engine failures, which, for instance, on the Prussian state system, are of such rare occurrence that it is not necessary to make of them a matter of daily or hourly report with continual irritating criticism of officers and men. Of course, reports are made of engine failures when they occur, but these are due almost entirely to some exceptional and unavoidable accidental cause, failures due to wear or weakness of the locomotive parts being corrected as to causes before a failure on the road can take

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place. This precaution is exercised by the most careful roundhouse inspection, both on the part of the engine crew to whom the engine is assigned, and on the part of the inspectors charged with this duty. This care in keeping the engine in condition results in a smoothness and reliability of working that is indeed enviable.

OPERATING ECONOMY.

Mention has also been made of the economy of the European locomotives in fuel and steam, this economy commencing with the design of the locomotive and ending with the personal interest of the engineer and fireman and the supervision given to their individual performances by the motive power and transportation officers. Despite our abundance of cheap but excellent coal in America, our fuel bill constitutes such a large percentage of railroad operating cost that we surely should be no more sparing in pains and effort to bring this fuel consumption to a minimum than have been the Europeans.

In view of the several respects in which the European railroads are excellently maintained and operated with closest regard to excellence of service and detailed attention to economy in repair and operation, it may be wondered why European railroads are not more profitably run than are the American roads. While abroad I gave my attention to the practical shop and locomotive aspects of the roads, rather than a comprehensive study of their financial and fiscal arrangements and conditions, but as far as I could gather from the published statistics available in these latter respects, and from conversations with the higher railroad officials, the greater first cost of the railroads in Europe, due to their having originally been built through thickly settled regions where the right-of-way had to be acquired at a high price from private concerns, has imposed upon the roads abroad fixed charges much greater in proportion to the volume of traffic than obtains with us. Another influence is the small clearance of locomotives and cars, and the consequently short train lengths, these limitations having their origin in the fact that the early railroad equipment comprised carriages and wagons transferred from the highways to the metal railed tracks by providing them with flanged wheels and pulling them by a steam locomotive instead of animal traction. With the extension of lines, the early wagon wheel gage, distance between double tracks, sections of tunnels and cuts (often walled so that the least width of strip of land necessary would have to be purchased) were not increased, and it was not considered necessary in view of the greater cheapness of steam railroad haul compared with the previous traffic for the roads. The reason we have employed larger clearances in America is that we were fortunate in building our railroads through a thinly settled and comparatively undeveloped country where the land cost was not so serious a problem.

Since coming back to my native home, I have wondered over the contrasts, the differences that have arisen in so many details in Europe and America, and I am most weighed down by the difference in the way the European and the American view the human aspects of the rail transportation problem. We have dealt with certain aspects of the employee—his selection, his formative period, his security in the enjoyment of the fruits of years of service. These methods are in distinct contrast to "the individualistic shift for yourself free American melee," which has finally crystallized in making our unions so strong—strong because they furnish the channel through which workmen have become more secure in their positions. How often have we seen workmen lose their positions due to the fact that some gang foreman was tyrannical and wished to exercise the power to which he had recently been promoted.

The contrast in the attitude toward and by the public is equally striking. Rates and bases for them typify such relations. In England and America rates have arisen almost entirely out of competitive activities between either routes or localities. Certain maxims have been established by law. On the Continent, and particularly in Germany, an attempt at a scientific kilometric-plus-terminal charge classification has been attempted, governmental control of this matter being similar to the aim of our own Interstate Commerce Commission legislation and decision today. The result in Germany has been devious, as exceptions to the flat or zone tariffs; certain commodity rates existed when the new scientific plan was adopted. Under these exceptions or "Ausnahume" tariffs most of the German freight of today moves more pliant to traffic growth than with the rigid so called scientific method, which has correspondingly diminished in proportion to traffic moved.

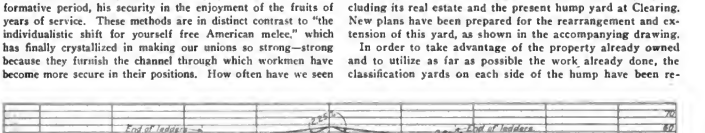
Strangely enough, however, nowhere abroad do we see any indication of an attempt to base rates upon physical valuation of the property used to effect transportation. This is a new shibboleth that has raised its head in our land, and that is destined to wander a tortuous course; we cannot but wonder what will be the effect on two roads of different construction standards between the same termini, or two roads of similar construction, but different operating conditions?

NEW CLASSIFICATION YARD AT CHICAGO.

Preliminary plans have just been announced by the Belt Railway of Chicago, showing the nature of the improvements and additions to be made to the Clearing yard, located in the southwest portion of Chicago, as outlined in our news column last week. The original Clearing yard was constructed about 12 years ago by the Chicago Union Transfer Railroad Company, and at the time it was built it was the largest of its kind. Two classification yards were built, one on each side of the hump over which were carried two tracks, one for use in each direction. Small receiving yards were located on the lower level at each side of the hump, but no departure yards were provided, the classification yard serving also as a departure yard. The approach tracks to this yard were so located as to cross each other at grade. This feature combined with others, resulted in considerable delay and interference with train movements, although the old yard has only been used to a very limited extent.

Until recently the Belt Railway has been owned by the Chicago & Eastern Illinois, the Erie, the Grand Trunk, the Wabash and the Monon. As mentioned in the issue of March 22, 1912, page 693, seven other roads, the Burlington, the Chesapeake & Ohio, the Illinois Central, the Pennsylvania, the Rock Island, the Santa Fe and the Soo, have each purchased an interest in this road. The Belt Railway has also recently purchased the Chicago Union Transfer Company, including its real estate and the present hump yard at Clearing. New plans have been prepared for the rearrangement and extension of this yard, as shown in the accompanying drawing.

In order to take advantage of the property already owned and to utilize as far as possible the work already done, the classification yards on each side of the hump have been re-



Profile Over Hump.

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Layout of the Proposed Enlargement of Clearing Yard, Chicago.

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tained, but each has been separated into two yards, each yard leading to its own track over the hump. This yard will serve as a clearing or interchange yard between the various owning roads, and the interchange traffic of each road will, in most cases, be practically all in one direction, although some of the southern roads, as the Illinois Central, for instance, will deliver cars to this yard for connecting lines both east and west. Cars delivered by the eastern lines will be brought into the yard from a connection with the Belt near the Grand Trunk crossing at Hayford. Traffic from the western roads will be delivered at the western end of the yard over the four-track connection from the north, which will swing around parallel to the yard and connect with the Belt about a half mile north of the yard. In this way all traffic will pass through the yard in the direction of its final travel, eliminating reverse movements. This interchange business will all be brought into the yard by the individual roads with their own power, moving over the tracks of the Belt Railway from their various connections.

The receiving and departure yards at both ends will be entirely new. Each receiving yard will consist of 30 tracks of 70 cars capacity each, while each departure yard will have 21 tracks of the same length. The classification yards will each contain 52 tracks holding 45 cars each. One unusual feature worked out in the design of this yard is that providing for four tracks over the hump, enabling this number of trains to be classified at one time. Each hump track is provided with two approach tracks, while the two hump tracks in each direction are connected with crossovers, enabling cars from either track to be sent to any classification track. Arrangement is made for communication between the two sides of the yard by a track passing under the hump.

It is proposed to operate the switches at the ends of the classification yards next to the hump from an interlocking tower placed on the hump. Provisions will be made to light the yard by electricity and to provide means for the proper return of the car riders to the hump. Compressed air will be carried into the departure yards as well as into the repair yards. All power required for various purposes will be generated at the powerhouse, already completed and located near the hump. A coal chute, water tank, cinder pit and turntable will be provided between the classification and the receiving and departure yards at each end.

Work has already been started on this extension and it will be pushed as fast as weather conditions permit. It is aimed to have the yard completed for service late in the present season. Over 1,000,000 cu. yd. of grading will be required to provide for the additional tracks.

When completed, the yard and its approaches will contain about 150 miles of track, while the car capacity in the receiving, classification and departure yards, exclusive of ladders and thoroughfare tracks, will be between 11,000 and 12,000 cars. The plan shown is considered as a first unit and has been designed with a view to the construction of additional units with a minimum interference at any time when the business demands.

In designing this yard the principal ideas kept in mind were: to separate incoming and outgoing business at each end as far as practicable; to provide receiving and departure yards so located with reference to the classification yards that the progressive movements of the cars tended to move them in the direction of their final destination; to bring the points where inbound engines cut off into close proximity with engine terminal facilities and convenient to the departure yards, and, in fact, to enable all movements within the yard to be performed by yard engines so that the transfer engines may be enabled to depart with the least delay and interference to yard movements.

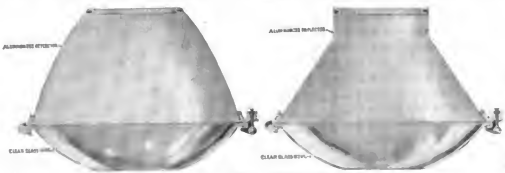
This work has been designed and will be carried out under the direction of E. H. Lee, chief engineer, Chicago & Western Indiana and Belt Railway, who is chairman of an advisory committee of engineers of the proprietary lines, the other members of which are A. S. Baldwin, chief engineer, Illinois Central; J. B. Berry, chief engineer, Rock Island; W. L. Breckenridge, engineer maintenance of way, Burlington, and R. Trimble, chief engineer, maintenance of way, Pennsylvania lines west.

LIGHTING FIXTURES FOR POSTAL CARS.

The results of the exhaustive tests made on a Baltimore & Ohio postal car at Washington during the latter part of last year and the recent specifications for lighting postal cars issued by the post office department are described elsewhere in this issue. The Safety Car Heating and Lighting Company has developed a new line of fixtures for this class of service.

Where the Pintsch lighting system is used, it was found desirable to use a type of metal reflector that would distribute the light properly on the letter cases, bag-racks and paper boxes without a wasteful use of the light on the ceiling and other parts of the car where it was not needed in the distribution of mail matter. Two types of aluminumized steel reflector units have been developed, one for letter case lighting and the other for bag-rack, paper box and storage lighting. Both of these reflector units are made to fit the standard Pintsch mantle lamp, and not only give the required illumination at all points in the car but, by a careful distribution of the light, economize on the gas consumption. The reflector unit shown in Fig. 1 is designed for use on Pintsch lamps in the center of the car to light the bag-racks and paper boxes as well as for general illumination in the car. The characteristic light distribution curve of this reflector is such as to make the labels at all points in the bag-rack and storage portions of the car very distinct.

The reflector unit shown in Fig. 2 is designed for use at the letter cases and its characteristic light distribution curve is such as to insure ample illumination on the horizontal reading plane as well as on all the letter case labels. The conditions of letter case lighting are such as to require careful study in the design of a reflector to meet the requirements, and without extreme care the lighting at some points on the letter case labels is very apt to fall below or above the specifications.



Figs. 1 and 2—Bowl Units for Pintsch Mantle Lamps.

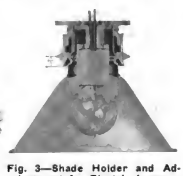


Fig. 3—Shade Holder and Adjustment for Electric Lamp.

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This reflector meets these requirements in all cases and allows an ample margin for depreciation. With the standard postal car construction adopted by the post office department, the mounting height of Pintsch mantles should be 7 feet 7 inches from the center of the mantle to the floor of the car, and two different types of mantles are recommended for use with these reflectors.

For electric lighting the government has allowed a wide latitude in the use of lamps and reflectors, and the development of a universal type of lighting fixture has necessitated careful study of all conditions. With different spacing of the light units, any of the standard electric train lighting lamps can be successfully used. Considering the metal reflectors alone, it is necessary to provide a fixture that will give a variety of mounting heights considered in the relation of the top of the reflector to the base contact of the electric lamp. A reflector is designed to meet certain lighting requirements by providing a characteristic light distribution curve when the center of the light source is in a certain fixed relation to the reflector, and it is on account of the variable position of the filament, in different types of electric lamps of different shapes and different wattages, that different heights of the base contact of the lamps in relation to the top of the reflector must be provided for in any universal lighting fixture. As in the case of the Pintsch mantle lamp, the light should be distributed where it is needed for the distribution of mail, and not wasted to light the ceilings of the car. It is claimed that the aluminumized and enameled steel reflectors are most satisfactory for this purpose, since they distribute the maximum light downward and in addition are practically free from the danger of breakage. The Safety Car Heating and Lighting Company has selected five types of steel reflectors for postal car lighting, of which that for letter case lighting is shown in Fig. 3. This is intended for all types of electric lamps used at the letter cases. To provide for the use of these different types of lamps and reflectors, six different positions of the base contacts of the lamps in relation to the top of the reflector must be available, and a shade or reflector holder has been developed on the principle of the safety shade holder, wherein a practically universal adaptation to any of these types of reflectors or lamps is obtained. The variable mounting height of the lamp filament in the reflector is taken care of by an extension member or socket support inside of the shade holder, while all the other parts of the shade holder are interchangeable for all conditions of postal car lighting. These shade holders are made to attach to the base and stem of a fixture designed to give the correct height from the center of the lamp filament to the floor of the car according to the requirements in the government specifications. The bases of these fixtures are made with either one or two outlets for either ½-in., ¾-in. or 1-in. conduit, and provide for an easy and accessible method of conduit wiring inside the car. This universal type of shade holder is also adapted, without change in its construction, to the many types of Crouse-Hinds conduits occasionally preferred by the engineer in installing his electric wiring.

The feature of universally adapting a fixture for every requirement in postal car lighting is of immense advantage to the operation of car lighting, since it provides for future developments in electric lamp manufacture or for a change in the standard types and sizes of lamps in use on the railway having these fixtures already installed. These fixtures use the most approved type of electric lamp sockets having a substantial spring base contact and heavy insulation. For the convenience of railways ordering lighting fixtures for postal cars, the Safety Car Heating and Lighting Company has prepared a table of the lamps, reflectors, and types of holders which may be used to meet the government specifications.

Fig. 4—Universal Electric Lighting Fixture for Postal Car Letter Cases.

Fig. 5—Universal Electric Lighting Fixture for Bag Racks, Paper Boxes and Storage.

Fig. 6—Universal Electric Lighting Fixture for Letter Cases in Apartment Cars.

Construction of Light Railways in Argentina.—The government inspector supervising the construction of the light railways in the province of San Juan has reported to the government that progress on the construction of these lines is very slow. He states that the branch to Marquesado is finished and that with respect to the circuit from San Juan to Santa Lucia the buildings, earthworks, sidings, and telegraph have been finished to Santa Lucia, and this branch has just been opened. The branch from Caucete to Albardon is progressing very slowly, earthworks are finished to kilometer 18, and wiring on both sides of the line is complete to that distance. He states that this branch is of great importance for the commercial and agricultural development of this important zone.

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General News.

A message by wireless telegraph sent from Key West, Fla., recently was heard at Cairo, Egypt, about 7,000 miles away.

The United States district attorney at Chicago filed a bill in the district court on March 13, to recover $6,200 in penalties from the Illinois Central for violations of the federal hours of service law.

The Department of Agriculture reports that the losses by fire in the national forests during the year 1912 were lower than for many years. The total is estimated at $75,250. The aggregate number of acres burned over was 230,000, as compared with 780,000 acres in 1911.

A letter from the president of the Pennsylvania Railroad to the governor of New York, protesting against the adoption of a full crew law, is given in another column. The presidents of the New York, New Haven & Hartford, the New York Central and the Erie have sent similar letters to the governor.

The postmaster general reports that the number of parcels carried in the mails during the month of February was about fifteen million, or 50 per cent. in excess of the number carried in January. The number mailed in Chicago was 5,167,540 more than a million greater than the number sent from New York, which showed the next largest record.

About five hundred men working in the track repair department of the Pennsylvania Railroad in New Jersey struck and left their work last week. Two hundred electrical workers of the New York, New Haven & Hartford struck March 17, demanding higher pay and better conditions. These men are repair and maintenance men on the electric-traction section of the road, west of Stamford.

Another new passenger train is to be put in service on April 1 by the Chicago & North Western and the Union Pacific between Chicago and San Francisco in addition to the new extra-fare "Overland Limited." It will be called the San Francisco Limited, and will leave Chicago daily at 8:30 p. m., arriving at San Francisco at 8:50 p. m., the third day. Eastbound it will leave San Francisco at 11:40 p. m., arriving in Chicago at 8:30 a. m.

A press despatch from Washington, purporting to give the utterances and views of Interstate Commerce Commissioner McChord, says that orders have been issued to safety appliance inspectors to be more rigid in the inspection of railroad equipment; and that the commission intends henceforth to impose maximum instead of minimum penalties. This increase in vigilance is for the purpose, we are told, "to avert the usual spring crop of wrecks."

The Pennsylvania Railroad has increased the pay of 2,700 telegraphers, despatchers, agents and signalmen an average of 10 per cent. The employees were represented in negotiations by a committee of 28, headed by C. M. Giles. The readjustment will add $75,000 to the payroll of the company and will affect 790 offices and towers on the lines east of Pittsburgh. The question of a general increase for men of these classes throughout the system is now being considered. The question of granting two relief days a month will be taken up later.

The mayor of Youngstown, Ohio, has ordered the Erie railroad to cease running trains through the city faster than six miles an hour. This enforcement of an old city ordinance follows a long campaign in which the city has called on the Erie to abolish five grade crossings in the heart of the business section. The final crisis arrived on March 13, when an eastbound Erie passenger train crashed into a street car on one of the crossings, demolishing the car, seriously injuring 22 persons and killing two outright. The state railroad commission will investigate the case, and the city officers think the commission will order the road to abate the crossings. The cost of such a change would be very high, probably $1,000,000.

New Jersey Grade Crossing Law.

The law which has been passed in New Jersey to abolish grade crossings of highways and railroads is chapter 57 of the public laws of 1913. It gives the Board of Public Utility Commissioners authority to order railroads at their own expense to abolish a crossing whenever it shall appear that it is dangerous, or that public travel is impeded. The entire expense is to be borne by the railroad, except that (1) a street railway may be required to pay 10 per cent. of the direct cost; (2) the expense of relaying sewers, pipes, paving, etc., is to be borne by the city or town, and (3) wires, pipes, etc., belonging to corporations or private parties must be moved by their owners.

Passenger Train Equipped with Automatic Connectors.

A train on the Cincinnati, New Orleans & Texas Pacific, consisting of locomotive, mail, baggage and express car, combination coach, day coach and parlor car and operating between Cincinnati, Ohio, and Danville, Ky., has been equipped with automatic connectors for steam heat, brake and signal pipes, as well as a telephone line. According to officers of the railway the device has been in service two weeks with good results, the train covering 230 miles daily. The connector is manufactured by the Durbin Automatic Train Pipe Connector Company, St. Louis, Mo.

Speed Recorders on the Baltimore & Ohio.

The through passenger trains of the Baltimore & Ohio are now equipped with two speed recorders, two to a train; one in the baggage car and one in the locomotive. In the baggage car the "Haushalter" speed tape is used, while on the locomotives the Boyer speed recorder is used. Both of these machines make records on tapes. At the end of each trip the tape is taken out by the local inspector, who makes a suitable record of the date, time, etc., and sends the whole to the office of the general inspector of transportation, where a permanent record is kept. The information given on the tapes is checked against the rates of speed prescribed in the results limiting speed at different points on the road, so that excessive speed is at once brought to notice. The maximum speed of passenger trains on the Baltimore & Ohio, except between Philadelphia and Washington, is 60 miles an hour, and the officers require a rigid observance of the limit. On the Philadelphia-Washington line the limit is 65 miles an hour.

Railway Legislation, Passed and Proposed.

The Utah senate has rejected a bill providing for the creation of a public utilities commission.

The governor of Indiana has signed a bill passed by the legislature giving the railroad commission power to order the separation of grades at crossings in the state.

Both houses of the Missouri legislature have passed bills requiring all railways, electric railways, street railways and terminal companies to incorporate under the laws of Missouri. The senate bill prohibits such companies from transferring freight or passengers within the state, unless so incorporated, and imposes a penalty of $2,000 to $10,000 for each violation.

New York City Subways.

After exasperating delays in the courts and elsewhere extending over more than two years, the New York State Public Service Commission First district, on Wednesday of this week signed contracts with the Interborough Rapid Transit Company and the Brooklyn Rapid Transit Company for the construction and operation of new subways, designed to complete the system of underground rapid transit in the boroughs of Manhattan, Bronx, Brooklyn and Queens. The city government has appropriated $88,200,000 for this work, the estimated amount which will be necessary to pay for the share of the improvement which is to be paid for by the city.

Railroad Valuation and Rates.

It is not surprising that "members of the Interstate Commerce Commission are said to be staggered by the problem of physical valuation of railroads, telephone and telegraph lines, laid upon them by a recent act of Congress." It is said that "a huge corps of engineers and accountants and writers will be required for the valuation" and that "this is the most gigantic task ever imposed on any government." It may also be said that the task will cost an enormous sum and cannot possibly be accomplished with any approximation to accuracy. Such a result as may be reached will be absolutely worthless.

The man more responsible than any other for getting this

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absurd requirement through Congress is Senator La Follette, of Wisconsin, and it is amazing that a majority of both parties should have been brought to its support. The only excuse for it is the contention that the Interstate Commerce Commission cannot determine what a reasonable rate is without knowing the actual value of the railroad property. This is the height of absurdity. It is certain that a reasonable rate cannot be determined by any such method as that proposed. The value of any property in use, that for which it can be bought or sold now and upon which its owners are entitled to a return, depends upon many considerations besides what it originally cost. A rule for rate-making, of the kind proposed, would throw into confusion the whole system of traffic and shift lines of communication all over the country, leaving many of them in ruins. If this task of the Interstate Commerce Commission should be prosecuted for a series of years at great cost to the government and the railroads, all paid for in the end by the people of the country, the result would be found to be utterly useless for the ostensible purpose. Congress ought to put a stop to the ridiculous farce.—*Journal of Commerce, New York.*

Argument for Government Valuation.

On the subject of valuation of railroads by the government, Chairman Clark of the Interstate Commerce Commission is quoted as follows:

The law requires that the rates of the carriers shall be reasonable. Manifestly the fair return upon the value of the property cannot be determined until the value of the property is known. In one important case involving advanced rates on a commodity that moves in large volume the carriers presented to the commission voluminous testimony as to the value of their properties. This testimony was uncontradicted, as no one aside from the carriers themselves had any reliable information on that subject. Advanced rates prescribed by the commission were established by the carriers, but the validity of the order was challenged in the courts. Exhaustive testimony was presented before the court in which the carriers again proved the value of their properties, and, strangely, those values for each of two carriers were something like $100,000,000 more than those which had been proved before the commission a comparatively short time before. And it was not because of additional investment or improvement in the interim. The commission was finally upheld by the Supreme Court of the United States. But suppose that the carriers had proved the value of their properties to have been much greater than they did. Who could have disproved the claim? Who knows the value of the property of a single carrier? Congress has provided a means for securing reliable authentic and exhaustive information on which to base a determination of the cost, the present, and the reproductive value of these properties that exist under public franchises and perform public functions. The owners of the properties are guaranteed a hearing upon any objections which they may desire to present against valuations proposed by the commission. The work is one of great magnitude, but the commission is not, as has been suggested, staggered or dazed by the duties that have been placed upon it. The work will be approached and proceeded with in a business-like, impartial and thorough way. The amount of available funds, the number of available, competent men, and the time necessarily spent in securing reliable information as to financial matters in the past, all bear directly on the question of how soon the work can be completed.

New Haven's Experience with the Automatic Stoppers.

The New York, New Haven & Hartford announces that since Mr. Mellen made his ten-thousand-dollar offer, published a few months ago, 1,574 automatic train stops have been presented to it; and that two of the devices submitted are going to be tried. The names of these two are not given, being withheld, evidently, for the purpose of breaking the news gently to the friends of the other 1,572. Proposals came from Panama, Porto Rico, Jamaica, Belgium, France, Ireland, Hawaiian Islands, England, Scotland, Wales, Germany, Denmark and a few other places. This list should make the government at Washington a trifle jealous, for in the list of applicants before the Block Signal Board, Panama, Porto Rico and Ireland do not appear. The New Haven people have searched the patent office records, and find there 1,483 patents on automatic stops and cab signals. The 91 devices not patented are, doubtless, so full of merit that they have no need of such adventitious protection as a patent.

Describing his experiences, an officer of the New Haven says: "Many of the devices submitted were ingenious, if not practical, but only about 5 per cent. of them were worthy of consideration. One device consisted of a heavy spring hook which it was claimed would automatically raise up from the roadbed when a train passed a signal and catch hold of an axle on one of the cars, thereby stopping the train. [Described in *Scientific American* about 30 years ago.] The competitors represent nearly every walk of life, from clergymen to jail birds. Four of them are in jail and one has recently been indicted in Canada for attempting to sell stock on false pretences [and has been sentenced to imprisonment in the United States]."

The New Haven road must henceforth be classed as a benevolent institution—anything but a soulless corporation. Merely to classify and acknowledge these 1,574 communications must have required a lot of work, and the statements of the officers indicate that they expect to test the two devices at the road's expense. Mr. Mellen's offer may be taken as one more demonstration of the power of money, for the number of inventions presented to him is more than double the number brought before the Block Signal Board at Washington during its four years' existence. A large share of the 1,146 schemes presented at Washington had to do with other elements of railroad operations; ties, rails, rail joints, brakes, life-saving cushions, health-promoting apparatus, etc.

Annual Report of Bureau of Explosives.

The annual report of Colonel B. W. Dunn, chief inspector of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles, shows that 14,609 inspections were made by the bureau during the last calendar year. The total number of packages condemned as unsafe for transportation was 5,197; 4,798 boxes of high explosives and 399 kegs of black powder. These figures show a decided reduction, the totals for the preceding year having been 6,591 boxes of high explosives and 1,205 crates of black powder. The number of cars in transit found to seriously violate the regulations was very much larger last year than the year before; 456 in 1912 and 210 in 1911.

The number of railway companies belonging to the bureau has steadily increased, and now aggregates 290; and the mileage of these lines is 249,751. The aggregate losses caused by accidents in transportation of explosives during the year 1912 was $10,200, which is very much less than in any preceding year of the record, except 1909, when the total was only $2,673. A table is given showing accidents occurring in the manufacture, storage or use of explosives, which during the year aggregated 56 accidents; persons killed 80; persons injured 53; property loss $2,136,428.

The inspectors of the bureau, reporting on cases of rough treatment of cars, have not been able to find any improvement over preceding years. Investigation of instances of rough handling of cars almost always brings from the operating officer of the railroad the reply that he finds no evidence of rough treatment. The train men do not attend the inspectors' lectures as often as do other employees. The inspectors have tried to instruct trainmen and yardmen by going into the yards at night; and they find that most of the men respond readily to instruction. Commenting on the difficulty of securing the interest of all employees in the instructions which are given by the inspectors, looking to safeguarding lives and property, Colonel Dunn says:

"The only cheap way to get valuable experience is to learn of the misfortunes of others. It is true unfortunately, that the maximum interest in our work is taken by those who have suffered from explosions. If a car of dynamite were to explode about once a year on the lines of each of our members, our lecture halls could not contain the audiences, and the reports of our inspectors would be on the top of every pile of correspondence awaiting action."

A general meeting of the bureau will be held in New York City in the month of May.

Thirty pages of the report are devoted to detailed accounts of accidents; eight pages to a report from the chemical laboratory, and twelve pages to lectures.

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Full Crew Law: Cost $783,917.

President Samuel Rea, of the Pennsylvania Railroad, has sent to Governor William Sulzer of New York a protest against the proposed full crew law in that state, the bill for which has been passed by the Assembly and favorably reported to the Senate. Following a strong statement of arguments with which our readers are already familiar, Mr. Rea says:

"This measure lays down an arbitrary rule. There must be the same number of men on a passenger train, for example, whether it is a continuous run of 100 miles or a run involving stops at every way station. Such a rule adds an extra and unnecessary brakeman, arbitrarily, to a large number of trains. If he contributes to the safety of passengers or other train employees, by all means put him on the train. But no additional security is obtained. Advocates of similar legislation have been repeatedly and successfully challenged to name any serious accident resulting from insufficient train crews.

"Bills similar to that now pending in New York were vetoed by Governors Hughes and Dix, and also by Governor Foss of Massachusetts and Governor Harmon of Ohio, on the very proper ground that the public service commission should deal with all such questions. The decision in different cases should be left to the railroad manager, unless there is an inadequate or improper practice, in which case public service commissions should have power, after hearings, to prescribe the practice to be followed. As a matter of fact, there are runs on our own road calling for even more men than are stipulated in the unvarying rule of this bill. In other cases, a smaller number of men is quite sufficient.

"If then there is no additional safety and no increased efficiency in a superfluous crew, and if the public interests are adequately safeguarded through the Public Service Commission, why place upon the railroads, and ultimately upon the public, the burden of a heavy and fruitless expenditure?

"How will the unnecessary extra employees advantage the men already working for our company, especially our lines in New York state which do not now fully earn their fixed charges, let alone any dividends; or how will this unnecessary expense help these lines to provide the high character of service required by the public?

"Our records show that the Pennsylvania Railroad has already wasted $783,916.84 in complying with the extra crew law which is now being contested before the courts of Pennsylvania. How will a similar waste benefit the people of New York?"

In connection with Mr. Rea's letter the reader will be interested in the following extract from the *Wall Street Journal* of December 11, 1912:

"On November 3, two days before election, the legislative representative of the Brotherhood of Railroad Trainmen sent the following letter to all members of the organization in New York state: . . .

"Sirs and Brothers:

"Believing that the most important subject concerning our organization today is the full crew bill, and being anxious to secure the passage of said bill, I considered it my duty to learn the attitude of the candidate for governor who is most likely to win out, so I called upon the Hon. William Sulzer and requested that he state his position on this most important measure.

"Mr. Sulzer said to me, 'If I am elected I will sign the full crew bill, and I will aid you in securing its passage.' He also requested that I notify the lodges of the state as to his position. Continuing, he said: 'I would come out openly for the bill, but if I did the railroads would spend a barrel of money to defeat me. . . .'

"Fraternally yours,

"JOHN FITZGIBBONS, Leg. Rep. B. of R. T."

President W. C. Brown, of the New York Central, sent to the governor a letter similar to Mr. Rea's and adding certain other points. Mr. Brown said:

The placing of an additional man on all trains is not only not an additional source of safety but may prove otherwise. No accident in this State has ever been laid by a proper authority to undermanning of trains. Since the Public Service Commission has been in office it has not reported that a single one of the many accidents which have been investigated by it was caused by the undermanning of trains. It is estimated that if this legislation should become a law the increased cost to the railroads of the State would be $2,000,000 a year. The increased cost to the New York Central will be $750,000 per year. In the view of the railroad managers the expenditure of this vast amount of money will be a pure waste. It will in no sense tend to greater safety or greater efficiency of operation. It is a vast, unreasonable and unnecessary economic waste. The overmanning of a train causes the excess man or men to idle away their time, and thus detracts from the efficiency of the service performed.

If, however, there is any necessity for an increase of the number of men upon any trains, the Public Service Commission has jurisdiction to entertain a complaint and to make an authoritative decision. It has already exercised it in two cases, one being against the New York Central.

This particular bill and bills of a kindred nature are a direct and serious blow to the farmers of the State.

The State of New York consumes approximately $1,200,000,000 worth of farm products each year, but of this amount it produces only about $300,000,000 worth.

During the ten years from 1900 to 1910 the acreage of improved lands in the State of New York fell from 16,000,000 to 15,000,000, or a loss of 1,000,000 acres.

During the same period the production of butter fell from approximately 75,000,000 pounds in 1900 to 25,000,000 pounds in 1909.

The most discouraging obstacle in the way of agricultural improvement is the absolute inability to secure help. Dairy farmers are selling their cows, producers of cereals, vegetables and fruit are having their operations curtailed every year on account of the inability to obtain efficient help.

This bill, if it becomes a law, will draw from the present inadequate equipment of help on the farms of New York approximately 2,000 men, and will to that extent further cripple the farmers and discourage the efforts now being made in the interest of agricultural improvement in the State.

The railroad draws on the rural communities along its lines for nearly all its employees. There is no other source from which they can be recruited, and this bill, compelling the railroads to employ men for which there is no the slightest necessity, is an economic mistake and a direct blow at every farmer in the state now struggling desperately to keep help to run his dairy and maintain his farm.

American Society of Mechanical Engineers.

The railway committee of the American Society of Mechanical Engineers has arranged for the discussion of the subject of Steel Passenger Car Design in its various phases at a meeting to be held April 8, as mentioned in the *Railway Age Gazette* of March 7. The final list of papers and authors is as follows: Introduction to General Discussion of Steel Passenger Cars, H. H. Vaughan (C. P.); Interior Steel Finish, Felix Koch, Pressed Steel Car Company; Roof Structures, C. A. Seley (Rock Island Lines); Corrosion and Protection of Steel Passenger Cars, C. D. Young (Penna. R. R.); Problem of Steel Car Design, W. F. Kiesel, Jr. (Penna. R. R.); Suspension of Steel Cars, E. W. Summers, president, Summers Steel Car Company; Truck for Steel Passenger Cars, J. A. Pilcher (N. & W.); Provision for Electric Lighting in Steel Cars, H. A. Currie (N. Y. C. & H. R.); Provision for Electrical Equipment on Steel Motor Cars, F. W. Butt (N. Y. C. & H. R.); Special Ends for Steel Passenger Cars, H. M. Estabrook, president, Barney & Smith Car Company; Draft Gears for Steel Passenger Cars, S. P. Bush, Buckeye Steel Castings Company; Cast Steel Double Body Bolster and End Frames for Steel Cars, C. T. Westlake, Commonwealth Steel Company.

Railway Signal Association.

Secretary Rosenberg has announced that all of the propositions submitted to letter ballot at the last annual meeting have been adopted by the required two-thirds affirmative vote. The specifications, drawings, etc., thus adopted are printed in the March issue of the *Journal* of the association.

The proceedings of the association for the year 1912, including these newly adopted standards, will be issued about April 1, making volume 9. Bound in cloth, these proceedings will be sold to members of the association at $1.50, and to non-members at $2. Orders should be sent in to the secretary at once.

Secretary Rosenberg announces that Vandyke negatives or

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blue prints of any one of the 124 standard drawings of the association will be furnished by him, full size, at the following prices: Vandyke negatives, 50 or over, 40 cents a copy; less than 50, 50 cents a copy; blue prints 18 cents each. The drawings are 8½ in. x 13 in.

American Society of Engineer Draftsmen.

The Boston members of the American Society of Engineer Draftsmen have made arrangements to hold a general gathering of draftsmen at Franklin Union, Boston, on March 25, with the idea of determining the advisability of forming a branch of the society. The New York office of the society has been moved from 116 Nassau street to 74 Cortlandt street, where larger space has been secured. Walter M. Smyth is secretary.

Machinery and Supply Convention.

A triple joint convention of the National Supply & Machinery Dealers' Association, the Southern Supply & Machinery Dealers' Association and the American Supply & Machinery Dealers' Association will be held at Indianapolis, Ind., April 10-12. F. D. Mitchell, 309 Broadway, New York, is secretary of the American Supply & Machinery Dealers' Association.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, March 19, a paper by E. J. Schneider, M. Am. Soc. C. E., entitled Construction Problems, Dumbarton Bridge, Central California Railway, was presented for discussion and illustrated with lantern slides. This paper was printed in the *Proceedings* for January, 1913.

New York Railroad Club.

The ninth annual electrical meeting of the New York Railroad Club will be held March 21. There will be no set papers, but addresses will be made by men actively engaged in the electrical field.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

American Association of Demurrage Officers.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

American Association of General Passenger and Ticket Agents.—W. C. Hope, New York.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

American Association of Railroad Superintendents.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Electric Railway Manufacturers' Assoc.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

American Railway Association.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

American Railway Bridge and Building Association.—C. A. Liebty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

American Railway Engineering Association.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

American Railway Master Mechanics' Association.—A. M. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

American Railway Tool Foremen's Association.—A. R. Davis, Central of Georgia, Macon, Ga.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

American Wood Preservers' Association.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

Association of American Railway Accounting Officers.—G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

Association of Railway Telegraph Superintendents.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 75 Church St., New York.

Association of Water Line Accounting Officers.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

Bridge and Building Supply Men's Association.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—J. G. Hales, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

General Superintendents' Association of Chicago.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thur., Chicago, Ill.

International Railway Congress.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1913, Berlin.

International Railway Fuel Association.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

International Railway General Foremen's Association.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 22-25, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 19, Richmond, Va.

Maintenance of Way Master Painters' Association of the United States and Canada.—W. G. Wilson, Lehigh Valley, Easton, Pa.

Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

Master Car and Locomotive Painters' Association of U. S. and Canada.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

National Railway Appliance Assoc.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

New England Railroad Club.—W. E. Cade, 3d, 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railroad Club.—C. L. Kennedy, 24 E. Duluth, Minn.; 4th Saturday, Duluth.

Peoria Association of Railroad Officers.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Business Association.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

Railway Club of Pittsburgh.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Electrical Supply Manufacturers' Assoc.—J. Scribner, 1021 Monadnock Block, Chicago. Meeting, Chicago, Ill. See Engrs.

Railway Gardening Association.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-13, Nashville, Tenn.

Railway Development Association.—W. Hall, Kansas City, Southern, Kansas City, Mo.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

Railway Supply Manufacturers' Association.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

Railway Supply Manufacturers' Association.—W. Hennessy, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

Railway Tel. and Tel. Appliances Assoc.—J. Harrison, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

Richmond Railroad Club.—G. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

Roadmasters' and Maintenance of Way Association.—L. C. Ryan, C. & N. W. Sterling, Ill. Convention, September 16-18, Chicago, Ill.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July, Aug., St. Louis.

Signal Appliance Association.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

Society of Railway Financial Officers.—C. E. Pugsley, La Salle St. Station, Chicago.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

Southwest Railway and Southwestern Railway Club.—Peters building, Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—F. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Track Supply Association.—W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings first Saturday, Pittsburgh.

Traffic Club of St. Louis.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

Train Despatchers' Association of America.—J. F. Maehle, 7042 Stewart Ave., Chicago. Annual meeting, October, Chicago.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Travelling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

Utah Society of Engineers.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

Western Canada Railway Club.—W. H. Rosevear, P. O. 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

The Magnolia Petroleum Company is to construct a pipe line, eight inches in diameter, from Cushing, Okla., to Alvord, Tex., where it will connect with another line to the Gulf coast. The length of the new line will be about 210 miles and it will cost about $2,000,000. With the completion of this line, there will be four oil pipe lines connecting the Oklahoma fields with Texas.

Oliver Garby, of the Garby Produce Company, was arrested on March 13, at Los Angeles, Cal., on a complaint filed by an examiner of the Interstate Commerce Commission, charging him with having misrepresented the weight of a carload of vegetables shipped from Los Angeles to Goldfield, Nev., via the San Pedro, Los Angeles & Salt Lake. According to the complaint, Garby billed the carload at 25,000 lbs., and paid $255.63, while the correct weight was 31,500, for which the charge would be $322.09.

Traffic Club of New York.

At the regular meeting of the Traffic Club of New York, to be held March 25, Honorable John Barrett, director general of the Pan-American Union, will deliver an address on the Commercial Aspect of the Panama Canal.

INTERSTATE COMMERCE COMMISSION.

Long and Short Haul Rates on Southeastern Roads.

In a hearing at Washington this week, the Interstate Commerce Commission listened to arguments presented by railroads of the southeastern states objecting to the requirement of the commission that the long and short haul rule of the law be strictly complied with in that territory. Freight rates to all important points are determined by water competition, and also by a good deal of competition between markets of distribution, and the present adjustment of rates is necessary to the business prosperity of the region. Statements were presented showing estimates of losses which would be sustained if the commission's rule were to be adopted, the aggregate annual loss on shipments from the west being over $12,000,000, which is about 7 per cent. of the total gross freight revenue of the roads interested.

Weighing Cars; Hearings at Philadelphia and New York.

The Interstate Commerce Commission's investigation of weighing practices on the railroads of the country, which was the subject of hearings at Chicago last month, was continued in Philadelphia, March 10, and in New York, March 17.

The principal complainants at Philadelphia were retail coal dealers receiving anthracite coal over the Reading and the Pennsylvania roads. Numerous statements were made to the effect that cars falling short 2.5 per cent. were frequent, and that larger shortages were common. Robert H. Large, general coal freight agent of the Pennsylvania Railroad said that allowances of 1 to 2 per cent. were made for water when coal was shipped wet; but some of the individual coal operators refuse to declare their coal wet, and will not allow for the water loss to the receiver.

William H. White, president of the Pennsylvania Retail Coal Men's Association, suggested that the government should compel all shippers to notify the carrier when shipments are wet, and should require a uniform allowance for moisture. Mr. White said that weighing cars while in motion over the scales was not a sufficiently accurate method; and if a car gets by him, the weighmaster is liable to guess at its weight.

W. C. Dunning, a Philadelphia merchant, exhibited details of a claim which he had made against the Pennsylvania Railroad for shortages of coal amounting to $154,000. On this statement the average shortage was 2.5 per cent. James C. Tattersall, of Trenton, said that 20 per cent. of the cars of coal received by him weighed more than they were billed and 80 per cent. weighed less.

William C. Bister, chief of the police department of the Philadelphia & Reading, said that considerable coal was stolen from cars in yards; but the thieves are mostly women and children and convictions are hard to obtain.

At the hearing in New York, Arthur E. Rice, representing the New York Coal Dealers' Association, said that his clients had no complaints to make. They were getting all the coal they bought. Officers of the Erie and of the Central of New Jersey were questioned as to shortages of coal, coming from the anthracite regions over their lines, but they said that cars were carefully reweighed at tidewater, and that losses were not more than 1 per cent. Testimony was given by James Carr, scale inspector of the Delaware, Lackawanna & Western. W. J. Richards, general manager of the Philadelphia & Reading Coal & Iron Company, testified that coal was weighed on railroad scales, and explained in detail how the different kinds of coal are sorted at the mines.

Baggage Regulation.

In re regulations for fixing the dimensions of baggage. Opinion by Chairman Clark:

Prior to 1910 no restrictions existed as to the dimensions of baggage containers. The carriers were experiencing a difficulty, however, in handling the so-called "wardrobe" trunks and other trunks of freak shapes, which were of large, irregular and unwieldy dimensions, and which were used by traveling salesmen for the transportation of their samples. After a series of conferences, the western roads filed tariffs, effective July 1, 1912, which provided that where any dimensions of any piece of baggage exceeded 45 in. there would be an additional charge for each additional inch of each dimension exceeding 45 in. equal to the charge for 10 lbs. of excess baggage. This tariff also provided that on July 1, 1914, extra charges should be collected on the same scale on baggage any dimension of which exceeded 40 in.; also commencing July 1, 1912, no piece of baggage of any class the greatest dimension of which exceeded 70 in. would be transported in baggage cars. The rule adopted by the eastern lines contained substantially the same provisions, except that no declaration was made of intention at a future time to reduce the 45 in. limitation; also the charge for each additional inch above 45 in. is the same as for 5 lbs. of excess weight instead of 10 lbs. This rule does not apply to sample whips contained in flexible cases of leather or canvas, or to public entertainment paraphernalia. The tariffs containing these rules were suspended by the commission. The carriers maintained that it was necessary to preserve aisle space down the center of the car between the piles of baggage, and that this space should not be less than 23 in. wide. It was further shown that if this aisle space were 23 in. wide, only 40 in. would be left on either side of the aisle. This was why the western carriers proposed to make 40 in. the limit of dimension. The commission found that the question related not to the matter of revenue but primarily to the physical limitations of carrying facilities and to the conditions under which the baggage men must work; also that replacement of space is one of the essential factors in which carriers must necessarily give consideration in the furnishing of facilities required by law. Whips in flexible cases were exempted from the proposed limitation in the rule of the eastern lines, but because they exceeded 70 in. in length they were excluded by the western lines' rule from transportation as baggage in the future. Whip manufacturers proposed to pack their sample whips in single flexible canvas or leather cases not exceeding 12 in. in diameter at the base, which is the widest diameter, and not exceeding 90 in. in length or 100 lbs. in weight. As sample whips could not be carried in shorter cases, and as the weight of the cases was only 100 lbs., the carriers agreed to carry whips as baggage under the conditions stated free from other limitations as to dimensions. The commission consented to this exception. The commission found that the rule of the western lines was unreasonable, but decided that carriers could provide for an extra charge for the transportation of pieces of personal or sample baggage having dimension or dimensions exceeding 45 in., but that the extra charge per inch in excess of 45 in. should not exceed the charge for 5 lbs. of excess baggage. As there are now many trunks 72 in. long or over in service, and as it was shown that when placed on end they would not take up much more space than 70 in. trunks, the commission decided that the carriers could reasonably provide that a piece of baggage exceeding 72 in. in any dimension should not be accepted for checking as baggage. The commission found that trunks or rigid containers with more than two bulging sides, or with two bulging sides that are not opposite to each other, were inconvenient in tiering. A number of such

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trunks are now in service, so with the idea of protecting the owners, the commission decided that, upon notice of not less than one year, carriers could provide that trunks or rigid containers of this character should not be accepted for checking as baggage. Carriers' definition of sample baggage should permit including salesmen's catalogs. At present the minimum overcharge for excess weight is 25 cents, and the commission decided that where the charges for excess weight and excess dimensions do not exceed this minimum charge, the single minimum charge of 25 cents shall apply. The commission ordered that new rules be adopted in accordance with these conclusions. (26 I. C. C., 292.)

STATE COMMISSIONS.

The New York State Public Service Commission, Second district, has called on the Erie to show cause for not complying with the law of New York, requiring that drinking cups be provided in cars for passengers. The road defends itself by calling attention to the federal law prohibiting the use of common drinking cups.

The New York State Public Service Commission, Second district, has rescinded its order made last November requiring the Boston & Albany to run a passenger train regularly from Chatham to Albany, 23 miles. The train has been run since November 24, and the average number of passengers has been only 11½ per day; and the commission decides it is not justified in directing the continuance of the operation of the train.

New Public Utilities Law in Indiana.

The legislature of Indiana has passed a law creating a Public Utilities Commission which will supersede the present state railroad commission. The law gives extensive power, like those of New York and Wisconsin. The number of commissioners will be five, or two more than the present railroad commission, but the intention seems to be that the present railroad commissioners shall hold over and be members of the new commission. The salaries of the commissioners and of the commission's counsel will be $6,000 a year each; secretary $3,600, and clerk $3,000. The commission is directed to value every public utility in the state.

COURT NEWS.

The government will appeal to the supreme court of the United States against the decision of the commerce court in granting an injunction which forbids the Interstate Commerce Commission to treat as common carriers certain pipe lines used only by their owners, for their own oil.

The federal court at Charleston, W. Va., has decided against the Norfolk & Western in the suit of the state to enforce a passenger tariff based on the uniform rate of two cents a mile. During the pendency of the suit the old rate of two and one-half cents has been collected, but with rebate checks, which will enable passengers to reclaim a half cent a mile, if the law is finally sustained.

The Supreme Court of Wisconsin has rendered a decision suspending a decision of the Dane county circuit court, and declaring constitutional the Wisconsin law of 1911, requiring railways running four trains each way daily, passing a given station, to stop at least two trains daily each way at that station. The Chicago, Burlington & Quincy had appealed from an order of the state railroad commission ordering the road to stop an additional train at Columbus, Buffalo county.

The Delaware, Lackawanna & Western has filed in the federal court at Trenton, N. J., its answer in the suit instituted against it by the government to compel a separation of the railroad company from the Lackawanna Coal Company. In general the charges made by the government are denied, the claim being made that the amount of traffic done, and the influence of the company as related to competitors, had been much overstated. The road denies that the coal purchased by it from independent mines has constituted almost the entire production of the mines; it is declared that the coal thus bought constitutes only a small part of the whole. The company denies that its financial ability or its power of its facilities have been used to the disadvantage of competitors.

In the case of the Southern and other railroad companies against the United States, the Commerce Court last week sustained the Interstate Commerce Commission. The railroad companies asked the Court to annul an order of the commission which had been made in 1912, requiring the carriers to refrain from collecting higher rates for carrying freight to and from Newport News than were collected from the southeastern territory to and from Norfolk. The Chamber of Commerce of Newport News contended that the carriers discriminated in favor of Norfolk and the commission held that the discrimination was unjust. The Commerce Court decides that it was for the commission to determine what the actual conditions surrounding the transportation were, and that it was for the commission to determine the method of service, the relative location of the two cities, how the interchange of freight is made, what the markets for traffic are, the extent of the competition, and other matters pertaining to the welfare of the communities affected. The court says that the commission was amply justified in finding as a fact that the City of Newport News was unjustly discriminated against by the carriers, and that the court would not disturb the finding of the commission.

Are All Pipe Lines Common Carriers?

The Commerce Court on March 12 granted a temporary injunction against the enforcement of the order of the Interstate Commerce Commission requiring certain private pipe lines to file tariffs.

The commission in this case accepted the law of Congress, passed in 1906, making such pipe lines common carriers. Being common carriers they become, when doing an interstate business, subject to the Interstate Commerce law. The Commerce Court, however, holds, evidence, that Congress in this legislation had exceeded its constitutional authority.

The lines involved in the present decision are the Prairie Oil & Gas Company, the Uncle Sam Oil Company, Robert D. Benson and others, the Ohio Oil Company, Standard Oil Company of New Jersey and the Standard Oil Company of Louisiana. In the summer of 1912 the commission, after an extended investigation, made an order requiring certain pipe lines to file tariffs showing their rates to the public for the transportation of oil. Six pipe line companies brought suits to enjoin the order of the commission and applied for preliminary injunctions. Some of these companies are Standard Oil companies, but others are independent companies in strong competition with the Standard.

It was claimed that the amendment in question applied only to such pipe lines, of which there are a considerable number, as are in fact common carriers, and hold themselves out to the public as such; and that if the amendment applied to all pipe line companies, whether public or private, and Congress thereby undertook to make common carriers of such pipe line companies as used their pipe lines solely for carrying their own oil in their own private business, the amendment was unconstitutional, because its necessary effect was to take private property without process of law and without compensation.

The commission held that the amendment of 1906 applied to all pipe line companies, but did not discuss its constitutionality, leaving the question to be decided by the courts. Judge Mack, while agreeing with the majority of the court as to the construction of the statute, dissented on the ground that Congress, in the exercise of its power to regulate interstate commerce, could regulate pipe line owners and pipe lines by prohibiting their use in interstate commerce until they permitted a like use to the public, on the payment of reasonable compensation; that the act did not involve an unlawful taking of property, and that even if the property could be held to be taken, the provision for reasonable compensation for its use met the constitutional requirement.

These six cases arose in as many different states; and the facility and expedition incident to their trial in the Commerce Court affords an illustration of the wisdom of Congress in establishing a single court for the hearing of interstate commerce cases. Under the old procedure these cases would have been tried in various circuits extending from New Jersey to Louisiana, necessitating six different trials and the additional expense in records and travel occasioned by each case being tried by itself rather than all being grouped in one court.

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Railway Officers.

Executive, Financial and Legal Officers.

Henry B. Hull, assistant chief claim agent of the Illinois Central, has been appointed chief claim agent, with headquarters at Chicago, to succeed Charner T. Seaife, deceased.

W. P. Newton, assistant general auditor of the St. Louis & San Francisco, at St. Louis, Mo., has been appointed general auditor, with headquarters at St. Louis, succeeding T. B. Dixcy, resigned.

E. B. Pierce, auditor of the Ft. Worth & Rio Grande and the St. Louis, San Francisco & Texas, with office at Ft. Worth, Tex., has been appointed auditor of the Missouri, Kansas & Texas, with headquarters at St. Louis, Mo., to succeed T. O. Edwards, resigned.

J. W. Taylor, assistant comptroller of the Chicago, Milwaukee & St. Paul, has been appointed assistant to President Earling, with headquarters at Chicago, and the former position is abolished. B. A. Dousman, assistant auditor, has been appointed general auditor, with headquarters at Chicago.

J. B. Berry, who has been appointed assistant to the president of the Chicago, Rock Island & Pacific, has been chief engineer of the C. R. I. & P., since the year 1905, and during this time has for a considerable period been consulting engineer of the St. Louis & San Francisco. Before going to the Rock Island road, he was for some years chief engineer of the Union Pacific.

J. A. Jordan, vice-president of the St. Louis & Hannibal, the Green Bay & Western, the Ahnapee & Western, the Kewaunee, Green Bay & Western, and the Iola & Northern, with headquarters at Green Bay, Wis., has been elected president of all these roads, with headquarters at Green Bay, succeeding Stephen S. Palmer, deceased, and Edgar Palmer has been elected vice-president, with headquarters at New York, succeeding Mr. Jordan.

Operating Officers.

William Coughlin has been appointed general superintendent of the Missouri, Oklahoma & Gulf, with headquarters at Muskogee, Okla.

Charles Forrester, who has been appointed superintendent of the Stratford division of the Grand Trunk, with headquarters at Stratford, Ont., as has been announced in these columns, was born on March 5, 1876, at Wanstead and was educated in the public school of his native town and at the high school at Petrolea. He began railway work on July 15, 1891, with the Grand Trunk, and has been in the continuous service of that road ever since. He was an operator at various stations on that road until August, 1899, and was then made train despatcher at London. From August, 1906, to October of the following year, he was night chief despatcher, and in October, 1907, was promoted to chief despatcher. He remained in this position until July, 1910, when he was made trainmaster at Stratford, which position he held at the time of his appointment on January 22, as superintendent of the Stratford division of the same road with headquarters at Stratford.

C. Forrester.

Patrick K. Hanley has been appointed trainmaster of the Clinton, Havana and Decatur districts of the Illinois Central, with headquarters at Clinton, Ill., to succeed William Lamb, transferred.

C. E. Brower, trainmaster of the Atlanta, Birmingham & Atlantic, at Manchester, Ga., has been appointed superintendent of the Brunswick division, with headquarters at Fitzgerald, Ga., succeeding Adolph Moritz, resigned.

Owing to the death of A. W. Moss, superintendent of the Schuylkill division of the Pennsylvania Railroad at Reading, Pa., the duties of that position, until further notice, will be performed by G. W. Creighton, general superintendent of the Eastern Pennsylvania division, with headquarters at Altoona.

John C. Muir, whose resignation as division superintendent of the Chicago & Eastern Illinois, with office at Danville, Ill., was recently announced, has been appointed general superintendent of the Chicago, Terre Haute & Southeastern, with headquarters at Terre Haute, Ind., to succeed M. W. Wells, assigned to other duties.

J. F. Hickey, division superintendent of the Missouri, Kansas & Texas at McAlester, Okla., has been appointed superintendent of the Smithville district, with headquarters at Smithville, Tex., to succeed F. R. Blunt, resigned. It is reported that Mr. Blunt has accepted a position with a railroad in Brazil, South America.

Traffic Officers.

Joseph J. Brignall, traveling passenger agent of the Canadian Pacific at Toronto, Ont., has resigned.

J. C. Carey has been appointed commercial agent of the Toledo, St. Louis & Western, with headquarters at Memphis, Tenn.

H. C. Strohm has been appointed traveling passenger agent of the Baltimore & Ohio, with headquarters at Omaha, Neb., in place of Edward Emery, resigned.

Wm. Henderson has been appointed soliciting freight agent of the Georgia Southern & Florida, with office at Macon, Ga., succeeding W. B. Dewberry, assigned to other duties.

L. W. Mosher has been appointed commercial agent of the Missouri, Kansas & Texas at Oklahoma City, Okla., succeeding J. F. Reily, who has been transferred to Sedalia, Mo., as commercial agent in place of Mr. Mosher.

Walter Sorrell has been appointed assistant live stock agent of the Southern Railway, with headquarters at Greensboro, N. C., and C. D. Lowe has been appointed assistant live stock agent, with headquarters at Chattanooga, Tenn.

C. E. Horning, city passenger and ticket agent of the Grand Trunk, at Toronto, Ont., has been appointed district passenger agent, with office at Toronto, succeeding A. E. Duff, resigned, and Charles E. Jenney, traveling passenger agent at Pittsburgh, Pa., succeeds Mr. Horning.

W. M. Campion has been appointed commercial agent of the Carolina, Clinchfield & Ohio, with headquarters at Cincinnati, Ohio, to succeed R. D. T. Hollowell, resigned to engage in other business. Frank P. McEwen, traveling freight agent, with office at Cincinnati, has been appointed commercial agent at that place, and the former position is abolished.

Engineering and Rolling Stock Officers.

B. G. Horton has been appointed superintendent of locomotive fuel service on the New Orleans, Texas & Mexico, with headquarters at De Quincy, La.: Fred Hooker and O. Tefteller have been appointed superintendents of locomotive fuel service of the St. Louis, Brownsville & Mexico, both with headquarters at Kingsville, Texas.

S. W. Mullinix, mechanical superintendent of the second district of the Rock Island Lines at Topeka, Kan., has been appointed superintendent of shops at Silvis, Ill., succeeding G. W. Seidel, resigned. C. M. Taylor, mechanical superintendent of the third district at El Reno, Okla., succeeds Mr. Mullinix, and L. A. Richardson, master mechanic at Chicago, succeeds Mr. Taylor.

John D. Isaacs, formerly consulting engineer of the Harriman Lines at New York, has resigned from that office on the Union Pacific system, and remains as consulting engineer of the Southern Pacific Company. E. E. Adams, formerly assistant consulting engineer of the Harriman Lines at New York, succeeds Mr.

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Isaacs as consulting engineer of the Union Pacific system, both with offices at New York.

Charles Adelbert Morse, chief engineer of the Atchison, Topeka & Santa Fe system, with headquarters at Topeka, Kan., has been appointed chief engineer of the Chicago, Rock Island & Pacific, with office at Chicago, succeeding J. B. Berry, who has been appointed assistant to the president. Mr. Morse was born on January 1, 1859, at Bangor, Me., and was educated at the University of Maine. He began railway work in 1880 as chainman, instrument and office man on the Chicago, Burlington & Quincy, remaining with that company until 1884. He was then division engineer of the Mexican Central, and for about a year and a half again in the service of the Burlington. From January, 1886, to July, 1901, he was with the Atchison, Topeka & Santa Fe as transitman, division engineer and resident engineer at Fort Madison, Ia., and at Pueblo, Colo.; and then until the following February was assistant chief engineer of the same road at Topeka. He was then principal assistant engineer at La Junta, Colo., until March, 1903, and the following five months was engineer of the Eastern Grand division at Topeka. In July, 1903, he was made acting chief engineer of the Atchison, Topeka & Santa Fe at Topeka, and one year later became assistant engineer. On September 1, 1905, he was appointed acting chief engineer of the company's Coast Lines, and in August, 1906, was made chief engineer of the Atchison, Topeka & Santa Fe, proper, with headquarters at Topeka. He was later made chief engineer of the entire system, the position he now leaves to go to the Rock Island.

C. A. Morse.

OBITUARY.

Edward H. Eden, commercial agent of the Delaware, Lackawanna & Western, with headquarters at Minneapolis, died in that city on March 12, aged 43 years.

C. T. Scaife, chief claim agent of the Illinois Central, with headquarters at Chicago, died March 8, aged 65 years. He had been in the employ of the company continuously since December, 1872, and was appointed chief claim agent in June, 1910.

Reuben F. Smith, president of the Cleveland & Pittsburgh, with office in Cleveland, Ohio, died in the latter city March 11, aged 92 years. He had been connected with the Cleveland & Pittsburgh since 1855, when he was made paymaster. He became auditor six years later, and in 1869 was chosen vice-president. Later, under lease of the property to the Pennsylvania Railroad, he was appointed assistant general manager of the Cleveland & Pittsburgh division of the Pennsylvania Lines west of Pittsburgh. Subsequently he was elected president of the Cleveland & Pittsburgh Railroad.

DOUBLE TRACKING IN SPAIN.—The single-track railway from Barcelona to Villanueva y Geltru, province of Barcelona, is being double tracked. The line, which is 30 miles long, has already been double tracked 16 miles, from Barcelona to Castelldefels, and construction work has been commenced on the prolongation of the second track up to Villanueva y Geltru. This work will necessitate construction of several tunnels through the Sierras de Garraf, to run parallel to the ones now in existence. The total cost of the work is estimated at about $1,080,000.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE HAVANA CENTRAL is in the market for 8 consolidation locomotives and 4 Pacific type locomotives.

THE UNION RAILROAD has ordered 5 consolidation locomotives from the Baldwin Locomotive Works.

THE PENNSYLVANIA RAILROAD has ordered 144 consolidation locomotives from the Baldwin Locomotive Works.

THE AMERICAN SMELTING & REFINING COMPANY has ordered one six wheel switching locomotive from the Baldwin Locomotive Works.

THE NEW YORK, NEW HAVEN & HARTFORD advises that it has just ordered 85 freight locomotives, 25 switching locomotives and 12 electric locomotives.

THE LAKESIDE & MARBLEHEAD has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 21 in. x 28 in., and the total weight in working order will be 162,000 lbs.

THE KEESVILLE, AUSABLE CHASM & LAKE CHAMPLAIN has ordered 1 mogul locomotive from the American Locomotive Company. The dimensions of the cylinders will be 16 in. x 22 in., and the total weight in working order will be 96,000 lbs.

THE OHIO & KENTUCKY has ordered 1 mogul locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 24 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 112,000 lbs.

THE CHESAPEAKE & OHIO has ordered 12 Mallet (2-6-6-2) locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 22 in. and 35 in. x 32 in. cylinders, 56 in. driving wheels, and in working order will weigh 425,000 lbs.

THE ST. LOUIS NATIONAL STOCK YARDS have ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 24 in., the diameter of the driving wheels will be 51 in., and the total weight in working order will be 121,000 lbs.

CAR BUILDING.

THE GREAT NORTHERN is making inquiries for 500 box cars.

THE GRAND TRUNK is making inquiries for 3,000 forty-ton box cars and 1,000 fifty-ton coal cars. This road will soon order about 10,000 cars.

THE NEW YORK, NEW HAVEN & HARTFORD advises that it has just ordered 50 coaches, 50 baggage cars, 25 postal cars and 11 dining cars, all of steel construction throughout.

THE HAVANA CENTRAL, Cuba, mentioned in the *Railway Age Gazette* of February 14 as being in the market for 740 freight cars, is now in the market for 450 flat cars, 250 box cars, 50 coal cars and 12 passenger cars.

THE PENNSYLVANIA LINES WEST have ordered 42 coaches, 31 combination passenger baggage cars, 5 baggage cars, 5 dining cars and 2 mail cars. This order was divided between the American Car & Foundry Company, the Pressed Steel Car Company and the Standard Steel Car Company.

SIGNALING.

The Illinois Traction System will this season extend automatic block signaling so as to have the main line between Springfield and St. Louis entirely equipped. The new signaling will cover about 60 miles of road, the signals, style B, being furnished by the Union Switch & Signal Company.

The Buffalo, Rochester & Pittsburgh has contracted with the General Railway Signal Company, Rochester, N. Y., for automatic signal equipment for 85 miles of its road; 48 miles single track and 37 miles double track. The signals will be upper quadrant, three-position. The same road has bought telephone train despatching apparatus for 178 miles additional, and with this improvement will have the entire length of the road equipped with telephone despatching lines.

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Supply Trade News.

Joseph K. Choate has been made a vice-president of the J. G. White Management Corporation, New York.

F. W. Hubbard, secretary of the Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio, died on March 2.

Edgar N. Easton has associated himself with the railroad sales department of Joseph T. Ryerson & Son, with headquarters at New Haven, Conn.

George W. Greene has been appointed resident manager for Morgan T. Jones & Company, with headquarters at 213 Wabash building, Pittsburgh, Pa.

C. J. Morrison has resigned his position with Suffern & Son, and with others has organized Froggatt, Morrison & Company, 149 Broadway, New York, efficiency engineers.

Rex Gay, formerly with the Ajax Forge Company, Chicago, has resigned to accept a position with the Verona Tool Works, Pittsburgh, Pa., with headquarters in the Karpen building, Chicago.

John H. Craigie, formerly associated with the mechanical department of the Boston & Maine, is now associated with the railroad sales department of Joseph T. Ryerson & Son, with headquarters at Boston, Mass.

The Canton Culvert Company, Canton, Ohio, advises that J. H. Schlafly, president of the company, has been granted patent No. 1,055,806 on corrugated metal culverts of spiral construction and that in future it will protect its interests in this patent which it now controls.

The Asbestos Protected Metal Company, Beaver Falls, Pa., has acquired an additional tract of land adjoining its present main plant at Beaver Falls, upon which it is planning to build a special steel treating plant, a storage building, and a new single story steel and concrete factory for the manufacture of an architectural roofing tiles and asbestos shingles.

Judge Kohlsaat, of the United States Circuit Court at Chicago, on March 3, rendered a decision sustaining patents granted to George F. Colmer and George C. K. Colmer, now owned by the Standard Asphalt & Rubber Company, in the case of the Standard Asphalt & Rubber Company *vs.* the American Asphaltum & Rubber Company, for infringement, and issued an injunction restraining the latter company from further infringement of the patents.

The Pedrick Tool & Machine Company, 3640 N. Lawrence street, Philadelphia, Pa., has been formed by A. D. Pedrick and H. A. Pedrick, who have recently resigned from the firm of H. B. Underwood & Co. The new company will make and sell the Pedrick portable tools, including cylinder boring bars, cylinder and dome facers, crank pin turning machines, driving box planer tools, pipe benders, milling machines, radius planing attachments, and valve seat rotary planers. D. W. Pedrick has also resigned from H. B. Underwood & Co.

Among the bridges for which the Strauss Bascule Bridge Company has recently received orders are the following: A three-track bridge for the Boston Elevated over Mystic river, Boston, Mass.; a bridge for the Chicago, Burlington & Quincy across the Illinois river at La Salle, Ill.; a bridge for the Northern Pacific across Steilacoom creek, Wash.; a bridge for the Baltimore & Ohio across the East Chicago canal, near East Chicago, Ill.; a 160-ft. single-leaf bridge for the Department of Public Works, Canada, across the Cataraquia river at Kingston, Ont.; two bridges for the city of Green Bay, Wis., one across the East river and the other across the Fox river; a 202-ft. double-leaf bridge for the Sanitary District of Chicago over the south branch of the Chicago river at Jackson boulevard, Chicago; a highway bridge for Snohomish county, Wash., over Eby Slough; a 171-ft. double-leaf highway bridge across the Red river for the city of St. Boniface, Man. The bridges for the Northern Pacific and the Chicago, Burlington & Quincy are of the Strauss direct lift type, and are similar in design to the two bridges of this type already being constructed by the Grand Trunk Pacific and by Van Buren county, Ark. The Strauss direct lift type operates without flexible connections.

Railway Construction.

BILLINGS & EASTERN MONTANA.—An officer writes that the company is building a line with its own forces from Billings, Mont., northeast about 15 miles. The principal commodity to be carried on the line will be sugar beets. R. E. Shepherd, president; F. J. Egan, engineer, Billings. (See Billings & Central, March 14, p. 528.)

BUFFALO, ROCHESTER & PITTSBURGH.—An officer writes that contracts have been given to the Miller Construction Company, Lock Haven, Pa., for grading a three-mile branch at Craigsville, Pa., and a two-mile branch near Homer City.

CANADIAN PACIFIC.—According to press reports contracts for double-tracking 135 miles of the Lake Superior division, and 30 miles of the Ontario division, immediately west of Toronto, Ont., have been let as follows: Lake Superior division, Cartier sub-division, 29 miles, to Cook Construction Company, Sudbury; Chapleau sub-division, 13 miles, also on White River sub-division 33 miles, and Schrieber sub-division, 13 miles, to Dominion Construction Company, Toronto, Ont.; Schrieber sub-division, 22 miles, to Chambers, McQuaig, McCaffrey & Cochrane; Nipigon sub-division, 25 miles, to Dominion Construction Company. Ontario division—London subdivision, 30 miles, from Guelph Junction east to Islington, to Jones & Girouard, Ottawa. The contracts include the grading, bridge and culvert work, and track laying. (March 7, p. 459.)

A grading contract has been given to Janse Brothers, it is said, for work on 118 miles of the Bassano-Swift Current line from Bassano, Alta., east, and the work on 90 miles has been sub-let as follows: Ten miles out of Bassano, to Clifford & Company, Bassano; 30 miles to Frank Jackson, Calgary; 12 miles to David Fitzgerald, Carstairs; five miles to F. Brandenberg, Minneapolis; four miles to Cailawait Bros. & Batter, Brooks; seven miles to W. Pearson, Dillon, Mont.; and 22 miles to Noeliere & Mannix, Edmonton.

CHINOOK RAILWAY.—Application is being made to the Alberta legislature to incorporate this company to build from the Chinook Coal Company's mines at sec. 12, tp. 10, range 22, west 4th meridian, to the Crowsnest branch of the Canadian Pacific near Kipp, Alberta. Shepard & Dunlop, Lethbridge, Alberta, are solicitors for applicants.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—Extensive improvements are to be made in the McLean avenue yards in Cincinnati. Eight new tracks are to be constructed and the present tracks will be rearranged.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—The report of this company for the year ended December 31, 1912, shows that additional main tracks were laid from Miamisburg, Ohio, to Middletown; from Indianapolis, Ind., to Dix., and from Sharonville, Ohio, to Kyles; a number of sidings were also put in and a connection with the Erie constructed from Dayton to Cold Springs. Yard improvements were carried out at Beech Grove, Ind.; at Bellefontaine, Ohio, and at Harrisburg, Ill.

CLEVELAND SHORT LINE.—See Lake Shore & Michigan Southern.

DALLAS & CLEBURNE INTERURBAN.—This company, which is being promoted by E. P. Turner, Dallas, has not yet completed its organization. Mr. Turner owns franchises granted by the city of Dallas, also a right of way from Dallas southwest to Cleburne, and from Dallas north to Gainesville. Application has not yet been made for a charter, as it has not been definitely decided when the line will be built. It is expected that work will be started during 1913.

EDMONTON, DUNVEGAN & BRITISH COLUMBIA.—Contracts have been let for grading 170 miles, and work is now under way clearing the right of way. Track has been laid to Sunniebend, about 70 miles north of Edmonton, Alta., and this portion is to be ballasted at once. The plans call for building from Edmonton northwesterly via Dunvegan to Fort George, B. C. (November 15, p. 973.) J. D. McArthur & Co. are the general contractors.

GANANOQUE, PERTH & LANARK.—The Ontario legislature is being asked to incorporate this company, to build from Gananoque to Lanark, with a branch from Morton northerly to

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Portland, and other branches. J. C. Judd, Ottawa, Ontario, is solicitor for applicants.

LAKE SHORE & MICHIGAN SOUTHERN.—The report of this company for the year ended December 31, 1912, shows that on the Sandusky division additional main tracks have been provided, and considerable progress was made on the grade separation work, particularly in the Chicago territory, and in connection with the change of line at Port Clinton. The Cleveland Short Line was opened for operation in July, 1912, between Marcy, Ohio and Collinwood, 9.56 miles, and the entire belt line is now in operation around the city of Cleveland from Rockport on the west to Collinwood on the east, 1964 miles. An agreement in conjunction with the New York Central & Hudson River has been made with the Lehigh Valley for a share of the land bought from the city of Buffalo, N. Y., known as the Hamburg strip, for enlargement of terminal facilities. The important improvements carried out during the year included additional main tracks from Elyria Junction, Ohio, to Amherst, and from Martin to Millbury; the separation of grades at Port Clinton and track elevation from Grand Crossing to Englewood. The freight yard at Ashtabula Harbor was enlarged and considerable dock improvements were carried out at that place. At Air Line Junction the yard improvements included additional tracks and subways. Between Toledo and Detroit double-tracking work and renewal of bridges was carried out, and at Buffalo a new draw-bridge was built over Buffalo creek. A locomotive and car repair shop was built at Elkhart, and at Englewood, the improvements included a new roundhouse, and power plant, also a car repair yard. A large amount of industrial and passing sidings, new signals, bridge and culvert renewals, additions and improvements to various station buildings and other structures were carried during the year.

LONG ISLAND.—The report of this company for the year ended December 31, 1912, shows that on the Bay Ridge improvement the tunnel section between Atlantic avenue and Central avenue, in Brooklyn, N. Y., and the filling in between streets and bridges of the section between Central avenue and Fresh Pond Junction was started in December, and this work will be carried on during 1913. Satisfactory progress has been made on the Jamaica improvement, and on the elimination of grade crossings through Richmond Hill. The platforms and station in the new location at Jamaica, will be put in operation in March, and the whole improvement will be finished during 1913. The North Side division improvement covers the elimination of grade crossings on the Port Washington branch through Flushing, the laying of second track between Flushing and Great Neck, and the electrification of the lines to Port Washington and Whitestone Landing. This work calls for the elimination of 12 grade crossings. The line to Whitestone Landing was electrified and put in operation in August, and the line to Port Washington will be electrified by September, 1913. It is planned to let contracts and have work well under way in 1913, on the Woodside-Winfield cut-off. This improvement involves the elimination of 11 grade crossings. When this work is completed there will be no highway crossings at grade between New York City and Jamaica. A great deal was accomplished in beginning new work and completing work begun in the previous year on the elimination of grade crossings at 13 other points. The most important crossings are at the South Country Road, at Great River, at Oakdale, and Eastport and at Good Ground. The New York Public Service Commission has ordered the elimination of several crossings on the Montauk division at Bushwick Junction, and on the main line at Queens. Negotiations are now under way with the authorities of New York City in connection with crossings at Hollis on the main line. Work on these improvements will be pushed during 1913. The extension of main tracks during the year consisted of completing the second track on the Oyster Bay branch to Locust Valley; completion of third and fourth tracks to Lynbrook, and a small amount of work in connection with second track between Oakdale and Patchogue.

LOUISVILLE & NASHVILLE.—See Tennessee Western.

MICHIGAN CENTRAL.—The report of this company for the year ended December 31, 1912, shows that work was carried out on third and fourth main tracks from Junction Yards to Detroit, and on improvements at South Bound Yard, Detroit. Considerable work was carried out on the grade separations at Detroit and at Joliet, Ill.; also on additional yards at Windsor, Ont., at Grating, Mich., at Wenona and at River Rouge. Improvements were made to the yards, North Detroit and Belt Line Junction; double track was laid at Detroit, and miscellaneous siding, yard tracks and logging branches were constructed.

MISSOURI, KANSAS & TEXAS.—An officer writes that surveys are now being made for an extension of the Wichita Falls & Southern south and west from New Castle, Tex. (March 14, p. 529.)

NEW YORK, NEW HAVEN & HARTFORD.—The Public Utilities Commission of Connecticut will give a hearing on March 26, to consider the application of this company in reference to the double tracking of the Berkshire branch, including all line changes incident to the double tracking, between Berkshire Junction, Conn., and New Milford, 13½ miles.

NORFOLK & WESTERN.—An officer writes that the company has completed arrangements for double-tracking work on 51 miles of the eastern section as follows: From the present end of the second track at Suffolk, Va., work on 15½ miles has been started, one-half of the work is being carried out by the company's forces, and the other half by the Luck Construction Company, Roanoke; from Disputanta, west eight miles, contract let to W. W. Boxley & Company, Roanoke; from Wilson, 16 miles to connect with a section of completed second track, one-half of this has been let to the Vaughan Construction Company, Roanoke, and the other half to Rinehart & Dennis Company, Charlottesville; from Elam west to Evergreen, 11½ miles, contract let to David W. Flickwir, Roanoke. A new double track structure is to be built to replace High Bridge over the Appomattox river. A contract for the masonry work has been given to W. W. Boxley & Company, Roanoke, and contract for the superstructure to the Virginia Bridge & Iron Company of the same place.

ORANGE NORTHEASTERN.—An officer writes that the plans call for building from Orange, Tex., in a general northeast direction via Vinton oilfield, La., and through Vinton, Starks, Fields, Merryville and Leesville to Natchitoches, about 135 miles. A branch is projected from Merryville northwest to Nacogdoches, Tex., about 90 miles. The company has absorbed the Nacogdoches Railway, a lumber road, and the Lutcher Moore lumber road running east from the Sabine river, 30 miles, will also form part of the system. This latter road is now being laid with heavy rails, and grading work is under way on a 6-mile extension to a connection with the Southern Pacific at Vinton. M. Tansey, Mount Pleasant, Tex., has the contract for the work. The company expects to develop a traffic in lumber, oil, cotton and grain. Edward Kennedy, president, Houston, Tex., A. B. Thurston, chief engineer, Orange. (February 7, p. 271.)

OREGON SHORT LINE.—An officer is quoted as saying that an extension of the Twin Falls branch is to be built to a connection with the Central Pacific, probably at Wells, Nev.

TENNESSEE WESTERN.—An officer writes that the plans call for building from Iron City, Tenn., northwesterly about 18 miles to a point in the center of Wayne county. No track has yet been laid. Contract for grading has been let to Lacy-McDowell & Company, Brentwood, Tenn. The grading work is about one-third completed, and it is expected that the line will be opened for business about September of this year. It will be operated by the Louisville & Nashville. The company expects to develop a traffic in forest products, iron ore, and agricultural products. C. N. Brady, president, Washington, Pa., W. W. Olney, chief engineer, Iron City, Tenn.

WICHITA FALLS & SOUTHERN.—See Missouri, Kansas & Texas.

RAILWAY STRUCTURES.

AITKIN, MINN.—The Northern Pacific has announced that it will build a new passenger station to cost approximately $30,000.

BEECH GROVE, IND.—The report of the Cleveland, Cincinnati, Chicago & St. Louis for the year ended December 31, 1912, shows that repair shops were put up at Beech Grove, Ind., also that bridges were renewed at various points, and engine houses were built at Sharonville, Ohio, at Bellefontaine, at Carey, at Hillsboro, Ill. at Elkhart, Ind., and at Duane. At Harrisburg an engine house annex and coaling station, also a freight house were constructed, and a coaling plant was constructed and other im-

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provements were made at Bellefontaine. New passenger station and water facilities were added at Carmi, Ill., and at various points other buildings were constructed during the year.

DALLAS, TEX.—Amended plans for the proposed Dallas station have been adopted, and it is announced that work will be started within four months, to be completed within a year or a year and a half after that time. The following officers of the Dallas Terminal Company, which will build the station, have been elected: President, F. G. Pettibone, of the Gulf, Colorado & Santa Fe; first vice-president, W. B. Scott, of the Southern Pacific; second vice-president, W. W. Webb, of the Missouri, Kansas & Texas; secretary, M. L. Buckner; treasurer, R. P. Roach.

DETROIT, MICH.—The report of the Michigan Central for the year ended December 31, 1912, shows that a large amount of money was spent for the increase and improvement of terminal facilities in and about Detroit, Mich. Work upon the extensive terminal station has progressed rapidly and it is expected that it will be completed and ready for use before January, 1914. The improvements to stations and other structures included a roundhouse, etc., at West Detroit; roundhouses and facilities at Bay City, North Yard, North Toledo, and at Wolverine, and a freight house and facilities at Lansing. A bridge was built at Fort street, Detroit, and some smaller structures were put up at various points.

HIGH BRIDGE, VA.—See Norfolk & Western under Railway Construction regarding construction of a new bridge over the Appomatox river.

HOUSTON, TEX.—The Texas & New Orleans has begun work on the construction of a new blacksmith and boiler shop building of re-inforced concrete construction, 314 ft. x 120 ft.

JAMAICA, N. Y.—The report of the Long Island for the year ended December 31, 1912, shows that in addition to the Jamaica improvements on which work is expected to be finished during 1913, the company has material for sub-stations, etc., on the ground for the line to Port Washington. It is expected that this work will be completed by September. At various points improvements were made to the passenger service facilities including new passenger stations at Bayshore, at Arverne, at Flushing Main street, at Murray Hill and at Hempstead, and work was started on new stations at Grand street, Newtown, and at Garden City. In addition high platforms in electrified territory, shelter sheds, passing sidings, platform extensions, etc., were built at 18 different points, and in connection with the freight service additional sidings, warehouse tracks, freight yards and additions to freight houses were built at 22 points. Improvements were also made to the company's shops, including the installation of new machinery, additions to buildings, etc.

MARQUETTE, MICH.—The Duluth South Shore & Atlantic is preparing to build a new 15-stall roundhouse.

SLATON, TEX.—The Gulf, Colorado & Santa Fe has appropriated $30,000 for the erection of a three-story passenger station and office building

YOUNGSTOWN, OHIO.—The new freight house of the Baltimore & Ohio has been completed and it was put in use March 17. This structure, which, with surrounding improvements cost $800,000, is fireproof, and has a basement equipped for cold storage.

RAILWAY DEVELOPMENT NEEDED IN BRITISH EAST AFRICA.—For some time there has been a congestion of traffic on the Uganda Railway of British East Africa owing to a deficient supply of rolling stock. With the general development that is going on so rapidly in the country, the capacity of the cars and engines has been taxed far beyond their power to respond to the economic demands of an extensive and a variously productive region. The completion of some branch lines and the projection of others make the demand for railway equipment increasingly imperative. Considering the agricultural possibilities of this region, the extensive timber resources, the mineral prospects, the facilities for communicating with Europe and America, and the climate so conducive to European colonization, British East Africa must, for years to come, appeal to the railroad builder as a profitable field for the investment of capital.—*Consular Report.*

Railway Financial News.

ASHERTON & GULF.—This company has asked authority of the Railroad Commission of Texas to issue $550,000 bonds on 32 miles of its completed lines.

BOSTON & MAINE.—See New York, New Haven & Hartford.

CHICAGO & NORTH WESTERN.—The property of the Des Plains Valley, a subsidiary of the Chicago & North Western, has been merged with the parent company, the North Western having assumed the guarantee of the subsidiary's bonds.

DENVER, LARAMIE & NORTH WESTERN.—The Bankers Trust Company, New York, as trustee of the first mortgage bonds of 1910, of which about $1,500,000 have been issued, has brought suit in the United States district court at Denver to foreclose this mortgage and to have an additional receiver representing its interests appointed for the D. L. & N. W.

DES PLAINS VALLEY.—See Chicago & North Western.

NATIONAL RAILWAYS OF MEXICO.—E. N. Brown, president, in a recent interview in New York City, said in part in speaking of the effect of the revolution in Mexico: "Now as to the position of the National Railways of Mexico . . . grossly exaggerated statements have been published recently regarding our property losses. Since January 1 they have not exceeded $100,000. This amount includes the damage to or destruction of buildings, cars, locomotives and track. Our losses in earnings have not been so much from the destruction of property as from the necessity of using circuitous routes in order to keep traffic moving."

NEW YORK, NEW HAVEN & HARTFORD.—The Boston News Bureau intimates that as a result of the expected discontinuance of dividends on the Boston & Maine, directors of the N. Y. N. H. & H. will consider the question of reducing the New Haven dividend from 8 per cent. to 6 per cent.

PERE MARQUETTE.—The Guaranty Trust Company, New York, as trustee under the collateral indenture of March 1, 1911, is to offer for sale on March 20, $16,000,000 improvement and refunding mortgage 50-year 5 per cent. bonds. These bonds are held as collateral for $8,000,000 5-year 6 per cent. notes on which interst has been in default since September 1, 1912.

SOUTHERN NEW ENGLAND.—This subsidiary of the Grand Trunk, which was to have built a line from Palmer, Mass., to Providence, R. I., has been the subject of a special investigation by a committee of business men appointed by Governor Pothier, of Rhode Island, and this committee has decided not to recommend that the state lend its guarantee for $6,000,000 bonds.

UNION PACIFIC.—The California railroad commission, having failed to agree to any modification suggested of the plan for the dissolution of the Union and Southern Pacific, and the time for underwriting the sale of Southern Pacific stock held by the Union Pacific having expired on Saturday of last week, the plan has been abandoned, and it is understood that a new plan is being worked out by Southern Pacific and Union Pacific directors, and will in time be submitted to the new attorney general for his approval.

WESTERN MARYLAND.—The Western Maryland Terminal Company has applied to the Maryland Public Service Commission to issue $700,000 stock, and the Western Maryland has asked permission of the commission to buy this stock. The stock is to pay for land recently secured for terminals at Port Covington.

RAILROAD CONSTRUCTION SYNDICATE.—Negotiations are being conducted between a group of French capitalists headed by the Russo-French Commercial Bank and the representatives of a number of Russian banks in regard to the organization of a syndicate for railway construction. According to their plan, they will finance railway companies that are already organized, purchase concessions, make investigations, etc. Special attention is to be paid to the east and south of Siberia, the Caucasus, and Turkestan. One of the participators of this syndicate is already taking part in construction of railways.

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ANNUAL REPORTS.

FORTY-THIRD ANNUAL REPORT OF THE LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY COMPANY.

To the Stockholders of

THE LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY COMPANY:

The Board of Directors herewith submits its report for the year ended December 31, 1912, with statements showing results for the year and the financial condition of the company.

The mileage embraced in the operation of the road is as follows:

	Miles
Main line and branches	871.90
Proprietary lines	289.32
Leased lines	521.90
Trackage rights	190.08
Total road operated	1,872.30

An increase of 97.23 miles in road operated is due to the acquisition through lease of the Lake Erie, Alliance and Wheeling Railroad and to the opening for operation of the additional miles of the Cleveland Short Line Railroad extending from Marcy, Ohio, to Collinwood, Ohio. There is a reduction of .36 miles due to remeasurement and adjustment of mileage of the Lake Erie and Pittsburg Railway. The net total increase in miles operated over 1911 is 96.87 miles. A statement showing in detail the miles of road and track operated will be found upon another page.

There was no change in capital stock during the year, the amount authorized and outstanding December 31, 1912, being $50,000,000.00.

The mortgage, bonded and secured debt outstanding on December 31, 1911, was	$168,172,482.57	
It has been increased during the year by pro-rata liability for certificates under the New York Central Lines Equipment Trust agreement of 1912	2,974,961.25	
	$171,147,443.82	
It has been decreased during the year as follows:		
January 1, pro-rata of second installment 1910 equipment trust	$918,071.04	
November 1, pro-rata of fifth installment 1907 equipment trust	447,226.18	
By reduction of liability for certificates outstanding under 1910 trust, account transfer of 25 locomotives to Michigan Central Railroad Company	375,979.50	1,741,276.72
Total mortgage, bonded and secured debt outstanding December 31, 1912		$169,406,167.10

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

OPERATING INCOME.	1912.	1911.	Increase or Decrease
RAIL OPERATIONS—	1,872.30 miles operated	1,775.43 miles operated	96.87 miles
Revenues	$54,283,616.52	$48,360,997.13	$5,922,619.39
Expenses	35,534,644.36	32,443,875.09†	3,090,769.27
NET REVENUE — RAIL OPERATIONS	$18,748,972.16	$15,917,122.04	$2,831,850.12
Percentage of expenses to revenues	(65.46%)	(67.09%)	—(1.63%)
AUXILIARY OPERATIONS—			
Revenues	$1,206,895.79	$577,657.87	$629,237.92
Expenses	1,091,491.27	608,734.97	482,756.30
NET REVENUE—AUXILIARY OPERATIONS	$115,404.52	*$31,077.10	$146,481.62
NET OPERATING REVENUE	$18,864,376.68	$15,886,044.94	$2,978,331.74
RAILWAY TAX ACCRUALS	1,771,097.88	1,673,939.54	97,158.34
OPERATING INCOME	$17,093,278.80	$14,212,105.40	$2,881,173.40
OTHER INCOME.			
From lease of road	$5,000.00	$5,000.00	
Hire of equipment—credit balance	551,998.49	157,555.78	$394,442.71
Joint facility rents	357,851.47	336,426.81	21,424.64
Miscellaneous rents	98,394.37	132,904.57	—34,510.20
Net profit from miscellaneous physical property	1,211.26	.....	1,211.26
Separately operated properties—profit	1,272,125.22	557,040.96	715,084.26
Dividend income	6,904,180.66	7,878,679.77	—974,499.11
Income from funded securities	488,111.25	288,623.75	199,487.50
Income from unfunded securities and accounts	663,001.23	845,556.19	—182,554.96
Miscellaneous income	6,702.73	82,800.43	—76,097.70
TOTAL OTHER INCOME	$10,348,776.68	$10,284,588.28	$64,188.40
GROSS INCOME	$27,442,055.48	$24,496,693.68	$2,945,361.80
DEDUCTIONS FROM GROSS INCOME.			
For lease of other roads	$2,663,239.19	$2,531,081.50	$132,157.69
Joint facility rents	774,143.47	449,678.61	324,464.86
Miscellaneous rents	8,029.45	5,173.90	2,855.55
Miscellaneous tax accruals	5,948.22	.....	5,948.22
Separately operated properties—loss	178,693.51	109,624.81	69,068.70
Interest for funded debt	6,678,440.31	6,567,806.05	110,634.26
Interest for unfunded debt	549,177.27	563,063.49	—14,786.22
TOTAL DEDUCTIONS FROM GROSS INCOME	$10,857,671.42	$10,227,328.36†	$630,343.06
NET INCOME	$16,584,384.06	$14,269,365.32	$2,315,018.74
DIVIDEND APPROPRIATIONS OF INCOME—			
On guaranteed stock (18%)	$96,030.00	$96,030.00	.....
On common stock (18%)	8,903,970.00	8,903,970.00	.....
TOTAL DIVIDEND APPROPRIATIONS OF INCOME	$9,000,000.00	$9,000,000.00	.....
INCOME BALANCE TRANSFERRED TO CREDIT OF PROFIT AND LOSS	$7,584,384.06	$5,269,365.32	$2,315,018.74

*Deficit.
†Revised for purposes of comparison.

Amount to credit of profit and loss (free surplus), December 31, 1911	$36,154,623.35
Balance to credit of profit and loss for the year 1912	7,584,384.06
	$43,739,007.41
Deduct:	
Initial payment of ten per cent on New York Central Lines equipment trust of 1912	$330,551.25
New equipment purchased from the company's proportion of profit from operations of the Pittsburgh, McKeesport and Youghiogheny Railroad	777,311.07
Expenditures for additions and betterments, equipment, etc., on account The Lake Erie Alliance and Wheeling Railroad Company	582,594.75
Value of property at Ashtabula Harbor and other locations abandoned during the year	408,939.39
Commissions and expenses on sterling and franc notes	80,108.44
Commission and expenses (net) on New York Central Lines equipment trust certificates of 1912	48,545.87
Per adjustment of sundry accounts including uncollectible items	323,788.75
Balance to credit of profit and loss (free surplus), December 31, 1912	$41,187,167.89

The revenues from rail operations for the year were the largest in the history of the road, amounting to $54,283,616.52, an increase of $5,922,619.39, or 12.25% as compared with the previous year.

Freight revenue was $36,371,244.49, an increase of $5,269,909.87. The revenue freight carried amounted to 41,081,571 tons, or 6,193,876 tons more than last year. With the exception of products of animals, each group of commodities shows a greater tonnage carried than in 1911. The notable increases are, anthracite and bituminous coal 2,218,874 tons; ores 916,501 tons; sand and other like articles 890,269 tons; other castings and machinery 296,208 tons; bar and sheet metal 263,226 tons; and other manufactures 490,393 tons. There was a slight decrease in the average rate per ton mile due to reduction in rate on coal rates effective May 1, 1912.

Passenger revenue amounted to $11,835,198.83, an increase of $485,103.16 over last year, attributable to additional business. There was an increase in local passengers carried of 144,232, a decrease in interline passengers carried of 92,932, resulting in a net increase of 51,300 passengers.

Revenue from transportation of mails was $1,974,227.74, a decrease of $204,405.87, being the result of a reweighing of mails commencing September 1, 1911, when the United States Post Office Department inaugurated the transportation of magazines and periodicals by freight service at freight tariff rates, since which time the earnings from that class of matter have accrued to freight revenue.

Revenue from express traffic was $1,985,690.32, an increase of $239,754.48, attributable to the additional business handled during the year.

Other transportation revenues amounted to $1,626,784.00, an increase of $143,197.60, principally due to increased revenue derived from switching service.

Revenues other than from transportation were $499,471.12, a decrease of $10,939.85. The principal decrease is in rents of buildings and other properties, due to cancellation of leases of the company's coal and ore unloading machinery at Ashtabula Harbor, which have been taken over for direct operation by the company.

Operating expenses for the year, by groups, were:

	Increase.	Per Cent.
Maintenance of way and structures	$6,516,211.90	$337,588.59	5.46
Maintenance of equipment	9,283,832.83	1,214,439.89	15.05
Traffic expenses	1,041,451.66	*64,555.63	6.29
Transportation expenses	17,797,334.45	1,552,282.23	9.55
General expenses	975,503.52	51,014.19	5.52
Total	$35,534,644.36	$3,090,769.27	9.53

*Decrease.

The increase in maintenance of way and structures was occasioned largely by the very heavy volume of traffic moved over the road during the year. In order to maintain the roadbed and track in first class condition, additional track men were employed and owing to the scarcity of laborers of that class, it was necessary, in order to secure and hold a sufficient force, to grant a higher scale of pay, which in itself added $95,000, to roadway and track expense. Severe weather conditions during the first three months of the year caused a large expense for removal of snow, sand and ice. Several large bridges were renewed during the year. There were increased payments for the use of other companies' tracks under trackage right agreements. The expense for maintenance of signals and interlockers was not so large as in 1911, owing to the unusually heavy expenditures in that year for renewal of various interlocking plants.

The great demand on the company's equipment to transport the large volume of traffic moved during the year, made necessary increased charges to maintenance of equipment expenses. In order to keep equipment in service and up to standard, 199 locomotives received general repairs than in the previous year and 85,615 more freight cars were repaired than in 1911. Additional charges to renewal of equipment were occasioned by a larger number of old and obsolete locomotives and freight cars having been disposed of and dismantled during the year.

Traffic expenses indicate a decrease as compared with the previous year. Participation of the company in the expenses of fast freight lines was considerably diminished, owing to some withdrawals and reductions in assessments.

In transportation expenses practically all items affected by the volume of traffic handled, show increases. This is clearly attributable to the fact that the company transported 6,193,876 more tons of freight than in 1911. Although increased expenses are shown, there was a considerable saving in the cost of road service, particularly in consumption of fuel. Tonnage

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moved during the year increased 17.75 per cent. over the previous year, while freight train miles increased only 7.81 per cent. and freight locomotive miles 6.7 per cent. Demand made upon the company by engineers for increased scale of wages was submitted to arbitration, resulting in an award granted to this class of labor, which added to the cost of transportation expenses subsequent to May 1, 1912. Expenses growing out of personal injury claims were large, there having been serious crossing accidents at 105th Street, Cleveland, and Ashtabula, Ohio. Furthermore, the personal injury compensation laws passed in various States through which the company operates, has increased this item of cost to a large extent.

General expenses show an increase of $51,014.19. Of this increase $13,408.88, represents additional disbursements to retired employes for pensions.

Net revenue from auxiliary operations for the year increased $146,481.62, through the taking over for operation by the company of the ore unloading machinery on its docks at Ashtabula Harbor, Ohio.

Railway tax accruals amounted to $1,771,041.64, an increase of $97,158.34 over the previous year, and is attributable to higher valuations placed upon the company's property by various State Tax Commissions.

Other income for the year amounted to $10,348,776.68, an increase of $64,168.40 as compared with the previous year. Additional income was derived from hire of equipment and separately operated properties due to a greater excess of the company's equipment having been in use on foreign lines and in the larger surplus for the year of the Pittsburgh McKeesport and Youghiogheny Railroad on which the company has a one-half interest. The increase shown in miscellaneous rents is accounted for principally by the full year's interest received on bonds of The Cleveland Short Line Railway Company and The Lake Erie and Pittsburg Railway Company, acquired by The Lake Shore and Michigan Southern Railway Company in last year in reimbursement of notes of those companies. The retirement of the notes mentioned caused a decrease in bills receivable, which is practically offset the increase in income from funded securities. Income from dividends on stocks owned was $7,584,384.06, an increase of $192,181, due to redemption of extra dividends by The Pittsburgh and Lake Erie Railroad and The Mahoning Coal Railroad Companies.

Deductions from gross income amounted to $10,857,671.42, an increase of $630,343.06, due to following causes:

Deductions for lease of road rentals increased $132,157.69, due to a full year's rental paid to The Cleveland Short Line Railway Company as compared with nine months' rental in 1911, and to the taking over for lease of The Lake Erie Alliance and Wheeling Railroad, effective July 1, 1912.

Joint facility rents increased $324,464.86, principally due to payments covering the entire year for trackage rights acquired over the Pennsylvania and Baltimore and Ohio Railroads in connection with operation of the Lake Erie and Pittsburg Railway.

Separately operated properties rents increased $69,068.70, owing to participation by the company in the guarantee in connection with the Merchants Despatch Transportation Company.

Interest for funded debt increased $10,857,671.42, an increase of $630,343.06, due to following causes:

Deductions for lease of road rentals increased $132,157.69, due to a full year's rental paid to The Cleveland Short Line Railway Company as compared with nine months' rental in 1911, and to the taking over for lease of The Lake Erie Alliance and Wheeling Railroad, effective July 1, 1912.

Joint facility rents increased $324,464.86, principally due to payments covering the entire year for trackage rights acquired over the Pennsylvania and Baltimore and Ohio Railroads in connection with operation of the Lake Erie and Pittsburg Railway.

Separately operated properties rents increased $69,068.70, owing to participation by the company in the guarantee in connection with the Merchants Despatch Transportation Company.

Interest for funded debt increased $6,634.26, due to a full year's interest having been accrued on $5,720,000.00 of gold bonds of 1906 issued in 1911, as against a part year's interest thereon in 1912, and also to interest accrued on the company's pro-rata of equipment trust certificates of 1912, there being no corresponding charge in 1911.

From the net income of the company for the year, amounting to $16,584,384.06, there were paid three dividends on both the guaranteed and common capital stock, aggregating 18 per cent ($9,000,000.00), leaving a balance of $7,584,384.06, which was transferred to the credit of profit and loss.

There was expended during the year for additions and improvements to the property $3,286,613.74, which was charged direct to profit and loss account. For the increased train movement on the Sandusky Division, additional main tracks have been provided. To facilitate the movement of traffic and to meet future requirements, it has been found wise and desirable to extend the work of grade separation, upon which substantial progress has been made during the year, between Cleveland and Lorain territory and in connection with the change of line at Port Clinton. The company has also provided additional terminal facilities and other facilities to meet the requirements of the increase in business. Details of such expenditures will be found on a following page.

The company on account of its non-standard capital stock of The Lake Erie Alliance and Wheeling Railroad Company, entered into an agreement and lease effective July 1, 1912, whereby it acquired the right to use for the term of its corporate existence, the railroad and properties of The Lake Erie Alliance and Wheeling Railroad Company, extending from Phalanx, Ohio to Dillonvale, Ohio, a distance of 87.67 miles. The Lake Shore and Michigan Southern Railway Company will keep and maintain at its own expense the property leased, and is entitled to receive all revenues derived from the operation thereof. As rental it agrees to pay an amount equivalent to the fixed charges upon the non-standard capital stock, interest on the outstanding obligations, and all taxes and assessments of that company.

The opening for operation on July 1, 1912, of that part of the Cleveland Short Line Railway between Marcy, Ohio, and Collinwood, Ohio, a distance of 9.56 miles, has placed in operation a belt line around the eastern side of the city of Cleveland, Ohio, extending from Rockport on the west, to Collinwood on the east, a distance of 18.66 miles.

The company issued on March 2, 1912, notes payable February 24, 1913, for 20,000,000 francs equivalent to $3,860,555 and notes payable March 2, 1913, for 1,400,000 pounds or $6,819,889.50, making a total of $11,647,788.05, from the proceeds of which the company retired its one year frame notes of February 4, 1912, amounting to $60,000,000 francs.

The company purchased from The Michigan Central Railroad Company 30,000 shares of the common stock, par value $1,000,000.00 of the Chicago Indiana and Southern Railroad Company, and the collateral trust gold notes issued by the latter company, amounting to $495,000.00. Through the acquisition of this stock the company became possessed of all of the outstanding capital stock of the Chicago Indiana and Southern Railroad Company. In the consummation of this transaction it was stipulated that The Michigan Central Railroad Company would be released from its obligation under a contract dated January 15, 1908, by which that company agreed to hold The Lake Shore and Michigan Southern Railway Company harmless from liability on its guaranty of $3,825,000.00 of the fifty year gold mortgage bonds of the Chicago Indiana and Southern Railroad Company.

There were also acquired during the year by purchase, 27,998 shares of stock, par value $1,399,900.00 of the Pittsburgh McKeesport and Youghiogheny Railroad Company, 47,881 shares of stock, par value $2,394,050.00 of The Pittsburgh and Lake Erie Railroad Company, 25 shares of stock, par value $2,500.00 of the Kanawha and Michigan Railroad Company, $1,000,000.00 of The Cleveland Cincinnati Chicago and St Louis Railway Company general mortgage four per cent bonds and $97,000.00 of The Toledo and Ohio Central Railway Company, St. Mary's Division, first preference income bonds.

The Board has authorized the cancellation of the agreement dated November 1, 1907, between the Merchants Despatch Transportation Company, The New York Central and Hudson River Railroad Company, The Lake Shore and Michigan Southern Railway Company, The Michigan Central Railroad Company, The Cleveland Cincinnati Chicago and St Louis Railway Company, The Pittsburgh and Lake Erie Railroad Company, The Peoria and Eastern Railway Company, Rutland Railroad Company, The Lake Erie and Western Railroad Company and the Chicago Indiana and Southern Railroad Company, covering the use of Merchants Despatch Transportation Company refrigerator cars by those companies, to be effective January 1, 1913, and has further authorized the purchase, in conjunction with The New York Central and Hudson River Railroad Company, at its present value, of the Merchants Despatch Transportation Company's refrigerator equipment, consisting of 3,388 owned cars and 1,000 leased cars covered by Merchants Despatch Transportation Company Equipment Trust of 1911. Apportionment between the purchasers is to be on the basis of their respective stock ownership in the Merchants Despatch Transportation Company. Through this division of the equipment, The Lake Shore and Michigan Southern Railway Company will acquire 2,330 of the owned cars and an equity in 468 of the equipment trust cars, which it will also take on behalf of the company, given consent to a reduction of the capital stock of the Merchants Despatch Transportation Company from $5,000,000.00 to $1,200,000.00, under which authority this company will sell, at par, 17,772 shares of its present holding in that company.

All agreements with various dock companies for the lease of ore docks owned by the company at Ashtabula Harbor, and for the handling of ore at that point were terminated as of May 1, 1912, and new agreements were made providing for the handling of ore from vessels to cars by the company through the agency of a contractor. In this connection, the company purchased the machinery owned by the Pittsburgh and Conneaut Dock Company located on the company's property at Ashtabula Harbor, agreeing to pay therefor the sum of $775,672.61 in five equal installments.

During the year the company acquired under contract about 76,000 acres of coal lands in Christian, Montgomery, Fayette, Saline, Franklin and Williamson Counties, Illinois, at a cost of approximately $2,500,000.00, herein the 40,000 acres have already been delivered and $728,307.98 paid by the company therefor. These coal lands are on or near the line of The Cleveland, Cincinnati Chicago and St Louis Railway, the majority of whose stock is owned by this company, and the said lands are tributary to the Cleveland Cincinnati Chicago and St Louis Railway and the Chicago Indiana and Southern Railroad, the latter a subsidiary of this company. Contracts have been entered into by The Cleveland Cincinnati Chicago and St Louis Railway Company for the mining of these lands from this company at cost, plus 5% interest, payable July 1, 1917, and it has made an initial payment of $150,000.00 thereon. The Guaranty Trust Company of New York has acted as agent for The Lake Shore and Michigan Southern Railway Company in the making of these purchases and contracts.

Under an agreement dated February 1, 1912, the company has granted to The Pittsburgh and Lake Erie Railroad Company the right to use the tracks of The Lake Shore and Michigan Southern Railway Company between Elliott Junction and Wellsville, Pennsylvania. The company has also, as lessee of the Jamestown Franklin and Clearfield Railroad Company, granted to The Pennsylvania Southern Railroad Company, under an agreement dated December 30, 1911, the right to operate over that part of the Jamestown Franklin and Clearfield Railroad Company between Sulzou and Franklin, Pennsylvania, the passenger service by way of Titusville.

Under date of August 22, 1912, this company in conjunction with The New York Central and Hudson River Railroad Company, entered into an agreement with the Lehigh Valley Railroad Company for a share in its purchase from the City of Buffalo of a tract of land known as the "Hamburg Canal Strip," for enlargement of terminals, at a cost of $500,000.00, of which The Lake Shore and Michigan Southern Railway Company's proportion will approximate $166,000.00.

In the operation of the Pension Department 61 employes were retired and placed upon the pension rolls. Of these retirements, 34 were authorized because of the attainment of years of age and 27 because of total and permanent physical disability. Twenty-four pensioners died during 1912 and at the close of the year 1,000 pensioners were carried upon the pension rolls. The average monthly pension allowance to these men was $21.13 and the total amount paid in pension allowances during the year was $99,528.28.

By an arrangement made with the Guaranty Trust Company, Trustee of the New York Central Lines Equipment Trust of 1910, the company assigned and delivered during the year to The Michigan Central Railroad Company twenty-five class GS locomotives owned by the company under the terms of that trust, The Michigan Central Railroad Company assuming payment of the remaining unpaid installments applicable to the locomotives so assigned.

On November 20, 1912, the Board of Directors authorized The Lake Shore and Michigan Southern Railway Company to issue, with The New York Central and Hudson River Railroad Company, The Michigan Central Railroad Company, The Cleveland Cincinnati Chicago and St Louis Railway Company, The Pittsburgh and Lake Erie Railroad Company and The Toledo and Ohio Central Railway Company to enter into an equipment trust agreement, to be dated January 1, 1913, for the purpose of establishing the New York Central Lines Equipment Trust of 1913. This agreement will provide for an issue of $15,000,000 of equipment trust certificates, bearing interest at the rate of 4½% per annum; being not to exceed 90% of the total cost of the equipment to be furnished under the terms of the said agreement. The certificates are to be paid in fifteen annual installments, the first installment being payable January 1, 1914. Out of the $24,000,000.00 of certificates authorized there will be issued, early in 1913, $12,540,000.00. The cost of the equipment to be assigned to this company in connection with the issue of these latter certificates will be approximately $1,006,000.00, and the pro-rata amount of the certificates, representing not to exceed 90% of the cost, will be approximately $879,000.00. Full particulars as to the character of the equipment to be assigned will be set forth in the report to the stockholders for 1913.

Cost of road and equipment on December 31, 1911, was..... $131,078,914.00

It has been increased during the year as follows:

Expenditures for additions and betterments

the property as shown in detail elsewhere..$3,238,615.21

Cost of equipment received during the year

under the equipment trust of 1911..... 777,311.07 7,321,438.78

$138,400,352.78

Value of equipment retired from service during

the year, exclusive of accidents..... $866,253.67

Less amount charged for new equipment acquired, consisting of 7 passenger cars, 1 dining cars, 10 steel smelting cars, 1 pile driver, 1 coaling machine, 5 steam shovels and cost of applying superheaters to 41 locomotives.. 444,726.90

$421,526.77

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Credit adjustment in connection with trust equipment to cover profit on parts and accessories, freight and inspection charges, etc...	222,767.30	
Value of twenty-five class G-6 locomotives acquired under 1910 equipment trust and transferred to The Michigan Central Railroad Company	483,524.95	1,127,819.02
		$137,272,533.76

Amount credited in 1912 for account of 1907, 1910 and 1912 equipment trust installments..... 1,505,784.97

Cost of road and equipment, December 31, 1912..... $135,766,748.79

Grateful acknowledgment is made of the faithful, efficient performance of duty by employes in every department of the service during the year.

WILLIAM C. BROWN,
President.

SIXTY-SEVENTH ANNUAL REPORT OF THE MICHIGAN CENTRAL RAILROAD COMPANY.

To the stockholders of

THE MICHIGAN CENTRAL RAILROAD COMPANY:

The Board of Directors herewith submits its report for the year ended December 31, 1912, with statements showing the results for the year and the financial condition of the company.

The report covers the operation of the same mileage as the previous year, as follows:

	Miles
Main line	270.07
Proprietary lines	341.31
Leased lines	1,110.20
Lines operated under trackage rights.....	93.18
Total road operated (as shown in detail on another page)	1,816.76

There was no change in capital stock during the year, the amount authorized and outstanding being $18,738,000.00.

The funded debt outstanding December 31, 1911, was..... $41,269,055.01

It has been increased during the year as follows:

Pro-rata liability for certificates under the New York Central Lines Equipment Trust agreement of 1912	$2,375,663.50	
Additional liability for certificates outstanding under 1910 trust, account transfer of 25 locomotives from Lake Shore and Michigan Southern Railway Company.....	375,979.50	2,651,643.00
		$43,920,698.01

It has been decreased during the year as follows:

Pro-rata of installment on New York Central lines equipment trust certificates of 1910, paid January 1, 1912.....	$339,098.22	
Pro-rata of installment on New York Central lines equipment trust certificates of 1907, paid November 1, 1912.....	260,425.45	
Michigan Central Jackson, Lansing & Saginaw three and one-half per cent gold bonds of 1951 purchased and cancelled by the Trustees of the Land Grant Fund of the Jackson, Lansing & Saginaw Railroad Company.....	5,000.00	604,523.67
Total funded debt December 31, 1912 (detail on another page)		$43,316,174.34

The changes in the road and equipment account during the year were as follows:

Amount charged against main line to December 31, 1911...			$48,361,257.59
Charged for additions and betterments in 1912, as shown in detail on another page:			
Against capital account:			
For road	$325,054.78		
For equipment	2,475,653.36	$2,800,708.14	
Against income account (appropriated surplus):			
For equipment	$482,909.55		
Less: For road (adjustment)..	171.70	482,737.85	
		$3,283,445.99	
Less: Equipment replacement fund	$309,042.31		
Equipment trust installments	780,156.07	1,089,198.38	2,194,247.61
Total main line.....			$50,555,505.20
Amount charged against leased lines to December 31, 1911.....			$17,166,727.53
Credited for additions and betterments in 1912, as shown in detail on another page:			
To capital account:			
For road	$181,018.15		
To income account (appropriated surplus):			
For road	367,098.94	548,117.09	
Total leased lines			16,618,610.44
Total December 31, 1912.....			$67,174,115.64

On June 19, 1912, this company purchased the entire railroad and property of the Buchanan & St Joseph River Railroad Company for a nominal consideration, all the stock of the latter company being owned by The Michigan Central Railroad Company, the railroad purchased consisting of a spur line 1.77 miles in length, situated in Buchanan, Berrien County, Michigan.

On November 1, 1912, this company subscribed to 1785.6 shares of the increased capital stock of the Toronto, Hamilton & Buffalo Railway Company and paid for the same at par. The Toronto Hamilton & Buffalo Railway Company also liquidated its indebtedness to this company, amounting to $24,586.76.

Under an indenture dated October 1, 1912, between The Michigan Central Railroad Company, The Lake Shore & Southern Railway Company and the Guaranty Trust Company of New York, this company guarantees the payment of the principal and interest of $40,000,000.00 of Canada Southern fifty-year five per cent gold bonds, of which $22,500,000.00 have been issued and sold, the proceeds to be used in the redemption of $14,000,000.00 of first mortgage bonds of The Canada Southern Railway Company maturing January 1, 1913; $6,000,000.00 of its second mortgage bonds maturing March 1, 1913; and to pay for improvements to the property of The Canada Southern Railway Company made and contemplated.

On November 20, 1912, the Board of Directors authorized The Michigan Central Railroad Company to enter into an equipment trust agreement, to be dated January 1, 1913, for the purpose of establishing the New York Central lines equipment trust of 1913. The cost of the equipment to be assigned to this company in connection with the issue of these latter certificates will be approximately $1,000,000.00, pro-rata amount of the certificates, representing not to exceed 90% of the cost, will be approximately $900,000.00. Full particulars as to the character of the equipment to be acquired will be set forth in the report to the stockholders for 1913.

On October 21, 1912, and in accordance with agreement dated October 1, 1912, supplemental to lease dated February 15, 1912, establishing New York Central Lines Equipment Trust of 1910, the Lake Shore & Michigan Southern Railway Company transferred to this company twenty-five freight locomotives, in consideration of which this company assumed the remaining indebtedness on these locomotives amounting to $375,979.50, and made a cash payment of $103,679.75 for the value of the Lake Shore Company's equity in the equipment, less depreciation while in the service of the latter company.

The Detroit Delray & Dearborn Railroad Company, December 5, 1912, increased its capital stock from $50,000.00 to $375,000.00. The unissued portion of the original amount authorized and equal amount of the additional issue as may be necessary to be issued and sold, will be used to pay for extensions and improvements to the property.

On December 17, 1912, this company disposed of its holdings of 30,000 shares of the common stock, and a promissory note amounting to $495,000.00 of the Chicago Indiana & Southern Railroad Company, to The Lake Shore & Michigan Southern Railway Company for a consideration of $1,000,000.00. As part consideration the Lake Shore Company also released this company from its guaranty of the principal and interest of $3,825,000.00 of fifty-year gold bonds of the Chicago Indiana & Southern Railroad Company.

The sale of two of the three Detroit River ferry boats, belonging to The Canada Southern Railway Company, and the other ferry boat belonging to this company, to the Wabash Railroad Company for a consideration of $200,000.00, was consummated November 15, 1912, the proceeds being apportioned between the two companies on basis of an impartial appraisal.

Under date of June 12, 1912, this company authorized a contribution of $82,000.00 to the Mackinac Transportation Company for its one-third proportion of the estimated cost of a new steel car ferry, the advances made on this account from time to time to be covered by the promissory notes of Mackinac Transportation Company.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

RAIL OPERATIONS—	RAILWAY OPERATING INCOME. 1912. *miles operated* 1,816.76	1911. *miles operated* 1,816.76	Increase or Decrease.
Revenues	$32,911,753.07	$30,164,490.16	$2,747,262.91
Expenses	23,008,755.63	21,345,754.85*	1,663,000.78
NET REVENUE RAIL OPERATIONS	$9,902,997.44	$8,818,735.31	$1,084,262.13
Percentage of expenses to revenue	(69.91%)	(70.76%)	—(.85%)
AUXILIARY OPERATIONS—			
Revenues	$663,850.55	$608,294.24	$55,556.31
Expenses	635,752.02	599,385.38	36,366.64
NET REVENUE AUXILIARY OPERATIONS	$28,098.53	$8,908.86	$19,189.67
NET RAILWAY OPERATING REVENUE	$9,931,095.97	$8,827,644.17	$1,103,451.80
RAILWAY TAX ACCRUALS.....	1,366,984.90	1,322,620.82	44,364.08
RAILWAY OPERATING INCOME..	$8,564,111.07	$7,505,023.35	$1,059,087.72
OTHER INCOME.			
Joint facility rent income.....	$207,114.02	$236,403.38	—$29,289.36
Miscellaneous rent income.....	2,093.84	3,259.77	—1,165.93
Dividend income	618,556.67	347,241.59	271,315.17
Income from unfunded securities...	46,580.00	46,580.00	.....
Income from unfunded securities and accounts	186,018.65	525,154.01	—339,135.36
Miscellaneous income	.....	12,018.43	—12,018.43
TOTAL OTHER INCOME	$1,060,663.18	$1,170,957.09	—$110,293.91
GROSS INCOME	$9,624,774.25	$8,675,980.44	$948,793.81
DEDUCTIONS FROM GROSS INCOME.			
Deductions for lease of other roads	$1,794,951.00	$1,605,443.67	$189,507.33
Hire of equipment—debit balance.	1,099,646.52	653,736.44	446,910.08
Joint facility rent deductions...	560,295.72	583,551.98	—22,756.26
Miscellaneous rent deductions...	3,013.41	6,816.35	—3,802.94
Miscellaneous tax accruals.....	11,286.94	.....	11,286.84
Separately operated properties—loss	245,802.66	174,887.13	70,915.53
Interest deductions for funded debt	2,989,956.28	2,911,715.81	78,240.47
Interest deductions for unfunded debt	192,988.94	624,464.64	—431,475.70
TOTAL DEDUCTIONS	$6,898,441.37	$6,559,616.02*	$338,825.35
NET INCOME	$2,726,332.88	$2,116,364.42	$609,968.46
DIVIDENDS, TWO, AGGREGATING 6%.	1,124,280.00	1,124,280.00	.....
SURPLUS	$1,602,052.88	$992,084.42	$609,968.46

*Revised for purposes of comparison.

AMOUNT TO CREDIT OF PROFIT AND LOSS (PARE SURPLUS) DEC. 31, 1911		$11,228,059.49
SURPLUS FOR THE YEAR 1912.....		1,602,052.88
ADD:		$12,830,112.37
Advances for improvements charged to income, now to be covered by capital of The Detroit Delray & Dearborn Railroad and The Canada Southern Railway companies	$740,353.77	
Sundry adjustments and cancellations (net)....	70,951.54	811,305.31
		$13,641,417.68

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DEBIT:		
Ten per cent payments account equipment trust of 1912	$252,851.50	
Per abandoned property	107,972.09	
Discount, commission and expenses equipment trust certificates of 1912, and one-year four per cent notes	52,051.81	412,875.40
BALANCE TO CREDIT OF PROFIT AND LOSS (FREE SURPLUS) DECEMBER 31, 1912		$13,228,542.28

The total operating revenues were $32,911,753.07, an increase of $2,747,262.91 as compared with the previous year.

The freight revenue was $21,178,904.05, an increase of $1,779,520.50. This was due to the increased movement of nearly all commodities, the largest increases being in the tonnage of grain, fruit, bituminous coal, stone, lumber, bar and sheet metal, and miscellaneous commodities.

The passenger revenue was $8,250,336.10, an increase of $643,284.14. A large increase in the number of tourist and other interline passengers more than offset the decrease in the number of local passengers carried, and is reflected in the increase in the average distance each passenger was carried. This additional interline business, together with the discontinuance, to a large extent, of the low-rate excursion travel, caused a slight increase in the average revenue per passenger per mile.

The express revenue was $1,610,393.82, an increase of $131,944.67 compared with the previous year, due to an enlarged volume of business.

The revenue from the transportation of mails was $434,320.74, an increase $22,630.19 due to an under estimate of $16,586.00 in 1911, and additional compensation effective July 1, 1911, of $6,044.19 allowed by the United States Government, based on weighing of mails.

The operating revenue from all other sources increased $169,883.41 over the previous year; the principal items of such increase being in switching $103,105.09, car service $30,676.76, other passenger train $20,899.95, excess baggage $6,941.83, storage-freight $6,106.01 and milk (on passenger trains) $2,506.52, partly offset by a decrease in rents of buildings and other property $4,579.08.

The total expenses of operation were $23,008,755.63, an increase of $1,663,000.78, as per detail on following pages. By groups and principal fluctuations they were as follows:

Maintenance of way and structures $3,629,732.27, an increase of $80,527.60, caused principally by larger force employed at higher rate of wages in maintenance of roadway, and removal of snow and ice; increased expenditure for track material, and for renewal of signals and buildings, offset by decreased prices in rails and ties, and decrease in bridge work caused by delay in building material.

Maintenance of equipment $4,211,843.11, an increase of $311,347.10, caused principally by heavy repairs to locomotives, partly offset by decreased charges in car repairs.

Traffic expenses $764,232.21, a decrease of $18,865.91, due principally to decreased charges account of Fast Freight Lines, and in the cost of advertising; offset by increased cost of supervision and maintenance of outside agencies and for increase in expenditures for stationery and printing, due to tariff requirements.

Transportation expenses $13,313,054.72, an increase of $1,263,955.38, principally due to handling increased business and to higher wages paid to station employes, telegraphers and towermen. Expenses were abnormally large during the first four months of the year owing to unusual weather conditions and inadequate facilities at important terminals, which brought about a congested condition of transportation that lasted into the middle of the year.

General expenses $389,388.32, an increase of $25,836.63.

There was an increase in the revenue from outside operations of $19,189.67 over the previous year received principally from dining car service and restaurants, and operation of stock yards.

The operating income was $8,564,111.07, an increase of $1,059,087.72.

Other income was $1,060,663.18, a decrease of $110,293.91 as compared with the previous year, of which $339,135.36 was due to a smaller return in interest on unfunded securities, caused principally by the liquidation of promissory notes of the Detroit River Tunnel Company, and also to a decrease in rentals of $30,455.29 and in miscellaneous income of $12,018.43, offset by an increase of $271,315.17 in dividends on stocks owned.

Deductions from income amounted to $6,898,441.37, an increase of $338,825.35. The principal fluctuations were increases of $189,507.33 in rental of the Detroit River Tunnel, $446,910.06 in hire of equipment, $76,250.89 interest on equipment trust certificates, $48,836.39 in operating guarantee of Merchants Despatch Transportation Company, $11,286.84 in miscellaneous taxes, partly offset by decreases of $431,473.70 in interest on unfunded debt and $26,559.20 in rentals.

The surplus from operation for the year, after payment of six per cent in dividends upon the capital stock, was $1,602,052.88 which has been carried to the credit of profit and loss.

The credits for retired equipment during the year amounted to... $367,745.00

The charges against this account for cost of one cafe coach, new bridge derrick, one exhoose car and superheaters, betterments, etc., aggregated 58,702.69

$309,042.31

Credit balance equipment replacement fund December 31, 1911... 32,194.36

Total eredit balance December 31, 1912 ..... $341,236.67

During the year $1,067,500.00 was expended for the increase and improvement of terminal facilities in and about Detroit.

The tunnel under the Detroit River has been in constant use during the year, and has proved to be an unqualified success from every point of view.

The work upon the extensive terminal station has progressed rapidly and favorably, and unless some unforeseen obstacle prevents, it is expected that it will be completed and ready for occupancy before January 1, 1914.

During the year this company paid its one-year promissory notes due March 1, 1913, for $4,000,000.00, bearing interest at the rate of four per cent per annum.

An arrangement was made with the Lake Shore & Michigan Southern Railway Company, effective November 24, 1912, for the reciprocal grant of running rights over the single track portion of the two companies between Detroit and Toledo, whereby the two roads will be operated separately and independently as before, but with the greater safety, efficiency and convenience of double track operation.

In the operation of the Pension Department 44 employes were retired and placed upon the pension rolls. Of these retirements 30 were authorized because of the attainment of seventy years of age and 14 because of total and permanent physical disability. Two pensioners died during 1912 and at the close of the year 194 retired employes were carried upon the pension rolls. The average monthly pension allowance to these men was $22.37 and the total amount paid in pension allowances during the year was $50,953.53.

Grateful acknowledgment is made of the faithful, efficient performance of duty by employees in every department of the service during the year.

WILLIAM C. BROWN,
President.

TWENTY-FOURTH ANNUAL REPORT OF THE CLEVELAND CINCINNATI CHICAGO AND ST LOUIS RAILWAY COMPANY.

To the stockholders of

THE CLEVELAND CINCINNATI CHICAGO & ST LOUIS RAILWAY COMPANY:

The Board of Directors herewith submits its report for the year ended December 31, 1912, with statements showing the results for the year and the financial condition of the company.

The mileage embraced in the operation of the road is as follows:

	Miles
Main line and branches owned	634.86
Proprietary lines	994.49
Leased lines	248.27
Trackage rights	134.02
Total road operated	2,011.64

A statement showing in detail the mileage of road operated will be found on another page.

There was no change in the capital stock during the year, the amounts authorized and outstanding on December 31, 1912, being as follows:

Preferred stock authorized	$10,000,000.00	
Common stock authorized	50,000,000.00	
Total preferred and common stock authorized		$60,000,000.00
Preferred stock issued and outstanding	$10,000,000.00	
Common stock issued and outstanding	47,056,300.00	$57,056,300.00
Balance common stock authorized but not issued, December 31, 1912		$2,943,700.00

The funded debt outstanding December 31, 1911, was..... $87,357,685.34

It has been increased during the year as follows:

C C C & St L Ry general mortgage bonds, issued for additions, improvements, double tracking, equipment, etc.	$1,000,000.00	
C C C & St L Ry general mortgage bonds, issued for retirement of prior lien bonds..	579,000.00	
To place upon the general bonds of the company its pro rata liability in connection with the certificates issued by the New York Central Lines Equipment Trust Agreement of 1912	2,398,353.00	
Real Estate mortgage, Cincinnati, Ohio, Rachel G. Holmes	9,000.00	3,986,353.00
		$91,344,038 34

It has been decreased during the year as follows:

I & St L Ry first mortgage bonds retired....	$500,000.00	
Pro rata equipment trust certificates due January 1, 1912	199,625.82	
Pro rata equipment trust certificates due November 1, 1912	246,689.81	
C I St L & C Ry Co first mortgage bonds retired	6,000.00	
C I St L & C Ry Co general first mortgage bonds retired	73,000.00	
C C C & St L Ry Co 5% Gold notes retired.	12,000.00	
C S & C R R Co bonds eliminated from funded debt, the interest thereon being treated as rent paid for lease of that property	2,571,000.00	3,608,315.63
Total funded debt outstanding December 31, 1912		$87,735,722.71

On November 20, 1912, the Board of Directors authorized The Cleveland Cincinnati Chicago and St Louis Railway Company to enter into an equipment trust agreement, to be dated January 1, 1913, for the purpose of establishing the New York Central Lines equipment trust of 1913. Out of the $24,000,000.00 of certificates authorized there will be issued, early in 1913, $12,540,000.00. The cost of the equipment to be assigned to this company in connection with the issue of these latter certificates will be approximately $1,258,000.00, and the pro rata amount of the certificates representing not to exceed 90% of the cost, will be approximately $1,098,000.00. Full particulars as to the character of the equipment to be acquired will be set forth in the report to the stockholders for 1913.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

OPERATING INCOME.	1912.	1911.	Increase or Decrease.
RAIL OPERATIONS—	2,011.64 miles operated	2,011.64 miles operated	
Revenues	$32,714,238.27	$30,431,914.86	$2,282,323.41
Expenses	24,359,744.53	22,685,707.81	1,674,036.72
NET REVENUE RAIL OPERATIONS	$8,354,493.74	$7,746,207.05	$608,286.69
Per cent of revenue	(74.46%)	(74.55%)	—(0.09%)
AUXILIARY OPERATIONS—			
Revenues	$378,302.75	$355,626.95	$22,675.80
Expenses	406,785.17	401,713.41	5,071.76
NET DEFICIT AUXILIARY OPERATIONS	$28,482.42	$46,086.46	$17,604.04
NET OPERATING REVENUE	$8,326,011.32	$7,700,120.59	$625,890.73
RAILWAY TAX ACCRUALS	1,190,242.60	1,062,512.28	127,730.32
OPERATING INCOME	$7,135,768.72	$6,637,608.31	$498,160.41

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OTHER INCOME.			
Joint facility rent income	$341,589.44	$319,639.86	$21,949.58
Miscellaneous rent income	219,016.81	207,988.31	11,028.50
Dividends on stocks owned	40,967.17	72,764.90	—31,797.73
Interest on bonds owned	35,040.00	46,120.00	—11,080.00
Interest on notes, loans, etc.	73,645.08	52,769.25	20,875.83
Miscellaneous income	34,490.00	8,448.94	26,041.06
Interest on sinking fund bonds owned	12,060.00	.....	12,060.00
TOTAL OTHER INCOME	$756,808.50	$707,731.26	$49,077.24
GROSS INCOME	$7,892,577.22	$7,345,339.57	$547,237.65
DEDUCTIONS FROM GROSS INCOME.			
For lease of other roads	$301,362.02	$132,500.00	$168,862.02
Hire of equipment—debit balance	193,124.46	293,307.31	—100,184.85
Joint facility rent payable	48,298.05	526,794.42	—478,473.37
Miscellaneous rent payable	140,906.56	141,710.61	—749.95
Miscellaneous tax accruals	2,970.00	.....	2,970.00
Separately operated properties—			
Ions	71,710.76	42,014.85	29,695.91
Central Indiana Ry.—deficit	54,245.00	56,300.00	—2,055.00
Interest on funded debt	3,820,899.87	3,747,347.53	73,551.32
Interest on unfunded debt	154,439.39	80,324.24	74,115.15
Amortization of discount on funded debt	.....	53,425.00	—53,425.00
Miscellaneous deductions	1,535.68	.....	1,535.68
Appropriation of income to sinking fund	12,060.00	.....	12,060.00
TOTAL DEDUCTIONS FROM GROSS INCOME	$5,348,235.47	$5,543,723.98	$4,501.49
NET INCOME	$2,344,351.75	$1,801,615.59	$542,736.16
Dividends on preferred, four, engaging 5%	500,000.00	500,000.00	.....
SURPLUS FOR THE YEAR	$1,844,351.75	$1,301,615.59	$542,736.16

Amount to credit of profit and loss (free surplus) December 31, 1911		$2,169,152.60
Surplus for the year 1912		1,844,351.75
		$4,013,504.35
DEDUCT:		
Discount on C C C & St L gen mtg bonds	$100,000.00	
Commissions on 1910 and 1911 gold bonds	273,371.53	
Income November 1890 to Jan. 1, 1912, from St Louis Sinking fund bonds (adjustment)	341,500.00	
Interest January 1, 1883 to July 1, 1888 on Kankakee & Seneca 1st mtg bonds (adjustment)	117,000.00	
Accumulated advances to Mount Gilead Short Line Ry Co (uncollectible)	26,864.29	
Adjustment of Chicago Indianapolis & St Louis Short Line Ry—advance account	162,624.89	
Value of property abandoned 1905 to 1912	1,365,110.00	
Adjustment of sundry accounts	104,093.67	2,515,564.38
BALANCE TO CREDIT OF PROFIT AND LOSS (FREE SURPLUS) DECEMBER 31, 1912		$1,497,939.97

The gross operating revenues for the year, $32,714,238.27, were the largest in the history of the company, showing an increase over the preceding year of $2,282,323.41, of which amount $2,215,691.44 was in transportation revenue and $66,631.97 in revenue from operations other than transportation.

The freight revenue for the year was $22,168,002.10, an increase of $2,234,706.23, or 11.21 per cent. There was increased an aggregate of 25,816,649 tons of revenue producing freight, an increase of 2,477,059 tons over the previous year, of which 2,094,932 tons was in the products of mines, 181,829 in the products of forests, the remainder of the increase being distributed among the other commodities. The average receipts per ton per mile were 5.43 mills, as compared with 5.50 mills in the previous year, a decrease of .07 mills. The average haul per ton increased 2.9 miles and the average number of tons of revenue freight per train mile increased 29 tons, while the average number of freight cars per train mile decreased 1.7 cars.

Passenger revenue decreased $41,119.12, there being a decrease in interline business of $44,868.34 and an increase in local business of $3,749.22. The average amount received from each passenger increased 1.1 cents and the average receipts per passenger mile increased from 1.825 cents to 1.907 cents, or .077 cents. There were 1,226,616 less passengers carried in 1912, the average distance carried decreased 1.2 miles and there was a decrease of 19,532,802 in passengers carried one mile.

Of the decrease of $67,128.25 in mail revenue, $32,070.11 was the result of decrease in mail compensation allowed by the Government, the balance of the decrease resulting from adjustment made in the mail revenue accounts for the previous year.

The increase in express revenue, $63,583.84, represents this company's proportion of the earnings from increased express traffic as compared with the preceding year.

Revenue from milk traffic carried on passenger trains increased $16,880.14 and reflects the efforts made to develop this source of traffic during the year, together with the improved facilities for handling same, afforded by the new baggage cars received during the year.

Revenues from operations other than transportation increased $66,631.97, of which $44,750.94 is from car service (demurrage) and $30,777.56 in miscellaneous revenue.

The operating expenses for the year aggregate $24,359,744.53, an increase of $1,674,036.72, detail of which by groups is as follows:

Maintenance of way and structures—increase	$544,944.96
Maintenance of equipment repairs—increase	320,750.34
Maintenance of equipment renewals—increase	133,036.88
Traffic expenses—decrease	52,604.89
Transportation expenses—increase	730,641.38
General expenses—decrease	12,241.92
Net increase	$1,674,036.72

The increase in maintenance of way and structures, while general through all of the accounts results principally from the increased expenditures for rails, ties and other track material, and in roadway and track, the latter account increasing $261,828.62. Included in this amount is an increase of nearly $180,000.00 in the pay rolls of the various divisions and approximately $59,800.00 covering abnormal expenditures for labor and material growing out of flood conditions in the vicinity of Cairo. The aggregate increase in pay rolls of this department was $373,495.25.

The increase in maintenance of equipment repairs is distributed to substantially all of the accounts, pay rolls of this department increasing $281,252.94.

Of the increase in charges to renewals of equipment, amounting to $133,026.85, $30,173.05 is in passenger cars, of which there were 10 retired this year against 8 last year, $198,546.05 in freight cars, of which there were 901 retired this year against 642 last year, and $18,047.04 in work equipment, of which there were 63 units retired in 1912 against 27 in 1911. These amounts are partially offset by a decrease of $113,737.29 for locomotive retirements, there having been retired but 14 locomotives this year, as compared with 39 in the preceding year.

The decrease in traffic expenses was $52,084.89, the important decreases being in advertising, damage, loss and injuries and industry and printing.

Transportation expenses increased $739,641.38, of which $394,513.49 was in pay rolls and is due to increased force in this department, together with increased compensation paid certain classes of labor due to changes in rates of pay. The increases extend to practically all of the accounts in the department and reflect the increases in tonnage, locomotive, car and train mileage. The principal item of increase was $88,662.31 in injuries to persons, due to abnormal payments in the preceding year.

General expenses decreased $12,241.92, the principal items of decrease being law expenses $17,173.11, salaries and expenses of general officers $5,635.94, stationery and printing $4,440.05, partially offset by increase in pensions of $18,684.73, insurance $10,484.80 and salaries of clerks and attendants $5,112.51.

The net deficit from auxiliary operations decreased $17,604.04, practically all of which is in the dining car service, from which the revenues increased $25,314.65 while expenses increased but $7,710.61.

Taxes increased $127,730.32, of which $64,619.40 is on real estate in Ohio, $27,565.19 on real estate in Indiana, $31,970.13 on real estate in Illinois, the balance being fluctuation in taxes in other states.

Operating income for the year was $7,135,768.72, an increase of $498,160.41 over the preceding year. Other income was $756,808.50, an increase of $49,077.24, due to increased joint facility and miscellaneous rent income, decreased interest on deposits, partially offset by decrease of $31,797.73 in dividends on stocks owned. Gross income was $7,892,577.22, an increase of $547,237.65 over previous year.

Deductions from gross income increased $4,501.49, of which the more important items are: increased interest on general mortgage bonds $43,750.00, on gold debenture bonds $18,750.00, on equipment trust certificates—1912 $106,726.70, increase in interest on notes $74,115.15, partially offset by decrease of $2,184.87 on C C C & St L general mortgage debt balance and decrease of $43,873.77 in joint facility rent payable.

The surplus for the year after paying a dividend of $500,000.00, representing 5% on the preferred stock, was $1,844,351.75, an increase of $542,736.16.

There was expended during the year for additions to the property, improvements, double tracking, equipment, etc., and charged to cost of road and equipment, the sum of $3,048,573.13, a detailed statement of which will be found upon another page.

Action was taken during the year by the stockholders and the directors of the several companies authorizing the conveyance to this company, under the Ohio statutes, of the entire properties of the Cincinnati & Springfield Railway Company, Columbus Delaware & Cincinnati Railway Company, Harrison Branch Railroad Company and Findlay Belt Railway Company; also the conveyance to this company, under the laws of Illinois and Indiana, of the entire properties of the Cairo Vincennes & Chicago Railway Company and Chicago Indianapolis & St. Louis Short Line Railway Company.

Upon execution of the several deeds of conveyance we purchased the properties of the six companies mentioned above will become a part of the property of this company and completely and effectually all of the several companies had become merged with this company, but subject, nevertheless, to the liens upon said property existing at the time of such conveyances.

At the annual meeting of the stockholders of the company, held at Cincinnati, Ohio, October 30, 1912, a resolution providing for the guarantee, by the Cincinnati Northern Railway Company & Big Four Railway Company, of the payment of principal of five million ($5,000,000.00) dollars, par value, of the Cairo Terminal first mortgage gold bonds of Evansville & Terre Haute Railway Company, and thereafter, interest, thereon, to be issued from time to time under the mortgage executed by that company to the Guaranty Trust Company of New York, dated November 1, 1910, maturing July 1, 1960, and bearing interest at the rate of four and one-half per cent (4½%) per annum, payable semi-annually, was carried by more than three-fourths of the entire capital stock of the company issued and outstanding, and having been consented to by more than three-fourths of the entire issue of the preferred stock, was duly adopted.

During the year an agreement was entered into with the Guaranty Trust Company of New York, providing for the purchase by the Trust Company, for the benefit of this company, of approximately 76,000 acres of coal lands in the Ohio River region, upon which advance payments of $150,000.00 were made by this company, the balance of the cost to be paid July 1st, 1917, at which time the deed or deeds of such lands are to be delivered by the Trust Company. Preliminary expenditures to the amount of $54,243.84 have been made for drilling, etc.

On March 12, 1912, this company entered into an agreement with the Erie R. R. Co., whereby each company uses the main track of the other between Hudson, O., and Cuyahoga Falls, O., a distance of about 4½ miles, thereby making a double track arrangement which became operative October 15.

To enable the passenger trains of this company to reach a connection with the tracks of the Cincinnati, Hamilton & Dayton Ry. Co. and to operate such trains to and from the Union Depot at Toledo, Ohio, jointly, on April 8, 1912, entered into an agreement with the Toledo & Ohio Central Ry. Co. and the Erie R. R. Co. by the terms of which each company has a trackage right over the entire property of the Pennsylvania Co.

A charter of authority of the Public Service Commission of Indiana was received in several instances affecting the Road and Equipment, Securities and Advances Accounts, to conform to the accounting requirements of the Interstate Commerce Commission, and involving the charging off against profit and loss of the value of certain property abandoned, all of which adjustments are reflected in the balance sheet, shown elsewhere in this report.

In the operation of the Pension Department 44 employees were retired and placed upon the pension rolls. Of these retirements, 25 were authorized because of the attainment of seventy years of age and 19 because of total and permanent physical disability. Nineteen pensioners died during 1912 and at the close of the year 197 retired employees were carried upon the pension rolls. The average monthly pension allowance to these men was $20.32 and the total amount paid in pension allowances during the year was $46,617.28.

Grateful acknowledgment is made of the faithful, efficient performance of duty by employees in every department of the service during the year.

WILLIAM C. BROWN,
President.

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Railway Age Gazette

DAILY EDITION

Copyright, 1913, by the Simmons-Boardman Publishing Co.

Vol. 54. CHICAGO—MARCH 21, 1913—NEW YORK No. 11d.

PUBLISHED DAILY BY

Simmons-Boardman Publishing Co., Transportation Bldg., Chicago, Ill., on the occasion of the annual convention of the American Railway Engineering Association.

NEW YORK: 83 Fulton Street CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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United States and Mexico.....$5.00
Canada.....6.00
Foreign Countries (excepting daily editions).....8.00
Single Copies.....15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign (excepting daily editions), $2.00.

Application made at the Post Office at Chicago, Ill., for entry as mail matter of the second class.

WE GUARANTEE, that of this issue 10,475 copies were printed; that of these 10,475 copies, 9,869 copies were mailed or delivered by messenger to regular paid subscribers; 425 copies were distributed among members and guests of the American Railway Engineering Association and at the Coliseum; 131 copies were mailed to advertisers; and 50 copies were set aside for office use.

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The Committee on Buildings deserves much credit for the report on Roof Covering, which was presented yesterday. Beginning with practically no accurate information some three years ago, the committee has devoted much time to this subject and brought out a very valuable comparison of the various materials. Roofing materials are largely trade products made under highly competitive conditions and by patented processes. Because of this the makers have been unwilling to give out information regarding their products, and the committee has labored under serious difficulties. The report is especially valuable, as it deals with materials which the average engineer is called upon to specify to a considerable extent and which, as a rule, he knows little about. It should, therefore, be of great assistance in determining the relative merits of the various products for specific purposes. The bringing out of much of this information should largely eliminate unfair competition and put the roofing business upon a higher basis where the purchaser may better know that when he orders a certain product he will receive it.

The methods of graphical analysis of the throat and station track capacity of large passenger terminals presented by the Yards and Terminals Committee yesterday morning, brought out information which should be highly useful in the design of large passenger stations or in the study of traffic conditions for the purpose of locating and relieving congestion. While a study of this nature is of direct value to only a small proportion of the railway engineers, it is of very great value to that small proportion having in charge the design or operation of large terminals. The three methods outlined for studying this special problem should form a basis on which such studies can be readily made and should also be of considerable assistance in making comparisons upon the same basis of traffic conditions at different terminals.

The directors of the Railway Business Association, following their meeting in Chicago on Wednesday, gave out a statement strongly advocating the amendment of the Erdman act at the special session of Congress which has been called by President Wilson. The association favors broadening the provisions of the law so as, among other things, to include mediation and arbitration of disputes among railways and their track employes. It will be recalled that the law now applies only to controversies between the roads and employes concerned directly with the operation of trains. The Railway Business Association believes it should be made applicable to trackmen, clerks, freight-handlers, machinists, boiler-makers, blacksmiths, car-repairers, etc. It also favors the creation of a board in which "the proportion of the neutral arbitrators to partisans will bring more minds to bear upon the many questions arising in large areas and tend to promote equity in decisions." Under the law as it now stands the arbitration board consists of one representative of the railways, one of the employes and an umpire, the last-named of whom really always decides the controversy. The defects of the existing law are conceded by practically all who have studied its workings. The country recently has very narrowly escaped several bad strikes, and something should be done speedily to remove the constantly recurring menace of serious interruptions of transportation service. There are few, if any, more important matters demanding attention by Congress.

In a number of ways the fourteenth annual convention of the American Railway Engineering Association, which closes to-day, has been better than any of the previous meetings. The number of members in attendance is greater than ever before, as shown by the official registration figures. In 1911, 351 members registered; in 1912, 386, and this year 434. This year's registration is more than 40 per cent of the total membership of the association, which was announced by President Wendt in his inaugural address to have reached 1,115. The attendance in the meetings has been uniformly good, even at the opening of the sessions. The meetings have been carried through on schedule time and the final adjournment of the sessions for hearing reports and discussions was made at the unusually early hour of 12:35 yesterday. One reason for the very large attendance at the sessions of the convention is that the association has this year, for the first time, officially recognized on its programme the exhibition at the Coliseum. The programme included four days, Friday being devoted to a "visit to the National Railway Appliances Exhibition

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in the Coliseum and Armory." The officers of the Appliances Association notified all exhibitors that the exhibition would close officially at 10:00 o'clock to-night (Friday), and that exhibits must be left intact up to that time. The knowledge that this was the case has caused many of the members of the engineering association to postpone their visit to the exhibition until Friday, which has allowed them to spend all of their time in the meetings of the convention. The attendance has also been augmented by a very general interest in the reports presented this year. Some of these were among the most important which the association's committees have yet prepared. The Track Committee had a long and detailed report, including much important matter. The Yards and Terminals Committee presented some very valuable data concerning the study of operating conditions of large passenger terminals, and also presented a good report on some features of the operation of hump yards. The report of the Iron and Steel Structures Committee covered the very important matter of inspection; the Committee on Buildings completed the report on roofing materials, and the Rail Committee maintained the very high standard that its previous reports have set. The retiring president, Mr. Churchill, and all the officers and committees of the association, are to be congratulated on the successful conclusion of the year's work.

The report of the committee on Electricity brought up a subject the importance of which is not generally realized by those not fully conversant with the subject of steam road electrification. Many consider that when the electrification of the tracks is completed, the only remaining problems are those of an operating nature. The elaborate precautions taken to guard against the attacks of electrolysis in the Grand Central terminal show that engineering problems of magnitude also remain to be solved. While the subject of electrolysis has required attention ever since street cars have been operated by electricity, and it has been found that stray currents have been the cause of frequent destruction of conduits and water pipes, the full effects of this destructive action have not always been realized when the advisability of the use of electricity in steam railway terminals has been discussed. Difficulties of this nature from the surface lines in many cities have been pronounced, and, notably in Chicago, have given rise to many complaints and careful study within the past year. With the much larger amounts of power required for heavy railway service, these troubles may be greatly intensified and care will be necessary to avoid damage to private property as well as to the railway structures themselves. The committee on Electricity has an interesting subject, which will become increasingly important to steam railroad men as the mileage of electrified tracks increases.

NEED FOR DATA REGARDING TRACK CONSTRUCTION.

An examination of the reports of the committees studying the various elements of the track structure indicates that there is a very general sentiment that the time has come when more accurate data should be collected regarding the stresses to which the track is subjected and the strength of the individual parts singly and together. The Ballast committee reports that as a result of its study "a further test in track under regular traffic is desirable," and has outlined in some detail how such a test should be conducted to determine the proper depth of ballast of various kinds to insure uniform distribution of loads on the roadway. The Roadway committee renews the recommendation made by it a year ago that a special committee consisting of members of the Roadway, Ballast and Track committees be appointed to make experiments to determine the magnitude and distribution of the load transmitted to the roadbed and the bearing power of various materials ordinarily found in the construction of the roadway. Because of the close relation between the roadbed, ballast, ties and rail, such an investigation must cover the entire track structure, for it is impossible to study the action of any one part alone. The use of a heavier rail decreases the load upon the individual tie by distributing it over a greater number of ties. Likewise, an increased depth of ballast distributes the load more evenly upon the roadbed. The Tie committee bears this in mind when it reiterates the statement made a year ago that it is impracticable to make successful experiments to determine the size of crossties because of the influence of these other variables.

The rapidly increasing cost of maintenance of track shows plainly that it is less able to withstand the demands made upon it from year to year, and some remedy is necessary. In spite of the many years that railway tracks have been built and maintained there is practically no data regarding the actual service track can withstand. A number of excellent theoretical analyses have been made and some elaborate experiments have been carried out, notably those of the Pennsylvania at Altoona and of Director Schubert in Germany. These experiments, however, have been conducted largely under artificial conditions with the track equipment especially constructed and with assumptions more or less accurate regarding the loads, climatic and other conditions, so that the results only approximate those secured under traffic.

Before the track structure can be intelligently designed, the forces acting on it must be known. The track of to-day is not the result of such a design, but rather of a gradual development along more or less arbitrary lines. As it is becoming more evident that the limit of this development along the present lines will soon be reached, if indeed it has not already been reached, a series of tests carried on in a main track under actual traffic conditions should be extremely valuable in indicating the weak points in the present construction and showing wherein it may be strengthened. Aside from the necessity of securing a track structure of sufficient strength to meet present traffic conditions, it should be possible, with such tests, to determine the most economical construction to withstand given loads, so that one could determine, for instance, whether it is more economical to use a greater depth of ballast or larger ties to secure the desired resistance. One road is now making a careful study along this line, paying particular attention to the influence of the subgrade on the track structure above. It aims to divide the roadbed into four general classifications, depending upon its degree of solidity. Then, with a certain grade of foundation, one depth of ballast and one size and spacing of ties could be recommended to give a strength equal to that of another depth of ballast on another roadbed. A series of experiments to cover all the variables entering into track construction would necessarily be extensive and expensive, but when one considers the amount of money spent annually for track maintenance it should be well worth the cost. Because of these numerous variables, it is not to be expected that a section of track can ever be designed with the mathematical exactness that a bridge can, but a good series of tests should go a long way towards removing many of the uncertainties and bring us nearer to an exact solution.

MISSOURI PACIFIC-IRON MOUNTAIN DINNER.

The officers of the Missouri Pacific-Iron Mountain system who were present at the convention held their annual dinner Tuesday noon. The representatives of the system who were present included Messrs. Hadley, Leighty, Hale, Carpenter, Dorley, Curd, Burton, White, Rickert, Buckholz, Walker, Simons, Butterworth and Bishoff.

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Proceedings.

The Thursday morning session of the American Railway Engineering Association was called to order at 9:20 a. m. by President Churchill.

YARDS AND TERMINALS.

The Board of Direction has assigned the following subjects to this committee:

(1) Report on typical situation plans of passenger stations, of both through and stub types, with critical analysis of working capacity, and include a review of the different methods of estimating their capacity.

(2) Report on developments in the handling of freight by mechanical means.

(3) Report on developments in the design and operation of hump yards.

TYPICAL SITUATION PLANS OF PASSENGER STATIONS.

In the development of the subject the committee presented situation plans and description of the business handled at the following passenger stations: Baltimore, B. & O.; Baltimore, Pennsylvania; Boston, South Station; Philadelphia, B. & O.; St. Louis, Union Station; and Washington, Union Station.

C. H. SPENCER,
Chairman Committee on Yards and Terminals.

In arriving at a description of the business handled at each station, the following outline has been used:

Handling of mail, handling of express, handling of baggage—individual, theatrical; passengers, through, local and suburban.

Each item should be considered apart from any other, particularly as to that which fixes the maximum capacity in a certain unit of time, say, one hour. This would be followed by consideration as to whether this speed or maximum capacity could be sustained for a longer period. Finally the four headings would be considered as applied to each layout.

The committee offers three methods of graphical critical analysis of working capacity of throat and station tracks at a station. The first method has been used by the Belgian state railway and is shown in article by Messrs. Weissenbruch and Verdeyen in Bulletin of International Railway Congress, for September, 1908. The second method has been used by the Pennsylvania railroad in studies of the Broad Street (Philadelphia) station. The third method has been designed for the committee work this year.

A method devised for the Dirschau Passenger station and described in Bulletin of International Railway Congress, for February, 1909, is, after consideration, not recommended.

The essentials to be shown on diagram for analysis of working capacity of a passenger station are:

(1) Occupation of station tracks—
  (a) Capacity of each track;
  (b) Time of occupation;
  (c) Make-up of trains;
  (d) Movements, if any, on internal crossovers in station,
  (e) Number of trains and route arriving and departing and direction of movement.

(2) Movements on throat tracks—
  (a) Arbitrary time over route;
  (b) Whether scheduled trains, drafts, road engines or switch engines;
  (c) Route used before entering and after leaving and direction of movements;
  (d) Interference from cross movements.

Each of the three methods submitted has stood the test of application to extremely heavy traffic conditions.

Diagram of Train Movements at Camden Station, Baltimore, Md., Using Belgian Diagram.

A diagram was presented showing train movements at the Camden station of the Baltimore & Ohio, which was an application of the diagram used on the Belgian State railways, and worked out by officers of that system. It was explained by L. Weissenbruch and J. Verdeyen in the Bulletin of the International Railway Congress issued in September, 1908.

In applying this diagram to Camden station there were certain minor features added to those given in the above bulletin, especially the table showing the capacity of tracks and the symbols used to designate the number and kind of cars occupying the platform tracks. This was for the purpose of showing whether or not two trains could occupy the platform track at the same time.

In the diagram of Camden station two hours were selected in which the number of movements was at a maximum. Many of these movements were switching movements, and during the particular time chosen the station platforms were not utilized to their full capacity for inbound and outbound main line trains. This period was selected and the diagram prepared to show especially the possibility of representing internal switching movements as well as the movements of trains and light road and switching engines.

The diagram as applied to Camden station showed its use both for a terminal station and a through station, since tracks 1 to 7 inclusive are stub tracks in the train shed, while tracks 8 and 9 are on a lower level entering the Belt Line tunnel on the main line between Philadelphia and Washington, constituting a through station.

The fundamental idea of the Belgian diagram is to select a certain number of platform tracks, access to which is secured over one track, or a short stretch of a track, which can be called the "running line" of the group selected. Tracks 8 and 9 show in reality a through station, and therefore, have two running lines. In order to represent routes and to immediately detect movements which would foul each other, numbers are selected to indicate the different routes.

The value of the diagram depends entirely upon the selection of the running lines and the numbers representing routes. The route numbers and the station platform numbers can be made different in design, and running lines should be shown in dotted and broken lines or in lines of different colors. There may be several selections of running lines and routes, but after one or two trials the arrangement that gives the greatest station capacity will be easily determined.

This diagram covered the five essentials which had been submitted by the committee as necessary for a graphical analysis of working capacity of a passenger station in regard to the occupation of station tracks. In the table at the right-hand side of the diagram the capacity of each track could be ascertained. It showed the composition of the train or cut of cars occupying the track and the length of time that the different trains or cuts occupied that track, and whether cars were taken off or added to those on the track. It showed internal movement, also the number and route of arriving and departing trains with their direction. As applied to the movement through throat tracks or fouling points, the numbers were placed at these fouling points and showed the route, the arrows the direction of movements, and the symbols as noted in the legend the class of movements, such as trains, light load or switching engines, or switching engines with a cut of cars. The time taken by a movement on any track was shown by the length of the heavy movement line as drawn on the line representing that track on which the movement is taking place.

All diagrams at first seem quite complicated, but after giving a little time to thoughtful study and becoming

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thoroughly familiar with the meaning of each symbol, it is very easy to read them, and they can then be used correctly and quickly.

The make-up of the diagram would depend considerably upon the purpose for which it might be employed. A superintendent or station master, in making a study for rearranging station movements to secure greater capacity, would not need as large a diagram, nor possibly the same kind of a diagram, as would be needed by a towerman, or a train dispatcher, who must handle an emergency movement. It is possible that we might have a station used practically to its maximum capacity, and a certain train might come in late, or on some days there might be unexpected heavy switching movements, and a diagram to fulfill this purpose should show at a glance at what time, on what track and by what route the different trains could be received. A towerman who has been working for any length of time in a certain tower would probably not have occasion to refer very frequently to this diagram, but a new man would use it constantly, until he became thoroughly steeped in the knowledge of the facilities which he has to handle.

The Belgian diagram gives a very complete picture at a glance, and concentrates on one chart all fouling points and tracks so that the whole situation is shown on the same sheet. It is composete in its representation; it can be spread out if the number of its movements are large, and after a knowledge is had of the fundamental principles it is very simple and can be read without hesitation. It is most important, however, to secure full value of the diagram, that we make a careful selection of the running lines and the numbers representing routes and fouling points.

Diagrammatical Method of Showing Actual Occupation and Working Capacity of Station and Throat Tracks, Broad Street Station, Philadelphia, Pennsylvania Railroad.

For a number of years past, it has been apparent that the track layout of the station and approaches at Broad Street station, Philadelphia, is seriously congested by the train movement incident to handling the service of that terminal. This condition is most in evidence during the rush hours, or peak load periods of the morning and evening, at which time any interference with the normal movement of traffic, such as occurs during wet weather, results in disorganization of the service and consequent delays to trains, from which recovery is slow.

The need for additional relief led to the appointment about two years ago of a board of engineers to study the whole situation, and prepare plans and submit a report for additional facilities. In considering the problem, the committee's first thought was to devise some means of showing graphically the conditions actually existing at the station and on the tract approaches, during the peak load periods, or hours of maximum train service; the train movements handled during such hours requiring the maximum demand on the facilities provided. It was necessary that these diagrammatic studies, to be of practical service, should be of such a nature that the results obtained through any change in operating methods could be clearly indicated on the original charts. The charts fully met expectations, and were indispensable in studying the overcrowded condition of the terminal and the resulting changes that would ensue from electrification.

An analysis of the station and throat track layout developed the fact that there are six route or throat tracks at 18th street connecting the eight elevated approach tracks to the sixteen station tracks, over which all passenger train movements are made. A movement over any given route will, of course, block such route for other movements from the moment the route through the interlocking is set up until the movement in question clears the fouling point. It is also evident that when such a movement involves the use of switches which are necessary to the movement of train units over one or more of the five remaining routes, the routes so fouled are blocked until the movement in question clears.

It was apparent from these facts that with the proper data at hand, graphical charts could be prepared that would show all movements actually made over the throat tracks, including blockade of routes, and would indicate the extent to which these facilities were used. This method was, therefore, adopted and the necessary data obtained.

In preparing the throat track charts, the six routes were plotted as adjacent parallel spaces of convenient width and length, on which time was indicated by perpendicular lines. Each individual movement made over the different routes was plotted as a solid line rectangle, cross-hatched with solid lines to show the direction of movement and covering the time included between the actual setting up of the route and its clearance by the movement in question. The blocking of routes other than the one actually in use by any given movement was shown by rectangles, cross-hatched with dotted lines. The character of each train unit handled was indicated on the charts, and, where blockades of other routes resulted, the actual movement made was shown.

The station track diagram showed by means of rectangles, the equipment properly designated, occupying the different station tracks during the busy hours, and the time of the arrival or departure of each unit. The width of track spaces and train diagrams were drawn to scale, and the relative amount of track room occupied by each train unit was, therefore, indicated.

Examination of these diagrams or charts indicated very clearly the congestion now existing, and showed conclusively that the tightest place was at the throat of the station, and that the six routes in their capacity for handling movements were not evenly balanced. This condition is due to the character of the track layout.

These different charts are well adapted to the study of the results to be obtained from electrification; the elimination of shifting movements that would follow the use of multiple-unit electric traction for certain groups of trains being readily indicated on the original diagrams.

The re-plotting of trains can be done without introducing unknown factors, as it is only necessary to adhere to the figures obtained in actual practice, as given in the tower records and plotted on the original diagrams. If new trains are to be introduced, a glance at the station chart will show what platforms are available at any particular time, and, by referring to the throat track chart, one can easily ascertain whether the movement can be made at the desired time without interference with existing conditions.

The daily number of scheduled trains when the tower record was taken in January, 1912, was 643; the number of scheduled trains in the busy two-hour period from 4:00 to 6:00 p. m. was 78, and 286 movements were made in both directions past "A" tower in the same period.

In addition to suburban and long distance passenger trains, a large amount of baggage, mail and express must be cared for. The handling of theatrical scenery and some full carload lots for periodicals is undertaken at West Philadelphia.

Graphical Diagram Devised by Committee for Use in Analyzing Working Capacity of Passenger Stations.

The purpose of the graphical diagram showing the working capacity of a passenger station is twofold: To make clear the necessity for changes in design in the way of revision of or additions to the track layout, and to lay out a working time card.

It is desirable to be able to see at a glance for each station track relatively for any instant: The capacity and the space yet available, the make-up and the amount of equipment occupying, the scheduled time of arrival and departure of such equipment, the switching movement required on any connecting internal crossover and the route arriving and departing, and the direction of the movement.

The diagram should show clearly what throat tracks directly serve the various station tracks without interference with other routes, also, similar information as between the throat tracks, and the different grain of running tracks outside of the station; the arbitrary time consumed by a movement over a throat track from the time the route is set up until it is cleared, whether the movement is a scheduled train, draft road engine or a switch engine, the route used before a movement enters a throat track and after it leaves, the direction of the movement and any interference from cross movements.

The method of graphic analysis designed for the committee contemplates satisfying each of these requisites. It has been applied on the diagram presented by the committee to the Broad Street (Philadelphia) station, for which data was available covering approximately 150 movements that are regularly made in the two-hour interval, 8:00 a. m. to 10:00 a. m. Such heavily congested traffic was selected so as to thoroughly test the method.

On the diagram heavy lines plotted as coordinates represented, respectively, the abscissa or horizontal lines the station track, the ordinate or vertical line the throat track, and a second abscissa the main running track. A line

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was provided for each unit in these three classes of tracks A scale representing hours and minutes was plotted on each of these lines. For clearness, no less than 1-20 in. should be allowed for each minute.

The capacity of each station track may be shown by a number placed against the station track line to show its length in cars. Each station track line was also marked to show the number of track which it represents. The amount of space available on any track at any instant is the difference between the number of cars shown in any movement or movements occupying the track, and the total capacity of the track. Each occupying movement was shown by a relatively thin line paralleling and alongside of the station track line, and marked as to the character and make-up, both in cars and engines. The time of arrival and departure of any movement was shown by the minute on the scale at which the movement line, now extending vertically, crossed the track line. The heavy horizontal scale lines representing the station tracks jointly served by any certain throat tracks were assembled in a parallel group. The switching movements required on any internal crossover connecting with station track may be shown by drawing thin movement lines from the proper point, as to scale, on the occupation line on one track, through the proper point on the scale of the track to which the crossover connects, paralleling the latter during the time of occupation, and returning vertically again to the original occupation line on the first track. The route arriving and departing for any movement was shown in order by the figures and letters plotted on each movement line near the point of origin or ending on the station tracks, and denoted the respective station tracks, throat tracks and running tracks occupied. The direction of the movement is shown by an arrow.

The relative position of the vertical lines representing the throat tracks, and the horizontal lines, representing respectively the station tracks and the running tracks, showed the grouping as to direct connection one with the other. The arbitrary time consumed by a movement over a throat track from the time the route was set until it was cleared was measured by the minimum space allowed between the crossing movement lines on the vertical scale line representing the throat tracks, and could also be shown by a number representing the latter and placed at one end of the throat track line. The scales used should be no less than 1-20 in. to the minute for clearance sake. The vertical lines representing the throat tracks were respectively marked with the letters used to designate each throat track. The conventional movement line in addition to being designated at the points of origin and ending by figures and letters denoting as to whether they were trains, drafts, road engines or switch engines, and also as to the route used before a movement enters a throat track and after it leaves, could also be distinguished as to classification of movement, by the use of different colors, just as is customary in the use of strings or lines denoting on an ordinary railroad district time-card chart somewhat similar classification. The direction of a movement was given by the arrows at the points of origin and ending, and the interference of a movement on any throat track was shown by the fact that the movement line passed across each and every throat track line that might be blocked by the movement.

Should it be desired at any terminal to use this method in laying out a working time card, chart boards of a size sufficiently large to suit the purpose could be provided, on which could be permanently plotted the scale line conventions for the station tracks, throat tracks and running tracks. The movements would be indicated temporarily by lines of different colors and would be shown upon the chart by means of strings fastened by pins, as is done on the ordinary railroad district time chart. Tags properly marked and attached to the pins at the originating and terminating point of the movement would give the detail information required, so that after the movements are plotted to meet requirements of the proposed new time card, the information could be checked and called off in the customary way for making up the printed working list, showing arrival and departure of trains and tracks used for each. Should certain movements during any interval of time appear to create an undesirable congestion of traffic, a rearrangement of the strings on the chart may be studied and put into effect, and the possible interference brought about by any such change anticipated and avoided. Should one or more station tracks appear to be handling more than their share of the traffic, similar attention to the chart or diagram can be given, and if no other solution develops, the necessary slight changes in track connections may be made.

Where congested traffic demands, the working charts or diagrams need only be limited in size by the space on the wall available and within reach, and as a rule, where the traffic is as congested as in the Broad Street station, extra sets of charts may be required to satisfactorily cover the day's work. One possible good feature of this method is that it may be handled personally by transportation men, making use of the colored strings, and may be revised and rearranged by them quickly to suit any change in traffic conditions. The make-up of the train may, if desired, be shown on the diagram also by conventions, representing arbitrarily each style of equipment, placed in order on a line at right angles with each station track scale line and against the time of arrival or departure, indicating the mail, express, baggage, coaches, dining cars, sleeping cars and parlor cars.

In General.

The committee recommends that for the design of a large passenger terminal there should be considered the situation plans submitted to the association in 1911, employing the notation 1-7 as applied to the angle of the ladder. These layouts would be expanded or multiplied in such a way as to best meet the requirements of the real estate owned at any particular location.

The committee also desires to emphasize the possibility of the substitution of inclines or ramps in place of stairways in busy stations. In all such stations where the track level is above or below street level, stairway connections have the objection of interrupting and checking the flow of travel at busy hours. This is especially the case where much suburban traffic is handled. It is of interest to note, therefore, that in the new Grand Central terminal at New York inclines have been adopted at several points, presumably because they were considered safer and more expeditious than stairways. The grade of these inclines seems to be eight per cent. Experiments have been made to determine the grade best adapted for convenience. In many places there is not space available for such inclines, but in designing new stations this feature might well be studied.

Conclusions.—In the design of a large passenger terminal the committee presents for adoption the following conclusions:

(1) A holding yard should be directly connected with the platform tracks to provide for a quick emptying and refilling of the latter.

(2) At passenger terminals, where large quantities of baggage and express must be handled, and it does not appear expedient to provide intermediate platforms to be used exclusively for this service, it is recommended that, where conditions permit, baggage and express be received, delivered and handled below or above the train floor (as grade conditions demand) and raised and lowered by elevators, conveniently located, to avoid interference with the movement of passengers.

(3) To provide for proper coupling of cars a maximum curvature for storage and loading tracks of six deg. is recommended.

(4) For safe, efficient and economical operation on station throat tracks the curvature through switches should not exceed that of a No. 8 slip on tangent.

The committee presents as a progress report, without recommendation as to relative merits, the three methods of graphical analysis of working capacity of a passenger station.

DESIGN AND OPERATION OF HUMP YARDS.

Circular letters were sent out during the year to a number of large railways, and as far as the committee was able to ascertain, the only large hump yards built during the last year were the Centralia, Ill., yard of the Illinois Central and the Godfrey, Ill., yard of the Chicago, Milwaukee & St. Paul. A small hump yard has been partially constructed by the Kentucky & Indiana Terminal railway near Louisville, Ky., but as some changes are to be made in plant, it will not be possible to make any report on the yard at this time. (The report then described the Centralia and Godfrey yards, which were described in the *Railway Age Gazette* of Aug. 9, 1912, and April 14, 1911.)

The committee feels that a careful study should be made of the operating conditions of all hump yards and results tabulated to see if improvements cannot be made in some of these yards to secure better efficiency.

Conclusions.

Where tracks are set aside for holding empty cars, the grade leading to such empty tracks should be increased so

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that empty cars will move with the same velocity as loaded cars switched to adjoining tracks.

The committee has investigated the "Cut List" system of handling cars on the hump and recommends it as being safe and efficient. This system is briefly described as follows: The yard clerk makes up a list of cars to be switched and tracks they are to be placed on in receiving yard, cut No. 1 being the first car to go over the hump. Cut list form is perforated on three vertical lines, so the list may be divided up into four parts, each part being a duplicate of the other.

Where switches are thrown from a tower, one copy of the list is given to the towerman and one to the man cutting off cars on the hump. Where switches are thrown by hand, each

Cut List			Cut List		Cut List		Cut List	
No. of Cut	No. of Track	Cars in Cut	No. of Track	Cars in Cut	No. of Track	Cars in Cut	No. of Track	Cars in Cut
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
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Cut List for Switching in Hump Yards.

switch tender has a copy of the cut list, as well as the man cutting off cars on the hump.

DEVELOPMENT IN THE HANDLING OF FREIGHT BY MECHANICAL MEANS.

During the past year the committee has made considerable study of the mechanical handling of freight, especially as to the work carried on at the freight house of the Missouri, Kansas & Texas at St. Louis; the Baltimore & Ohio, Pier No. 8, Locust Point, Baltimore, Md.; the Wabash Pittsburgh Terminal freight house at Pittsburgh, Pa. It has also made further study of the use of electric trucks and other appliances.

Commenting on the M. K. & T. freight house, which was described in the *Railway Age Gazette* of June 23, 1911, the committee reports as follows: The daily duty required at this station is approximately as follows:

(1) To handle one million pounds of outbound freight per day for loading into 77 cars.

(2) To handle a considerably less amount of inbound freight, the outbound freight being mostly handled in the afternoon and the inbound freight mostly handled in the morning.

The cost of maintenance of the telpherage system is considerable. In this particular case, however, it was due to the first installation of the overhead rail being soft, necessitating its renewal with a harder grade of steel. Along with the rapid wear of the rail originally installed it was noticed there was more or less injury to the eyes of the employes on account of fine particles being ground off the rail and falling through the air. It has further been found that considerable damage to freight is likely to result—more than results from the ordinary handling of freight, due to crushing by heavy loading on the trucks and on account of the motorman dropping loads with too great force. It has been found in practice that the trucks cannot generally be loaded to their full capacity without frequent rebanding, which is impracticable on account of not sufficient freight destined to a particular car being assembled for loading in its immediate vicinity.

There has been greater difficulty in preventing freight going astray as the result of two sets of men handling the freight on the two floor levels and no check between them. It is further impracticable to avoid a great many empty runs with the telphers to bring back empty trucks, by reason of the fact that when a loaded truck is deposited through a hatchway no empty truck can be placed at the same point to be picked up at that time, and the telpher has to return later to pick up the empty truck from that same hatchway. There is a hazard of personal injury to truckers compelled to work under the trucks while being conveyed, due to the liability of packages falling therefrom. It has developed that there is likely to be considerable idle time of employes, resulting from difficulty in so distributing the freight as to have trucks at all times at the several cars ready for unloading as soon as the trucks previously delivered have been emptied. There is more supervision required to check against idleness and also against pilferage. A repair force at considerable expense is required for the maintenance of the electrical equipment, even at the present time, when the installation is comparatively new, and the cost of maintenance is expected to increase in considerable measure as the equipment becomes older and more worn. The manual labor required in the handling of freight has been demonstrated by experience to be necessarily about as great as the handling of freight on one level without any intermediate mechanical handling, as the result of which the cost of handling freight by this system is materially, and apparently unavoidably, increased, rather than decreased.

It is probably true that the design of the building and of the telpher equipment could be improved, involving less first cost and less maintenance cost. It is naturally to be expected that this would be the case on account of this undertaking being entirely novel as applied to the handling of less-than-carload freight. While the working of this plant seems to indicate that the practicability of handling less-than-carload freight is questionable, there is no question but that the use of the telpher for any certain commodity can be successfully and economically worked where elevation and distance are factors to be considered, or where, regardless of classification, freight is to be delivered at a common point, as for the loading of a vessel. This is further borne out by the fact that a successful telpher system is in use by the Baltimore & Ohio Railroad on its Pier No. 8, Locust Point, Baltimore, Md., where miscellaneous freight is transferred from cars to vessels.

It was expected that the capacity of this St. Louis freight house, with its equipment, would be greatly in excess of the present demand for handling freight, or at least could be made capable of handling a greatly increased amount of freight simply by the addition of telphers and men. But it has been demonstrated by experience that the present volume of traffic about measures the capacity of this plant for handling classified freight, which is a disappointment.

The Missouri, Kansas & Texas was forced to quick action in the nature of providing facilities and was limited as to space in order to obtain desirable location. It is to be complimented for making the bold experiment at a very heavy cost of installation, and it is to be hoped that it may yet find a way of attaining economy in its operation.

Electric Trucks.

Four-wheeled platform motor trucks have been introduced in a number of cases to replace the ordinary two-wheel trucks,

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the former having greater carrying capacity and higher speed than the latter. The truck system has the advantage of flexibility of movement with no fixed routes, as where carrier or telpher systems are used, and no investment for fixed plant, while it may be tried and introduced in existing freight houses without trouble.

The Delaware, Lackawanna & Western Railroad is using several storage battery one-ton trucks of this kind (Sprague and General Electric systems) at its transfer station at Secaucus, N. J., where freight brought in cars from various collecting stations in New York is transferred to cars for the outbound local and through trains. The transfer station has two pairs of tracks for the transfer cars, two for local cars, and two for through cars, these being separated by three platforms 900 ft. long (23 cars) and about 22 ft. wide. The trucks are 72x44 in., with the floor 22 in. above the rail and a motorman's platform at one end with controller, brake and steering gear. They have electric bells to warn the truckers and other men, and can move at a speed as fast as ten miles per hour. The trucks are run directly into the cars, over steel bridge plates placed at the doors, and in this way pass to cars on the second track from the platform. Current is supplied from a line supplying the yards and is converted to the necessary voltage by a small plant on one of the platforms. This transfer house with electric truck service is described in further detail in the Engineering Record of September 21, 1912.

Abstracts of papers presented before the New England Railroad Club on February 13, 1913, were also given. (See Railway Age Gazette, November 8, 1912.)

Another type of storage battery truck, built by the Cleveland-Galion Motor Truck Company, has been used experimentally in the freight station of the Lake Shore & Michigan Southern Railway, at Cleveland, Ohio. This is described in the Railway Age Gazette, October 11, 1912.

In addition to the above, we find some roads and steamship companies are using inclined elevators, overhead jib cranes, stacking or elevating conveyors, briefly described as follows:

Inclined Elevators.

There is a somewhat extensive use of inclined elevators at piers to assist the moving of loaded hand trucks on the inclines between ships' decks and the pier floor. Some of these are traveling platforms, which carry men and the trucks. Others are simply endless chains which have lugs to engage the axles of the trucks and push them forward, the men walking the ordinary way. The Otis Elevator Company has built a number of installations of the latter class and some of the former class (all on the Reno patents). The installations of the chain type include piers of the Boston & Maine at Boston; the New York, New Haven & Hartford at Bridgeport, Conn.; the Merchants' & Miners' Transportation Company at Savannah, Ga., and the Metropolitan Steamship Company at Boston. Each of these has two electrically operated machines, except that the last has three machines. It is stated that the last named company estimates a saving of $33,000 in handling its freight for one year, which is approximately six times the cost of the machines. Each machine can handle from 600 to 1,900 trucks per hour, according to the speed of the chain.

Overhead Jib Cranes.

A type of crane which is used extensively in freight houses in Great Britain is a combined traveling and revolving overhead crane. Instead of the usual hoisting trolley on the bridge of the crane, the trolley has suspended from it a frame which carries a horizontal boom or jib, and this frame can be revolved through a complete circle. The freight house of the Great Western Railway at Cardiff, Wales, has a Babcock & Wilcox electric crane of this type: its bridge has a span of 50 ft., and the boom on the traveling trolley has a working radius of 18 ft. The hoisting capacity is one ton, and the speeds are as follows:

Bridge travel	250 ft. per minute
Trolley travel	120 ft. per minute
Swinging	230 ft. per minute (at end of boom)
Hoisting	30 ft. per minute

The new freight station of the North British Railway at Glasgow, Scotland, has 15 overhead traveling cranes for unloading cars. These are of the revolving jib type mentioned above, the jib being 23 ft. long, but the trolleys run on narrow parallel runways instead of upon a traveling bridge. Two of these are three tons and the other 1½ tons hoisting capacity. Each of the latter has a 17 h. p. motor for hoisting at 100 ft. per minute, one of 2 h. p. for swinging at two-thirds of a revolution per minute, and one of 4½ h. p. for traveling at 360 ft. per minute. For hoisting freight from cars to the upper floors of the warehouse, there are two traveling trolley hoists on each floor, with three wells or shafts for interior hoisting, while the top floor has a 1½-ton trolley carrier or helper. There are also six elevators at one side of the house. For handling heavy freight, there is a gantry crane, having one end of the bridge supported by a leg with wheels riding on a rail laid on the ground level, while the other end is carried by wheels on a runway built on the freight-house wall. The bridge is of 50-foot span, and carries a traveling hoist of 40 tons capacity. The bridge has a travel of 200 ft. along the front of the freight house and into the yard.

Stacking or Elevating Conveyors.

In pier sheds, cotton sheds, storage warehouses, etc., it is often desirable to stack goods (in bales, sacks, boxes, etc.) to a considerable height, in order to save floor space. Sometimes an overhead traveling crane, or traveling bridge with hoisting trolley, may be installed for this purpose. In many cases, however, a portable machine would have a greater range of usefulness, and several portable elevating and conveying machines of this kind have been installed by the Brown Portable Elevator Company. These installations include the stacking of grain and sugar in sacks, stacking hay in bales, and also handling miscellaneous materials and freight. One installation is for the Central Railroad of Georgia, at Savannah, Ga., for piling bags of material on a pier. The conveyor is carried on a steel frame mounted on a wheeled truck, on which is mounted also the motor and driving mechanism, and this frame can be adjusted to any desired inclination and height. In some machines there is a separate carrier on each side of the truck, so that one may be inclined to raise material from the floor to the heel of the other conveyor, this latter being adjusted to a horizontal or inclined position, according to the point to be reached.

Some freight handling installations at piers have been mentioned above, but in crane equipment for handling ship cargo American ports are notably behind European ports. At the former, reliance is placed mainly on the ship's winches and cargo booms, which can handle material only directly alongside. In European practice there are usually numerous traveling cranes along the quays and sheds. The tower type of crane is a jib crane on a tower mounted on wheels to run on tracks along the piers or docks. The portable type of crane is mounted on a steel tower traveling on a track of wider gage than that of a railway track, and made open so that cars can run beneath the crane, and the crane can move from point to point, without interfering with car on the track which it straddles. A semi-portal or semi-gantry crane may span the width of quay between the freight house and water; the outer end of the bridge is supported by a leg traveling on a rail near the edge of the quay, while the inner end is carried by wheels riding on an elevated runway on the freight house, like a traveling crane. On the tower bridge is a revolving jib crane, which may be fixed in position or may traverse along the bridge. In many modern installations, the cranes travel on the roof of the pier or warehouse, so that they handle cargo between ship, car or warehouse without obstructions to the tracks or driveways between the house and the ships.

The rail and water terminals at Texas City, Tex., on the mainland side of Galveston Bay were described in the Railway Age Gazette of July 12, 1912. The main pier is 1,400 ft. long and 1,000 ft. wide, with four parallel warehouses: 80x1,120 ft., 118x520 ft., and two 100x750 ft. On shore there are four warehouses in line: One 75x1,000 ft., and three 100x250 ft. One warehouse is equipped with three overhead traveling cranes and an electric conveyor along the floor extending the full length of the building. On one side of the dock are two traveling gantry cranes about 120 ft. long, with hoisting trolleys on the bridge. The inner end of the bridge extends over the warehouse roof, the alternate panels of which are removable so as to form hatchways. The outer end of the bridge projects beyond the dock line, so that freight can be handled directly between the ship's hold and the warehouse.

C. H. Spencer, Chairman; E. B. Temple, Vice-Chairman; W. G. Arn, Hadley Baldwin, W. C. Barrett, G. H. Burgess, A. E. Clift, H. T. Douglas, Jr., A. C. Everham, Geo. P. Johnson, D. B. Johnston, H. A. Lane, L. J. McIntyre, B. H. Mann, A. Montzheimer, W. L. Seddon, E. E. R. Tratman, W. L. Webb, J. G. Wishart, Committee.

Discussion on Yards and Terminals.

Mr. Fritch: I would like to know what the committee means by "holding yard" in the first conclusion under the heading "In General."

B. H. Mann (M. P.): A reservoir yard, you might say, for empty equipment in advance of placing the cut at the station platform.

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Mr. Fritch: I believe "storage yard" is a preferable term.

Mr. Mann: "Storage yard" does not correctly represent the meaning of the committee. A storage yard may be a yard in which the empty equipment is placed after the receipt of the train. The wording here is intended to cover the condition where, as the equipment comes from the storage yard, it comes up to the mouth of the station, so as to have that draft, all ready to be pushed into the station just as soon as the track is empty. "Storage yard" has a broader meaning. The "holding yard" has a more limited and a narrower meaning.

Mr. Spencer: The committee wish to change conclusion 2 on page 401 of the Manual, to read as conclusion 2 in the report.

William McNab (Grand Trunk): It seems to me the recommendations would read better if we reverse the wording slightly: "It is recommended that, wherever conditions demand, baggage and express be received, delivered and handled, below or above the train floor (as grade conditions permit)," etc.

The President: The committee will accept that.

Hunter McDonald (N. C. & St. L.): There seems to be some question about the wording regarding the receiving of baggage and express. In most cases that must be done at grade and then the baggage and express is lowered or elevated to platforms. You receive it and deliver it at grade, but you lower it in order to deliver it to the trains or elevate it in order to deliver it to the trains.

Mr. Spencer: I presume in the larger number of smaller stations that may be true. In a large number of our stations, however, baggage is received below the grade. For instance, in Washington, the baggage is received below the grade and elevated to the train floors by means of elevators. In the New York Pennsylvania station the baggage is received above and is lowered. It is to meet these varying conditions and to bring out the best arrangement possible for handling baggage with the least interference with the movement of passengers that the committee made this conclusion.

C. E. Lindsay (N. Y. C. & H. R.): I move the omission of the word "safe" in conclusion 4. (The motion was seconded.)

Mr. Spencer: The committee rather objects to the omission of the word "safe." We had a great deal of discussion in the committee meeting as to entering into questions of safety, but we have taken this position; the Eastern roads, and I think it is spreading out into the West, are putting the question of safety first. I think that is illustrated by the New Year's address sent out by President Willard to the employes of the Baltimore & Ohio Railroad. The time has come when this department has got to enter into questions of safety, and I believe it is the province of every committee to enter into these questions and to recommend what appears to it to be the safe and efficient method. In regard to "No. 8 slip switch on a tangent," a great deal of the trouble experienced in curves is in switches, and it has been found by experience that the curvature through a No. 8 slip switch, although that varies on the different roads, is about the maximum of what should be used.

L. C. Fritch: I think the word "safe" is unfortunate in that connection. By adopting that we practically say that anything greater than that, or, say, a No. 7 or No. 6 slip switch, is unsafe. We have many installations in this country that have a curvature where it exceeds that of a No. 8, and to make the change would involve very large expenditures. The operation through them, if it is conducted properly, is just as safe as it is through a No. 8.

The President: Your idea is that safety can be secured by proper control of the speed?

C. E. Lindsay: A road that adopts a No. 8 turnout for its equipment may be entirely justified, whereas another road, with other equipment, may be entirely justified in using a frog as low as No. 6. We have just about completed the Grand Central Terminal, in which 6½ frogs are used. We think it is perfectly safe under the operating conditions and the equipment that we have.

S. S. Roberts (I. C.): I agree with the committee in regard to the statement of the curvature. To my mind, it is a warning against placing a slip switch on a curve. Very frequently, if you say the curvature shall not be greater than the curvature of a No. 8 slip switch, some man may thoughtlessly place a slip switch so that part of it will be on the inside of a curve, and then he increases the degree of curve in the slip. This statement conveys to me the idea that the curvature in a No. 6 switch upon a tangent is the maximum curvature that you desire to use. If this slip switch were placed on a curve some other number would have to be used in order to attain the degree of curve you would want.

The President: The committee will accept the proposition to remove the word "safe" in that paragraph.

C. Dougherty (C. N. O. & T. P.): In connection with this it seems to me the proper design of connections with slip switches in terminal stations involves so many surrounding conditions, such as the class of engines used or equipment, the speed with which trains are expected to move over the switches and the cost of providing rights of way sufficient to put in frogs of a lower number, that it makes it impossible for this association to adopt a general statement in regard to such matters.

Mr. Lindsay: On our road we have had a great many derailments of a certain type of locomotive on No. 7 slips and turnouts. The No. 7 slip is in general use, but we have had so many derailments of engines supposed to be designed for use around No. 7 slips, it came to be a question whether we would have to throw away the engines or rebuild the slips. We secured the co-operation of the motive power department and tested out those engines, and we have shown to that department the error in the design of the locomotives. They have corrected it, and made it perfectly possible for that engine, a big one, to go around those slips without any danger of derailment. I believe firmly it is perfectly desirable to limit the No. 8 where it is possible to do so, but to say it must be done is going too far.

J. L. Campbell: There may be a question as to the interpretation of the words "efficient and economical." I suppose the committee had in mind the things involved only in running the train around those curves. However, if all of the elements are taken into consideration the substitution of sharper curves in some cases cited might show that it will not be either efficient or economical to do that. I would ask the committee to modify that to read as follows: "Where practicable on station throat tracks the curvature through switches should not exceed that of a No. 8 slip on tangents."

The President: The committee will accept that.

Mr. Spencer: Mr. President, I move the adoption and insertion in the Manual of the 4 conclusions as modified. (The motion was seconded and carried.)

Conclusions under Hump Yards were next considered.

Mr. Spencer: We wish to change conclusion No. 2 from the way that it reads now to read as follows: "The cut list system of handling cars on the hump is recommended as being safe and efficient and is briefly described as follows: 'The yard clerk makes up a list of cars to be switched and tracks they are to be placed on in receiving yard, cut No. 1 being the first car to go over the hump. Cut list form accompanies this report. It is perforated on three vertical lines, so the list may be divided up into four parts, each part being a duplicate of the other. Where switches are thrown from a tower, one copy of the list is given to the towerman and one to the man cutting off cars on the hump. Where switches are thrown by hand, each switch tender has a copy of the cut list, as well as the man cutting off cars on the hump.'"

C. G. Kittredge (N. Y. C. & H. R.): I would like to ask if it is necessary to put the word "safe" in that second conclusion? It carries with it the insinuation that any other process is unsafe.

Mr. Spencer: Not necessarily so. The committee visited a number of hump yards this year. We saw several methods of marking the cars going over the hump. We did not mention the ones that we felt were decidedly unsafe. We saw men running in front of cars chalking on the ends. We saw men running along the side of the cars, taking hold of the grab iron, reaching around the ends and putting figures on the end. This cut list system is in use on the Pennsylvania Railroad. In the work of marking up the cars as done with this list there is no occasion for a man to get injured in any way in giving information to the towerman or to the switchman as to where those cars should go.

S. S. Roberts: The use or the lack of use of this cut list will have some effect on the design of the yard. If you adopt the method of marking on the ends of cars to meet the classification track on which the cars go, it necessitates a very much more complete and much more careful design on the hump than if you adopt this list, because it is necessary that, if the switch is thrown by hand, and to the towerman, if the switch is operated by power, to see the numbers on the cars by night as well as by day, so they can properly set the switches. A good many yards have had difficulty, and some roads have spent a good deal of money because they do not use a switch list. I think the word "safety" in this list is entirely proper. I have visited a number of yards, operated in different ways, and I have seen men dancing around moving cars, putting numbers on the ends of those cars. I would not consider such a job as that for five minutes, no matter what they pay for it. I think safety is entirely proper in this association. An-

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other thing, about the lighting, if you have sufficient light on your hump to indicate the number of the car to the towerman or to the switchman, you have got so much light that your car riders are almost blinded, and they get off away down the yard before their eyes become accustomed to the darkness, and you are apt to have more trouble on account of the cars coming together.

Mr. Mann: Just for information, it was the thought of the committee as well that the cut list is a splendid help in O. S. & D. work. The man who handles the cut list keeps a record of the rider, and if there is any damage to the car or the freight in the car, it can be directly traceable to one individual, the rider, provided we file away the cut list. It is a splendid help in the operation of the yard in keeping down damages.

G. D. Brooke (B. & O.): I would inquire from the committee if they consider that these methods which they state were unsafe were efficient? It seems to me that the word "efficient" covers the matter of safety well enough; but a method of operation which is inherently unsafe is at the same time inefficient, and I will be very glad to see the word "safe" omitted.

The President: The committee will accept that amendment. It is also understood that the word "efficient" takes the place of "safe."

Mr. Spencer: The recommendation No. 2 now reads:

"The committee has investigated the 'cut list' system of handling cars on the hump and recommends it as being efficient, and the system is briefly described as follows:

"The yard clerk makes up a list of cars to be switched and tracks they are to be placed on in receiving yard, cut No. 1 being the first car to go over the hump. Cut list 4 accompanies this report. It is perforated on vertical lines, so that it may be divided into multiple parts, each part being a duplicate of the other. Where switches are thrown from a tower, one copy of the list is given to the towerman and one to the man cutting off cars on the hump. Where switches are thrown by hand, each switch tender has a copy of the cut list, as well as the man cutting off the cars on the hump."

The President: Unless there is objection, these two recommendations are approved.

W. I. Trench (B. & O.): I believe, in addition to giving this information to the four persons listed here, that the car rider should also have the information, and this can only be given efficiently by chalking on the ends of the first car or cut. If the car rider does not know on which track his car is going he has no means of determining just what amount of breaking should be done.

Mr. Mann: This matter is subject a good deal to the state of the weather. The yard has to be operated in a pouring rain and the design of the yard is such that the car moves at a certain speed from the top of the hump to the end of the ladder, and after it reaches the ladder it is designed, presumably, to be at such speed that the rider has the cars under control. Each track is preanmably marked by a light on the first car so that the rider has all the information necessary without this, and it would be a serious handicap to hold the rider responsible for anything which you would give him on a sheet of paper, bearing in mind that he is ont in a good hard rain.

Mr. Trench: I did not refer to giving the information on a sheet of paper. The method which I have seen used successfully is to mark on the first car of the cut "five cars, track 18," or some such notation as that. It is not possible for the man who is cutting off the cut to give the car rider this information, because he is on the opposite end of the cut. I believe it to be true that it is necessary for the car rider to apply the brakes because we see it done on almost every cut. If it is necessary, to avoid a collision, to apply the brakes at the first end of the track into which he is entering, he should have this information.

Mr. Spencer: There is no end to the extent to which this cut list might be carried. It is a matter of how the different roads may want to operate it. There is no objection giving the car rider one of these lists or anyone else who might have use for it. We have provided in our recommendation, as last presented, a multiple cut list which would furnish sufficient copies to extend the system as far as it is desired.

Mr. Roberts: In watching the operation in the use of the cut list. It seems to me entirely necessary to mark on the car where the cnt is going to. The foreman tells the rider where to take the cars—he says, for instance, "Take five cars to track No. 4." That is all the information the rider needs, and he should have memory enough to know to what track he is going while he rides through the yard.

Mr. Spencer: I move the adoption of the conclusion as revised. (The motion was carried.)

Mr. Spencer: The last subject assigned to the committee is entitled "Development in the mechanical handling of freight by mechanical means." We present a further report on this subject for information only.

The President: The committee has presented a very complete and enlightened report that will be useful in all branches of railroad work, relating to the operation of yards and passenger stations. The committee is relieved, with the thanks of this convention.

ELECTRICITY.

CLEARANCES.

The committee submits the following report as one of progress and information. It has considered a communication calling attention to interference with the bridge clearance line of the association hy the recently adopted third rail, permanent way structures and rolling equipment clearance lines, and has made a recommendation to the committee on Iron and Steel Structures that as much of the bridge clearance diagram as interferes with the third rail and permanent way structures clearance line be eliminated, and in place thereof the clearance line for permanent way structnres be substituted on roads where electric equipment is likely to be used.

GEORGE W. KITTREDGE,
Chairman Committee on Electricity.

The committee on heavy electric traction of the American Electric Railway Association submitted a report at the annual meeting held at Chicago in October, 1912, which report recommended clearance lines for third rail, permanent way structures and rolling equipment identical with the lines adopted hy this Association at its last meeting, and also snbmitted for information and guidance a suggested clearance diagram for automatic stops, with the recommendation that the matter be continued to allow the committee time to confer with similar committees of this Association and the American Railway Association. The American Railway Association at its meeting in May, 1912, adopted a clearance diagram for third rail, permanent way structures and rolling equipment identical with the diagram adopted by this Association.

The committee has been following up the progress made during the year on third rail installation and has had the table which accompanied last year's report brought up to date. It is urged on the members of this Association that they try and induce their companies to conform to the clearance diagram on all new work and gradually change over their present installation so that nltimately there can be a free interchange of electric equipment between the various roads.

The committee has been collecting data during the year in regard to overhead clearances and is studying anme with a view of taking up this question during the coming year with committees of the American Electric Railway Association and the American Railway Association, so that joint recommendations for overhead clearance lines may be made by the respective committees of each Association.

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DATA REGARDING THIRD RAIL CLEARANCES. Revised January 15, 1913.

Name of Company	Plan No.	Top or Under Contact	Protected	Uses Steam Equipment	Structures Clear Prop. Lines	Mileage in Operation	Mileage Planned for Immed. Future	Mileage Using Steam Equipment	Mileage Clearing Proposed Lines	Remarks
Albany Southern	1	Top	No	Yes	Yes	65.00	.....	65.00	65.00	
Aurora, Elgin and Chicago	2	Top	No	Yes	No	95.00	.....	95.00	.....	7.70 Miles O. H. Trolley.
Baltimore & Ohio	3	Top	No	Yes	Slight	8.70	.....	8.70	8.70	
Boston Elevated Ry.	4	Top	No	No	No	33.81	.....	.....	.....	
Brooklyn Rapid Transit	5	Top	No	No	No	87.99	.....	.....	.....	49.83 Miles O. H. Trolley.
Northwestern Elevated, Chicago	6	Top	No	No	No	60.00	.....	10.00	.....	16 Miles O. H. Sliding Contact.
Central California Traction	7	Under	Yes	Yes	Yes	70.00	.....	70.00	70.00	27 Mi. O. H. Trolley, inc. in 70 Miles.
G. R., G. H. & M	8	Top	No	No	No	31.28	.....	.....	.....	10 Miles O. H. Trolley-Urban.
Hudson & Manhattan	9	Top	Yes	No	No	18.76	.....	.....	.....	Subway.
Interborough Rapid Transit	10, 11, 12	Top	Partly	No	No	202.36	.....	.....	.....	Elevated 113.0. Subway 89.36.
Lackawanna & Wyoming Valley	14	Top	No	No	No	44.00	.....	44.00	.....	8 Miles O. H. Trolley.
Long Island R. R.	13, 15	Top	Yes	Yes	Yes	186.80	15.20	186.20	186.20	
Metropolitan West Side, Chicago	6	Top	No	Yes	No	51.08	.....	.....	.....	Elevated.
Michigan United	16	Top	No	Yes	No	107.00	.....	107.00	.....	
Nor. Electric Ry., Chico, Cal	17	Top	No	Yes	No	130.00	42.00	130.00	.....	18.70 Mi. O. H. Trolley & Pantograph.
P. R. R., Manhattan Div	18	Top	No	Yes	Yes	70.93	.....	70.93	70.93	1.63 Mi. O. H. Contact included in total.
Puget Sound Electric Ry	19	Top	No	Yes	No	37.50	.....	37.50	.....	10.0 Mi. O. H. Trolley-Urban.
Philadelphia & Western	20	Under	Yes	Yes	No	34.00	.....	34.00	.....	1.50 Mi. Trolley in Yards.
Scioto Valley Traction Co	21	Top	No	Yes	Yes	66.50	.....	66.50	.....	3.86 Mi. Trolley-Urban.
P. R. R., New York Division	.....	Top	Yes	Yes	Yes	27.45	.....	27.45	27.45	
South Side Elevated, Chicago	6	Top	No	No	No	6.61	.....	.....	.....	0.6 Mi. at Yard Leads.
P. R. R., West Jersey & Sea Shore	23	Top	Yes	Yes	Yes	150.36	.....	150.36	150.26	8.65 Mi. O. H. Trolley included in total.
Wilkesbarre & Hazelton	24	Top	Yes	Yes	Slight	29.50	.....	29.50	.....	1.20 Mi. O. H. Trolley.
N. Y. C. & H. R.	26	Under	Yes	Yes	Yes	185.89	52.70	185.89	185.89	1.6 Mi. O. H. Conductors.
Detroit River Tunnel Co	26	Under	Yes	Yes	Yes	19.27	.....	19.27	19.27	New station will require add 3rd Rail.
Phila. & Rapid Transit Co	.....	Under	Yes	No	No	18.61	.....	.....	.....	Subway & Elevated Lines.
Oneida Railway Co	25	Under	Yes	Yes	Yes	109.47	.....	98.23	109.47	8.95 Mi. O. H. Trolley.
						1982.55	112.90	1433.43	887.17	

Summary of Data Regarding Third Rail Location.

The committee is not prepared at this time to take up the question of clearance lines for automatic stops, but as soon as a device that is adapted to conditions obtaining on roads operated in the open has been perfected, the question of established clearance lines will be further considered.

TRANSMISSION LINES AND CROSSINGS.

The committee desires to report progress on the consideration of modifications of the specifications for overhead crossings of electric light and power lines adopted by the Association at the last convention for Transmission Lines and Crossings as will be necessary to cover voltages over 70,000 and also the consideration of the revision of the specifications in paragraphs Nos. 10, 13, 18, 24, 29, 31, 32, 34, 45, 49 51, 55, 60 and 61, which were adopted by the Association with the understanding that the revision of these particular paragraphs would be considered this year. The committee, however, is not prepared at this time to make any further recommendations for the reason that more time is required to study the development of the art in respect to voltages over 70,000, and further because of the fact that the committees of all the various engineering associations have not as yet arrived at an acceptable joint specification.

ELECTROLYSIS.

An invitation has been received from the American Electric Railway Association to unite with them in jointly considering the subject of "Electrolysis," and the chairman has appointed Messrs. Katte, Gibbs and Brumley to serve on this joint committee.

The committee submits the following report with recommendations that it be printed in the Proceedings of the Association as information.

Introduction.—The effect of electrolysis upon steel and iron structures, including water, gas and electric conduit pipes, also on the lead sheaths of insulated cables, has been a matter of serious concern ever since the first street car was operated electrically by means of a grounded return, but not until the advent of electrification on steam railroads did the subject become one of much interest to railway engineers. The matter is receiving the careful consideration of electrical engineers in conference with structural engineers and representatives of various municipal departments, but up to the present time there is no unanimity of opinion as to the best methods of preventing electrolysis, or for protecting metal structures adjacent to the path of grounded return circuits.

Nature.—Electrolysis as referred to in the Electric Railway discussions may be described as the wasting away or corrosion of a metal which is caused by an electric current passing from one metallic conductor to another conductor where both are buried in damp earth, or other semi-conducting medium.

Causes and Effect.—In direct current railway circuits the electric current passes from the power station or substation to the trolley wire or third rail, then through the motors of electric cars or locomotives and back to the station by the track rails. Owing, however, to the fact that it is practically impossible at all times to insulate the rails adjacent to the ground, part of the current leaks into the earth and finds its way back to the station through the ground, and in doing so, if pipes, cable sheaths or steel work be under or adjacent and parallel to the tracks, some of it may return by these metallic structures. At some point or points this current must leave these metallic structures and usually does through the earth in the neighborhood of the power station or substation, causing electrolytic effects in the underground structure or conductor at the points in question, unless precautions have been taken, as later indicated.

There is less opportunity for current to escape from the tracks on electrified roads where the rails are above ground and rest on wooden ties in ballast and there is no opportunity for such escape where the return circuit does not enter the running rails, but is conducted back to the power station by independent and insulated contact rails or wires. Examples of this method of construction are found in slot conduit street railways and those having double overhead trolleys; also in those using a separate insulated return conductor rail.

It is common practice to connect the negative bus-bars in the power station or substations with the running rails by copper cables at the points nearest to the stations. Leakage of current from the rails to the adjacent water pipes along the line may thus occur, and the current flowing in these pipes leaves them and returns to the rails in the neighborhood of the power station, causing electrolysis at the points where it passes from the pipes through the earth.

Prevention.—It is possible to prevent electrolysis by precluding the escape of electric current from the return conductors, but frequently this is not practically possible, as in the case of buried rails carrying return current. Several methods of meeting this latter condition have been employed, briefly described as follows:

Drainage System.—In order to prevent this escape of current into the earth, negative cables are sometimes run from the power station or substation to adjacent pipes or metal work so that the current will leave these structures through metallic paths, thus preventing electrolysis at such points. This system is successfully used in connection with continuous cable sheaths or pipe lines having screw joints, although it results in inducing a larger volume of flow by these paths. joints, as frequently, however, in water pipe lines having lead joints, as frequently electrolysis is induced at the pipe joints.

Insulated Negative System.—Another system employed is to provide insulated cables which are connected to the rails at points remote from the station. It is largely employed in

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Europe and is beginning to be specified in connection with the American systems. This has the effect of maintaining a more uniform and lower negative potential and largely prevents the current from leaving the bonded rails. The objection to this system is the high cost of the insulated copper cables, which must be relatively very large and which do not carry current to their full capacity.

Booster System.—A modification of the above system devised to compel the cables to carry current to their full capacity is known as the Booster system. In this system the cables carrying return current are connected to a low potential generator of large capacity which acts like a pump placed in a pipe line of low flow head to increase the volume of flow.

Other Systems.—There are sometimes peculiar local conditions of which advantage can be taken by an electrical engineer, but usually one or the other of the above systems, or combinations of them, are employed to safeguard metallic structures adjacent to the path of the return current.

The first heavy electric traction system in New York City was installed on the Brooklyn Bridge. The power was used principally to switch trains into position to grip a propelling cable. The current demand was usually small and no serious electrolytic problem arose. When, however, the trolley cars and electrified elevated trains crossed the bridge, the situation changed. The return current leaked to the bridge structure and streamed back to Brooklyn by all metallic paths, some even returning to the water of the East River. In 1900 sixty observation stations were established and as a result the bridge structure, particularly the cables, were heavily bonded to the traction tracks at the Brooklyn end and the voltage of the structure at the danger end was reduced.

Grand Central Terminal—New York City.

General.—In the Grand Central Terminal there are thousands of columns supporting terminal yards, streets and buildings and in the midst of them there is operated an electric railway with a grounded return. It is obvious that the means for adequately protecting this immensely valuable property must be most complete. This situation was early recognized and steps were taken as follows:

(1) A substation was located in the Terminal. This was done primarily to reduce the transmission losses, but it also made possible the maintenance of the structural steel at a low potential—a most important circumstances, as will appear later.

(2) This substation was connected to the return rails by seven 2,000,000 c.m. cables, which in consequence of their short length provided a return circuit of very low resistance.

(3) Independent negative cables were connected to the terminal steel and the Post Office Building, the first of the group of buildings which will cover the terminal.

(4) A system of inspection, in the nature of an electrolytic survey, was established with regular dates for inspections and a prescribed form of report.

Such precautions were adequate during the early stages of construction, but as additional steel was erected, the ratio of the resistance of the copper to the steel was steadily falling and the protection correspondingly became less effective.

Voltmeter Method.—The early electrolysis survey consisted of taking readings of the potential between the steel structure and the adjacent tracks, pipes, etc., and noting the direction of the flow. It was realized, however, that the difference of potential method was not satisfactory. For should a potential of four volts exist between a column and an adjacent pipe, it might be assumed that the situation required immediate attention, whereas if only one-tenth of a volt existed, the condition might be regarded as entirely satisfactory. As a matter of fact, if the four volts were due to there being good insulation between the columns and the pipe with no flow of current there would be no electrolytic action, while, on the other hand, if the one-tenth volt was due to a low resistance joint over which a large volume of current was flowing, electrolysis would surely be taking place. In other words, the readings indicated only the potential difference between two points of a circuit and the important factor, the amount of current flow, was unknown. Appreciation of the incompleteness of this system of readings, which, however, is the one in common use, lead to the development of a new method, briefly described as follows:

Galvanometer Method.—The problem in the Grand Central Terminal is to protect the column bases. It is accepted that when current flows upwards from a column foundation that this column is free from any possible electrolytic damage. If, however, it flows downward to the foundation, then electrolysis is possible and it becomes important to know the volume of the current. There is one other condition, when the current reverses, sometimes flowing upward and sometimes downward. With equal reversals of current electrolysis is only one-thirtieth as destructive as when persisting in one direction. Because of the large sections of the Grand Central Terminal steel and the small current flowing, it was impossible with the instruments in common use to determine either the direction of flow or the volume of current. After investigation and experimental work a special portable galvanometer was constructed that would read to three-millionth (.000003) of a volt, per division. Reading points were established five ft. apart on the columns to be surveyed, the concrete protection being pierced and the steel columns drilled, a ¼-in. pipe inserted and the terminals of the instrument attached. By this method it has been possible to obtain readings on columns having a resistance as low as two hundred and thirty-five millionths (.000000235) of an ohm between terminals and current flows as low as one ampere in such a column can be read and its direction determined. The instrument has not proven too delicate for practical use.

A complete electrolytic survey of the terminal has been made and the current flow in each column measured, its direction ascertained and the data plotted. In general, the steel was found to be in a state of balance; current flowing up some columns, down others, and reversing in many of them. Such being the case, it appears that without much change the balance can be deflected to the safe side by making the current flow up all the columns, all the time, and that condition made permanent.

Upward Drainage System.—To effectually drain the steel structure and cause all current to flow up the columns, it is first necessary to directly connect the steel deck and the upper tracks with the substation negative bus by short cables of large cross-section, and second, to remove all metallic connections between the tracks and the steel structure. In view of the enormous section of this steel and the small current it carries, the steel work may be at a slightly higher potential than the substation negative bus and all escaping current will tend to flow towards it, which is in the harmless direction. However, to make sure and to accentuate this action, especially at the column bases, it is proposed by an arrangement of circuits to raise the potential of the lower level track rails so that at all times they and the surrounding earth will be strongly positive to the columns, thus preventing any flow of current from the columns into the earth without which there can be no electrolysis.

The above described plans of reducing the potential of the structure and draining it upward to the substation is now in course of execution. The water pipes and gas pipes crossing the Grand Central Terminal are carried on wooden supports and insulated from the steel structure, and when the work is completed all such pipes and their connections will be insulated from the steel structure and the negative conductors.

Recently the bases of some of the columns were exposed for examination and although some rusting was found, there was no distinct evidence of electrolysis. These columns have been in place carrying electrified track for six years.

An experimental electrolysis investigation has been started to determine the best means of protecting future structures by various compounds and processes and to determine the amount of electrolysis per square foot of steel per year under a given flow of current when the steel is painted and enclosed in concrete in accordance with standard practice.

Pennsylvania Terminal—New York City.

This system is operated with a grounded return and no attempt has been made to insulate the rails or conductors from the ground. In the return circuits both track rails are used except at interlockings. All lead-covered cables in each manhole are covered with asbestos and steel tape and the lead sheaths bonded together. The sheaths of cables are bonded to the negative wires at each substation, in order to take the current flowing in the sheaths back over a cable and thus prevent damage by electrolysis. The sheaths almost without exception are negative to tracks and tunnel linings. There are 25 cables, including high and low tension, control and telephone cables leaving the power house, and two 5,000,000 c.m. bare negative cables connecting the negative bus in the substation with the rails at the nearest point to the power house. The lead sheaths of the above cables are equivalent to about 2,400,000 c.m. of copper. There have been only two cases of trouble caused by electrolysis of lead sheaths and they have been remedied by locally bonding them at points of outflow of current.

A number of examinations of the rails, tie-plates and screw spikes have been made at various points on the system, but no serious trouble has been found. The rails and tie-plates are found to be in good condition at all points.

There has been no trouble with water pipes, which run parallel with the tracks. The signal air pipes are carrying considerable current at times, due to insufficient cross-bond-

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ing between the tracks in one of the yards. This trouble is being remedied by bonding at local points and by installing additional cross-bonding between tracks. Regular investigations are made to determine the amount of current on the steel columns and girders in the station area and almost no current has been found. No trouble has developed and there are no indications to lead one to expect any trouble.

The track bonds are tested every year and the cross-bonding is frequently inspected. Very few bad bonds are found. Provision is made at each station to find the amount of current carried on the cable sheaths. Readings of these amounts are taken frequently and when any material increase or decrease in these amounts is found the matter is looked into. By keeping the cable sheaths bonded together and negative to tracks and iron, no trouble is anticipated from electrolysis.

Baltimore & Ohio Railroad—Baltimore, Md.

Electric propulsion is in use on the Baltimore & Ohio from the vicinity of its power house just west of Camden station, Baltimore to Waverly, 3.73 miles east; 1.11 miles of this line is four-tracked, the rest being double-tracked. Within the electric territory there is a total of 1.79 miles of tunnel, the longest of which is Howard Street Tunnel, 7,240 ft. in length. The grade varies from 1 per cent. to 1½ per cent. towards the east. Two motors drawing 5,000 amperes under maximum tonnage of 2,250 tons are used on the trains up the hill, eastbound. Westbound trains drift through the tunnels, the motors returning light. The track is well constructed of 100-lb. rail on good ties and clean stone ballast. The subsoil consists of heavy clay and is in places wet. Drainage conditions are good. The track is high and dry and conditions are such as to discourage the escaping of currents as much as are usual in track circuits. In Howard Street Tunnel drainage is effected by a conduit between the tracks, the track being carried on stone ballast; this in turn on one-man stone, the later resting on the inverted arch of the tunnel. Conditions here are generally wet. There is a heavy seepage of water through the walls of the tunnel, which in places saturates the ballast and ties, the water escaping through the ballast to the conduits between tracks.

The electric system is direct current, 750 volts, third rail contact, and return through running rails. The power is supplied at two points; the Company's power house at Camden and the substation at Mt. Royal, at which purchased power is furnished. The positive conductor consists of 100-lb. R. B. section rail placed in 1912 in Howard Street Tunnel, and 80-lb. Mexican Central rail placed in 1901 over other parts of the line. Previous to the renewal of third rail in the tunnel in 1912, 1901 Mexican Central 80-lb. rail had been in use. The renewal was made necessary by the corroded and eaten condition of the rail, especially at wet points, where onethird of the rail section had disappeared. Previous to the renewal, the insulation and bonding had not been of the best, having greatly deteriorated since installation. The eastbound third rail is reinforced by two 1,000,000 c.m. copper cables from the power house to Huntington avenue, laying in close contact with the base. The westbound rail is not reinforced. The east and westbound third rail are crossbound every 300 ft. in the tunnel and every 1,000 ft. over the rest of the territory. The third rail is bonded at the joints with the two 500,000 c.m. copper bonds. The negative conductor consists of the running rail, 100-lb. titanium in Howard Street tunnel and 100-lb. A. S. C. E. Bessemer on the other parts of the line. The rails are reinforced through the four-track territory and through Howard Street tunnel by a 1,000,000 c.m. copper cable. This cable is uninsulated and is covered with stone ballast laying between tracks throughout the four-track territory and on the footing course of the tunnel throughout Howard Street tunnel. It was installed in 1901, and has been much patched on account of deterioration. The running rails and negative cable are cross-bonded every 1,000 ft. The rail joints are bonded with one 500,000 c.m. copper bond. The negative bus bars at Camden power house and Mt. Royal substation are connected with the negative conductor and neither is grounded at the respective points in question.

The evidence of electrolysis observed has been the corroding and eating away of negative conductors. The running rail now in Howard Street tunnel, laid in 1910, already shows pitting at points where the ties are saturated and is eaten away slightly at the spikes. The rail removed from the tunnel in 1910 had been in the track for three years only and was so far corroded and eaten at the base that its removal was necessary. Just how much the gases of the tunnel assisted in the deterioration of the rail, we are unable to say. Outside the tunnel where the gas factor does not exist and where the drainage is good, there is still unmistakable evidence of electrolysis. The rail here was laid in 1906 and 1908. Its base is pitted and eaten away, especially in the vicinity of the spikes, where a semi-circle of metal has disappeared about each spike. The spikes themselves deteriorate rapidly, requiring renewal about once in two years, in some cases the head entirely disappearing in this time. The 1906 rail is intended for renewal next year. It appears that we are getting about twice the life out of the rail in the electric zone outside the tunnel that we are getting in the tunnel, and that the renewal in both cases is due to the action of electric currents rather than mechanical wear. Data on electrolytic action on neighboring water and gas pipes caused by escaping currents from the Baltimore & Ohio Railroad System are meager, no survey having been made. The city water works several years ago made connection between their pipes and the negative conductors at the power house in order to concentrate the discharge from their pipes, but how serious the difficulty was when they were trying a remedy or the result of the connection is unknown. Two years ago, so much difficulty had been experienced in maintaining the Company's water pipes at Mt. Royal that these also were connected electrically to the negative conductor. Time enough has not yet elapsed to note the effect. A neighboring railroad has several times complained of injury to its water pipes at North avenue and various arrangements for improving the negative conductors have been resorted to, but the trouble has not yet been eliminated. A test shows Baltimore & Ohio rail four volts negative to pipes at this point, except when motors are passing, when Baltimore & Ohio rail is five volts positive to pipes. Connection will probably be made between the pipes and negative return of Baltimore & Ohio circuit. Nothing definite can be shown regarding stray currents from the Baltimore & Ohio rails until survey has been made.

RECOMMENDATIONS FOR NEXT YEAR'S WORK.

The Rules and Regulations of the National Fire Protection Association are frequently used by the National Board of Fire-Underwriters in formulating rules and instructions for the guidance of their inspectors, and since the wiring and other electrical work of the railroad companies must conform to the rules and requirements of the Underwriters' Association, it is the recommendation of this committee that a representative of the Association be delegated to serve with the National Fire Protection Association.

This committee respectfully recommends the continuation of work already outlined, particularly consideration of "Clearance for overhead third rail working conductors and automatic safety stops," "Electrolysis" and "Insulation" and the consideration of any new information that may develop in reference to "Maintenance Organization" and "Relation to track structures."

George W. Kittredge (N. Y. C. & H. R.), chairman; J. B. Austin, Jr. (L. I.), vice-chairman; D. J. Brumley (I. C.), R. D. Coombs (Cons. Engr.), A. O. Cunningham (Wabash), L. C. Fritch (C. G. W.), Geo. Gibbs (P. R. R.), G. A. Harwood (N. Y. C. & H. R.), E. B. Katte (N. Y. C. & H. R.), C. E. Lindsay (N. Y. C. & H. R.), W. S. Murray (N. Y., N. H. & H.), Frank Rhea (Cons. Engr.), J. W. Reid (C. & A.), A. F. Robinson (A. T. & S. F.), J. R. Savage (L. I.), Martin Schreiber (Public Service Rys.), W. I. Trench (B. & O.), H. U. Wallace (Cons. Engr.), committee.

Discussion on Electricity.

Mr. Kittredge: The report is one of progress and information. Under the heading "Transmission lines and crossings," we desire to have the last sentence of that section read: "Your committee, however, is not prepared at this time to make any further recommendations for the reason that more time is required to study the development of the art in respect to voltages over 70,000, and further, because of the fact that all of the various similar associations have not yet modified theirs or formally adopted ours so as to make a uniform specification. We know of no reason, however, why those that have not should not do so as opportunity for revision comes up. In other words, our specifications are not objectionable."

Under "Electrolysis," we want to substitute for the members of the joint committee appointed by the American Electric Railway Association Messrs. Townley, Richey and Palmer.

The President: If there is no objection the changes desired by the committee will be made and the report of the committee accepted. Are there any remarks? If not, the committee is relieved with the thanks of the association.

CONSERVATION OF NATURAL RESOURCES.

The Committee has under consideration the fostering of closer relations between it and the officers of the National Commission, as well as with the National Association of State Conservation Commissioners and the Western Forestry and Conservation Association, believing as it does that more officially recognized co-operation with these Asso-

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cations would be conducive to the attaining of the general objects for which Conservation Commissions were established, and more particularly those features in which the railways are vitally interested.

DOMINION OF CANADA.

Tree Planting and Reforestation.

The Forestry Branch, Department of the Interior, has taken the lead in connection with forest planting in Canada. The forest nursery at Indian Head, Sask., has been furnishing a constantly increasing amount of plant material for free distribution among the farmers of the prairie provinces. The number of trees and cuttings sent out has increased steadily from 48,000 in 1901 to 2,729,135 in 1912, with a total all told, of approximately 23,000,000. These trees are scattered in small plantations throughout the settled portions of Alberta, Saskatchewan and Manitoba, so the actual showing is much greater than the number alone would indicate.

In addition to supplying trees for distribution to farmers, the Forestry Branch is inaugurating a policy of reforestation on the Dominion Forest Reserves in the prairie provinces. Some of these reserves, entirely surrounded by large farming sections, formerly supported a good forest growth, but are now largely denuded as a result of forest fires.

WILLIAM McNAB,
Chairman Committee on Conservation of Natural Resources.

The Department of Agriculture of the Province of Ontario has, since 1904, encouraged the development of farmers' woodlots through the distribution of trees and cuttings. The principal tree-planting activity in the Province of Quebec has been in connection with the fixation of certain areas of shifting sands in the eastern portion of the Province. About 200 acres of shifting sands at Lachute have been purchased at $1 an acre from farmers who have the privilege of buying it back within the first 15 years at a price covering the original cost, the cost of reforestation and interest at 4 per cent. The Province, however, guarantees that the cost of such repurchased lands shall not exceed $10 an acre. On the area purchased, 40,000 white pine, white spruce, elm and green ash seedlings were planted in 1912. At Berthierville there is a government forest nursery where forestry students are trained each Spring in reforestation.

The Canadian Pacific has done considerable planting along its line in the prairie sections in places where there has been trouble with drifting snow. The intention is to secure a growth of trees which shall replace the numerous snow fences along portions of the line. This company is also encouraging the planting of trees and shrubs for shelter-belt purposes by farmers who have purchased land from the company in specified sections of Southern Alberta. One-half the trees required are furnished free, and prizes are offered for the best plantations.

Prevention of Fires from Railways.

On May 22, 1912, the Board of Railway Commissioners for Canada issued an order requiring railways subject to its jurisdiction to take certain measures for the prevention of forest and grass fires along their lines. This order included in a slightly modified form provisions contained in former orders for the use and inspection of fire-protective appliances on locomotives, the construction of fireguards in the prairie provinces and the non-use of lignite coal. In addition, provision was made for the appointment of a chief fire inspector, who is given authority to prescribe special patrols to be maintained by the railway companies where such action is considered necessary. The regulation of the burning of inflammable material along the rights-of-way during the fire season is also provided for. Railway employes are required to report and extinguish railway fires, and any fires starting or burning within 300 feet of the track are presumed to have started from the railway, unless proof to the contrary is furnished. Regulations of a similar nature have been issued by the Public Utilities Commission of the Province of Quebec, applicable to provincially chartered railways. The prevention of railway fires along provincially chartered lines in British Columbia, through the adoption of similar measures, is provided for by the new Forest Act, which became law early in 1912.

Order of the Board of Railway Commissioners for Canada, Describing Regulations to be Adopted by Railway Companies for the Prevention of Fires.

2. Until further order, every railway subject to the legislative authority of the Parliament of Canada, under construction, or being operated by steam, shall, unless exempted by a special order of the board, cause every locomotive engine used on the said railway, or portion of railway, being constructed or operated by it, to be fitted and kept fitted with netting mesh as hereinafter set forth, namely:

(a) On every engine equipped with an extension smokebox, the mesh shall be not larger than 2½x2½ per inch of No. 10 Birmingham wire gauge, and shall be placed in the smoke-box so as to extend completely over the aperture through which the smoke ascends, the openings of the said mesh not to exceed 17-64 inch to the square.

(b) On every engine equipped with a diamond stack, the mesh shall be not more than 3x3 per inch of No. 10 Birmingham wire gauge, and shall be placed at the flare of the diamond of the stack, so as to cover the same completely, the openings of the said mesh not to exceed 13-64 inch to the square.

3. Every such railway company shall cause—

(a) The openings of the ashpans on every locomotive engine used on the railway, or portion of railway, operated or being constructed by it, to be covered, when practicable, with heavy sheet-iron dampers; and, if not practicable, with screen netting dampers 2½x2½ per inch of No. 10 Birmingham wire gauge, such dampers to be fastened either by a heavy spring or by a split cotter and pins, or by such other method as may be approved by the board.

(b) Overflow pipes from lifting injectors, or from water pipes, from injector-delivery pipe, or from boiler, to be put into the front and back part of the ash pans and used from the first day of April to the first day of November, or during such portion of this period as the board may prescribe for wetting ashpans.

4. Every such railway company shall provide inspectors at terminal or division points where its locomotive engines are housed and repaired, and cause them, in addition to the duties to which they may be assigned by the officials of the railway companies in charge of such terminal or division points—

(a) To examine, at least once a week—
- (1) The nettings;
- (2) Dead plates;
- (3) Ash pans;
- (4) Dampers;
- (5) Slides; and
- (6) Any other fire-protective appliance or appliances used on any and all engines running into the said terminal or divisional points.

(b) To keep a record of every inspection in a book to be furnished by the railway company for the purpose, showing—
- (1) The numbers of the engines inspected;
- (2) The date and hour of day of such inspection;
- (3) The condition of the said fire-protective appliances and arrangements; and
- (4) A record of repairs made in any of the above-mentioned fire-protective appliances.

The said book to be open for inspection by the chief fire inspector or other authorized officer of the board.

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(c) In case any of the said fire-protective appliances in any locomotive are found to be defective, said locomotive shall be removed from service and shall not (during said prescribed period) be returned to service, unless and until such defects are remedied.

(d) Every such railway company shall also appoint one or more special inspectors, as may be needed, whose duties shall be to make an independent examination of the fire-protective appliances on all the locomotives of such company, at least once each month, and report the condition of such fire-protective appliances direct to the chief mechanical officer of the railway company, or other chief officer held responsible for the condition of the motive power of said company.

5. Any authorized officer of the board shall have power to inspect at any time any and all locomotives, and may remove from service any locomotive which is found to be defective in the said fire-protective appliances; and any such locomotive so removed from service, shall not (during the said prescribed period) be returned to service unless and until such defects are remedied.

6. No employe of any railway company shall—

(a) Do, or in any way cause, damage to the netting on the engine smokestack or to the netting in the front end of such engine;

(b) Open the back dampers of such engine while running ahead, or the front dampers while running tender first;

(c) Or otherwise do or cause damage or injury to any of the fire-protective appliances on the said engine.

7. No such railway company shall permit fire, live coals, or ashes, to be deposited upon its tracks or right-of-way outside of the yard limits, unless they are extinguished immediately thereafter.

8. No such railway company shall burn lignite coal on its locomotive engines as fuel for transportation purposes, unless otherwise ordered by the board—lignite, coal consisting of and including all varieties of coal between peat and bituminous, with a carbon-hydrogen ratio of 11.2 or less, such ratio being based an analysis of air-dried coal.

9. Every such railway company shall establish and maintain fire-guards along the route of its railway as the chief fire inspector may prescribe. The nature, extent, establishment and maintenance of such fire-guards shall be determined as follows:

(a) The chief fire inspector shall each year prepare and submit to every such railway company a statement of the measures necessary for establishing and maintaining the routes of such railways in a condition safe from fire, so far as may be practicable.

(b) Said measures may provide for the cutting and disposal by fire, or otherwise, of all or any growth of an inflammable character, and the burning or other disposal of debris and litter on a strip of sufficient width on one or both sides of the track; the plowing or digging of land in strips of sufficient width on one or both sides of the track; and such other work as may, under the existing local conditions and at reasonable expense, tend to reduce to a minimum the occurrence and spread of fire.

(c) Said statements of the chief fire inspector shall be so arranged as to deal with and prescribe measures for each separate portion of such railway upon and adjacent to which the fire risk calls for specific treatment. The intention shall be to adjust the protective measures to the local conditions and to make the expense proportionate to the fire risk and the possible damage.

(d) Said statements of the chief fire inspector shall prescribe dates on or within which the foregoing protective measures shall be commenced and completed, and the fire-guards maintained in a clean and safe condition.

(e) No such railway company shall permit its employes, agents, or contractors to enter upon land under cultivation, to construct fire-guards, without the consent of the owner or occupant of such land.

(f) Wherever the owner or occupant of such land objects to the construction of fire-guards, on the ground that the said construction would involve unreasonable loss or damage to property, the company shall at once refer the matter to the board, giving full particulars thereof, and shall in the meantime refrain from proceeding with the work.

(g) No agent, employe, or contractor of any such railway company, shall permit gates to be left open or to cut or leave fences down whereby stock or crops may be injured, or do any other unnecessary damage to property, in the construction of fire-guards.

10. In carrying out the provisions of Section 297 of the Railway Act, which enacts that "the company shall at all times maintain and keep its right-of-way free from dead or dry grass, weeds, and other unnecessary combustible matter," no such railway company or its agents, employes, or contractors, shall, between the first day of April and the first day of November, burn or cause to be burned any ties, cuttings, debris or litter upon or near its right-of-way, except under such supervision as will prevent such fires from spreading beyond the strip being cleared. The chief fire inspector or other authorized officer of the board may require that no such burning be done along specified portions of the line of any such railway, except with the written permission or under the direction of the chief fire inspector or other authorized officer of the board.

11. The railway company shall provide and maintain a force of fire-rangers fit and sufficient for efficient patrol and fire-fighting duty during the period from the first day of April to the first day of November of each year; and the methods of such force shall be subject to the supervision and direction of the chief fire inspector or other authorized officer of the board.

12. The chief fire inspector shall, each year, prepare and submit to each and every railway company a statement of the measures such railway companies shall take for the establishment and maintenance of said specially or ganized force. Said statements, among other matters, ma, provide for—

(a) The number of men to be employed and the said force, their location and general duties, and the methods and frequency of the patrol;

(b) The acquisition and location of necessary equipment for transporting the said force from place to place and the acquisition and distribution of suitable fire-fighting tools; and

(c) Any other measures which are considered by him to be essential for the immediate control of fire and may be adopted at reasonable expense.

13. Whenever and while all the locomotive engines used upon any such railway, or any portion of it, burn nothing but oil as fuel, during the aforesaid prescribed period, under said conditions as the board may approve, the board will relieve the said railway of such portions of these regulations as may seem to it safe and expedient.

14. The sectionmen and other employes, agents, and contractors of every such railway company shall take measures to report and extinguish fires on or near the right-of-way, as follows:

(a) Conductors, engineers, or trainmen who discover or receive notice of the existence and location of a fire burning upon or near the right-of-way, or of a fire which threatens land adjacent to the right-of-way, shall report the same to the agent or persons in charge at the next point at which there shall be communication by telegraph or telephone, and to the first section employes passed. Notice of such fire shall also be given immediately by a system of warning whistles.

(b) It shall be the duty of the agent or person so informed to notify immediately the nearest forest officer and the nearest section employes of the railway, of the existence and location of such fire.

(c) When fire is discovered, presumably started by the railway, such sectionmen or other employes of the railway as are available shall, either independent or at the request of any authorized forest officer, proceed to the fire, immediately and take action to extinguish it; provided such sectionmen or other employes are not at the time engaged in labors immediately necessary to the safety of trains.

(d) In case the sectionmen or other employes available are not a sufficient force to extinguish the fire promptly, the railway company, shall, either independently or at the request of any authorized forest officer, employ such other laborers as may be necessary to extinguish the fire; and as soon as a sufficient number of men, other than the sectionmen and regular employes are obtained, the sectionmen and other regular employes shall be allowed to resume their regular duties.

Note.—Any fire starting or burning within 300 feet of the railway track, shall be presumed to have started from the railway, unless proof to the contrary is furnished.

15. Every such railway company shall give particular instructions to its employes in relation to the foregoing regulations, and shall cause appropriate notices to be posted at all stations along its lines of railway.

16. Every such railway company allowing or permitting the violation of, or in any respect, contravening or failing to obey any of the foregoing regulations, shall, in addi-

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tion to any other liability which the said company may have incurred, be subject to a penalty of one hundred dollars for every such offense.

17. If any employe or other person included in the said regulations, fails or neglects to obey the same, or any of them, he shall, in addition to any other liability which he may have incurred, be subject to a penalty of twenty-five dollars for every such offense.

Coal Resources.

As a result of an investigation by the Commission of Conservation it was found that there was in Saskatchewan, Alberta and British Columbia, a considerable waste of slack coal which had been mined and brought to the surface. This waste of unmarketable slack coal varies from 10 to 35 per cent of the output. In Saskatchewan, 10 to 25 per cent of the output from the mines is slack coal, which is dumped on the ground and wasted. In the vicinity of Estevan, 10 to 12 per cent of the output from some of the larger mines is dumped on the prairie and burned. It is necessary to remove this coal (lignite) from the mine pinnt, as it readily ignites by spontaneous combustion.

The waste of slack coal varies from 10 to 12 per cent in the Lethbridge district, and from 20 to 35 per cent in the Edmonton district. In the Crowsnest Pass district, in Alberta and British Columbia, the coal is of better grade and some of the slack is marketable; the remainder is made into coke in beehive coke ovens. At Bankhead, briquettes are made from the slack coal. On Vancouver island, some of the large producing mines waste from 10 to 15 per cent of their output as slack coal, and, unfortunately, it is generally dumped into the sea. The high freight rates make it impossible to market this slack at a profit.

In order to save the community what amounts to more than 15 per cent of the total output of coal, besides the low-grade coal which is often left in the mine, it was suggested that the following studies be made:

(1) To ascertain the price of coal in different parts of the West, and which portions of the country are supplied with coal from the different mining centers, also the prices of coal in Canada and the freight rates on the same from the mines to the market.

(2) Owing to the necessity of obtaining a suitable domestic fuel and cheap power for the prairie provinces, it is desirable that investigations be carried on with a view to utilizing the lignites which underlie the greater portion of these provinces. In this connection it is of interest to know that the United States Bureau of Mines has demonstrated that suitable briquettes can be made from low-grade lignites. The bureau has also shown that many fuels of such low-grade as to be practically valueless for steaming purposes, including slack coal, bone coal, and lignite, may be economically converted into producer gas and may thus generate sufficient power to render them of high commercial value.

Petroleum Resources.

While the actual petroleum resources of Canada are comparatively small, nevertheless, the potential resources are considerable. In New Brunswick and Nova Scotia there are enormous deposits of oil shales which are valuable as a source of oil. On an average these shales will give a higher yield of crude oil per ton than the oil shales worked so extensively in Scotland. In the vicinity of Fort McMurray and Fort McKay, on the Athabaska River, Alberta, there are enormous deposits of tar sands. The bitumen in the tar sands is the residue from evaporated petroleum. It has been estimated that there is 6½ cubic miles of solid bitumen in the tar sands exposed on this river. Although enormous quantities of oil have evaporated from this district, nevertheless it seems probable that accumulations of petroleum may exist in places where the geological structure was such as to prevent its escape. This is also exemplified by the fact that natural gas occurs in quantity in districts where the tar sands are capped by overlying measures. If large quantities of petroleum were discovered in Alberta it would be a factor of great importance to the railway interests which operate in the Rocky Mountains and Jasper Parks and the forest areas in British Columbia and Alberta.

The Canadian Pacific is now using oil-burning engines on its main line between Kamloops and Field, in British Columbia. The Grand Trunk Pacific and some of the Canadian Pacific coast steamships also burn oil, and other boats are being changed from coal-burners to oil burners. The oil is at present obtained from the California oil fields. If supplies can be obtained at the prices now prevailing, its use will be very largely extended. Its cleanliness, the greatly decreased smoke, the decrease in the number of firemen required, the economy, particularly in intermittent service, the increased efficiency—two boilers with oil, in steamship service, giving the same steam as three with coal—and other considerations, make it an almost ideal fuel.

William McNab (G. T.), Chairman; R. H. Aishton (C. & N. W.), Moses Burpee (B. & A.), F. F. Busteed (C. P. R.), A. W. Carpenter (N. Y. C. & H. R.), C. H. Fisk (Chat. Sou.), W. A. McConagle (D. M. & N.), G. A. Mountain (Can. Ry. Com.), W. L. Park (I. C.), G. H. Webb (M. C.), R. C. Young (L. S. & I.), committee.

Discussion on Conservation of Natural Resources.

Mr. McNab: This report on conservation may be accepted as one of progress.

L. A. Downs (I. C.): I have not been clear in my mind as to why this association fosters this committee on conservation of natural resources. We are an association of builders. Unfortunately, in this country, at the present time, conservation is getting mixed up with the differences between the "interests" and the common people. I was in Alaska this past summer, and Alaska is dead. It is dead because of the conservation policy in this country.

The Copper River and Northwestern Railroad operates 194 miles of road in Alaska. They had been burning coal in their locomotives until about a year ago, importing the coal from Canada and paying a duty on it, while the hills of Alaska are full of coal, but the laws of the United States prevented them from getting the coal out of the hills. This road is now burning oil in its locomotives because oil is cheaper than coal which they buy in Canada and pay a duty on it.

I think that God, in His Almighty wisdom, never intended, when he placed us on this continent, that we would run out of anything. While some things have become somewhat scarcer, I question whether you can recall anything which we have run out of entirely.

It seems to me if we could have a committee to prevent waste, a committee to prevent forest fires and other things, rather than a committee of conservation as holding the opinions of those great conservators in this country who seem to array the "interests" against the common people, then it would be all right.

Prof. S. N. Williams (Cornell College): Unfortunately in this country we have suffered during the past four or five years to the extent of millions of dollars by forest fires which have been caused by the railways. I know that in some cases the railways have not taken the precautions to prevent forest fires, and have not provided the means for the extinguishment of forest fires, after they have started along the lines of the railways, which they should have done. I think if you have paid any attention to the situation in this country for the last five years you will be convinced that this is one of the most important subjects which can be presented to us in the association, and still further that the matter of reforestation, which has been considered to be so important in Europe and which has been developed to a limited extent in our own country, is one of the most practical matters which can be considered.

George W. Andrews (B. & O.): The gross waste of timber in this country has been outrageous. There are probably no corporations in the world to-day that are suffering more on account of the gross waste of timber than the railroads, and many important railroad systems in this country have realized that fact, and they have gone into the planting of trees on an extensive scale, and many others are contemplating doing it.

Mr. McNab: Now, gentlemen, this question of conservation is one concerning which we must divorce from our minds the idea that it has anything to do with any one country. Whatever interests Canada in the way of conservation interests the United States. We are all really working for the conservation of the resources of the one continent.

J. L. Campbell (E. P. & W.): I understand that primarily conservation is intended to provide for the efficient and economical use of our resources, saving those parts of our resources which we do not need for the present for future generations, and I believe we can all agree on that feature of conservation. As engineers, I believe it is our special duty to see that the resources of the country which we handle are efficiently and economically used.

R. C. Young (L. S. & I.): The railroads are interested in conservation in many ways. In the first place, a great many of our railroads are dependent more or less for their business on the products of the forest and the products of

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the mines. I do not think it is our province to conserve these products to such an extent that they cannot be used, but to see to it that they are conserved to such an extent that they can be used at the right time, and the portions not used now will be conserved for use by future generations.

Prof. Williams: One of our governmental departments has recently made the statement that the annual waste of resinous products in the United States is estimated at 15,000,000 cords, and if made up into paper-making products in the shape of wood pulp would be worth $300,000,000. I think that is a sufficient commentary on the waste which is being practiced at the present time. The Chicago & North-Western, and I believe also the Pere Marquette, some time since issued a circular letter to all the agents of these railways advising them that they must be careful in the use of the stub ends of pencils, and also in the use of pens, and all the other office stationery, and giving an estimate as to the waste which was being incurred in the use of these articles.

(The report was received and the committee relieved.)

BALLAST.

The work assigned to the Ballast committee was divided between three sub-committees, as follows:

PROPER DEPTH OF BALLAST OF VARIOUS KINDS TO INSURE UNIFORM DISTRIBUTION OF LOADS ON ROADWAY.

In last year's report on this subject the committee had as a basis for its report several reliable and thorough tests,

H. E. HALE,
Chairman Committee on Ballast.

such as the tests made by the Pennsylvania railroad at Altoona and by Director Schubert, of the German Railways, and on the information obtained for these tests the committee drew its conclusions and made its recommendations to the association, which recommendations covered the subject as far as the information permitted. These recommendations were printed in the report of 1912, and adopted by the association, but the subject in a modified form was again referred to the committee.

The tests on which the committee based its conclusions have been conducted largely under artificial conditions, which were designed to be, as nearly as possible, those which actually existed in the track under regular traffic, but under the circumstances it was impossible to absolutely reproduce conditions existing in track under regular traffic.

Careful search has been made to obtain reports or results of tests on this subject, both in foreign and American engineering papers, and this search has been practically without result. It therefore appears that if further investigation or report is to be made by the committee, it must be based upon new tests, which should be made in track under regular traffic—preferably heavy traffic.

Discussion of this subject by the committee with other members of the association has led the committee to believe that many members of the association feel that a further test in track under regular traffic is desirable, and to place this before the association in tangible form, the committee has worked out the following proposed test:

Proposed Test to Determine Proper Depth of Ballast of Various Kinds to Insure Uniform Distribution of Loads.

(1) Select a stretch of track on clay roadbed, under heavy traffic, where trouble has been experienced with clay working up between the ties.

(2) Excavate the roadbed to a uniform depth of 30 in. below the bottom of the ties, for a space of two rail lengths; prepare the adjacent rail lengths in the same manner, decreasing the depth 3 in. under each successive two rails, until the bed is 12 in. below the bottom of the tie (14 rail lengths).

(3) Place on this bed a thin layer of fibrous material, such as hay, to make a well-defined separation between the roadbed and the ballast.

(4) Place stone ballast on the bed to the above-mentioned depths, tamp well, and put the track in good line and surface.

(5) Make note of tie spacing and width of ties, keep accurate levels and record of amount of time spent on surfacing various parts o. track, also keep record of axle loads and amount of traffic. Take photographs at regular intervals to show deformation of roadbed.

(6) Make similar test for gravel and similar for ballast section, having a sub-ballast of gravel equal to one-half the total depth and a top ballast of stone equal to one-half the total depth of ballast.

(7) The estimated cost of this test is as follows:

(a)	Cost of material (stone), 500 yds. at 80 cents..	$ 400
(b)	Labor, preparing track and widening bank, where necessary, at $30 per rail (14 rails per test)..	420
(c)	Labor, inspecting, six inspections at $2 per rail.	170
(d)	Line and surface to be paid for by railway owning track, at regular maintenance charge.....	
	Total for one test.....	$ 990
	Three tests	$3,000

Conclusion.

The committee recommends that the above test be made under the direction and supervision of the Ballast committee, and that it be financed by the association or some railroad or railroads. The location for the test to be arranged for by the committee with a railroad that would be willing to have this test made in their main tracks under heavy, regular traffic.

CONTINUE STUDY OF PHYSICAL TESTS OF STONE FOR BALLAST.

The committee has previously recommended certain physical tests of stone for ballast, with full description of the tests and how to have same made by the United States Government at Washington. Further investigations by the committee this year have resulted in practically no additional information except a paper read at the Sixth Congress at New York of the International Society for Testing Materials by A. T. Goldbeck and F. M. Jackson, which quoted, in part, the table and data given in the American Railway Engineering Association report of 1912 and practically give the same information as given in our reports. The table showing results of physical test of stone for ballast, as presented to the association last year, has been checked, and the various railroads represented have advised that they had nothing further to add to the table. This table is considered by the committee to be a very good guide for comparing stone from various quarries when selecting it for ballast.

The further consideration of the physical tests of stone for ballast by the committee resulted in their recommending the physical tests as a guide only in the specifications for stone ballast, and it is recommended that the following note be added in the manual to the specifications for stone ballast.

Conclusion.

NOTE—"*Attention is called to the physical tests of stone for ballast printed in the manual, page 47, which are recommended as a guide, in connection with the specifications.*"

After further consideration of this subject, the committee feels that the information, as at present printed in the manual in regard to the physical tests of stone for ballast, was not clear to some of those who were not familiar with the subject, and it is recommended that the information given in the manual on this subject on page 47, under the heading of "Physical Tests of Stone for Ballast," be changed to read as follows (portion in italics is additional):

"It is recommended that the following be used for physical

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tests of stone ballast. *Other things being equal, the maximum or minimum results as indicated will govern in selecting stone for ballast:*

(a) Weight per cubic foot—*Maximum.*
(b) Water absorption in pounds per cubic foot—*Minimum.*
(c) Per cent. of wear—*Minimum.*
(d) Hardness—*Maximum.*
(e) Toughness—*Maximum.*
(f) Cementing value—*Minimum.*
(g) Compression test—*Maximum.*"

SIZE OF STONE BALLAST.

The committee wishes to present to the association a copy of a report of a test made by the Pennsylvania railroad in regard to the first cost of putting in ballast and maintaining same for various sizes of stone ballast; the report is given below.

Sizes of Ballast.

Investigation conducted by the Pennsylvania company between August, 1899, and October, 1903, inclusive, record of experimental tests of three different sizes of broken stone ballast:

	Size of Stone Ballast.		
	¾ in	1½ in.	2½ in.
Double track ballast, feet.....	5,280	5,211	5,280
Double track ballast, miles.....	1.0	0.987	1.0
Stone ballast used, cars.....	226	171	198
Stone ballast used, tons.....	6,300.5	4,651.8	4,947.9
Cars stone per mile double track.	228	173	198
Tons stone per mile double track.	6,200	4,713	4,948
Linear ft. double track to 1 car..	23.1	30.5	26.7
Linear ft. double track to 1 ton..	.85	1.12	1.07
Average depth ballast under ties.	7.25 in.	6.5 in.	6.75 in.
Total first cost of ballast, freight, unloading, putting in tracks, lining and surfacing, etc.	$7,911.60	$5,633.51	$5,263.92
Average cost per ft. double track.	1.50	1.08	.997
Average cost per mile d'ble track	7,911.60	5,708.10	5,263.92
Cost ballast per ton at quarry...	60-70c	60-68c	58-69c
Average cost of maintenance for period of 51 months, per mile.	94.66	84.94	82.13

Conclusion.

After considering this information, the committee does not wish to make any change in the size of stone for ballast, as now recommended in the manual.

CONTINUE INVESTIGATION ON GRAVEL BALLAST AND RECOMMENDED METHODS OF GRADING DIFFERENT QUALITIES.

The committee has made extensive tests in regard to classification of gravel for ballast in past years. During this year Mr. Meade, chairman of the sub-committee on this subject, had a very thorough test made, which is presented herewith.

Tests made last year of river gravel gave results that indicated that gravel which was much higher in sand than called for in the manual for first-class roadbed gave first-class results, and, therefore, the committee was unwilling to approve the former recommendations, but further investigations this year show that the reason for this discrepancy was largely due to the use of improper screens and different methods of selecting the sample. The committee, therefore, wishes to incorporate in the manual a brief but complete description of the method of making the test of grading gravel for ballast, as follows:

Method of Testing Quality of Gravel for Ballast.

(1) The size of the sample to be tested should be approximately one cubic foot.

(2) Five average samples of about one cubic foot each should be selected from various parts of the pit, which is to be tested. The five samples should then be thoroughly mixed and about one cubic foot of the mixture selected for testing.

(3) To separate the gravel from the sand and dust use a No. ten (10) screen (ten meshes to the inch), made of No. 24 wire (B. & S. gage); to separate the sand from the dust use a No. fifty (50) screen (fifty meshes to the inch), made of No. 31 wire (B. & S. gage),

(4) Measure the percentage of gravel, sand and dust taken from the sample by volume, giving the percentage of each ingredient, compared to the volume of the sum of the ingredient, as follows:

$$\text{Per cent of sand} = \frac{S}{G + S + D}$$

Where S = Volume of sand.
G = Volume of gravel.
D = Volume of dust.

(5) When sample is shipped for test it should be carefully and securely marked with name and location of the pit from which it was taken.

The above will necessitate canceling the following paragraph on page 47 in the manual: "The term percentage above is used to indicate the proportion of the original bulk."

CLEANING STONE BALLAST.

Appendix B is a copy of report on cleaning stone ballast made by W. I. Trench, division engineer, to S. A. Jordan, engineer maintenance of way of the Baltimore & Ohio, which report was forwarded to the chairman after the last ballast committee meeting and is included as information. The investigation by Division Engineer Trench and Supervisor Zepp has resulted in a very material saving in this class of work.

RECOMMENDATIONS FOR NEXT YEAR'S WORK.

The committee recommends the following subjects for investigation for the year 1913:

(1) Further investigation of the proper depth of ballast of various kinds to insure uniform distribution of loads on roadway.

(2) Revise the ballast sections, with particular reference to the use of a sub and top ballast.

(3) Investigate methods of cleaning stone ballast and obtain cost of same by various methods.

H. E. Hale (M. P.), Chairman; J. M. Meade (A. T. & S. F.), Vice-Chairman; W. J. Bergen (N. Y. C. & St. L.), C. C. Hill (M. C.), A. F. Blaess (I. C.), S. A. Jordan (B. & O.), L. W. Baldwin (L. C.), William McNab (G. T.), T. C. Burpe (Intercolonial), A. S. Moore (C. C. C. & St. L.), O. H. Crittenden (I. & G. N.), J. V. Neubert (N. Y. C. & H. R.), F. T. Darrow (C. B. & Q.), S. B. Rice (R. F. & P.), J. M. Egan (I. C.), E. V. Smith (B. & O.), T. W. Fatherson (C. R. I. & P.), F. J. Stimson (G. R. & I.), H. L. Gordon (B. & O.), S. N. Williams, Cornell Colby, G. H. Harris (M. C.), Committee.

APPENDIX B.

CLEANING STONE BALLAST BY USE OF SCREENS.

By W. I. Trench,
Division Engineer, Baltimore & Ohio.

During the summer of 1912 experiments were made on the Baltimore & Ohio with screens in cleaning stone ballast, as opposed to the method of shaking out with ballast forks now generally in vogue on the railroads of this country. A screen developed by the writer and Supervisor A. G. Zepp of Baltimore is the subject of this discussion. In approaching the problem of cleaning ballast by means of screens it was recognized that the present methods involved one of the most expensive and tedious operations in railway maintenance and that for this reason the periodical cleanings are often deferred much longer than good practice would seem to demand. It was felt that if a screen could be designed which would make a proper separation of stone and dirt and at the same time dispose of these two materials in a way to avoid further handling, with a single cast of the shovel instead of the repeated sifting motion and the further shoveling of the dirt in its disposal as required by the fork, an enormous saving could be made.

It was believed that to be practicable this screen must be as cheap as was commensurate with durability, easily portable, and so related in position to the track when in use as to make its removal unnecessary on the passage of trains. Its operation must be progressive along the track and complete, working toward the dirty ballast and leaving the clean ballast behind it in such shape as to require no further handling. Its capacity must be limited only by the speed with which the laborers can handle the shovel, and it must be susceptible to use by a gang, so arranged that the work of every man is continuous and unchanging and so proportioned that no man's work is dependent on the progress made by another; that is, there should be no halts. It is believed that these results have been secured in the screen to be described and that its use, by a properly organized gang, will result in such a saving as to make the further general use of the fork method improbable.

Experiments on the Baltimore & Ohio were made on a portion of its double track line, and it was found that the most efficient gang for this condition was one of 12 men equipped with three screens. The photograph shows such a gang at work. It will be seen from this photograph that there is a screen for each berm and one for the center ditch. The construction of all three is identical, there being interchangeable legs for use on the berm and in the center ditch. The legs for use on the berm are so designed that the screen rides on the ends of the ties outside the rail at such a distance from the

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track as not to interfere with traffic, and at the same time deposits the cleaned stone on the berm in final position. It stands at such an elevation that the dirt is deposited directly into a wheelbarrow standing on subgrade. The legs for use in the center ditch are designed to ride on the cleaned subgrade as the screen is slid along and are of such a height that the dirt is deposited in a handbarrow, which is placed beneath the screen, and the clean stone is left in the center ditch in final position. The upper end of the screen is carried on supports, which are readily adjustable in height to accommodate it for use in the center ditch or on the berm in either cut or fill. When in use in the center ditch the screen is laid flat upon the ground on the passage of trains and lies wholly below the top of rail.

A short description of the structural details will be made so that a better understanding will be had of the method of operation to follow. The screen frame is constructed of standard 2-in. x 3-in. x 1¼-in. angle iron set up so that the short leg turns out, the long leg forming the vertical sides of the screen. The screen proper is formed of ¼-in. rods, crimped together, giving a mesh ¾ in. x 8 in. It was found with this mesh and with the screen inclined at 45 deg. that the separation of stone and dirt was perfect even in damp weather, and this cannot always be said of the results secured from forks. These crimped rods are set in a rectangular steel frame made of 1-in. x ½-in. x ½-in. channel iron, and this frame is bolted inside the main frame so that the screen proper can be readily detached, as a whole, and sent to the shop for repairs. The entire screen is backed with a galvanized iron slide, which is so formed that it gathers the dirt which has come through any part of the screen and deposits it in a receptacle set beneath by means of a spout. The spout is really a hinged door suspended at its outer end by a chain and convenient fastening so that its height can be regulated, and when the receptacle is removed for emptying, can be

Ballast Screens on Double Track.

closed. With this door closed the screen will hold about one wheelbarrow load of dirt, so that the operation of the screen is not stopped while dirt is being dumped. At the top of the screen is a hood which is used in the position shown when in the center ditch, forming a deflector for the ballast thrown over the top, the method of operation in this case being to slide the screen backwards from the cleaned ballast towards the uncleaned ballast, the latter being thrown over the top and being left in clean condition at the bottom. When the screen is in use on the berm this hood is thrown back and forms the top against which the ballast is thrown when in this position. The screen separator as indicated is practically indestructible and will support the weight of a man without impression.

A galvanized iron handbarrow for use with each screen is provided, which is so formed that it fits exactly upon horizontal legs when in use on the berm, being so placed after a sufficient quantity of cleaned ballast has been allowed to fall outside the rail, the remainder being caught in the handbarrows and drawn across the rail to be deposited in the cribs. When in use in the center ditch the handbarrow is placed beneath to catch the dirt.

The cribs are cleaned to the bottom of the ties, the center ditch 18 in. below the top of rail and the berm 24 in. below top of rail at the end of tie and sloping to 3 ft. below top of rail at back of side ditch. Every 50 ft. one crib is cleaned to the bottom of the center ditch on one end and to the top of subgrade on the other, forming an outlet for water collected in the center ditch. This arrangement gives an absolutely dry and stable roadbed. The dirt from the ballast, or so much of it as is required, is dressed upon the subgrade outside the ballast line, and in addition to giving a neat black appearance and a pleasing contrast to the white stone ballast, serves to keep down weeds very effectually. What is not required for this purpose is used to widen the embankment along the line.

As stated above, for double track work, three screens are used. When tracks are on fills on both sides the dirt from each side screen is disposed of on its own side of the embankment, and the dirt from the center ditch is dumped directly from the handbarrow over the bank on the side most desirable. When one side is on a fill and the other side in a cut wheelbarrow loads of dirt are wheeled or carried bodily from the cut side to the fill side. When it is necessary to carry dirt across tracks care is used to keep the screen on the side from which it is carried in an advanced position, with reference to the other screens, so that the dirt will be carried over the uncleaned roadbed and not over that which has been cleaned. This is clearly illustrated in the photograph, where the side of the track towards the observer is in a cut and the other side on a fill. It will be seen that dirt carried to the fill on the other side of the tracks from the center screen passes over dirty ballast before the arrival of the screen to the right, and likewise, dirt from the screen to the left passes over the tracks before the arrival of either of the other two screens, the screens in this case traveling from right to left. When the tracks are in a cut, on both sides, wheelbarrow loads are wheeled out to the end of the cut at the nearest end, the handbarrow from the screen in the center ditch being dumped into a wheelbarrow or shoveled directly from the pan to the barrow standing across one rail. It is found that dirt can be wheeled out of a cut for a distance of 800 ft. to 1,000 ft. at less expense than would be the case if thrown upon the ground and loaded again upon a work train on a busy railroad.

The following gang organization has adhered to: For the operation of three screens, as indicated under ordinary circumstances, 12 men are sufficient; with long hauls of dirt, more men to be added for wheelbarrow work, so screen gang will be kept going. Of the 12 men two shovel from each side of herm onto their respective screens, two from the center ditch onto the center screen, and one man in the center of each track shoveling from the cribs onto the screen most available. One man with a pick advances ahead of the shovelers to loosen the hardened ballast before their arrival. These are dispensed with if ballast is loosened by means of a plow attached to the work engine. Long stretches of ballast can be loosened in this way in a short time by the work engine sufficient to keep a gang going for several days. The remaining three men are sufficient usually to handle wheelbarrows in disposal of dirt, dress dirt down on herm and fork a uniform ballast line, although if a hand laid ballast line is required, more men would be necessary. By careful handling of this gang ballast and dirt are disposed of at one operation in their final position and no further attention is necessary. In most cases it is found that the cleaning of ballast so reduces the volume that additional stone is necessary. In this case the disposition of the stone from the screens is so handled that the herms and center ditch are filled out completely, and any deficiency occurs between the rails where additional stone can be most conveniently distributed from Rodger ballast cars without further handling. The gang of 12 men cost per day: Foreman, $2.40; 11 laborers at $1.60, $19.60; total, $20.

We find that a gang equipped and organized as above will cover 155 ft. of double track per day of 10 hours, making the cost per mile of double track $640. This, of course, includes cleaning ballast, dressing ballast and disposal of dirt. Single track work would cost considerably less than half this amount, as there would be no center ditch to contend with. The ballast really handled in this test was considerably more than the cross-section would indicate, as before cleaning the ballast was piled above the rail in the center ditch and rounded high on the berm. An average of 227 wheelbarrow loads of dirt were removed per 100 ft. of double track cleaned.

For comparison with the fork method, the identical gang used above was tried with forks and advanced but 72 ft. per day. This also included the dressing complete and disposal of dirt, it being necessary to shovel the latter in wheel and handbarrows. This shows a cost per mile of double track, $1,466.

We see various figures given from time to time on the cost of cleaning ballast per mile. Some of them are very much less than the above, and we can only believe that this is occasioned by omitting to include the disposal of dirt and dressing the road complete, or on account of cleaning to a less depth in track than indicated above, or perhaps a less thorough separation of stone and dirt. In many cases a raise is given the track and the ballast is put under without cleaning. In the above test no raise was made. For the quality of work done we do not believe the figures can be much lessened. This shows a saving of 56 per cent by use of screens over forks.

This screen weighs about 325 lbs., and can be easily propelled along track by the two shovelers at work at the re-

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spective screens, and with the material used in them with careful handling and pointing, they should last for years. The trial lot of three made for us with handbarrows complete by a Baltimore firm cost $45 each. We believe, if made in quantity and bid on by competitive firms, the cost would be greatly reduced.

Discussion on Ballast.

The President: This is a progress report, and is offered for information. The recommendation that funds be appropriated is a matter that will be handled by the directors, and we have reason to believe that it can be handled in some way. This report is submitted as a matter of information as to the methods of procedure that this committee proposes to follow.

John R. Leighty (M. P.): I would call attention to the very short distances over which the various depths of ballast proposed is to extend, under the heading of "Proposed Test." We all know that a bad spot in a track will grow like a bad spot anywhere else. It seems to me if you take 2 rail lengths of track under one condition and compare those 2 rail lengths with the adjacent 2 rail lengths, such a comparison will not lead to any definite information. The result of the test you get on one section of 2 rail lengths long will very materially influence the conditions that will be found on the adjacent 2 rail lengths, and it would be my suggestion in carrying out this experiment that the sections of track be made sufficiently long so as to make sure that the conditions existing on one section of track will not influence the conditions existing on an adjacent section of track, so that you will get a comparison which will really amount to something.

Mr. Hale: Concerning the investigation on gravel ballast and recommended methods of grading different qualities. Last year your committee obtained from various railroads report of the percentage of sand and dust in their ballast, and they tabulated this information and presented it to the association, but the results were so erratic that little conclusion could be drawn from it. One of the reasons for this, your committee found, was that the method of testing was not uniform; far from it. Some of the railroads weighed the ballast to determine the percentage of sand and dust, others measured it by volume and others had different methods of calculating the percentage. The committee felt it was of the first importance to have a uniform method of making the testing the sand in ballast, and, with that end in view, we have recommended the accompanying method, to be printed in the Manual.

C. C. Cook (B. & O.): That first "S" is confusing.

Mr. Hale: S means volume of sand.

Mr. Cook: In both cases?

Mr. Hale: In both cases.

E. A. Hadley (M. P.): I note that if this formula is adopted, it will change the wording in the Manual. Ballast is generally purchased by the cubic yard and generally the per cent. of sand in the ballast is specified; for instance, 35 per cent., which I understand to mean 35 per cent. of the original volume. It seems that in making the other formula the committee have omitted one of the component parts of the ballast, which is the voids, as without the voids the ballast will not properly serve its purpose, and should they add the voids in their formula they would still come out with 100 per cent. at the end. If the committee's suggestion is adopted it would add to the percentage of sand in the last, and as ordinarily accepted, it would amount to from 5 to 8 per cent., depending on the quality of the material. It seems to me in leaving out all consideration of the voids an omission has been made which should be corrected.

Mr. Hale: The committee considered that, but instead of making it 100 per cent. by the old method, or the method now printed in the Manual, by taking into consideration the voids, we simply get a percentage of voids by the old method of possibly 10 or 15 per cent., or maybe more, which is added to the percentage, and the sum therefore becomes 140 or 130 per cent., which is very unsatisfactory in practice. Your committee investigated the methods of washing gravel by several of the gravel companies and selling it by contract, and it found the method being used by the contractors similar to this method recommended by the committee. It was almost impossible to explain to a contractor when complaining to him that he had too much sand, and when the sand was added to the gravel the sum equaled over 100 per cent. The contractor refused to believe the figures. The committee is not altogether satisfied with this formula in one sense, but it is by far the best that has been suggested.

Maurice Coburn (Vandalia): I would like to ask if the committee considered the question of measuring by weight?

Mr. Hale: Your committee did consider that and the variation due to moisture was so great that they abandoned it. The C. B. & Q. and the Santa Fe made quite a number of extensive tests by weight which were not satisfactory.

E. A. Hadley: I cannot agree with the chairman of the committee that the use of the percentage of voids in the ballast would go to make 140 per cent., as the percentage of voids properly used is a minus quantity, as the sand runs into the voids in the gravel, partially filling them, the same as the dust running into the voids in the sand, if properly used, the percentage would still equal 100.

Mr. Hale: Fifth paragraph. Some of these clauses seem rather unnecessary, possibly. The committee has had so much trouble in getting samples properly tested that they found every clause here very important. I would like to make a motion that the above method of testing gravel for ballast be accepted and put in the Manual. (The motion was carried.)

Mr. Hale: The carrying of this motion automatically cancels clause 4 paragraph of the Manual, on page 150: "The above will necessitate the canceling of the following paragraph, on page 49 of the Manual."

The President: If there is no objection, this will be done.

S. B. Rice (R. F. & P.): We have operated a ballast pit on the R. F. & P. branch, known as the Richmond-Washington line. It is immediately in the center of the road; it is 57 miles in either direction. We first started to handle this ballast as pit-run material. We had good results from it. We afterwards considered that we would get better track by having a washer. It was started in November, 1908. Since that time the entire line was rehallasted with washed gravel, at a cost, in track finished, of less than 58 cents. The average loading was 8½ cents, washing 11½ cents, hauling 13¼ cents, placing in track 24½ cents; total 58 cents. The extreme haul was 57 miles. There were cases where the loading was as low as 6 cents. The pit varied from 6 to 22 ft. in depth. Of course the deeper the cut the slower the loading. Of course the long and short hauls made a difference, the average in 400,000 yards—these were the average figures made up after three years' work. The track that was ballasted in 1908 is in good condition to-day. Of course it shows a little dirt from trains, but we have not had any bad joints. The track is in good condition. In regard to our maintenance, for the month of December, 1912, January and February of the present year, we had an average of $19.00 per mile per month, or an average of 63 cents per day per mile. We have 24 through passenger trains over our line. We are handling the Coast line and Seaboard trains, which are very heavy. We have an average of 22 freight trains. Our tonnage is from 10,000 to 12,000 tons per day. We think we have as good track with that washed ballast as we ever could get with any stone that could be furnished.

Prof. W. K. Hatt: In the formula at the end of the report the ratio is given and not per cent.

Mr. Hale: The committee will accept that suggestion.

BUILDINGS.

The following subjects were assigned to the committee by the Board of Direction:

(1) Present principles covering the design of inbound and outbound freight houses.

(2) Report on recommended methods of heating, lighting and sanitary provisions for medium-sized stations.

(3) Complete report on roof coverings.

(4) Report on the advantages and disadvantages of various types of freight house floor construction.

Progress is reported on subject (1).

Reports on (3) and (4) are presented herewith.

No recommendations are made as to revision of the manual.

ROOFING.

The following report on roofing combines the matter presented in the reports of the two past years, with some corrections and some additions.

The Bituminous Roofing Materials.

The bituminous roofing materials are varied and complex and what accurate knowledge there is about them is largely held by the experienced manufacturers. This is gradually being disseminated and the intelligent purchaser every year is able to buy with more confidence.

The bitumen substances are organic compounds, largely composed of many different hydrocarbons, with different chemical formulæ and widely-varying melting points. They vary so and the knowledge concerning them is so limited and new that considerable confusion exists in regard to nomenclature and classification. They are always accompanied by greater or less amounts of impurities, and are obtained either

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naturally or as the heavier distillates or residues of coal, petroleum or other organic substances. Their distinguishing characteristics are their elasticity and binding power or adhesiveness, their considerable immunity from action by water and their solubility in oils and certain other organic compounds.

Asphalt.—The term asphalt is ordinarily considered as referring to bitumens found naturally in the solid state and will be so used in this discussion. These are obtained all over the world with widely-varying qualities. Mention will be made of those most important commercially in this country.

The asphalts are generally stable in the atmosphere. As found naturally, they are not commercially available, even after the impurities are removed, being too hard and brittle for most purposes. This is ordinarily remedied by softening or fluxing with various oils, an operation requiring skill. The character of the fluxes has a most important effect upon the finished product. Petroleum products are ordinarily depended on for this purpose. The fluxes should be sufficiently stable to insure against too rapid hardening of the fluxed asphalt. They should be free from deleterious constituents and should be of such a character that they will combine with the asphalt to be fluxed so as to make a homogenous and perfect solution. Certain fluxes which work well with certain asphalts are not at all suitable for use with other asphalts. Tars are sometimes employed for fluxing purposes, but they do not mix easily with the asphalt. As asphaltic compounds age they

MAURICE COBURN,
Chairman Committee on Buildings.

tend to become brittle and hard, losing their elasticity and binding power. Poor fluxing hastens this process.

Commercial refined asphalts, intelligently and honestly refined, should and do run very uniform. When they are compounded, however, brand names have very little significance and less value, and should not be taken in themselves as indicative of the character or value of the compound. Some types of asphaltic compounds properly prepared and used have qualities which make them almost indispensable for some classes of roofing.

Rock Asphalt or Mastic Rock.—Sandstone saturated with bitumen is found naturally in various places in the country, principally in California. It is sometimes known as mastic rock, and is more valuable for paving and floors than for roofing or waterproofing, where it is rarely used. There is also bitumen saturated limestone, of which that found in Uvalde County, Texas, is an example.

Petroleum Residuals.—The petroleums found in the United States vary in quality according to their location.

The Pennsylvania oils are rich in the paraffines and in the lighter and more valuable illuminating oils and naphthas. Most of the California oils are practically free from paraffines and have comparatively small quantities of the illuminating oils. They are darker in color, have a greater specific gravity and have what is known as an asphaltic base. The oils found in the intermediate fields have qualities varying between the two extremes in the order named.

Eastern oils are largely made up of compounds of the paraffine series, varying in consistency from comparatively thin oil to hard scale paraffine. While most of the paraffine compounds are useless as binding materials, many of the fluid paraffines are excellent solvents for certain asphalts and are in every way suitable for use as a flux.

The heavy residue from the distillation of the California oils is a substance with many of the desirable qualities of the best asphalts. The crude oil is distilled down to the required density and a product obtained with even and valuable qualities. Very large quantities of California oil asphalt have been used throughout the United States for paving and roofing purposes. It is probably true that more asphalt roofing felt has been saturated with California oil asphalt than with any other kind of asphalt. This oil asphalt when heated becomes very liquid at comparatively low temperatures, and, for this reason, is especially suitable for saturating felt.

The heavy residuals of the Gulf, Mid-Continent and Illinois petroleums are used in large quantities as substitutes for asphalts, frequently under that name. They are ordinarily less expensive than the natural asphalts. As compared with the California residuals, they contain more paraffine, are lower in ductility and adhesiveness and, except that some of the residuals of the Texas oils are very stable, are in most ways inferior for roofing. Sometimes they are used as adulterants with better materials.

To make them more stable and less affected by heat and cold, air is blown through them while hot. This reduces their ductility and adhesiveness as well as their susceptibility to temperature changes. Their use has in the past been limited by patents, but the original ones have expired and the validity of others is now before the courts. They are not as good saturants as an untreated residual, but for the protective coating of ready roofings they have considerable value, as they are stable and are not readily affected by the heat of the sun. They are not selected for stone-surfaced roofings because of their lack of adhesiveness.

The Tars.

Coal Tar.—Coal tar contains some water, various impurities and free carbon which, after the water has been removed, is ordinarily from five to 35 per cent of the total. This is carbon formed by the cracking of the hydrocarbons and is in a very finely divided condition. The percentage varies with the method of manufacture. The distillates or bitumen are composed mainly of hydrocarbons which have widely varying melting points and degrees of volatility. These may be roughly classified into light oils, creosotes and pitches. The character of the tar varies with the coal used and the manner in which the process is carried on. The tar from each plant has its individual characteristics. The greater the heat, the more the hydrocarbons are cracked into their constituents and the greater the amount of free carbon and of gas found and the less the amount of coal tar.

The question of the relation between the free carbon and coal tar is one of considerable importance. It is generally considered to be a valuable adjunct to roofing tars and pitches. Free carbon makes the material less affected by changes in temperature. Comparing two pitches of similar consistency at normal temperatures, the one having the greater amount of free carbon must have to neutralize it a greater per cent of the lighter, more elastic and to some extent more volatile hydrocarbons and less of the heavy pitches. When it is cold the pitch is less brittle and when it is hot it does not flow so readily because of the carbon present. Thus a tar of given consistency may, notwithstanding the fact that it contains large quantities of an inert material, apparently have more tar than another with less of the free carbon. To determine the probable action of any tar or pitch under different temperatures its percentage of free carbon must be known as well as its melting point. The free carbon in moderate amounts does not interfere with the saturating power in felt.

When coal tar pitch is exposed to the weather there is found upon its surface a thin layer, hard and brittle, the residue after the drying out of the volatile oils. This acts as a sort of protective coating to what is underneath. As soon as it is disturbed, exposing fresh pitch, the process is repeated. High carbon pitch seem to weather better than low carbon.

Water Gas Tar.—In the process which it undergoes the oil residues of water gas tars are so changed by the high heat as to lose many of their characteristics and to acquire some of those of the compounds found in coal tar. Compared with coal tar, its oils have less antiseptic properties.

Water gas tar contains some free carbon, but usually not over two per cent. Its pitch is not acted upon by water. There is a very general opinion among practical roofing men that the water gas tar products are less stable than the coal tar pitches, but we cannot find that there has been any accurate proof of this. Its small percentage of free carbon materially interferes with its value as a roofing pitch. It is said that carbon can be added, but we doubt the commercial practicability of such a scheme.

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Oil tar decomposes more easily than coal tar. It often contains some paraffine, though ordinarily not in sufficient quantities to affect the product as compared with coal tar. The crude water gas tar is also much more affected by water and is capable to a considerable extent of forming an emulsion with it. Good coal tar is practically unaffected by water, and it deteriorates from the surface only.

We would sum up the remarks on the bituminous materials as follows:

With skill in compounding, based on a thorough working knowledge of the materials used, asphaltic compounds can be prepared of natural asphalts and oil residuals with valuable qualities for many different roofing needs, whose durability under known conditions can be foretold with considerable accuracy. The same can be said, perhaps with more certainty as to results, of the different tars. Either can suffer from adulteration and poor preparation. Considering first-class materials the coal tar is cheaper, more easily affected by temperature changes and is not acted upon by water nor is it liable to internal changes.

In order to meet the statements concerning the difficulties in getting, at the present time uniform straight run coal tar pitch of good quality, the leading manufacturer of coal tar is making arrangements with the Underwriters' Laboratories to make factory inspection of his labeled products. Preparations for this are being made in a thorough manner and competitors, to put their products in the same class, must also arrange for the same inspection. This, together with the specifications, enlarges considerably the possibility of being sure of getting good materials for a built-up coal tar roof.

Felts.

The felts used with almost all bituminous roofings play a very essential part in the final product. The desirable qualities of the felt vary with the saturating material to be used. With asphalt saturating power is the main desideratum. For coal tar, which under heat is much more liquid, this quality is not so necessary. All must be strong enough to avoid damage in handling before saturation. The strength of the finished product is due to a great extent to the saturation.

The felts are mainly made of rag stock, which is chiefly cotton rags. Notwithstanding the statements of many manufacturers, all-wool felt is never used for roofing, because of its expense and because it would be too soft and tender to work. A certain proportion of wool rags helps to make a felt which is open and spongy with considerable saturating power. Felts for saturation by asphalt rarely contain more than 25 per cent of wool. As ordinarily used the term wool felt applies to a soft open felt with very little wool in it.

Sometimes paper stock, which is ordinarily wood pulp, though it may contain an appreciable percentage of straw, is used in small quantities if the felt is getting too soft. It has practically no saturating power, but it can add to the cheapness of the material. If used in anything over two or three per cent, it is an adulterant to cheapen the product when it is made to sell to roofing manufacturers, or to make it less absorbent, as in the case of slaters' felt or hard felt for making up into two and three ply coal tar felt.

The dry felts are sold by weight. The standard is the amount which would lay 480 sq. ft. If a felt weighs 28 lbs. to 480 sq. ft., it is known as No. 28. For this reason felts sometimes have their weight increased by the addition of a mineral filler. This is nothing more than an adulterant which interferes with the saturating power. Some specifications which require a certain weight of felt get around such adulteration by requiring that the ash in the unsaturated felt must not exceed 5 per cent.

Felts of asbestos are used in one or two roofings. These are poor saturants and are more in the nature of protection to the asphalts. They will not burn or decay. Jute woven in the form of burlap or canvas is used in some roofings to add strength. Its value is debatabio. It is not a saturant like the felts and its fibers are not so thoroughly protected, making it liable on exposure to rot. Burlap decays much more readily than the average cotton felt. The main use of tar for roofing has been in the construction of built-up roofs, where layers of felt saturated with tar are nailed down and by the use of a tar pitch protected and cemented together.

The following specification accompanied by the necessary diagrams give what is considered as good practice in the construction of a flat built-up roofing on wooden sheathing.

Specification for Felt, Pitch and Gravel or Slag Roofing Over Boards.

Incline.

This specification should not be used where roof incline exceeds three in. to one ft. For steeper inclines modified specifications are required.

Roofing.

First, lay one thickness of sheathing paper, or unsaturated felt, weighing not less than five lbs. per 100 sq. ft., lapping the sheets at least one in.

Second, lay two plies of tarred felt, weighing 14 to 16 lbs. per 100 sq. ft., lapping each sheet 17 in. over the preceding one, and nail as often as is necessary to hold in place until remaining felt is laid.

Third, coat the entire surface uniformly with straight run coal tar pitch.

Fourth, lay three plies of tarred felt, lapping each sheet 22 in. over the preceding one, mopping with pitch the full 22 in. on each sheet, so that in no place shall felt touch felt. Such nailing as is necessary shall be done so that all nails will be covered by not less than two plies of felt.

Fifth, spread over the entire surface a uniform coating of pitch, into which, while hot, imbed not less than 400 lbs. of gravel, or 300 lbs. of slag, to each 100 sq. ft. The gravel, or slag, shall be from ¼ to ⅝ in. in size, dry and free from dirt.

Flashing.

Flashings shall be constructed as shown in detailed drawings.

Labels.

All felt and pitch shall bear the manufacturer's label.

Inspection.

The roof may be inspected before the gravel or slag is applied by cutting a slit not less than three ft. long at right angles to the way the felt is laid.

N. B.—To comply with the above specifications, the material necessary for each 100 sq. ft. of roof is approximately as follows: 100 sq. ft. sheathing paper, 80 to 90 lbs. tarred felt, 120 to 160 lbs. straight run coal tar pitch, 400 lbs. gravel, or 300 lbs. slag.

In estimating felt, the average weight is practically 15 lbs. per 100 sq. ft., and about ten per cent extra is required for laps.

In estimating pitch, the weather conditions and expertness of the workmen will affect the amount necessary for the moppings, and to properly bed gravel or slag. The sheathing paper or unsaturated felt is placed on the bottom next to the roof boards, mainly to keep any pitch which might penetrate the two-ply felt above it from cementing the roofing to the sheathing. It also is of value in preventing the drying out of the roof through open joints from below.

To combat severe conditions encountered like those at locomotive engine houses, an asphalt or oil-saturated felt is sometimes used instead of the dry sheet. This does not so readily deteriorate. One roofer uses for this purpose asphalt asbestos sheets.

For a concrete roof the practice is similar except that a dry sheet is not necessary, there is no nailing and the concrete is first coated with pitch. Special care should be taken in regard to flashing and to prevent the roofing from being loosened at the edges either by wind or fire. Most leaks occur around flashings and openings.

The two layers of saturated felt first laid are necessary in order to carry and give full value to the amount of pitch which must be handled in one mopping. One of the troubles with built-up roofing as ordinarily laid is the difficulty in getting thorough moppings between the felt layers.

The felts are saturated with tar about as it comes from the gashouse, with the water and other impurities removed. Oil-tar with its liquid qualities is said to be much used for this purpose. This is more permissible than it would be if the felt were to be exposed.

The coating of gravel, crushed stone or slag helps to hold the pitch in place, protects it from wear and from the action of the elements and has considerable fire retardent value. If the material be too fine, its holding power is lessened. If it be too large, the stones are more apt to roll off and to damage the roof when it is walked upon and the pitch is not properly protected. Crushed material with its rough, sharp edges has a much better holding than rounded gravel. It can be used to help get results on a steep roof.

In the final coating of a coal tar roof the effort is to get the maximum amount of pitch coating which can be kept in place. The flatter the roof the greater the amount of pitch that can be used and the better both pitch and gravel will stay where put.

Where thorough inspection is not provided during construction the roof can be inspected by cutting a strip three feet long at right angles with the way the felt is laid before the gravel is applied. This can be readily repaired so that no damage is done to the roof.

When a built-up roof is in need of repair it can frequently be kept tight for a considerable time by patching and recoat-

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ing, as may be necessary, with pitch and gravel. When the original roof was well laid it can be repaired by scraping off the coating of gravel and laying a new two or three ply roof on top.

Tile or brick can be substituted for the gravel or slag where the roof is liable to have much wear and when the structure warrants the expense. The tile are sometimes grouted in Portland cement, but a bituminous cement is usually considered better. Properly built, this makes almost an ideal roof.

The built-up coal tar roofs have shown by many years' trial their value for protecting flat roofs. Instances where a life of from 20 to 30 years has been obtained are not at all rare, but poor results due to poor workmanship and poor materials are not new. The claim that at the present time the ordinary purchaser cannot be sure of getting coal tar of the quality of the best of that formerly produced would seem to have justification. At the same time, the oil tar may be no worse than the nuxes and residuals frequently used with competing materials. Pure coal tar and coal tar pitch are still made, and the dealers in roofing materials can, if they desire, furnish materials as good as any which have been sold in the past. Such materials, of course, are not the cheapest and where competition is severe the quality is liable to suffer. About all that can now be done to get the desired results is to be willing to pay the price and trust to the dealers.

The chances for poor workmanship are many and the most thorough inspection is very desirable. The moppings between the felts can be slighted, the flashings and work around gutters and openings neglected, the materials may be adulterated on the work and the quantities of pitch and gravel cut down. The cost of materials and the cost of laying for any job can be estimated within close limits and no contracts should be let which will require a slighting of the work to avoid a loss.

As an indication of what can be done in territory adjacent to Chicago and St. Louis, the following figures may be of interest. They show actual costs on a roundhouse roof of about 500 squares laid according to the specifications given above. The work was 75 miles from the gravel supply and 175 miles from the headquarters of the contractor, who paid all freight and fare. This work was done in 1911 close to a railroad track, so that nothing was necessary for hauling to the work. Nothing is included for overhead or fixed charges or for profit.

Cost per square:	
5 lbs. sheathing paper	$ .12
155 lbs. pitch at 60c per cwt.	.93
85 lbs. felt to square at $1.65 per cwt.	1.40
Nails and caps	.05
Cleats for flashing	.05
Gravel (about one-seventh of a yard)	.23
Labor, including hauling, board, railroad fare.	1.15
	$3.93

Costs have been revised to show 1912 prices for materials. Where, for temporary buildings or other causes, a cheaper roof than the standard specifications call for is desired, a saving in the quantities of material can be made by reducing the number of piles. From this fair results can be obtained.

Built-up Asphalt Roofing.—Built-up asphalt roofs have been used with considerable success. Asphalt is much less affected by temperature changes. For a roofing cement it must have considerable proportions of flux to make it easy of application. Coal tar felts are used with asphalt roofing cements. With asphalt, the dry sheet can ordinarily be avoided. Where first-class material is used it is ordinarily expensive and it is harder to handle. Except for steeper slopes than are suitable for coal tar, its use is not recommended unless unusual conditions make it more economical.

Asphalt coatings on a concrete deck are liable to lose their adhesion to the concrete. Asphalt used on a built-up roof is liable to have a short life and the builder of built-up roofs avoids it ordinarily. General specifications for an asphalt built-up roof cannot well be prepared because of the differences in materials, and ordinarily must come from the manufacturers of the materials.

Built-up Asbestos Roofing.—There are on the market materials for a built-up asbestos and asphalt roof. The asbestos felt is not as absorbent as are rag felts and acts more as a protection to the bituminous than as a saturant.

It is claimed that asbestos felt, acting as it does more as a protection to the layers of waterproofing material and not merely as a medium for carrying them, does not have any capillary action on the oil fluxes, and that the bitumen is so protected that it retains its elasticity and waterproofing qualities much longer than with the other types of felt. If this point is sustained, asbestos felts have a superiority for asphalt roofing over the ordinary felts which may more than overbalance the increased costs. While the experience obtained from this material is not nearly as extended as that which has been had from rag felts, these roofings have been in use for about eleven years, and we have so far found nothing to disprove this claim.

As compared with a five-ply tar and gravel roof, a four-ply asbestos roof will ordinarily cost at least from one to two dollars more a square. A three-ply roof is supposed to give good results over concrete, but for wood sheathing it would seem to be approaching too closely to the conditions met with in ready roofing, for first-class work.

This roof is ordinarily applied by the manufacturer.

Prepared or Ready Composition Roofings.

To compete with it and to meet some of the conditions where a built-up roof is not satisfactory or too expensive, innumerable prepared or ready roofings have been put on the market. These ordinarily come in rolls accompanied by the nails and cement necessary to apply them. They vary from a very light felt with the cheapest possible saturant and enough sand or soapstone coating to prevent sticking in the rolls, to a sheet so heavy that it cannot be rolled, built up of heavy felts and strengthening materials and saturated and protected by carefully prepared compounds, possibly protected also by a coating of crushed stone. The durability and fire-resisting value vary to as great a degree. Ordinarily the ready roofings are cheaper than any other types, but some brands sell at prices considerably above the cost of a good built-up roof. To a certain extent the weight is designated by the ply, but there is no uniformity of practice among the different manufacturers. A two-ply roofing may mean a heavier weight than a one-ply, or it may mean two separate felts stuck together.

The saturant should be liquid enough at workable temperatures to thoroughly impregnate the felt. The protective coating should be stable and not easily affected by the elements. The saturation of the felt is a very vital feature. This must retain its life and elasticity to keep the roofing efficient. A protective coating of material similar to the saturation is often used with the idea of helping to maintain the life of the saturating material. In any event, the coating must be elastic like the saturated felt.

With a coal-tar roofing made to be rolled, it is impossible to use nearly as much material as is found necessary for a good built-up roofing, and such a roofing, even if made in the very best manner, cannot be expected to have a life comparable with that of a first-class built-up roof. Tar is not considered the best material for a high-grade ready roofing.

Some ready roofings are adjusted by the manufacturer to suit the climate at the point of application. One concern selling all over the world keeps careful records of the temperature at its different markets and makes shipments accordingly.

The prepared roofings may be divided into two general classes—smooth and stone-surfaced. The stone-surfaced roofings are to a certain extent an adaptation of the built-up roofings. They frequently have at least two felts cemented together. The gravel or slag used must be uniform in size and finer than that available for a built-up roof. The steeper the roof the more chance they have to lose their stone coating. The amount of material that can be used in the heavier brands is limited to the amount that can be successfully rolled. If the stone is too large, the stone may damage the felt in rolling; if too small, the amount of pitch is limited.

The smooth-surfaced roofings are usually coated with some finely divided material to prevent sticking in the roll. Tar is not suitable for their protective coating. The protective coating must be stable and not easily affected by changes in temperature. Blown oils are frequently used for this purpose. The smooth-surfaced roofings, as a general proposition, have less insulating and fire-resisting value than the heavier stone-surfaced materials, and with them a regular recoating or painting is frequently necessary in order to get satisfactory results. This point and the chances of getting the necessary regular attention should be considered in making selections.

Tarred felts in which there are two or three piles of felts cemented together with pitch are sold all ready to be laid, at frequent intervals to show any value at all.

They must be covered with a tar coating upon laying and

The asbestos roofings are made to include one or more piles of asbestos felt, sometimes with a jute center. They are cemented together by asphaltic cements. In the heavier brands they are as expensive as a five-ply built-up tar and gravel roof. The asbestos felts are poor saturants. These roofings give promise of good results and are widely used. The asbestos will not burn, but the amount used is so small that its insulating value is not great, and the value of these roofings from the standpoint of fire protection is probably frequently overestimated.

Burlap or jute canvas is used in ready roofings as a strengthening material. It is not a good saturant and must

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be kept thoroughly coated, as otherwise it goes to pieces readily. It is employed in conjunction with either felts or asbestos sheets. We question its value, feeling that better results can be obtained from a proper quantity of ordinary felt.

The ready roofing is weak in that with the narrow lap and a large part of the roof covered with but one layer of material a single defect can cause a leak. The fact that on a flat roof water is liable to back up under the upper layer is a chance for trouble.

One of the chances for trouble with many of the ready roofings is their tendency to stretch and wrinkle and the difficulty in laying them absolutely tight and flat. As the roofing grows older and brittle, the wrinkles become danger spots which are liable to crack if walked on. The roofing should be as thoroughly stretched as possible in laying. Knot holes should be covered before applying the roofing. In cold weather it is well to warm the rolls to avoid any chance of cracking.

The ready roofings usually commence to show deterioration after they have been kept in stock for three or four months. In purchasing care should be taken to avoid stock material.

The ready roofings are of value for small and isolated buildings, where the cost of laying a built-up roof would be excessive, and for temporary structures where a roof of long life is not necessary. They can be laid without the special workmen usually considered necessary for built-up roofing, but careful workmanship and skill are necessary to get good results.

Most brands can be used on any slopes, but on a flat roof extra precautions are needed to avoid leaks, and on a steep roof some kinds do not do well. On steep roofs trouble from bagging is avoided by laying the strips vertically instead of horizontally. They can be obtained at almost any desired price, but ordinarily cheaper than a good built-up, coal-tar roof.

So many inferior roofings have been sold, so many have been poorly laid or used in the wrong places, so much has had to be learned by bitter experience, and there is such a chance for fraud, that the ready roofings are almost all together by many builders who want good results. But experience is being gained gradually, and they fill many needs so well that their use is bound to increase in their proper field.

Most of the ready roofings are sold under a five or ten years' guarantee, and many contracts for built-up roofs are similarly prepared. To depend upon these guarantees alone does not give satisfactory results, even though the manufacturer be financially responsible. He can expect more immediate profit by preparing a roof which he is sure will last six or seven years and selling it under a ten years' guarantee than by preparing a roof which he is sure will last for ten years.

New and untried brands are constantly being put on the market. In some of the older ones, which have gained a reputation, inferior products are substituted. Many of the best ready roofings are made of compounds whose composition is kept secret. The only way now of being fairly sure of good results is to use a brand which has been shown by long tests to meet the desired conditions and which is made by a concern with a reputation for fair dealing. The same course would seem to be desirable in the awarding of contracts for built-up roofs, though with them track can be kept of the weight of material used and the work on the roof can be inspected.

This is not a satisfactory condition, and, as indicated in the earlier part of the report, it is hoped that before many years specifications can be devised, which, coupled with the necessary tests and with efficient factory inspection, such as that the Underwriters' Laboratories is furnishing for some materials, which is explained below, will do away with the ignorance and fraud now too often met with in the bituminous roofing industry. We should then be able to buy roofing with as much certainty of quality as we can now exercise in ordering steel rail. To this end our Association, working in conjunction with other organizations, should do its part.

Tile.

The term tile roofing is ordinarily considered as referring to roofing made of hard burned clay tile made with overlapping or interlocking edges.

Originally the cost of tile was more than slate, but at the present time the price of ordinary patterns is about the same as for a good quality of slate.

Besides the interlocking tile, clay shingles are made which are laid like slate and give about the same results as slate.

With tile it is a little harder to get a tight roof than with slate. Tile should not be used on a roof having a less pitch than one-quarter, and a steeper roof is preferable. With them, as with slate, the less the chance for driving snow the flatter the allowable pitch, and for this reason in the South the use of tile can be more extensive than in the North.

Where there is a chance of driving snow, it is best to make a water-tight roof of prepared roofing, preferably a thirty-pound or heavier asphalt felt laid horizontally with well-lapped, cemented and nailed joints, as with slate. Sometimes the tile are imbedded in asphalt or coal tar pitch, but this method does not insure the best results. The waterproofing felt is better and cheaper.

It is usual to apply the tile directly over the asphalt roofing felt with heavy nails. They are sometimes fastened with copper wires from a pierced lug toward the lower end of the tile. The wire is fastened to battens nailed horizontally on top of vertically laid battens or laths and fastened on by wire. Copper wire not less than No. 12 gage should be used for this purpose. Steel wire or bands corrode quickly.

Sometimes the tile are laid directly on steel or wooden purlins, which must be placed to suit the lengths of the tile, with the omission of roofing boards and felt. This construction is objectionable when the building is to be heated, but is suitable where escape of heat through the roof is desired or not objectionable and where an absolutely waterproof roof is not necessary. When so laid, to prevent the entrance of dust or dry snow, the joints may be pointed on the under side after laying with elastic cement.

Some manufacturers of roofing tile make glass tile of the same pattern as the clay tile, so that they may be worked in with them and used in place of skylights. These glass tiles have been used on the roofs of train sheds, shops and factories.

Hips, valleys and combs of tile roof are formed of special designs for that purpose.

Roofing tiles weigh from 750 to 1,200 pounds per square.

It is a little harder to get a tight roof with tile than with slate, but there is any difference, the tile roof is liable to cost a little more. Tile better withstands great heat, contains more material and is so laid as to have more insulating value than slate. Properly made, it does not deteriorate through the action of the elements. It is a poor conductor of heat and cold. It is not so brittle as ordinary slate and is less liable to be damaged by settlement of the roof. Tile, with the possible variations in color and shades, can be better varied to meet the architectural requirements of the building. With the improvements in the manufacture of clay roofing tile, it would seem that its importance will be gradually increased.

Slate.

Slate comes with considerably varying qualities. It should be hard and tough and have a well-defined vein, which must not be too coarse. If too soft it will absorb moisture; if too brittle it cannot be cut and punched without splitting, and it will easily be damaged by walking on the roof. Crystals are sometimes found which disintegrate on exposure to the weather. Acid gases in the air and freezing of absorbed water tend to cause a disintegration of the slate.

The surface when freshly split should have a bright, metallic luster, be free from all loose flakes or dull surfaces, and be straight and true. Most slates contain ribbons or seams which traverse the slate in approximately parallel directions. Slates containing soft ribbons are inferior and should not be used in good work. Hard ribbons do not necessarily indicate inferior wearing quality. A clear, metallic ring when struck is an indication of soundness. A cracked slate gives a different sound, easily distinguishable. A soft slate gives a dull, muffled sound.

The color varies widely, but does not necessarily indicate the quality. Good, unfading black slate can be obtained. Some of the black slates fade rapidly on exposure to the atmosphere, assuming colors considerably varied. Various shades of green, red and gray may be purchased, some of which retain their original color very well. Some slates are marked with hands or patches of a different color, and the dark purple slates often have large spots of light green upon them. These spots do not, as a rule, affect the durability of the slate. Black ribbon slate may be obtained at less cost than strictly all black slate, and is suitable where slight variation in color is not objectionable.

Stock sizes of slate range from 7 in. x 9 in. to 14 in. x 24 in. They vary in thickness from ¼ to ⅝ in. Three-sixteenths inch is the usual thickness for ordinary sizes. For large plain roofs the larger sizes, such as 12x16, 12x18 or 12x20, are best adapted. They break a little easier, but make fewer joints in the roof, require fewer nails and better avoid small pieces at hips and valleys. For roofs cut into small sections, the smaller sizes, 7x14 or 8x16, look better.

Slate should not be laid on a roof having less than one-quarter pitch. Where the roof is flatter than one-quarter pitch, it is liable to leak from capillary attraction. Finely

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powdered snow driven under the slate by a high wind, later on melting and freezing, is liable to cause damage to a roof.

The best practice is to lay slate on wooden sheathing, tongued and grooved to an even thickness, and covered with a waterproof paper or felt to act as a bed and as an insulating medium. Tarred products should not be used, but a felt saturated with asphalt and weighing 30 lbs. or more is preferable.

Each course of slate should lap the slate in the second course below three inches, although this can be slightly cut down on the steeper roofs. In laying care should be taken to avoid cracking the slate by driving nails carelessly or too tightly.

The slates are fastened with two four-penny nails, one near each upper corner. The nails should have large, flat heads, so that they may get a good hold on the surface of the slate, and their length should be twice the thickness of the slate, plus the thickness of the sheathing. Three-penny nails are one and one-eighth and four-penny nails one and three-eighths inches long. Composition nails should ordinarily be used for railroad buildings.

Slate roofs rank well in regard to fire hazard, although they are not as good as tile on exposure to adjacent conflagrations.

Cement Roofings.

Reinforced concrete tile, several square feet in area, have been used to a considerable extent on shop buildings and freight houses with steel roof trusses. They are usually formed with projections, so that they can be placed directly on the purlins and held in place by their own weight, without additional fastenings. Wire clips can be successfully inserted in these tiles, thus avoiding expensive skylight construction. Their cost compares favorably with that of slate. The reports from them are good; but, unless the roof framing is stable and even, there would seem to be danger of leaks from driving rain and snow.

Small cement tile are in use to a limited extent and the criticism given concerning the reinforced tile also applies to them. They are less expensive than clay tile, but are more absorbent and brittle. Improved methods of manufacture and further tests may later develop their merits for some purposes, but no economy has so far been shown by their use.

Asbestos sheets made of Portland cement and asbestos under pressure give durable, efficient roofs. They can be made in different colors and have some desirable features. The different manufacturers use different methods and the results obtained must be used with caution, as it is claimed that the methods of manufacture have an important bearing on the results which may be expected.

For small buildings, or where the design is such as to make tile undesirable, they have especial advantages. Their cost is somewhat greater than good slate, but their uniformity is such that they can more successfully be laid French or diagonal method than can slate. A considerable saving can be made by laying them French method, but we do not consider this good practice with large sheets. The material is somewhat brittle, and with this method considerably greater amounts of breakage are to be expected, especially on the points.

The corrugated sheets should have value as a substitute for corrugated iron sheets. They must be laid with good fastenings and sufficient lap to insure against leakage. Some of these materials are strengthened by wire mesh and some with perforated steel sheets, giving a product grading toward the metal protected by asphalt and asbestos.

Shingles.

A wood shingle roof, properly laid and of good material, will last many years. The old clear white pine shingles, formerly obtainable, were superior to anything now on the market, but red cedar shingles of good quality can be obtained from the Pacific Coast. In the South red cypress from the Gulf States is preferable.

The main objection to a shingle roof is its fire hazard. When the roof is old, especially in a dry climate, shingles crack and get out of shape, providing a place for the lodgement of sparks and materially increasing the danger from fire hazard.

There should be two, and only two, nails for each shingle. If more are used the shingles will crack. They should not be laid too close together when dry, or they will tend to buckle when wet.

Metallic Roofings.

Metallic roofings may be laid in large sheets sometimes without any sheathing. These sheets are often strengthened by corrugating them. They are sometimes cut up into small sheets and laid as are shingles. Sometimes they are bent into interlocking shapes like clay tiles. The first cost of these tiles, except those of copper, is much less than that of clay tiles, and they do not require as heavy roof framing.

They are also soldered together on the roof into a single structure, of which the ordinary tin roof is typical. Copper, lead, Monel metal and tin are used this way. This type is especially valuable for flat roofs.

Iron or Steel.

Iron and steel are largely used as a basis for metallic roofings because of their strength and cheapness. Their corrosion, especially for railroad buildings, is the most important factor in connection with their use as roofing materials.

This question of the corrosion of iron and steel is a live one, but the following conclusions seem to be accepted by the best authorities:

The rate of corrosion depends much less upon the amount of impurities present than upon their distribution in the metal. Segregation, strain, or anything which causes differences in electric potential, hastens corrosion. Mill scale is a very important factor, causing pitting. The better results often obtained from wrought iron as compared with steel are due mainly to the greater homogeneity of the iron. Good wrought iron is not appreciably better than good homogeneous steel.

There are some elements like sulphur which, when present in steel, tend to hasten corrosion and some, like copper, nickel and silicon, tend to retard it. An absolutely pure iron in use on a building would not show results appreciably different from a high-grade steel, and with mill scale or internal strain might do much worse. Accelerated acid tests are not a fair index of the value of metals for roofing purposes. Part of the dissatisfaction with steel in recent years is due to the thin sections used. Cast iron is protected by a siliceous skin formed from contact with the mold at the time of casting and it is used in thick sections.

Where two sheets of different manufacture come together on a roof galvanic action and corrosion are liable.

Iron or steel may be used unprotected except by paint. This, of course, requires regular attention and unless access can be had to all the exposed metal satisfactory results cannot be had. Galvanizing, or coating with zinc, if properly done, gives excellent results.

One method employed in the preparation of steel for roofing purposes is to pickle the steel in acid baths to cleanse it from sheets of scale and dirt. Unless this process is most carefully followed by thorough cleansing, minute particles of acid remain to form within the plate itself an agent for its final destruction. This may occur either with tin plate or galvanized iron.

Asbestos-protected metal is sheet steel covered with a coating of bitumen and asbestos. It has not been long enough in general use to show just what place it should hold. Commercial tin or terne plate is iron or steel coated with an alloy of lead and tin. About 75 per cent. of lead is a common percentage.

Tin Plate.

When tin is specified, the coating should consist of not less than 30 per cent. pure tin nor more than 70 per cent. pure lead. Not less than 25 lbs. of the coating should be used per box of 112 sheets 14 in. by 20 in. A great deal of very poor coating has been put on the market by the manufacturers of tin roofing material. Good tin plate for roofing can be had, and where it is desired to use this material for roof covering, one of the reliable brands of hand-dipped plate, not less than IX or No. 28 gage, should be selected. Rolled tin plate should not be used for roofing, guttering or valleys.

Tin roofing must be painted with a good paint to preserve it. Tin roofings can be shown which have laster 20 or 30 years on railroad structures, but the danger of securing poor material and the cost of maintenance have made conservative builders very cautious in its use. It has the great advantage of being available for all slopes and it is adaptable to special and difficult conditions.

Gutters.

Gutters for many classes of railway buildings may and should be omitted. This is more particularly true of buildings with steep roofs near tracks, where cinders from passing locomotives roll down the roof into the gutters and in time, unless more care is taken to keep them clean than is usual in railway buildings, the downspouts become choked and fail to carry off the water.

Gutters may be of metal, wood, or be formed in roof of the materials used in the construction of the roof, the latter being ordinarily preferable where the design of the building permits.

Flashing.

A large part of the trouble with roofing comes from leaks due to poor flashing around the edges, at gutters, parapet walls and openings. Provision must be made for expansion

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and contraction, due to heat and cold, to loading and settlement and to shrinkage. It must be used far enough back to prevent any possible backing up of water. It is advisable to use as little metal as possible. Special care must be used in working up against parapet walls, as with two kinds of material this is difficult, special terra cotta block to insert in the parapet wall and give a point of application for the roofing material is on the market. It is valuable and would be more used were it not for the trouble in getting this special material on the ground unbroken and in getting it properly set in the wall. On a composition roofing the edges should be cut off to a straight line and project over above the gutter. For a built-up roof a metal gravel stop is desirable. Where no other metal work is used, a wood strip is used. For concrete the edge of the roof should be provided with a wooden nailing strip fastened by a bolt inserted into the concrete.

Conclusions.

The committee recommends the substitution for the last conclusion in the manual under roofing (reading as follows: "Steel or impure iron materials should be avoided, no matter how protected") of the following:

The various metallic roofings have an important place among the roofing materials. Care must be taken to have them properly used and protected.

In using iron or steel for roofing purposes every effort should be made to get a metal of best quality.

The roofings using Portland cement, either with re-enforced concrete or with asbestos, have value under the proper conditions.

FREIGHT HOUSE FLOORS.

Freight house floors should ordinarily be built to carry a uniformly distributed load of at least 250 lbs. per sq. ft. They should be of materials which will not in any way damage any articles placed upon them, which will provide a surface smooth and durable, and be so constructed that they can be easily repaired. Except for small houses, a filled-in floor, considering the cost of maintenance, is nearly always cheaper than joist construction. It is also advantageous, because it will carry the unusually heavy loads that sometimes occur.

The usual method of construction consists of filling up to the required level with sand or gravel, thoroughly flushed and compacted. To insure a dry floor a bed of cinders about 6 inches thick, thoroughly compacted, on this filling is laid. In the cinders are bedded sleepers, preferably about 4 in. x 6 in., laid flat, about two ft. six in. centers. These and the plank above them should be thoroughly treated with creosote or zinc chloride, where there is to be an additional wearing surface applied. With untreated timber renewal is sometimes necessary within four years, though under favorable conditions a life considerably greater is usually obtained. When no cinders are used on top of the sand the decay seems to be hastened.

In place of cinder filling and sleepers a layer of coal tar pitch spread upon a layer of sand over a course of concrete is being quite extensively used. This is durable and is said to give good results. Specifications for this method are obtainable from the coal tar producers. Either on the sleepers, laid in cinders, or on the pitch are laid planks about two inches thick. With the pitch sub-floor the plank should be laid with broken joints, toe nailed, and imbedded in the pitch by hammering until the proper stability is obtained. Care should be taken to see that they are brought to an exact grade. The plank need not necessarily be toe-nailed with the wooden sleepers.

To get a smooth-wearing surface on top of the plank, hard maple is generally preferable. It does not splinter and it wears evenly. It has a short life when exposed to the weather. It is growing scarce and getting expensive. Beech is often sold for maple, they being difficult to distinguish. It is somewhat darker in color and it splinters more. Birch is softer than beech or hard maple, but does not splinter so readily as beech.

Gum, especially tupelo, is recommended as a substitute for maple and it probably will, to some extent, displace it. It is darker in color and somewhat softer, but it wears evenly and it does not splinter much more than maple. Thorough seasoning is particularly essential. There is a large supply of gum in the South and its use for floors should be extensive.

Under most conditions, the best floor can be had by laying the top floor diagonally, putting the plank lengthwise and the sleepers crosswise of the house, without any bearing on the side walls. Inequalities in settlement of the floor are then less liable to make trouble, the plank can be laid with minimum expense, and the top floor gives the best results after considerable wear. This costs for the top slightly more for laying and more for repairs. Where there is a pronounced amount of trucking in one route, it is sometimes thought desirable to put the flooring parallel to this trucking, but where the amount of traffic warrants it would seem best to put a runway of steel plates.

Wood block pavements may be used in place of the board floor. They are best used on top of a concrete sub-floor, with a one-in. sand cushion between. With wood blocks care should be taken to obtain sufficient expansion joints, as many floors have failed from a lack of this precaution. One in. for 50 ft. is about the correct amount. Care should also be taken to avoid the use of creosoted blocks where flour or similar articles which are easily damaged by odors are handled. There is also a chance of such damage from tar used in the expansion joints. Zinc chloride is for this reason recommended as a preservative for wood blocks when used for freight house floors. Zinc chloride is cheaper than creosote, and in a freight house the blocks will not suffer from the leaching which takes place when they are exposed to the weather, the main objection to the use of zinc chloride for treatment of crossties and paving blocks. It is almost impossible to get this kind of floor as smooth as a maple floor, but if properly laid it tends to wear smooth. It is adapted to points where wear is especially severe, such as are due to the handling of castings and heavy machinery. Its main advantages are in the ease with which it can be repaired. The blocks are ordinarily made of pine. It would seem that gum blocks would be better. Maple blocks are also used, but are expensive.

Concrete has been used successfully where the wear is not too severe. There is chance of damage by falling freight, and its use must be restricted to places where there is little chance of castings and similar articles being handled, unless the top surface is carefully made of the best of hard aggregates. Under such conditions excellent results have been obtained.

A concrete sub-floor protected by a layer of asphalt mastic will give excellent results. It will cost more than the concrete floor, but it will not chip and scars made in its surface soon disappear. It is not so cold as the concrete floor and has been used for this purpose with success. Asphalt blocks properly made would seem to have some advantage for this purpose. They should make a smoother floor than the wood blocks and be easier repaired than the mastic floor.

Maurice Coburn, Vandalia, chairman; M. A. Long (B. & O.), vice-chairman; G. W. Andrews (B. & O.), J. B. Canty (B. & M.), O. P. Chamberlain (C. & I. W.), D. R. Collin (N. Y. C. & H. R.), C. G. Delo (C. G. W.), W. T. Dorrance (Me. Cent.), C. H. Fake (M. R. & B. T.), C. F. W. Felt (A. T. & S. F.), W. H. Finley (C. & N. W.), G. H. Gilbert (Q. & C.), A. T. Hawk (C. R. I. & P.), H. A. Lloyd (Erie), L. G. Morphy (B. & A.), C. W. Richey (P. R. R.), W. S. Thompson (P. R. R.), committee.

Discussion on Buildings.

Mr. Coburn: We would like first to consider the report on freight house floors. In going over this report and attempting to make conclusions for the Manual, it was decided that we would ask that this entire report on freight house floors be printed in the Manual.

Mr. Lindsay: I would like to call attention to the first paragraph, and to the new development that has given rise to some question in our minds as to the permissible load per square foot, and that is the use of electric trucks in freight houses, transfer stations and so forth, and the heavy loads that will result therefrom. We have a new freight house that was designed for 250 lbs. loading per square foot, and since then we have adopted the electric truck, with very heavy loads. I do not advocate increasing that at all, but I call your attention to the fact that it is coming and we must prepare for it.

Mr. Coburn: The committee will be pleased to insert in this report a paragraph stating that where there is any possibility of using this, that matter should be considered. It seems to me that should be a part of this report.

(The report on freight house floors was accepted.)

The President: The report on roofing was adopted, with the understanding that the committee will co-operate with the Committee on Publications and the proper material will be put in the Manual. The conclusions were also adopted for publication in the Manual.

WATER SERVICE.

The Board of Directors assigned the following subjects to the committee:

(1) Report on the design and relative economy of track pans from an operating standpoint.

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(2) Report on the design of water stations using deep well pumps as source of supply.

(3) Report on recent developments in pumping machinery.

THE DESIGN AND RELATIVE ECONOMY OF TRACK PANS FROM AN OPERATING STANDPOINT.

The committee asks for further time in which to make a final report on this subject.

DESIGN OF WATER STATIONS USING DEEP WELL PUMPS AS SOURCE OF SUPPLY.

The committee felt that a study of deep well pumps would cover the vital subject in the design of deep well pumping stations and submits a report which outlines the various types of deep well pumps and the conditions favorable to their use. The committee believes that most of the members are familiar with the ordinary single-stroke steam deep well pumps, but are not acquainted with other types and with conditions essential to satisfactory operation. It was desired to submit data on efficiency, but this was found lacking. It may be possible that tests and further report can be made later. The report will serve, however, to inform the Association in a general way and probably to insure against improper installations, and it is hereinafter submitted as information.

REPORT ON RECENT DEVELOPMENTS IN PUMPING MACHINERY.

Report progress. The subjects under consideration are: internal combustion engines, centrifugal pumps and turbines

ROBERT FERRIDAY,
Chairman Committee on Water Service.

and the use of electric power for water stations. The latter subject is thought timely in view of the availability of that power which is rapidly spreading through the construction of interurban roads paralleling steam roads.

WATER TREATMENT.

Report progress. A study is being made of water softeners from an operating standpoint.

Deep Well Pumps.

In this report a deep well is assumed to be a well usually of small diameter, in which the water does not stand within economical suction limits of the ordinary surface pump, or one in which the drop or draft with the desired yield brings the surface of the well water beyond an economical reach. This condition makes necessary the separation of the water end and the power end of the ordinary pump, the former being depressed into the well either to a point of submergence or within easy suction reach of the water during all its stages and the latter being placed on the surface of the ground within easy access of the boiler or other source of power. This arrangement has given rise to various devices known as "Deep well pumps."

Deep well pumps are of many varieties, but without attempting to include the many special devices for lifting deep ground water, those generally used with success in railway practice can be classified under the following heads: reciprocating, displacement or plunger pumps; centrifugal pumps, propeller pumps, air lifts and air displacement pumps.

Reciprocating, Displacement or Plunger Pumps.

The old-fashioned domestic, or yard pump, is of the first class. In this type the working barrel or cylinder is depressed in the well, either to a point of submergence, or within easy suction reach of the water, and the piston is connected with a power head located on the surface of the ground by means of a set of jointed rods of convenient length. The source of power may be either steam applied directly to the upper end of the rod as in a direct acting steam head, or a geared or belted power working head may be used.

This type of pump may have either a single-acting working barrel, in which water is discharged on the upstroke only of the piston; or double-acting, in which there are two pistons, one above the other in the same cylinder, operated by separate rods, working in opposite directions. One of the rods is a pipe and the other an inside solid rod. The inside rod is connected to the lower piston and the hollow rod to the upper. There is also on the market a double-acting type of displacement plunger pump having a single rod and a system of valves in the barrel so designed that water is discharged on both the upstroke and the downstroke of the plunger.

Of the double-acting pumps operated by double rods there are two types. In the first, the two plungers come to rest at the same time, one at the upper and the other at the lower end of the stroke, which results in an intermittent flow. The other type, called "constant flow" or "non-pulsating" pumps, are operated on the same principle as the quick-return mechanism used on shop machinery. About 53 per cent of the revolution of each plunger is spent in the upstroke and about 47 per cent on the downstroke. The plungers therefore come up more slowly than they go down, with the result that the first plunger has completed its downstroke and has picked up the load before the other plunger has come to rest at the end of the upstroke. In other words, one plunger is always lifting, and the column of water which does not come to rest as in the ordinary type of plunger has a constant and practically uniform flow.

Centrifugal Pumps.

There has recently come into use a vertical shaft, high speed, centrifugal pump of a diameter small enough to be lowered into a well of small bore to a point of submergence or within suction reach of the water in the well. The pump can be operated by a direct connected electric motor, steam turbine or with a belt drive having a quarter twist. The last arrangement will be found less desirable than the other two, as it is rather cumbersome for a permanent railway installation. Either single stage centrifugals, or multiple stage, where the lift makes it necessary, are suitable for the purpose. They are usually made for pumping water from wells whose diameter to the water level is twelve inches or larger, and a flexible connection between the motor and vertical shaft is generally used.

Propeller Pumps.

In this device, which is a modification of the old screw-pump, the power head is attached directly to the well casing and carries a vertical shaft that extends to a point of submergence in the well, both before and during the pumping. Propellers are placed on the shaft at regular intervals of about five feet. One propeller at least must be always submerged. Each propeller is usually provided with a stationary surrounding shield that protects the well casing against injury from the rapidly revolving propeller and also serves to center the shafting. The shields are usually riveted to several flat vertical spacing bars which form a casing to enclose the shaft and propellers.

Either a direct-connected vertical motor with a flexible coupling is attached to the power head or a yoke is provided to receive a pulley attached directly to the shafting. In the latter case, the pump is operated by a quarter-twist belt from a steam engine or other source of power.

This pump was first designed to discharge the water at the surface of the ground only, but there has recently been developed a combined turbine and propeller pump that will discharge against pressure, or, in other words, lift water above the level of the power head. The turbine is placed in alignment with the power head and propeller sections and the whole forms a concentric unit that will discharge water to the desired height above the pump head.

Air Lifts.

Opinions as to the true theory of the air lift differ widely, but it is generally accepted that its principle is that of a column of interminglied air and water in a vertical discharge pipe being lighter than the outside column of ground water, giving rise to a lack of equilibrium in the well, and resulting in the mixed air and water rising in the discharge pipe

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and overflowing at the top. The air lift consists essentially of a discharge pipe, of which the well casing may or may not form a part, and an air pipe which leads the compressed air into the bottom of the discharge pipe. Many forms of nozzles for the end of the air pipe are in use, but experience has shown that an open air pipe pointing downward is fully as efficient as any other form. The air pipe may be inside or outside the discharge pipe and the pressure of the air need only be slightly in excess of the pressure resulting from the static head of the water at the point of air admission. The distance from the water surface in the well to the point in the discharge pipe at which the air is admitted is called the submergence. Experience has shown that for unexplained reasons best results are obtained when the submergence, while pumping, is about 60 per cent. of the total distance between the point of air admission and the point of water discharge at the top. With greater or less submergence the efficiency of the air lift has been shown experimentally to rapidly decrease.

The diameter of the air and discharge pipes must be properly related to the quantity of water to be delivered in order to avoid undue resistance and loss of efficiency. A discharge pipe with a sectional area large that the velocity of the water exclusive of the entrained air falls below four feet seems to permit the air to escape through the water with great loss of efficiency, while a discharge pipe of so limited area that velocities over six feet are attained also suffers decreased efficiency, probably due, at least in part, to friction resistances. Experiments conducted in San Francisco in 1890 indicate that the highest efficiency is obtained when the velocity in the discharge pipe is about 4 to 6 ft. for the net volume of water discharged, not including the mass of intermingled air.

In Turneaure & Russell's "Public Water Supplies," the formula given as "commonly used for determining the relation of the various factors in an air lift problem" is—

$$q = \frac{125\ A}{h}$$

in which q = gallons of water per minute.
A = cu. feet of free air per minute.
h = height of lift in feet from water surface to point of discharge.

Air Displacement Pumps.

In this device for raising ground water, the air acts as a piston upon the upper surface of the water in a discharge chamber, depressing it to a given level and discharging it through an eduction pipe to the desired point. In wells of small bore the discharge chamber consists of a vertical pipe or barrel to which is connected the air pipe at the upper end and the discharge pipe at the lower end. The discharge chamber fills either by gravity or by suction. The air is admitted by a reversing valve that is actuated either by trip valves located in the discharge chamber, which in turn are operated by floats when the water has reached a predetermined level; or by the increase and decrease of pressure in the air line due to the rise and depression of the water surface in the discharge chamber.

In some types the air is exhausted into the atmosphere, while in others it is led back to the suction of the compressor under gradually diminishing pressure. The water flows into the discharge chamber by gravity as the air is displaced, and if the compressor forms a partial vacuum the discharge chamber will be filled by suction to a level above that of the water in the well.

In wells of large bore, two discharge chambers are sometimes placed side by side, from which the discharge takes place alternately with a practically constant flow. The same result is accomplished by connecting two or more wells with the same delivery pipe and the same reversing valve which admits air into the several discharge chambers alternately.

Conditions Governing Selection of Type and Efficiency.

It is beyond question that all the devices for raising deep ground water described have their particular field of usefulness. The intermittent flow plunger pumps undoubtedly have a low efficiency. In both the single and double acting types the column of water in the vertical discharge pipe comes to rest at the end of each stroke. The shock of overcoming the inertia of the column of water at the beginning of every stroke is necessarily violent and leads to great loss of power. The speed is limited to about 100 ft. of piston travel per minute to prevent undue injury to the mechanism, and this limits the yield of the well to the actual displacement capacity of the pump at this speed. In the "constant flow" or "non-pulsating" type, much higher speeds are practicable and the loss of efficiency due to the violent shock of stopping and starting the column of water is largely overcome.

Where the desired output is small and the lift is relatively low, the reciprocating pump undoubtedly has a wide field of usefulness. The first cost of installation is relatively small and the interest and depreciation charges are therefore correspondingly low. At water stations having a small output the fuel consumption, which is the factor most influenced by low efficiency, is a small part of the total cost of operation; the greater part of the operating cost usually represents the attendance and the interest and depreciation charges. However, this pump is simple and reliable and is giving good results where the yield per well or the desired quantity is small. The output can be increased approximately 100 per cent. by the use of the double-acting type as compared with the single-acting, with some increase in first cost. High efficiencies are shown by the "non-pulsating" type and an increased yield is obtained on account of the higher practicable speeds. A test made by the Engineering Experiment Station at the University of Illinois with a motor-driven pump of the "non-pulsating" type showed an overall efficiency for motor and pump of 47.7 to 49.2 per cent. Subsequent experiments indicated that the efficiency of the motor was about 70 per cent. and the pump efficiency was therefore also about 70 per cent., which is unusually high.

The reciprocating plunger pump does not lend itself well for operating scattered wells unless electric power is available. The maintenance of separate steam plants is impracticable, and where the character of the water-bearing formation requires a wide spacing of wells for good results, the loss in steam transmission is necessarily large. Such wells, however, may be located in a straight line and be operated from a single shaft, or may be located at random and operated by the electric service familiar in oil-producing territory, a description of such plant for a water station being given in the 1911 proceedings.

Where the yield per well is large and large quantities are desired at a constant rate, pumps of the centrifugal and propeller types offer particular advantages. Units of this type are simple and compact, and their output is perhaps larger than that of any other device for raising deep ground water except the air lift. Relatively high efficiencies result where the type and design selected are made to fit the quantity of discharge, lift and other conditions of service. Where electricity is available scattered pumps of this type can be operated by individual motors at a minimum expense for supervision. This pump also possesses the particular advantage of successfully handling waters that contain considerable sand, which in the reciprocating pump will soon destroy the wearing parts of the working barrel, but its use in wells that are not straight is not successful on account of the necessary bending and distortion of the shaft with every revolution. The maximum practical length of vertical shaft does not usually exceed 200 feet.

Air Lift and Air Displacement Pumps.

The air lift is not an efficient device, but it is capable of raising a larger amount of water from a small hole than any other deep well pumping method. The comparatively poor method of power application and many energy transformations can only result in limited efficiencies. However, it lends itself very well to serve scattered wells from one central power station, provided the spacing of wells is not so large as to result in excessive cost for piping the air supply. Its principal objections are the low efficiency and the disadvantage of providing the necessary submergence for best results, which under certain conditions is impracticable. The efficiency falls off so rapidly with a submergence decreasing below 60 per cent. that any wide departure from this submergence renders the loss of energy practically prohibitive. In the air displacement pump a fixed submergence for good results is not required, as it is only necessary to have the discharge chamber sufficiently submerged to insure its filling by gravity or by suction.

The air lift offers particular advantages in handling wells that contain considerable sand, as there are no valves to be affected, also in operating wells that are so crooked that the ordinary pump rod or vertical shaft cannot be used and in holes of too small bore for other methods, but since the wells are located in the immediate vicinity of the tank, a second pump is necessary to elevate the water into the tank, as the air lift will not convey water horizontally, which, however, is true only of the air lift and not the air displacement pump.

Robert Ferriday (C. C. C. & St. L.), chairman; J. L. Campbell (E. P. & S. W.), vice-chairman; H. M. Church (B. & O.), C. C. Cook (B. & O.), G. M. Davidson (C. & N. W.), A. P. Dorley (M. P.), E. G. Lane (B. & O.), Curtiss Milliard (C. G. W.), A. Mordecai (Cons. Engr.), W. A. Parker (S. J. & G. I.), Chas. E. Thomas (I. C.), committee.

The report was received without discussion and the committee relieved.

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GRADING OF LUMBER.

One of the aims of the committee was to secure the actual adoption of the rules drawn up jointly by this committee and the various lumber manufacturers' organizations. The committee can report this year that the standard rules for maintenance of way lumber adopted last year by this association, when submitted back to the lumber organizations interested, were agreed to, with slight modifications, as follows:

For southern yellow pine, by the Yellow Pine Manufacturers' Association.

For hardwoods, by the Hardwood Manufacturers' Association of the United States.

For Douglas fir, by the West Coast Lumber Manufacturers' Association.

The Northern Pine Manufacturers' Association refused to accept the white pine rules. The acceptance of the rules adopted last year by the three associations referred to was made subject to slight modifications in the rules made since the time when these rules were first proposed. These modifications are so slight, however, that the committee believes that they can be readily adjusted in individual cases.

The committee has been engaged in making further studies of rules for classes of lumber not included in the rules already adopted. These considerations are well under way, and it is expected two or three additional sets of rules will be ready for submission next year.

Consideration has also been given to the grading rules for cypress submitted for information last year.

The committee recommends that the lumber grading rules for cypress, as published in Appendix E, Bulletin No. 144

Dr. H. Von Schrenk, Chairman; B. A. Wood, Vice-Chairman; W. McC. Bond, D. Fairchild, R. Koehler, A. J. Neafie, W. H. Norris, J. J. Taylor, F. B. Walker, Committee.

The rules submitted last year on cypress were adopted, to be included in the Manual.

DR. H. VON SCHRENK,
Chairman Committee on Grading of Lumber.

ROADWAY.

The committee on roadway has had under consideration during the past year the four subjects assigned by the Board of Direction.

PRESENT FORMULAS OF GENERAL APPLICATION FOR DETERMINING WATERWAY AREAS UNDER VARYING CONDITIONS, INCLUDING CONSIDERATION OF HYDRAULIC FEATURES.

Considerable space has been given to the subject of waterway areas in the Association bulletins and proceedings in recent years, and somewhat favorable action has been taken tending to support the general practice of using formulas as an aid to the judgment in such work. Successive reassignments of this subject for committee work has been made by the board during the past two years and some further progress has been made. It does not appear, however, that data can be had at this time which would justify a further attempt to derive a simple formula having general application.

On the subject of the hydraulic features of culverts considerable information has been collected, but owing to incompleteness of certain features, it is deemed advisable to defer the presentation till a later date in one of the Association bulletins.

REPORT ON AND RECOMMEND UNIT PRESSURES ALLOWABLE ON ROADBEDS OF DIFFERENT MATERIALS, CONFERRING WITH COMMITTEE ON BALLAST.

The chairman of the committee on ballast advises that "the determination of the proper unit pressure with any degree of accuracy and without guesswork necessitates certain tests or experiments, and so far the ballast committee has not been able to find any information on this subject which has not already been given to the Association"; and the committee on roadway has failed to discover anything new on the bearing power of soils or on the magnitude of the unit pressures to be carried by the roadbed.

Under these circumstances the committee can do no more than again direct attention to the following resolution heretofore submitted:

"Resolved, That the Board of Direction be requested to set aside an appropriation and to appoint a special committee, consisting of members of the roadway, ballast and track committees, to make experiments to determine the magnitude and distribution of the load transmitted to the roadbed through ballast of various kinds and also to determine by test the bearing power of various materials under varying conditions ordinarily found in the construction of the roadway."

As the experiments should extend over a considerable period of time to cover seasonal variations and should be conducted under actual traffic conditions, the expense would be quite heavy and probably should be borne jointly by several of the larger railroad systems. The present high percentage of rail failures, together with the undoubted advent of the 100-ton car and the constant increase of locomotive axle loads, make it imperative that some systematic study of the roadbed be made as a foundation for the track.

W. M. DAWLEY,
Chairman Committee on Roadway.

REPORT ON TUNNEL CONSTRUCTION AND VENTILATION. THE VENTILATION OF SUBWAY TUNNELS.

The ways in which subways have been ventilated may conveniently be considered under four separate heads:

(1) By introducing or exhausting air at various points by means of fans.

(2) By forcing a current of air from one end to the other of the whole line by fans.

(3) By so-called natural ventilation.

(4) By the piston action of trains.

Fans are almost invariably employed to exhaust air, not to supply it. They may exhaust through side chambers directly to the outside air, as in older portions of the Boston subway, or by means of air ducts communicating at various points, as in the Severn and Mersey tunnels. In the former case a number of comparatively small ventilating fans are employed at the points where the air is to be extracted; in the latter

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large central pumping plants are used. In any case, fresh air is expected to enter at stations or other appropriate points as rapidly as the foul air is exhausted.

In the plenum principle the fresh air is forced in by the fans and the foul air escapes as best it can. This method is more often used to supply air during construction of deep subways than in subways after they are built. Many arguments have been brought forward to show the advantages of renewing the air at stations rather than elsewhere. It has been urged, for example, that the air should be exhausted between stations and allowed to flow in at the stations, since more passengers are congregated at stations than at other points, and in this way they will get the freshest air; the air in the cars is renewed at stations and not between them, so the air should be at its best there, and this method would most rapidly remove smoke and heat in case of fire and give the best opportunity for escape through the stations.

The earliest use of a fan for assisting the ventilation of a railway tunnel is believed to have been in 1870 in connection with the Lime street tunnel of the London & Northwestern Railway at Liverpool. Following the generous proportions of fans which had been employed in ventilating mines, this fan was 29¼ ft. in diameter and discharged its air into a conical brick chimney 54 ft. in diameter at the base. The quantity of air thrown was 431,000 cu. ft. per minute. The air was taken from a point midway between the two ends of the tunnel. The tunnel was 6,075 ft. in length.

The Boston subway is about 4 1/3 miles long and is operated by electricity. It is used by trains and single trolley cars, most of whose routes lie in the open air. The speed is so slow that the ventilating currents set up by the moving cars are often scarcely noticeable. The typical section is 332 sq. ft. where the subway is covered by two tracks and 707 sq. ft. where it is four tracks wide. In the section of the road first built ventilating fans are placed in chambers alongside the subway at points between stations and the air is discharged upwards through grated openings in the sidewalk overhead or through short shafts to the other air. The fans are 7 to 8 ft. in diameter. They were intended to be of such capacity as to enable them to completely renew the air every ten minutes. In the section under the harbor the same general plan is followed of taking air in at the stations and removing it between stations. In this case, however, an exhaust duct has been placed along the top of the tunnel with occasional openings which can be opened or closed at pleasure. The cross-section of the duct is about 48 sq. ft.; the openings are about 4 ft. long and 1 ft. 5 in. wide and they are placed at intervals of about 550 ft. The air is withdrawn at each end of the tunnel and exhausted by means of fans through shafts about one mile apart, on the opposite shores. At the East Boston end the air is exhausted through grated openings in the sidewalk 40 ft. long and 7 ft. 1 in. wide. At the other end the air is discharged about 21 ft. above the surface of the street. The fans consist of two 8-ft. vertical fans at the East Boston end and two 7-ft. horizontal fans at the Atlantic avenue shaft. At 175 to 218 revolutions per minute and about 12 h. p. each, the total rated capacity of the whole ventilating plant is 90,000 cu. ft. per minute. This gives a theoretical velocity for the whole air in the tunnel of about 2½ ft. per second and is equivalent to a renewal of the air every fifteen minutes.

The Severn tunnel of the Great Western Railway was opened in 1886. It is about 4⅝ miles long. It is covered by two tracks for steam railway travel. There is a ventilating shaft located near the center, through which air is exhausted by means of a fan 40 ft. in diameter. It is said that the capacity of the fan is sufficient to renew the air of the tunnel about every ten minutes.

The Mersey tunnel, connecting the cities of Liverpool and Birkenhead, is about 2 miles long and is occupied by a double line of electric railway. Air is exhausted through numerous passages communicating with ventilating galleries which lead to exhaust fans. These fans are from 12 to 40 ft. in diameter and are located at stations above ground. The combined capacity of these fans is estimated to be about 950,000 cu. ft. per minute, or sufficient to renew the air of the tunnel every nine minutes. This tunnel is often referred to as affording an example of the most perfect system of artificial ventilation yet devised. It was certainly the earliest tunnel in which a comprehensive system was adopted.

The general plan of ventilating the new tubes of the Electric Underground Railways Company of London is to take advantage of the piston action of the trains, as do all the London subways, and to supplement this by fans at the stations. The fans exhaust air from beneath the station platforms and carry it through airways averaging 12 to 16 ft. in cross-section to the roofs of the buildings used for subway stations, there to be discharged into the free atmosphere. The fresh air enters through these stations, stairways and lifts. The fans are of a designed capacity sufficient to remove 1,000,000 cu. ft. of air per hour when working at moderate speed. This is sufficient to renew all the air in the average length of subway between two stations in each of the parallel tunnels every 20 minutes. The fans are located at the tops of the buildings. They have been found, upon test, to deliver 18,250 cu. ft. per minute when operated at a velocity of 242 revolutions per minute. Great care was used to avoid vibration and noise from the motors and fans.

A system of forcing air through an electric subway has been installed in connection with the Central London Underground, a good example of the deep London tubes. The ventilating arrangement of the Central London Railway is capable of renewing all the air contained in this subway three times over every night. In order to accomplish this result double doors are arranged at the station entrances and shut at night. The air flows in at the city end of the Bank of England, passes through the two tubes, each over six miles long, and is exhausted by a fan at Shepherd's Bush.

The fan is 20 ft. in diameter and of the Guibal type. It is said to be capable of exhausting 100,000 cu. ft. of air a minute as measured at a point near the fan end of the line. During the day it is not possible to run this fan with much effect, because, with opening the station doors by passengers, it draws air from the stations, chiefly from the nearest one. But at night after the last train has run out of the subway on the surface at the west end all the doors are closed and the fan is started. It is kept going until the first train is run in the morning. The results are said to be excellent.

Although many subways are now provided with some system of ventilation requiring the use of fans, by far the greatest number still depend for a circulation of air upon currents set up without special mechanical aid. Among the more common ways of securing the so-called natural ventilation, the use of blowholes, or free openings to the outside air, deserves special notice. It is to ventilation accomplished in this way that the frequent renewal of air in the New York subway is due. The draught of air passing through the blowholes is sometimes violent. An average velocity of 16½ miles per hour through the stairways of the New York subway was observed as a result of several hours' observation with anemometers. Had this current taken place through one-half of the openings between Ninety-sixth street and the Brooklyn Bridge, the quantity of air so supplied would have been capable of renewing the entire atmosphere of the subway every few minutes. At first sight it would appear that nothing could be easier than to ventilate a subway by this means. It seems as simple as opening the window of a living room. Yet to get the best effects from blowholes, ventilation means much more than the opening of holes. To provide for a suitable and reliable movement of air requires careful study. Apparently the very simplicity of the idea of blowhole ventilation has prevented the development of this principle in the best manner. To some subways and tunnels it is particularly suited. The term blowhole is here used to include all openings through which the confined air can escape and fresh air enter, whether they be stairways, openings in the roof or openings through side chambers. In shallow subways such openings usually pierce the roof of the train station platforms with more or less directness to the outside air. They are usually much too small, too indirect and too long to accomplish all the benefit which may be obtained from them.

Inasmuch as the flow of the air is impeded by friction against the walls, blowholes should be as short as practicable. Since the friction increases as the square of the velocity of the current and inversely as the diameter of the passage, they should be large in section and but little obstructed by screen, doorways, nettings and other incumbrances. It is easy to see that blowholes may be more advantageously employed in subways built near the surface of the ground than in railways far beneath the surface. And yet this is the only way in which some of the deep London tubes are ventilated. If, as sometimes happens, the blowholes are open stairways covered by cowl-like kiosks, the direction of the openings with respect to prevailing breezes may materially aid or interfere with the amount of air which passes in or out. Let us briefly examine this effect.

The action of moving trains is more important than any other factor in establishing a circulation of air through blowholes. This so-called piston or plunger action has long been recognized as useful, but it has remained for the New York subway to demonstrate how extremely beneficial it may be. The main principle of the phenomenon of piston action is easily understood. The moving trains force air ahead of them and cause air to rush in after they are passed. The

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quantity of air moved depends upon many circumstances. Chief of these are the extent to which the tunnel section is filled by the section of the train; the speed of the train; the opportunity afforded by blowholes for the air to flow in and out; and the shape of the forward end of the train.

In studies made on the Berlin-Zossen railway into the resistance offered by the free outside atmosphere to the movement of trains, it was found that air piled up in front of the first car in the form of a cone of increased pressure and that a cone of reduced pressure followed behind the train. For example, the pressure in front of a car which presented a face perpendicular to the line of the track was 4.09 lbs. per sq. ft. at a speed of 12.4 miles per hour; 8.14 lbs. at 18.6 miles; 8.19 lbs. at 24.8 miles. This pressure was maintained for between 10 and 16 ft. in front of the moving train; beyond this it gradually fell off.

Observations made in the New York subway before any material changes were made in the arrangements for ventilation, with the ordinary train service of early afternoon, have shown that air passed from one station to another sometimes at a rate of over 8 miles per hour and at an average of about 2 miles. The approach of a train toward a station on the four-track road could be felt by the flow of air ahead of it while the train was over 1,000 ft. away.

The exhaling and inhaling action due to the operation of trains is of peculiar value where it occurs when trains are most needed, provided, of course, that the openings to the outside air are properly placed and unencumbered. The greater the number of passengers carried and the greater the number of trains, the greater is the amount of ventilation. And not the least conspicuous of the advantages of so-called natural ventilation is its economy.

No expense is necessary for the operation of mechanical devices in natural ventilation. Experience with the New York subway shows that it is not always necessary or desirable for a train to fit very closely into the tunnel section. In fact it is conceivable that when this fit is close, the cars carry along more of their own air than desirable and the passengers within them enjoy much less interchange than would take place otherwise.

The details of construction and equipment of the New York subway have been made the subject of so many extended and authoritative accounts that it is unnecessary to deal exhaustively with these questions here. The subway structure may briefly be described as virtually a steel cage enclosed and embedded in concrete. The walls and roof were alike in design, consisting of beams weighing from 42 to 70 lbs. per foot, placed about 5 ft. apart. Between these beams square, steel rods 1¼ in. long were placed to the extent of from 4 to 7 per 5-ft. panel. Round rods ⅝ in. diameter connected the columns about 2 ft. below the under face of the roof. The rods were set back from the inner face of the tunnel 2 in., but the beams projected to the surface.

Between the beams of the roof and sides comparatively thin walls of concrete imbedded the steel cage. This concrete has a thickness at the walls of from 14 to 16 in., exclusive of a thin protective wall of waterproofing outside, and of a space of variable thickness occupied by hollow ducts intended to contain electric cables. The roof has a thickness which varies from 18½ to 21½ in. In the four-track section of the subway rows of steel columns extend between each two lines of track at intervals of 5 ft. to support the roof. The floor is of concrete with an enclosed layer of waterproofing.

Nearly all of the studies recorded here, except those of temperature and humidity, refer especially to the representative section between Ninety-sixth street and Brooklyn Bridge. In many cases they have a much wider application. The length of this section was about 6 miles. The cubic air space included was in round figures 26,100,000 cu. ft., including the stations. The section was four tracks wide, excepting a piece of tunnel which ran between Forty-second and Fifty-fourth streets. Here there were two tunnels of two tracks each, running side by side, cut through the rock. The subway was ventilated through the stairways at the stations and through blowholes in the roof. All of the blowholes which were originally built were located in that portion of the road which lay above Sixtieth street. They were rectangular in shape, and opened upon small grass plots which occupied the center of a wide boulevard known as Upper Broadway. Iron railings surrounded the openings. To prevent the entrance of large objects the openings were covered with coarse wire netting.

The blowholes were located above the center of the railway, one being situated a little beyond each end of each station. An additional blowhole was placed midway between stations. The total number of blowholes between Fifty-ninth and Ninety-sixth streets was 18. Each was about 7x14½ ft. in the clear. Wire nettings, beams and other objects took up about one-quarter or more of their space so that the total effective area from these blowholes was about 1,368 sq. ft. Sections of the vault lights were early removed from the stations at Seventy-second and Ninety-sixth streets and left unobstructed by nettings. The area removed at Seventy-second street was about 108 sq. ft. and at Ninety-sixth street about 478 sq. ft. This greatly relieved the unsatisfactory condition of the air at Seventy-second street, where the subentrances had been covered by a building, and at Ninety-sixth street where the roof was very low and the extent of the vault lights extraordinarily great.

The stairways between the streets and the stations varied somewhat as to width and direction. Below Fifty-ninth street they were usually placed at right angles to the line of the road; above Fifty-ninth street they were parallel to the road. There were usually two stairways, each in cross-section about 5½x7½ ft., to each local station above Fifty-ninth street and eight narrower ones to the other local stations.

The subway was about 59 ft. wide and 18 ft. high on the four-track section between Brooklyn Bridge and Ninety-sixth street and the cross-section of air occupied about 74 per cent. of this section. The trains were from about 150 ft. to 408 ft. long. The local trains usually consisted of five cars and ran at a rate, exclusive of stops, of about 21 miles per hour. The express trains generally consisted of eight cars and ran at a rate, exclusive of stops, of about 26 miles per hour.

As a train moved through the subway air was forced ahead of it and air followed it. As a rule, a general current flowed along the track on each side of the subway in the direction of the train movement, and these currents continued even when no train was within hearing distance. The important action of a train was to force air along with it, but where stairways or blowholes occurred and offered lines of diminished resistance, the air rushed out through them as a train approached and rushed in as the train went by. The difference in barometric pressure necessary to set up these air currents was exceedingly slight; the effects of friction against the walls and pillars of the subway and the sides of the stairways considerable. A great part of the force with which the air currents were set in motion was generally used up in eddies about the trains.

The movement of the air depended upon the speed of the nearest train, the movement of other trains in the vicinity, the size and location of the neighboring openings to the outside air, the size of the particular cross-section of the subway with reference to the sections of the moving trains, the force and direction of the wind in the streets with reference to the position of the stairways, the difference in temperature inside and outside of the subway and other conditions.

From approximate computations made in a number of ways, it is practically certain that the air was renewed at least as often as once every half hour.

With the object of reducing the heat which had made the air uncomfortably warm during the summer months extensive alterations were made in ventilating arrangements of the New York subway after the above observations were made. The plan embodied several features.

Large sections of the roof were removed at the stations and the openings were covered with gratings. The aggregate area of the opening when allowance was made for the gratings was 2,356 sq. ft. in the section from the Brooklyn Bridge to Columbus Circle, and 1,805 sq. ft. in the section between the latter point and Ninety-sixth street. It was calculated that these openings, together with the openings at the station stairways, etc., would give a ratio of 1 sq. ft. of blowholes for every 3,200 cu. ft. of contents at each station. Blowholes, opening generally from specially constructed chambers, were also provided between stations. These blowholes were fitted with air valves and fans, the object of the arrangement being to induce fresh air to enter at the stations, and pass out through the blowholes between stations.

The air valves, called louvres, were made of galvanized iron and were so fitted into sheet iron boxes that when shut they entirely closed the area of the blowholes in which they were placed. The valves swung automatically upon axles, being so counterweighted as to open and let air out when it was forced ahead by the trains and then close and prevent fresh air from getting in after the trains had passed. The ventilation with the valves was like the natural ventilation which would have taken place without them, in one respect; they were entirely dependent upon the movements of the trains, producing an amount of ventilation which was proportioned to the number of trains passing in a given period.

The fans have been placed at the ventilating openings between stations to accelerate ventilation under special circum-

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stances, such, for example, as at night when few trains are running and in order to free the subway of smoke in case of fire. The fans are of the centrifugal type popularly known as blowers. They are from 5 to 7 ft. in diameter. They are operated by electric motors of 15 to 30 horse-power capacity and when run at their normal speed of 235 to 320 revolutions per minute are said to be capable of discharging about 990,000 cu. ft. of air per minute. On the basis that the fans are really capable of operating as effectively as assumed, they should be able to renew the air between Columbus Circle and Brooklyn Bridge in 19 minutes.

A plant for cooling the air at the Brooklyn Bridge station was constructed in 1906. The project required that the heated air of this station should be passed by means of a centrifugal fan over coils of cold water and distributed through ducts opening immediately over the heads of the passengers at the station.

The quantity of air cooled is about 75,000 cu. ft. per minute for each of the two units into which the plant is divided. When first put in operation, it was found that there was a transfer of heat between 9.4 and 11.3 B. T. U. per square foot per degree of difference between the air and the water and that the air which came in contact with the pipes could be cooled about 8 deg. under the conditions of practical operation.

VENTILATION OF THE HUDSON RIVER TUNNELS.

The tunnel system of the Hudson & Manhattan railroad company has been in operation about five years between Hoboken, N. J., and Sixth avenue, New York, and the downtown section between Hoboken and Church street, New York, about four years. Those sections now in operation extend from the Terminal building, at the lower end of New York, under the Hudson River to Jersey City, thence underground to the Erie and Lackawanna railroad stations, whence they pass under the river again back to Manhattan at a point about 1¼ miles above the downtown tubes. Continuing below ground, the tunnels extend to Sixth avenue and thence to Thirty-third street. In Jersey City the line to Newark comes to the surface about 1½ miles west of the Pennsylvania Railroad Station. Extensions now under way will carry the tunnels further up Sixth avenue and eventually to the Grand Central Station at Forty-second street and Fourth avenue.

The total length of the tunnels when completed will be 19 miles.

The Hudson tunnels were designed by Charles M. Jacobs, the chief engineer of the Hudson Companies. They are single track tubes, there being no connection between adjacent tubes except at junctions and at some stations. This plan has been adopted throughout, and it is of great importance in the ventilation, as only by this means can full advantages be taken of the piston action of the trains to maintain efficient circulation of the air. The Fourteenth, Nineteenth and Twenty-third street stations are constructed on the same principle, but structural and operating requirements would not permit the scheme at other stations.

The effective area of the iron-lined tunnel is 160 sq. ft. and of the concrete-lined tunnel 166 sq. ft. This is with ballast and bench wall in place. The cross-section of the standard tunnel car is approximately 90 sq. ft., which leaves a clearance area of 70 sq. ft. and 76 sq. ft., respectively, for the iron and concrete tunnels.

The original layout of the ventilating system was designed to take full advantage of the piston action of the trains and to draw out the foul air with exhaust fans, while using entrances to admit fresh air. But in three cases it was considered necessary to install fresh air blowers to supplement the air delivered through the entrances, which were either too small or too far apart for this purpose, and also to create sufficient circulation should trains become stalled in the tunnels.

The capacity of the fans was designed to give 30 cu. ft. of air per passenger per minute when traffic is at the maximum during morning and evening rush hours, and this capacity would change the air in the tunnels approximately 2½ times every hour. All fans are motor driven, the motors being coupled direct to the fan shaft. The motors are specially built of the inter-pole type, designed to operate under large voltage fluctuations. They are extremely rugged, reliability being of extreme importance in the installation. The speed variations in these motors is 20 per cent. All speed changes are obtained economically by field control. The motors are designed to operate on a 625-volt circuit which has fluctuations between 500 and 750 volts.

In November, 1909, A. W. Hodgson, assistant engineer of the Hudson & Manhattan railroad, made a series of anemometer tests to ascertain the direction and volume of air circulating through the tunnels and station passageways under existing circumstances. All readings were taken with trains running on 2½ minutes headway, except in the tunnels between caissons 1, 2 and 3, where the headway was 5 minutes. The temperature on the street was close to the freezing point or below. The average velocity of the air from the downtown river tunnels was 1,100 ft. per minute with trains on 2½ minutes headway. The highest recorded temperature in the tunnels was 76½ degrees in August, 1909, when the temperature on the street was 88 deg. Many other parts of the tunnel were only 70 deg. on this date. The average temperature of the tunnel is generally 70 deg. The train headway during rush hours is 1¼ minutes with four and five car trains. With trains on 2¼-minute headway, the velocity and direction of the air is governed almost entirely by train movements and not by fans. The large exhaust fans at Church Street Terminal, handling 114,000 cu. ft. of air per minute, increase the velocity in the river section of the south or inbound tunnel less than 10 per cent over the velocity in the north or outbound tunnel. The velocity in the river section of the outbound tunnel was influenced largely by the number of doors and ventilators open at Church Street Terminal entrances, being 180,000 cu. ft. on December 13, and failing to 126,000 cu. ft. per minute on December 23, when all doors and ventilation were closed.

It is, therefore, evident that the function of the fans is only to take the air pushed to them by the trains or to deliver fresh air where the trains can push or draw it in through the stations and tunnels, and this fact should mainly govern the location of fans and air ducts.

In the river sections of the iron-lined tunnels, with trains on 2½-minute headway and attaining an average speed of 30 miles per hour, the mean volume of air passing at any point is 180,000 cu. ft. per minute, provided that the air is not restricted by closing all possible inlets. At inland platforms, such as Christopher and Erie stations, also crossovers, such as Ninth street and Nineteenth street, about 70 per cent. of the air crosses the platforms or tracks within 50 feet from the end at which it enters and follows the direction of traffic in the adjacent tunnel. The 30 per cent. leaves the station in the same tunnel in which it enters.

The results prove that wherever passages or connections of considerable area are made between two adjacent tunnels, the section of tunnel between any two such connections must be considered independently, and cannot be efficiently ventilated by fans or shafts not within that section.

In the original design it was considered necessary to install all fans in duplicate. This idea has now been abandoned, as it has been found quite possible to shut down any fan for a day or more for repairs without appreciably affecting the air in the tunnels.

In installations of large capacity, such as are required for a system of deep tunnels, where access to the surface is only possible at long intervals, the design of the fans and air ducts requires very careful study. If they are not properly proportioned, the ventilation will become a very expensive proposition, both in first cost and in operation.

The committee presents the foregoing as information, withholding conclusion until experiments now being conducted on single and double track steam railroad tunnel ventilation are completed.

ECONOMICS IN ROADWAY LABOR.

The committee having agreed with the Track, Signals and Interlocking committees on a subdivision of the work, reports progress.

RECOMMENDATIONS FOR 1913.

The committee recommends that subjects 2, 3 and 4 be reassigned, again respectfully calling attention to the resolution above referred to.

W. M. Dawley (Erie), Chairman; J. A. Spielmann (B. & O.), Vice-Chairman; J. R. W. Ambrose (G. T.), John C. Beye (C. R. I. & P.), Ward Crosby (C. C. & O.), W. C. Curd (M. P.), Paul Didier (B. & O.), R. C. Falconer (Erie), S. B. Fisher (M. K. & T.), Frank Merritt (G. C. & S. F.), C. S. Millard (C. C. C. & St. L.), W. D. Pence (Univ. of Wis.), A. C. Prime (P. R. R.), H. J. Slifer (Cons. Engr.), John G. Sullivan (C. P. R.), F. L. Wheaton (D. L. & W.), J. E. Willoughby (Carribeau Cons. Co.), W. P. Wiltsee (N. & W.), Committee.

The report was received as information and the committee was relieved.

RECORDS AND ACCOUNTS.

The board of direction assigned the following work to this committee for the current year:

(1) Make a comprehensive study of the forms in the manual, which were adopted a number of years ago, and bring them up to date.

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(2) Continue the study of the economical management of store supplies.

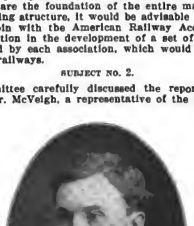
(3) Recommend feasible and useful subdivisions of Interstate Commerce Commission Classification, Account No. 6, with a view to securing uniformity of labor costs.

SUBJECT NO. 1.

Some of the forms, particularly those used in connection with the accounts, such as foremen's reports of labor and material consumed, might be changed in some particulars, but it is doubtful if such changes would bring about their more general use by the railroads, as little, if anything, would be gained by suggesting minor changes in these forms. It is the opinion of the committee that no changes be made at the present time in the forms appearing in the manual. It is suggested that since the selection of the proper forms for time books, foremen's material reports, distribution sheets and authorizations of expenditures is a matter in which the Accounting department is as much interested as the Maintenance of Way department, for the reason that these forms and reports are the foundation of the entire maintenance of way accounting structure, it would be advisable for this association to join with the American Railway Accounting Officers' Association in the development of a set of forms, to be recommended by each association, which would be generally adopted by railways.

SUBJECT NO. 2.

The committee carefully discussed the report made last year with Mr. McVeigh, a representative of the Storekeepers'



H. J. PFEIFER,
Chairman Committee on Records and Accounts.

Association, and we believe that the conclusions which we have reached will meet with the approval of Mr. McVeigh, and that there is a strong probability that they will be approved by the Storekeepers' Association. Discussions were confined to the conclusions approved by the association at the annual meeting in 1912, which were under the following headings:

Standardization.
Classification of Material.
Stock Account.
Distribution.
Organization.

Standardization.—No change is recommended for this heading.

Classification of Material.—The committee recommends that the details of classifications should conform to those adopted by the Railway Storekeepers' Association.

Stock Account.—The conclusion reached last year is fundamental. The detailed methods of keeping the accounts may be varied to fit the individual condition. Stock accounts can be kept, first, by ledger account; second, by card system, and third, by personal inspection and estimation.

Distribution.—No change is recommended for this heading.

Organization.—The essential elements are as follows:

Location.—The store should be located as closely as possible to the point of greatest consumption so that the minimum force will be required, and that the delay to material between the store and its destination may be reduced to a minimum. Usually this is at a point where equipment is maintained.

Force.—The force required is dependent almost entirely on the character and volume of material issued and on local conditions. As the prompt and efficient handling of material and tools has a vital effect on the economical operation and maintenance of the railway, the force in the storeroom should be large enough to bring about this result.

Position in Organization.—The consumption of supplies being greatest in the maintenance of way and equipment, the storekeeper should be closely associated with the heads of these departments. It is the opinion of the committee that this can best be accomplished by having the storekeeper, engineer maintenance of way and the master mechanic report to the same officer. In a divisional organization this would place the division storekeeper under the superintendent and the general storekeeper under the general manager or vice-president in charge of operation.

Mechanical Equipment.—Cost of unloading, storing and loading material depends solely upon the volume of business done by each store, and such appliances as will reduce this cost to a minimum are recommended.

Plan.—A typical layout of a store is presented, which can be expanded or reduced as the situation demands.

SUBJECT NO. 3.

The Interstate Commerce Commission, in their Classification of Operating Expenses, which became effective July 1, 1907, included in the maintenance of way accounts primary Account No. 6—Roadway and Track. This account includes about one-third of the total charges for material and labor in the maintenance of way and structures accounts. This account includes practically all of the labor performed by section and extra gangs chargeable to the maintenance of way and structures operating expenses, and it seems desirable to provide subdivisions of this primary account in order to analyze operating expenses and assist in securing uniformity of labor costs.

A brief outline of the reasons for recommending the proposed sub-accounts is as follows:

Sub-Account A—Track Maintenance:

Under this caption is included all labor necessary to maintain good line and surface of track, except for the application of material. In other words, if the material and drainage conditions are good, but the track is in poor line and surface, the labor necessary to place the track in good condition will be charged to this sub-account. Also, if it is necessary to temporarily reduce expenses, the available force should be used on line and surface work so far as possible.

Sub-Account B—Applying Track Materials:

Applying track materials is subdivided into

(B-1) Applying Ballast;
(B-2) Applying Ties;
(B-3) Applying Rails;
(B-4) Applying Other Track Material.

These sub-accounts will furnish as much detail as is practicable for convenience in comparing labor costs.

Sub-Account C—Cutting Weeds and General Cleaning:

This sub-account includes work which is less important than some of the other items, and the amount expended is largely dependent upon keeping the property in presentable condition rather than for reasons affecting safety or economy.

Sub-Account D—Ditching and Bank Widening:

This sub-account includes the most important element in providing good track. Frequently the material removed from cuts is used in widening embankments and, therefore, ditching and bank widening are logically included in the same sub-account.

Sub-Account E—Changing Alignment and Grades:

Under this caption is included the operating expenses resulting from abandoning the present alignment on account of reduction of grades or curvature, and it is necessary to separate this from the other expenses which more directly affect the economical maintenance of the property.

Sub-Account F—Flood Damage:

This sub-account includes the cost of repairing damage to the roadbed and track caused by unusual conditions, such as cloudbursts, floods, etc. It is necessary to separate this class of expenditures from the ordinary maintenance work in order that the latter may truly reflect the average expenses in maintaining the property. This sub-account also furnishes the basis for investigations to determine the amount which may be profitably expended to eliminate future damage.

Sub-Account G—Bank Protection:

Under this caption is included expenses necessary to protect the roadbed and track from slides, washouts and other unusual damage to the property.

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Sub-Account H—Filling:

This sub-account provides for the expense of filling bridges.

Sub-Account I—Other Care of Roadway and Track:

This sub-account is intended to include the cost of track-walkers, watchmen and other expenses not specifically provided for in the other sub-accounts.

It is the opinion of the committee that the subdivisions of the Interstate Commerce Commission Classification, Account No. 6, of Operating Expenses, will be of assistance in securing uniformity of labor costs, but in order to obtain the greatest efficiency and most economical results additional information must be obtained and action taken.

Some of the most important elements in securing uniformity of labor costs and efficiency in handling work are as follows:

(1) Adoption of proper method for doing the various kinds of work under usual conditions. Efficiency in the various kinds of work performed in the Maintenance of Way department has received very little study up to the present time, that are clearly mistakes, and by making corrections promptly—in that way we will keep up with the times, and that is what we are trying to do as railroad people. We have got to be alive, up-to-date, and take up the new questions that have been suggested and follow them out to the limit. I thank you, gentlemen.

Address of President-Elect Edwin F. Wendt.

I deeply appreciate the honor which you have conferred upon me. It will be my purpose to so work as to merit your confidence. With your help the work of this association during the coming year will be carried to a successful conclusion. This success will depend on the co-operation of many elements. During next year we expect to have Secretary E. H. Fritch with us, as in the past, however at an increased salary. The Entertainment Committee has been so successful as to have earned what will probably be a life tenure of office. Furthermore, as a business organization we feel justified in congratulating ourselves on having with us year after year two such skillful and faithful stenographers as have served us for so many years. Then, again, I feel that we are justified in saying even another word respecting the value of the exhibition which is given by the National Railway Appliances Association. I had the pleasure yesterday of going through that exhibition and ascertained that the direct expense of that exhibition amounts to as much as $27,000 per year. The attendance at the exhibition is fully up to 50,000 people, and many of whom are employes of railroads for a distance of 1,000 miles from Chicago. That exhibition also represents a capital of not less than $495,000,000.

Typical Layout for Maintenance Department Stores.

and it is safe to say that practically the same methods are being followed to-day that have been in use for a great many years. As an illustration, there are probably as many methods employed by section foremen in putting in ties under the same conditions as there are foremen doing this work, and by making a careful study of the elements entering into each operation the best method employed by each foreman may be combined to produce an approved practice for the various items of work under the most usual conditions.

(2) Economical distribution of material so as to reduce the amount of labor necessary in applying.

(3) The selection of proper tools and their maintenance in good condition.

(4) Organization and supervision.

(5) The selection of the proper season of the year for performing the various kinds of work.

H. J. Pfeifer, chairman; M. C. Byers, vice-chairman; J. M. Brown, Edward Gray, E. E. Hanna, Henry Lehn, J. H. Milburn, C. W. Pifer, Guy Scott, W. A. Christian, G. J. Graves, Orlando K. Morgan, Walt. Dennis, G. D. Hill, Frank Ringer, Committee.

The report was received as information.

OTHER BUSINESS.

Mr. Kittredge: I desire to offer the following resolution:

Resolved, by the members of the American Railway Engineering Association in convention assembled, That we desire to, and hereby do, give an expression of appreciation of the able manner in which the retiring president, Charles S. Churchill, has discharged the duties of president during the past year and presided over the meetings of this convention; that this resolution be spread upon the minutes and a copy be furnished to Mr. Churchill.

L. C. Fritch: I move that this resolution be adopted, that it be made unanimous, and that the vote be a rising vote.

(The motion seconded and the resolution was unanimously adopted amid applause.)

The President: I thank you very much, gentlemen, for your kind expressions. As one of the ancient members of this association, I enjoy appreciation of this kind. I consider it an honor to have had this position. I wish success to my successor. I know he will have it, because in this association every officer has the hearty support of all the members. That is one peculiarity of this association above all others with which I am acquainted. This is a working organization; it has the respect and esteem of the whole of the United States. It is growing in power and in the results accomplished by it daily, and it is all by the co-operation, by the frank discussion, by turning down mistakes that are made

Now, again, I feel that we are justified in saying even another word respecting the value of the exhibition which is given by the National Railway Appliances Association. I had the pleasure yesterday of going through that exhibition and ascertained that the direct expense of that exhibition amounts to as much as $27,000 per year. The attendance at the exhibition is fully up to 50,000 people, and many of whom are employes of railroads for a distance of 1,000 miles from Chicago. That exhibition also represents a capital of not less than $495,000,000.

Furthermore, we are especially fortunate in having as an aid to the work of our association the technical press, and however excellent their publications have been in the past with respect to our association, we confidently expect that their work will be carried on year by year, even to the greater benefit of our membership. The committees of this association are responsible for the direct, tangible results which find their expression finally in the Manual. Without the help of these 20 standing committees we would accomplish very little, and I say that the thorough work which is done in committee is that which receives the greatest approbation of the membership in general.

If we accomplish in the future that which we wish to accomplish, it is essential that we get more members. At the first of January our membership was 1066. Today we are pleased to say that the membership is about 1115. There are, however, in this country, at least 1500, and no doubt 2,000 persons who ought to be members of our association. They ought to be members because they can do this association much good and because they can derive from the association an equal benefit.

The object of our association is the advancement of the scientific study of those problems that pertain to the construction and maintenance of railways. We believe that the results of this scientific study will be of very great benefit to ourselves and to the railways of America. If we pursue the object of this association and bring about the scientific study of those problems which confront us and temper theory with experience we will have accomplished that which was the intention of the framers of the constitution. Our association was born in the tranquil days which characterized the opening of the 20th century, but since that time there has been a development on the part of the public, so that in 1906 Congress passed the Hepburn Act, which has brought about a great deal of discussion and much disturbance of financial conditions in connection with our business. We must meet these new conditions which have arisen since 1906 under the policy of government regulation, and I for one have no doubt that when we direct our intelligence to the determination of

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the scientific principles which underlie the success of the railway business we will be satisfied that a conservative policy of regulation will meet our approval.

A great work before the country during the next few years will be that of the valuation of railways. The Board of Direction has discussed this question for several years and has now under consideration the question as to what action, or what attitude our association should take with reference to this great problem. It is a tremendous problem, one which is being undertaken, we fear, without proper preliminary study, and it behooves every member of our organization to intelligently direct his energies toward the proper solution of this great question. We have in our midst those persons who are able to do this work and we should emphasize the point that was raised by several of the speakers last evening, that our membership should speak freely its mind with respect to the underlying principles which should govern the determination of this great question and I for one will venture a prediction that when the railways of America are intelligently valued the public will discover, contrary to its present idea, that the railway companies had properties are worth a great deal more in money than their present capital.

If there is no other business to come before this convention the Fourteenth Annual Convention will now stand adjourned.

REGISTRATION—AMERICAN RAILWAY ENGINEERING ASSOCIATION.

MEMBERS.

Archer, Wm., Asst. Eng., B. & O. S. W., Cincinnati.
Backes, W. J., Eng. M. W., N. Y. N. H. & H. R. R., New Haven, Conn.
Bell, Gilbert J., Div. Eng., A. T. & S. F. Ry., Marceline, Mo.
Blackman, Chas. H., Asst. Eng., L. & N. R. R., Louisville, Ky.
Boynton, C. W., Ch. Insp. Eng., Universal Portland Cement Co., Chicago.
Chamberlain, O. P., Chief Engineer, C. & L. W. R. R., Chicago.
Cochran, C. W., Eng. M. W., Big Four, Mt. Carmel, Ill.
Crittenden, O. H., Ch. Eng., I. & G. N. R. R., Houston, Texas.
Cunningham, A. O., Chief Engineer, Wabash R. R., St. Louis, Mo.
Curtis, L. G., Dist. Eng., B. & O. C. Ter. R. R., Chicago, Ill.
Dick, H. B., Eng. M. W., B. & O. S. W. R. R., Cincinnati, Ohio.
Eberly, G. F., Asst. Div. Eng., B. & O. R. R., Newark, Ohio.
Garman, H. O., Instructor C. E., Purdue Univ., Lafayette, Ind.
Gibson, H. R., Div. Eng., B. & O. S. W. R. R., Flora, Ill.
Gilbert, H. H., Eng. B. & B., Queen & Crescent Route, Cincinnati, Ohio.
Houghton, E. R., Asst. Eng., U. P. R. R., Omaha, Neb.
Hoyt, C. B., Supt. Tr., N. Y. C. & St. L. R. R., Bellevue, O.
Hynes, M. V., Supt., C. H. & D. Ry., Cincinnati, Ohio.
Johnston, T. S., Ch. Eng., C. A. & N. Ry., Chicago, Ill.
King, E. E., Iowa State College, Ames, Iowa.
Lane, H. A., Asst. Eng. Surveys, B. & O. R. R., Baltimore, Md.
Lehn, Henry, M. W. Asst., N. Y. C., New York.
Parrish, F. J., First Asst. to E. M. W., B. & O. S. W., Cincinnati, Ohio.
Smith, F. A., Civil Engineer, Chicago, Ill.
Smith, W. A., Res. Eng., Erie Railroad, New York.
Smith, W. W., Asst. Eng., G. T. Ry., Montreal, Canada.
Steile, C. A., Div. Eng., C. & A. Ry., Bloomington, Ill.
Stocker, J. A., Ch. Eng., Toledo & Ohio Cen. Ry., Columbus, O.
Thomas, Chas. E., Constr. Eng., Mt. Pulaski, Ill.
Ziegweld, A. B., Div. Eng., M. C. R. R., Saginaw, Mich.

GUESTS.

Abbott, George W., Act. Div. Eng., B. & A., Boston, Mass.
Bellamy, B. C., Union Pacific, Laramie, Wyo.
Brannon, C., Asst. Eng., C. & E. I., Evansville, Ind.
Deuer, H. W., Trainmaster, C. M. & St. P., Ottumwa Junction, Espenshade, E. B., Asst. Eng., Pere Marquette, Chicago.
Gardner, C. L., Supt., T. & O. C., Columbus, O.
Lloyd, J. E., Asst. Div. Eng., B. O., Ganett, Ind.
Moore, W. G., Asst. Eng., Operating Dept., B. & O., Baltimore.
Robinson, W. M., Jr., Special Engineer, Georgia R. R., Augusta, Ga.
Rockwell, W. F., Ill. Steel Co., Gary, Ind.
Schuyer, H. F., Asst. Eng., T. & O. C., Columbus, O.
Shea, Wm., Roadmaster, C. M. & St. P., Ottumwa, Ia.
Wenzell, A. J., Ch. Eng., Michigan Railway Engineering Co., Kalamazoo, Mich.

SPECIAL CAR FOR BOSTON.

The Lake Shore & Michigan Southern, for the convenience of persons attending the convention, will operate a special car for Boston on its train leaving Chicago at 10:30 this morning.

MEETING OF TELEGRAPH SUPERINTENDENTS ASSOCIATION.

The Association of Railway Telegraph Superintendents held a quarterly meeting in the assembly room at the North Western office building, Wednesday, March 19. After the meeting a joint meeting of the committees on arrangements of this Association and of the Telephone and Telegraph Appliance Association was held to make preliminary arrangements for the annual convention to be held in St. Louis during the week commencing Monday, May 19. There will be no organized exhibit in connection with this meeting.

J. J. Ghegan, J. H. Bunnell & Co., New York, is chairman of the Telephone and Telegraph Appliances Association; E. E. Hudson, Thomas A. Edison Company, Inc., is vice-chairman, and W. E. Harkness, United States Electric Company is secretary and treasurer. E. A. Chenery, superintendent of telegraph of the Missouri Pacific, is chairman of the arrangements committee of the Telegraph Superintendents Association.

CLASSIFICATION OF MEMBERS OF THE A. R. E. A.

Presidents	25
Assistants to Presidents	8
Vice-Presidents	29
General Managers	17
Director of Maintenance and Operation	1
Assistant General Managers	10
General Superintendents	15
Assistant General Superintendents	2
Division Superintendents	42
Chief Engineers	127
Assistant Chief Engineers	24
Principal Assistant Engineers	17
Chief Engineers, Maintenance of Way	5
Assistant Chief Engineers, Maintenance of Way	3
Engineers of Construction	19
Engineers, Maintenance of Way	79
Bridge Engineers	36
Engineer Survey	1
Division Engineers	81
Assistant Engineers	110
District Engineers	15
Electrical Engineers	4
Inspecting Engineers	17
Architects	5
Locating Engineers	5
Engineers, Track and Roadway	10
Maintenance of Way Asst.	1
Engineers, Bridges and Buildings	4
Office Engineers	10
Chief Draftsmen	4
General Roadmaster	1
Roadmasters	16
Master Carpenters	2
Rail Expert	1
Superintendents, Bridges and Buildings	9
Supervisors	3
Resident Engineers	31
Signal Engineers	16
Assistant Signal Engineer	1
Managers, Timber Department	8
Chief Timber Inspector	1
Forester	1
Contracting Engineers	19
Supervisor, Materials	1
Chemists and Engineers of Tests	8
Metallurgical Engineers	2
Professors in Colleges	25

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Associate Professors	18
Civil Engineers	37
Consulting Engineers	95
Engineers, Grade Elimination	4
Purchasing Agent	1
Receiver	1
Editors	4
Masonry Engineer	1
Drainage Engineer	1
Valuation Engineers	4
Engineer, Water Service	1
Municipal Engineers	8
Commercial Engineer	1
Miscellaneous	20
Total	1,066

THE THANKS OF THE ASSOCIATION.

The following resolutions were adopted yesterday by the American Railway Engineering Association on motion of L. C. Fritch; seconded by G. W. Kittredge:

"Resolved, by the members of the American Railway Engineering Association, that we desire to place on record our appreciation and extend our hearty thanks to the following: To Mr. B. A. Worthington, Rev. R. W. Dickie, Mr. Geo. A. Post and Mr. R. G. Rennick for their admirable and instructive addresses at our annual dinner; to the National Railway Appliances Association for courtesies extended to the members of the Association, and for the valuable and interesting exhibit of railway devices used in the construction, operation and maintenance of railways; to the technical press for their daily reports of the convention and useful information made available to the members; to the official reporters, Messrs. T. E. Crossman and G. W. Burgoyne for their accurate and painstaking reports and the proceedings of this and previous conventions; to the tellers for their arduous labors in counting and tabulating the ballots for officers for the current year; to committee No. 23 on arrangements, for the highly successful arrangements made for the comfort and entertainment of the members and guests attending the convention. And it is recommended to the Board to increase the committee's salary for the coming year."

THE NATIONAL MENACE OF RAILWAY STRIKES.

The directors of the Railway Business Association, who met here on Wednesday, as announced in yesterday's Daily, have given out the following interesting statemont:

The country's bare escape during recent months from railway strikes tying up traffic throughout territory containing in some instances nearly half the whole population makes it imperative to remove at once the possibility of such a situation in future.

What will occur if any one of the classes of labor in the operation of railway trains over such an area shall quit work is beyond anything in American experience. It would paralyze society and bring hunger, misery and even death to rich and poor, but especially to the poor.

There is no reason to doubt that demands for increase of wages or more favorable working conditions will frequently take the form of concerted action by employees on many lines at once. The allegation as to cost of living upon which railway employees have relied for public sympathy in their demand for enlarged compensation has been made simultaneously all over the country. The consequent concurrent demand which has developed the large-scale disputes gives every appearance of having become a permanent feature in such negotiations. The Eastern conductors and trainmen have announced a purpose to press demands after the firemen's case is concluded.

The urgency of the situation leads the Railway Business Association to go outside its main function of conciliation between railways and the public and seek to arouse the public, the railway employees and the railway managers to co-operation and the President and Congress to action at the extra session. The federal Erdman act, through which until recently strikes causing interruption to train service have been almost wholly prevented, has all but broken down at the point where, mediation failing, arbitration was attempted in the large-scale dispute involving many roads at once. The Eastern engineers' case was arbitrated outside the act. In the Eastern firemen's case the roads agreed to arbitration under the act only after earnest protest and because they believed this to be the only means of averting a strike. The firemen through their officials went on record as favoring amendments which would render the act more applicable to present conditions.

The Erdman act should be amended forthwith or legislation substituted for it providing a form of voluntary arbitration so little open to valid objection as to deprive disputants of all reasonable excuse for declining arbitration under the law. To postpone remedial legislation is to invite widespread and perhaps national disaster at any moment.

While effective in averting strikes through mediation in controversies of whatever extent, the Erdman act is unsatisfactory in large-scale disputes if they reach the arbitration stage.

Arbitration outside the act, on the other hand, as tried in the engineers' case, was declined by the firemen on the ground that they desired the decision to be an award, without recommendation of new legislation, and believed the act would so restrict the findings; and also on the ground that the testimony should be taken under oath as provided by the act.

What are the defects of the Erdman act?

The act provides for a board of but three arbitrators, two of whom represent the respective parties. All concerned urge that a decision involving many roads over a wide area, many thousands of employees and many million dollars annually, should be rendered by a board having more neutrals than one. Provision should be made in the act for fixing upon a larger number when desired. An increase in the proportion of the number of neutral arbitrators to partisans will bring more minds to bear upon the many questions arising in large areas and tend to promote equity in the decisions.

The act limits the time for the investigation to 30 days. It is said that in so short a time the investigation is likely to result in little more than a splitting of differences. The time for the investigation should be made elastic.

If statistics and other data now available are unfitted for this purpose, machinery should be established for standardizing, collecting, keeping and furnishing information which will meet the need.

The statute now affects only employees engaged in train service—engineers, firemen, conductors, trainmen, yard and switch men and telegraphers. Other classes frequently appeal to the government mediators, and their organizations have asked that the law be extended to include them. Some of the most serious strikes affecting large territories have been those of shopmen, signalmen and others not engaged in train service. The act should be made applicable to clerks, trackmen, freight handlers, machinists, boiler-makers, blacksmiths, car repairers and so forth, as well as to the train service groups.

It is urged that the burden of mediation, already heavy, will increase as time goes on, especially if the act is extended to include classes of railway employees other than those in train service. It is also pointed out that only a few federal officers are ex officio eligible to appointment as mediators. The mediator has the function, when the repre-

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sentatives of the parties fail to agree, of appointing neutral arbitrators. There would always be the temptation, in one quarter or another, when a vacancy arose in a position the occupant of which is eligible as mediator, to urge candidates primarily because of their supposed predisposition in labor disputes. Nor is there any assurance that future incumbents, however competent in the offices designated in the statute, will by temperament and training be efficient for the extremely difficult work of mediation. The machinery of mediation should be made adequate to the enlarging demands upon it and eligibility to appointment as a mediator having the function of appointing neutral arbitrators should be made to depend as completely as possible upon personality and experience for the specific function of mediation.

Railway managers, railway employees and the public should co-operate to obtain legislation which will place them squarely on the side of industrial peace and the public convenience and accomplish some progress in the direction of equity for all concerned in the settlement of wage disputes.

Avoidance of the possible horrors of strikes is so imperative that it would seem that the President and the leaders in Congress might well include in their legislative programme for the forthcoming extra session consideration of appropriate measures for the strengthening and improvement of the machinery for arbitration in railway labor controversies.

ASSOCIATION OF PENNSYLVANIA LINES DIVISION ENGINEERS.

The Association of Division Engineers on the Pennsylvania lines west held its spring meeting this week in the assembly hall of the Permanent Manufacturers' Exhibit of Railway Appliances, in the Karpen building, Chicago. The association includes about 40 members and delegates, of which at least 35 were present. All division engineers on the western lines are members of the association, and the officers are elected from among these members. An advisory committee, consisting of the officers and chairmen of committees, selects a number of delegates to the meetings of the association, including a man from the office of the purchasing agent, the assistant engineers of motive power and any other officers that the general manager may suggest. These appointments are approved by the general manager.

This association was organized in 1886, and at present holds two meetings each year; the spring meeting in Chicago during the convention of the American Railway Engineering Association, and the fall meeting in Pittsburgh. George Le Boutillier is president of the association and presided at the meetings. There are seven committees, covering practically all work handled under the direction of division engineers. The most important of these committees are those on Track and Tools, Roadway and Ballast, Bridges and Buildings, Wages and Accounts, and Maintenance. All of the committees presented reports at this meeting.

ELBERT HUBBARD ON "GIVING THE RAILWAYS A SHOW."

"Fra Elbertus,' the sage of East Aurora, and the man who made Emerson famous, visited the Coliseum yesterday afternoon. He had just come from Madison, Wis., where day before yesterday, he delivered before the legislature of that state a lecture on "Giving the Railways a Show." When he got through someone tipped him off to the fact that they already had one this week in Chicago, and he came right down to see about it.

His entrance into the Coliseum was unannounced, and for about thirty feet after he passed the door he was unrecognized. But after his "incog" had been penetrated he submitted to an interview. He said that while this show wasn't the kind he meant to talk about before the solons at Madison, still it was pretty good in its way and was in a class by itself, inasmuch as it was about the only show that railways had been given for some time.

He said he believed, in fact, that if the people of the various states through their representatives in legislature and on commissions would give the railway as good a show in its way as the National Railway Appliances Association is giving them in its own peculiar manner, the railways in turn would be able to show the public, tinged as it is with the "Missouri" spirit, that railway conditions are not so bad after all.

The Fra said he felt quite at home in the various exhibits which he visited. He thought he knew as much about railways as the average citizen. At any rate he has ridden on trains several times in his life. He seemed particularly interested in the signaling exhibits and listened attentively while the various aspects of the subject were explained to him. And from all the indications he understood it perfectly.

He authorized the statement that he believes in advertising.

BRIDGE AND BUILDING ASSOCIATION.

About twenty officers and committee chairmen of the American Railway Bridge and Building Association met at the Congress Hotel late Wednesday afternoon to discuss matters of interest to the association and make preliminary arrangements for the convention at Montreal next fall.

TO-DAY'S PROGRAMME.

The American Railway Engineering Association has this year provided, for the first time, for a fourth day. The day will be spent by the members in visiting the Exhibition of the National Railway Appliances Association in the Coliseum and Armory.

PENNSYLVANIA PUBLIC UTILITIES BILL.

At the public hearing at Harrisburg before the legislative committee having in charge the public utilities bill now pending in the Pennsylvania legislature, George Stuart Patterson, general solicitor of the Pennsylvania Railroad, appeared on behalf of the steam railroads. The following is an abstract of his argument:

The position of the railroads is that:

1. The bill should endow the commission with power to secure reasonable rates and facilities. Nothing in the law, however, should contravene the well-known statement of the United States Supreme Court that "the public is in no sense a general manager."

The function of management should be left to the railroads themselves. To illustrate: The commission should have power to insist that equipment be safe and to pass, if necessary, upon the adequacy of the provision made for safety. It should not, however, be empowered to specify the means by which such safety should be secured.

2. The bill should be clear in its meaning, and its language should in general be the same as that of other similar measures which have already received judicial inter-

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pretation. In such manner will the railroads understand the precise purport of their obligations.

3. Above all, the bill must be fair to invested capital. It is comparatively easy to force prosperous companies to submit to any burdens which may be imposed up to the point of actual confiscation.

No way has yet been devised, however, by which a man, or set of men, can be forced to embark upon a new enterprise involving the investment of their money unless there is a reasonable probability of profit from the transaction. Capital is volatile. Create unfavorable atmospheric conditions and it vanishes. It knows no national boundary lines. It seeks unceasingly to find a habitat where it will be welcomed and encouraged.

Now, through the development of its resources by private capital, the commonwealth of Pennsylvania has become the premier industrial state in the Union. Railroads and manufacturers have here prospered. But it is perfectly obvious that if we impose undue burdens, if we restrict the prerogatives of management, if we penalize efficiency, and make it evident that this state will not allow those who risk their capital here to enjoy the fruits of initiative, enterprise and industry—no new railroads will be built, and those which exist will make no improvements involving the slightest risk.

In other words, an impasse will develop through the refusal of private capital further to engage in developing our resources, and the public itself through the government will be forced to embark upon the perilous course of building and managing public utilities.

If government ownership is our goal, we must consider carefully the experience the world has had with government management. In general, it may be said that no country has as yet undertaken government railway ownership as a policy deliberately chosen upon economic grounds. Special and local considerations have determined the choice in practically every case.

The most recent instance of this character is that of the Western Railway in France, acquired by the nation in 1909. In 1909 that company's deficit was $7,750,000; in 1910, $11,700,000; in 1911, $14,000,000; in 1912, $16,000,000; and for 1913, the budget estimates that the people must be taxed $18,000,000 to provide the deficit in railway operation.

NEW ROCKFORD MOTOR CAR.

The Chicago Pneumatic Tool Co., Chicago, has developed a motor car which can be started with a crank and is equipped with clutches, enabling the operator to stop the car without having to stop the motor and to start it without having to push the car and the load.

The car frame is built of 3-in. channels, which is the usual standard for the Rockford cars. All joints are oxy-acetylene welded, and the frame is mounted on 1½-in., semi-elliptical springs to eliminate excessive vibration. The wheels are pressed steel, 16 in. in diameter, with standard M. C. B. tread and flange. One of the wheels on the front axle is given a running fit to compensate on curves and to facilitate the handling of the car when taking it from the track or turning it around on a crossing or in the section house.

The car is driven by bevel gear to the rear axle, allowing two speeds in each direction. The brake is attached to the drive axle, and is of the enclosed expanding type which is used on high-grade automobiles.

The motor is a single cylinder, air-cooled, 4-cycle engine of 3½-in. bore and 4½-in. stroke. It is rated at four h. p. Three systems of ignition are provided. In addition to the combined battery and low tension magneto ignition, which is usually called dual ignition, this car has another complete system with its own spark coil, circuit breaker and spark plug. The motor is equipped with a force feed oiler and automatic carburetor.

STEEL TANKS IN CANADA.

The accompanying cut shows the type of tank being used on the new Grand Trunk Pacific and National Transcontinental railways in Canada. In this region the weather is extremely cold during several winter months, and in portions of the country there are tracts of timber subject to forest fires.

This tank was designed to meet these conditions. In order to make it fireproof, no wood is used in any part of the structure, and so far as possible the location is chosen so

Steel Water Tanks Used on Grand Trunk Pacific.

that forest fires will not be likely to affect the structure by warping its supports. The usual heating arrangement consisting of steam coil or hot water pipe was not considered equal to direct radiation on this work, as small pipes, if frozen, may burst and cause damage and serious inconvenience. It is also found preferable to have as small and simple a heating plant as possible. For these reasons and others, such as cost and ease of installation in these regions, the usual large steel riser has a diaphram or special flanged head about eight feet from the ground, below which no water is stored. The room formed below this diaphram is lined with fire brick, having an air space between brick and steel, or is built of concrete. A door of convenient dimensions is provided into this room and a coal or oil stove placed therein. The stovepipes pass directly up through the tank

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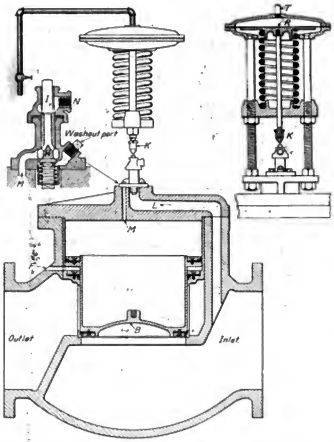
and roof and water is kept from freezing by direct radiation from stovepipes and heating room. The supply and discharge pipes, also blow-off connection, pass down through the heating room to the ground.

A recent order placed with the Des Moines Bridge & Iron Co., Pittsburgh, Pa., calls for 29 of these structures, most of them to be erected during the present year.

AUTOMATIC CONTROLLING ALTITUDE VALVE

Several changes have been made in the Golden-Anderson automatic cushioned controlling altitude valve, which was described in the *Railway Age Gazette* of February 14, 1908, page 228. The most important of these is in the pilot valve, an enlarged section of which is shown on the drawing. When water is drawn from the tank or standpipe the pressure is



Improved Controlling Valve.

relieved from the top of the diaphragm *R*, causing the valve spindle *K* to raise, thus permitting the high pressure auxiliary valve *H* to close, and the exhaust valve *I* to open, allowing the water above the piston or valve *B* to escape through *M* and *N*. The water above the valve *B* acts as a cushion and when the valve begins to travel upward, air is drawn in through the port *F* and acts as a cushion when the valve closes.

When the water in the tank reaches the required height, the pressure in the pipe *T* and on top of the diaphragm *R* causes the valve spindle *K* to close the auxiliary exhaust valve *I* and open the high-pressure valve *H*, allowing the pressure to come on top of the valve B, which is forced to its seat, thus shutting off the water in its flow to the tank. The upper part of the body is lined with bronze, and the valve *B* is of solid bronze fitted with rubber cups and disc. These altitude valves are so constructed that electrical apparatus may easily be applied and they may be controlled from a distance, in addition to the automatic feature above described. The valve is made by the Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.

SCIENTIFIC SHOVELING.

The application of system to the use of shovels in construction and track work opens many possibilities for economy. The elaborate experiments made by Frederick W. Taylor in his analysis of the hand-shovel service at the Bethlehem Steel Co.'s plant, covering the handling of many kinds of material from iron ore to pea coal, showed that the most economic shovel load to be lifted and thrown a standard distance and height is 21 lbs.

To a degree the problem is one of education of men, but success seems to depend quite as much on the selection of the proper tool as on the development of the men. As the plan contemplates adapting the capacity of the shovel to the weight and character of the material it would seem to require a large stock of shovels. This is the only objection, and it sinks into insignificance when measured with the advantages gained by a standard and uniform load for each movement which becomes impressed on the mind of the workman by the fact that he has changed tools to secure a standard of efficiency.

In the moving of iron ore it was found that the average number of tons handled per man per day was increased from 16 to 59. The average earnings per day per man were increased from $1.15 to $1.88 and the cost of handling was reduced from $0.072 to $0.033 per ton. This system so improved the service that in the second year, when all the work in the yard was task work, it was estimated from the results of the first six months that the saving on the year would be from $75,000 to $80,000.

The application of a standard shovel in railroad track service is now almost an accomplished fact, a large number of roads having adopted a No. 2 for ballast work and tamping. A No. 3 would probably be better as a standard for this work under all conditions. The shovels used in Mr. Taylor's investigation were made by the Wyoming Shovel Works, Wyoming, Pa. Since the great saving made by adapting the shovel to the material has become known, this company is making shovels designed to handle 21 lbs. of any specified material. It has issued a booklet on scientific shoveling, which will be sent on request, in which many of the ways of effecting economy in earth handling by shovels are explained.

UNION SWITCH & SIGNAL COMPANY'S NEW APPARATUS.

The new signal apparatus recently brought out by the Union Switch & Signal Company includes the Type "F" interlocking machine, which is similar in design and principle to the electro-pneumatic type but has a number of improved features which give it a timely interest.

The type "P-3" electro-mechanical machine has also been improved since the exhibit last year. The combination board is made of moulded insulated compound and is built up of units of convenient size. The rollers are so arranged that either top or bottom half can be operated independently or both halves may be rigidly connected together. If one roller does not provide for sufficient contacts and one on either side has more than sufficient space, the bottom half of the second roller may be connected to the first and be made to operate with it. This is done by providing a crank at the bottom of each lever and connecting two adjacent cranks with a link.

Indication lamps are provided below levers for showing condition of track circuits and there is now a mechanical push button for the control of a calling-on-arm from the

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same lever as a high arm without the necessity for a stick relay. The arrangement is such that with the lever normal the push button is locked normal and can be operated only when the lever is reversed. With the lever reversed if the button is pushed in it will be locked in until the lever is put normal when it will be automatically restored. There is also a time release.

Another new device is the electric light signal designed for daylight as well as night indications by light only. These light signals have been considerably improved within the last few months as the result of extensive installations particularly on electric railways. The new type consists of a wide sheetiron background in the center of which is mounted the lamp case containing two lenses. These lenses are shielded by a sheetiron hood so as to intensify the daylight indication. The whole device is suspended from the mast by a castiron bracket having a knuckle joint so that the signal may be adjusted to focus toward any desired point.

The new Model 12 polyphase relay consists of an induction motor movement similar to that of the radial type, but instead of having the contacts and fingers mounted radially they are arranged in a manner very similar to those of a direct current relay. The contacts are carried on a slate top. This can be furnished as a two or three position relay, 25 or 60 cycles, and for any voltage.

There are also two new transformers among the new apparatus. One is a standard track transformer and the other is a combined track transformer and reactance. Thus in this instrument two devices are combined, saving space and making for convenience in construction, maintenance, and operation.

The new stationary automatic reactance is designed to secure a quadrature phase relation between the current in the track coil and that in the local coil of a polyphase track relay. The reactance is connected between the track and the track transformer and is so designed that with the block occupied, the power consumption and flow of current to the track are less than that with the block unoccupied.

The advantages are that it has no moving parts and cannot close up its magnetic circuit during wet weather and thus cause the track relay to open; and it gives ideal quadrature relation between the currents in the two elements of a polyphase track relay.

These and other recent developments are shown at the Union Exhibit at the Coliseum.

NEW FAIRBANKS-MORSE MOTOR CAR.

The Fairbanks-Morse Co., Chicago, has on exhibition at the Coliseum, a new motor car, the No. 29. It has a capacity

Fairbanks-Morse New No. 29 Section Motor Car.

of six to eight men, seated; weighs 800 lbs., and has a single cylindsr, air-cooled, two-cycle, valveless engine, driving the car through a pinion on an extended shaft which meshes with a large gear located within one of the car wheels. The speed of the car is 6 to 18 miles per hour in either direction.

There are also on exhibit light inspection cars, Nos. 28 and 30, and larger cars Nos. 26, 32 and 33 for section, bridge and construction gangs.

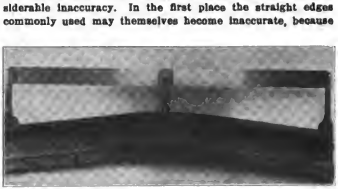
The two-cycle engine, air-cooled, is applied to all the cars shown. As these cars go into the hands of many men inexperienced in handling machinery of any kind, the two-cycle engine has advantages for such service on account of its simplicity, having no valves, cams, pawls, gears, etc. Being air-cooled, any trouble from water freezing, etc., is obviated and this also helps to keep down the weight.

Engine on New No. 29 Motor Car.

Lubrication is a distinctive feature on these two-cycle engine cars, the oil and gasoline being mixed, one-half pint of oil to one gallon of gasoline, making it unnecessary for the operator to worry about the engine getting proper lubrication as the system is automatic.

AN IMPROVED DEVICE FOR MEASURING RAIL DEFLECTION.

The customary method of measuring the deflection of a rail under the drop test is to lay a steel straight edge of a given length, or frequently a wooden straight edge with steel corners, on the head of the rail and measure the deflection from the edge of this straight edge to the head of the rail with a rule. This has been found to give rise to considerable inaccuracy. In the first place the straight edges commonly used may themselves become inaccurate, because



A Device for Accurately Measuring Deflection of Rails.

of wear or other reasons. Again, in falling upon the head of the rail the tup makes an indentation in the head. Also, quite frequently the web of the rail buckles more or less, especially under a second or third blow. When measuring from the head of the rail, this buckling and indentation are included in the deflection, and this may explain why there seems at times to be no relation between the deflection and the elongation.

To provide for a more accurate means of measuring this deflection, the device shown in the accompanying photograph has been made to measure the deflection on the base of the rail rather than on the head. This device consists of a steel

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bar 3 ft. long, rigidly mounted on two standards, the bases of which are at right angles to the bar. These standards are made of bard steel with a bigb resistance to wear. In the center a graduated scale passes through a slot provided with springs to retard free movement. This scale is graduated to read to the nearest .05 in., the zero being even with the top of the scale when the lower end is in the plane with the bases of the standards. By simply placing this device on the rail, the scale is pushed up to show the proper deflection and the springs hold it there. It weighs 6.5 lb. This device was developed under the direction of C. W. Gennet, of R. W. Hunt & Co., and has been used by the inspectors of this company for six months at the south works and Gary mills of the Illinois Steel Co. It has given such satisfaction at these points that it is planned to install it in all of the mills in the near future.

D. & A. CONCRETE FENCE POSTS.

The Chicago & North Western established a small plant at Dunlap, Ia., in 1907 for the manufacture of concrete fence posts. This plant was of the open-air character, all work being done when possible in the open air. A small temporary building was erected for a cement storage house. The equipment used was purchased from the D. & A. Post

Concrete Posts on C. & N. W. at Evanston, Ill.

Mold Co., Three Rivers, Mich., and consisted of 265 molds for the 7 ft. line posts and 25 molds for the 8 ft. end and brace posts; also one mold shaker, with a capacity of 12 molds. Three men were employed in this plant, who were paid from 16.5 to 17.5 ct. per hour, and were able to make an average of 60 posts a day. The 7 ft. line posts cost 18.3 ct. each and the 8 ft. end or anchor posts cost 53 ct. each. The posts were reinforced with steel strips ½ in. by ⅝ in. and 6 ft. 10 in. long, the concrete mixture being one part cement to six parts gravel.

About 5,000 posts have been manufactured at this plant, most of which have been used in the territory between Dunlap and the Missouri river. The Boyer river for many years was a source of trouble to this portion of the line on account of floods at certain seasons of the year, one result of which was to lift up wooden fence posts and destroy long sections of the right of way fences. The company decided to replace the wooden posts in these fences with concrete, which has been done with satisfactory results. The posts, which were placed in 1907-8, are giving good satisfaction, but it is recommended that future posts be made 8 ft. long and that they have same additional reinforcement in order to further reduce the likelihood of breakage in handling. Some of the posts manufactured at the Dunlap plant have also been used in Evanston, Ill., between the rights of way of the Chicago & North Western and the Northwestern Elevated, as shown in the accompanying photograph.

NEW STEEL DERAIL CONSTRUCTION.

The derailing block of the Hobart-Allfree derailers is now made of cast steel, which is an improvement over previous forms. In addition to this the new design of the base pre-

The No. 5 Hand-Throw Derailer.

sents a smooth outline, and protects yardmen in making it impossible for them to get their feet caught in the device. Another feature of interest is the lip, which brings the lateral thrust incident to derailment directly against the rail rather than against the supporting base. Then, too, the derail is clamped directly to the rail, a feature designed to eliminate trouble caused by partial displacement or by damage during either a derailment or an accidental trailing through.

No. 7 Mechanical-Throw Derailer.

The No. 7 derail for mechanical throw is made longer so as to insure positive action at unexpected higher speeds as well as at low speeds. The No. 5 hand throw is also made of cast steel. This and the No. 7 are both on exhibition at space 107 in the Coliseum, by the Hobart-Allfree Co., Chicago.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 FULTON STREET, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 6,350 copies were printed; that of these 6,350 copies, 5,704 were mailed to regular paid subscribers and 190 were provided for counter and news companies' sales; that the total copies printed this year to date were 113,909 copies—an average of 6,716 copies a week.

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A STATION agent should be paid what he is worth. Everybody will agree to this. But how to decide the rate of pay is not easy. The significance of the letter on this subject, printed in another column, is in the suggestion which it gives that a straight-edge is not a suitable instrument for regulating agents' pay. To the superintendent this suggestion is a reminder that labor-union principles, forever seeking "standardization," do *not* apply. But the absence of the stimulus of the labor-union grievance committee throws on the superintendent all the greater responsibility for seeing that no grievance arises. "Each case should be considered on its own merits." This means that the superintendent must know *very much* more about the work, at some of his stations, than superintendents usually know. In the absence of well-defined rules for grading the salaries of agents and fixing the number of helpers that they should have, a constant effort to increase the quality of the service will, in the long run, indicate quite well what ought to be done; for if agents are made more efficient, and if this policy is pursued vigorously, the men, when not adequately paid, will resign and go into other business. At any rate the younger men will do this; and these men's status should be reasonably well defined before they become old. An efficient agent, popular in his own town, should have his pay slightly increased every few years. In sticking to the policy of advancing agents only by transferring them to another station, a railroad often goes against its own interest. The worth of a station agent, like that of a physician, or a lawyer, is in large degree measured by his popularity, which in the majority of cases is a plant of slow growth. At least, it is one that cannot be forced.

FOR a number of years the electrical night of the New York Railroad Club has been one of the features of the year's program. Heretofore the discussion has been marked by the crispness of the ideas advanced and the, sometimes, sharp controversy between advocates of rival systems, coupled with some more or less poignant prognostications of what the future was to bring forth. But this atmosphere of the meeting was dissipated on Friday last, and the entire tone was changed from that of a few years ago. The discussion opened with the somewhat startling statement that no new electrification work of steam railroads had been undertaken during the past year. There had been some extensions, but no new work, and the reason given was the frank one that nothing had come up that warranted electrification. It was stated as a matter of course. The flamboyant attitude of the electrical engineer of a dozen years ago, which has been gradually disappearing, showed no signs of even a past existence. The atmosphere was one indicating a settled state of affairs. Electricity no longer needs an advocate. Its capabilities and limitations are known, and it is accepted by all at its face value, and, so, it has dropped out of sight as a question to be discussed as to its availability and possibility of application. It can be made to do its work and its adoption has become merely a matter of local conditions, operating facilities and cost.

ONE of the fundamental contentions of the firemen in presenting their demands for higher wages to the board of arbitration is that labor and, in this specific instance, firemen should share in the increase in revenue of railroads due to increased efficiency of the plant and to the greater volume of business. In presenting their case and in examining both their own witnesses and cross examining the railroads' witnesses they have at times confused with this contention certain socialistic doctrines which may be inadequately summarized by saying that they demand that while labor be protected from any of the risks of a business enterprise, it shall, on the other hand, share proportionately with those who take the risks in profits, if the business turns out to be profitable. On Tuesday issue was squarely joined on the underlying contention of the firemen, in the testimony of D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West. Carefully prepared figures had been submitted showing that from actual observation it was clear that there was no relationship between the weight of a locomotive and the work of a fireman. Mr. Crawford gave it as his unhesitating opinion that larger locomotives now in service were not worked in general as close to capacity as were the smaller locomotives in service some years ago, and that if the work of the fireman varied in any fixed ratio, it was

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more nearly in proportion to the percentage of work that was being gotten out of a locomotive, compared to its total capacity, than on any other basis. Mr. Crawford was asked whether in his opinion the heavier trainloads and greater traffic density were due to any added effort or any increased efficiency on the part of the man firing the locomotive. His answer was an unqualified "no." Cross examining Mr. Crawford, Mr. Carter asked him whether this was not from the point of view of the employer, implying, as we understand it, that the employer's point of view is that labor should not be allowed to share in the profits in the gaining of which they took no risk; but Mr. Crawford and probably Mr. Carter himself were not confused by this secondary issue. Mr. Crawford made it unmistakably plain that, regardless of any theory supposed to be held by employers at variance with the theories of organized labor, in his opinion the fireman had contributed nothing whatsoever as a factor in the development of heavier trainload and greater traffic density. If we understood Mr. Crawford correctly, the fireman has no more claim to a share in the increase in earnings on freight due to larger locomotives than has the mechanical draftsman who copies from an engineer's instructions the drawings of this locomotive.

THE address by Halford Erickson, member of the Wisconsin Railroad Commission, an abstract of which is published elsewhere in this issue, is of especial interest at this time for several reasons. The general subject of regulation of public utilities by commissions is prominently before the public; and Mr. Erickson's address is a broad statement and discussion of the policy of regulation followed by a commission that has large powers and has for some years been recognized, regardless of changes in its personnel, as one of the ablest and fairest regulating bodies in the country. The specific subject of valuation of railways also is prominently before the public. Congress having just passed a law providing for a valuation of all the railways in the United States; and Mr. Erickson tells in detail how valuations of all kinds of public utilities, including railways, are made, and the factors that are included, by a state commission that has studied this subject thoroughly from the standpoints of law, economics and public policy, and that has had a long and varied experience in making public utility valuations. Finally, the address gains interest from the experience and personality of its author. Mr. Erickson, prior to his appointment to the Wisconsin commission, was active in the politics of his state, was a supporter of the LaFollette wing of the republican party, and was one of Governor LaFollette's original appointees to the commission in 1905, when it was reorganized with largely increased powers. The other members appointed at that time were John Barnes and Prof. B. H. Meyer, both of whom long since retired from the commission. Mr. Erickson is, therefore, the oldest member of the Wisconsin commission in point of service. In view of all these facts, the moderate tone of Mr. Erickson's address, and his outline of the principles and methods that should be followed in public regulation, have much significance. His utterances are equally different in form and substance from those the public is accustomed to hearing from the radicals among politicians and railroad commissioners, and from the extreme conservatives among public utility managers. Undoubtedly both the tone and substance are partly due to the fact that Mr. Erickson has a natural disposition to be moderate; but they must also be very largely due to his thorough study of and great experience with the matters he discusses. The basis of the hope for the success of government regulation in the United States is that the number of moderate men among both those who regulate public utilities and those who manage them, is, as indicated by their public utterances, rapidly increasing and that it will continue to do so; for experience in this country has shown that men of moderate temper and views can usually agree on and carry out harmoniously sane and fair policies.

GRADE AND CURVE REDUCTION.

FEW subjects are of more vital importance in the study of economical railway operation than the extent to which grade and curve reduction should be carried. Several roads are now spending large amounts to secure standards of grade and alinement which would not have been considered practicable a few years ago. Theoretically, the best line between two points is a straight line with a uniform grade. Practically, the topography, possible traffic and ability to secure easier grades may make it advisable to vary considerably from a straight line. A reduction in the ruling grade enables larger train loads to be handled and thereby reduces the cost of operation. On the other hand, an increase in the length of the line increases the cost of construction, the fixed charges and the cost of maintenance. It is important to determine the economical limit to which this increase in length may be carried to secure lower ruling grades. This limit varies on different roads, for the greater the traffic, especially of low grade freight which permits heavy train loading, the greater the amount a road is justified in spending to reduce its grades. Obviously, a road having the traffic density of the Pennsylvania Railroad can afford to spend more to secure low grades than a western line having only a few trains a day.

Other considerations also enter, one being the starting resistance of a train, which is considerably greater than the resistance of the train in motion. Numerous tests have shown this starting resistance to be approximately equivalent to that of a 0.3 or 0.35 per cent. grade. Where possible, therefore, ruling grades are either reduced by this amount near stations, water tanks, signals and other points where trains stop frequently, or these facilities are located on grades lower than the ruling. As trains may occasionally have to stop at any point on the road, many engineers have not considered it advisable to reduce the ruling grade below 0.3 per cent.; but in the last few years lower ruling grades have been adopted on several roads, the first of which was the Spokane, Portland & Seattle, which was built in 1907 with a maximum grade of 0.2 per cent. between Pasco, Wash., and Portland, Ore., a distance of 230 miles. While this line was built along the Columbia river, the low grade adopted materially increased the cost of construction and caused considerable discussion. The Baltimore & Ohio fixed 0.2 per cent. as the maximum grade for a second track across the state of Indiana, which has been built during the past two years. The Erie is building a second track between Meadville, Pa., and Corry, which has the same ruling grade and involves some very heavy work. Measured by the standards of previous years, these grades may not be justified, but their adoption is proof that new standards are being developed.

One argument in favor of such low grades is based on the reasoning followed in adopting momentum grades. Within recent years the momentum or velocity grade has come to be considered approved practice when located between stations where there is no cause for regular stopping of trains. In such cases it is considered advisable to run the risk of a train being stopped by some unexpected cause, which would make it necessary to double to the first siding beyond the top of the grade, or to back down and make another run for the hill. The 0.2 per cent. grade may be operated in the same way if the grades at stations, water tanks and other regular stops are so laid that the virtual grade at these points does not exceed the actual ruling grade.

Even more startling than these standards for grade reduction are those which are being adopted for curves. The Burlington for the past three years has been building a second track along its line extending 300 miles south from St. Paul, Minn., along the east bank of the Mississippi river. The old line was built with a maximum curve of 3 deg. at a moderate cost. In connection with the building of the second track, this standard of curvature is being reduced to 1 deg., which adds considerably to the cost. The Milwaukee has been building a second track between Minneapolis, Minn., and Aberdeen, S. D., the past three years

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and is at present double tracking its line across the state of Iowa; and in both cases the maximum curvature is 1 deg. The lines included in this work aggregate over 600 miles and involve some heavy construction. These examples indicate that railways are being built today to standards which were not thought of a few years ago. For this reason the analysis of the various kinds of resistance by Walter Loring Webb in an article elsewhere in this issue is especially valuable. The subject is so important that it deserves serious consideration; and a thorough discussion will help to bring together all the essential facts.

"AMERICAN METHODS" AT HOME AND ABROAD.

THE annual report of the North-Eastern Railway of England for 1912 shows interestingly the results gained on an English railway by what are significantly known as "American methods." Some years ago George Paish, editor of the *Statist* of London, published a series of articles criticising the operation of English railways as unnecessarily costly. These papers were republished in a book entitled "The British Railway Position." The main ground of Mr. Paish's criticism was that the English roads handled their traffic in too small train loads. He sharply contrasted the fact that the train mileage of English railways increased practically as fast in proportion as the amount of traffic they handled with the fact that the railways of the United States, by working steadily to increase their freight train loads, handled a rapidly growing business without a proportionate increase in the number of train miles. The railways of the United States long ago began compiling ton mileage, passenger mileage and train load statistics, and it has been largely by constant study and comparison of these that the railway managers of this county have been able to exercise supervision that has resulted in the development of the very large freight train loads in which business is handled here. Mr. Paish urged the railway managers of England to follow the example of their American brethren. He recognized the fact that owing to differences in conditions, traffic in England could not be handled in as large train loads as in the United States, but he was sure that the train loading of English railways could be increased and that thereby substantial economies could be made.

Mr. (now Sir) George Gibb, then general manager of the North-Eastern, soon afterward introduced "American" methods so far as he thought they were applicable to British conditions. The North-Eastern ever since has compiled and used statistics similar to those of the railways of the United States. The results are indicated by its train load, train mileage and financial figures. In 1902, when it began compiling these statistics, its average goods train load was 59.76 tons; in 1912 it was 95.4 tons. In 1902 its mineral tonnage per train was 113.81 tons; in 1912 it was 183.86 tons. In 1902 its total average tonnage per freight train was 84.23 tons; in 1912 it was 133.84 tons. The increase in its average freight train load in 10 years was 66 per cent.

The average freight train load of the North-Eastern does not seem large when compared with that of the railways in this country, which, in 1910, was 380 tons. But when its trainload is compared with that of English railways in general the showing is quite different. While no trainload statistics for all of the railways of the United Kingdom are available, other statistics that are available indicate that their average trainload is only 85 to 90 tons. The main reasons for the small train loads in England are that the average haul per ton is very short—it was only 24 miles on the London & North-Eastern in 1912—that freight is shipped in small consignments, and that the railways handle it in small cars and in trains that are run on regular schedules and at high speeds. The experience of the North-Eastern shows, however, that the British roads by the use of American methods can increase their train loading. The North-Eastern, largely because it has secured better train loading, has strengthened its financial position. Its property is well maintained; and it announced a dividend for the last half of 1912 at the rate of 7½ per cent. per annum, which is more than twice the average for British railways.

Not many students of railway economics seem to appreciate that the system of economizing by handling freight traffic in large train loads originated in the United States, or how largely it is still confined to this country. For the development of this system the greatest credit to any individual is due to James J. Hill. The only country whose railways handle their freight in anywhere near as large train loads as those of this country is Canada; and there the methods developed in the United States have been applied by railway managers such as Sir William Van Horne, Sir Thomas Shaughnessy and Charles M. Hays, who were born in the United States and received their early railway training here.

The way that the freight traffic of the Canadian roads is handled contrasts sharply with the way in which that of the railways of Australia—the second greatest of British colonies—is handled. The freight traffic density of the Canadian roads is very much larger than that of the New South Wales roads, the average ton miles per mile in Canada in 1912 being 731,776 and in New South Wales only 226,906. While the volume of freight traffic on the New South Wales roads is comparatively light, a large part of it is well adapted to heavy loading, 63 per cent. of it being minerals. Nevertheless, while the Canadian roads handled an average of 325 tons per train in 1912, the New South Wales roads handled an average of only 90 tons per train. In consequence, in spite of the fact that the freight density of the Canadian roads was over 220 per cent. greater than that of the New South Wales roads, the New South Wales roads actually ran more freight trains per mile to handle their very much smaller traffic, the average freight train miles per mile on the Canadian roads being only 2,252 and on the New South Wales 2,512. It is largely owing to this that the Canadian roads can make an average rate of 7.57 mills per ton per mile, while the New South Wales roads charge 1.78 cents.

It strikes a student of American and Canadian railway affairs as rather curious that in Australia, in spite of the light traffic, the matter of "duplicating"—in other words, double-tracking—the lines is being vigorously agitated. Although the New South Wales lines are handling only a traffic which any single track railway in the United States or Canada would handle with ease, it is, nevertheless, a fact that some of their lines are congested. What they are congested with, however, is not traffic but trains. It would seem from their statistics that by increasing their car loads and train loads the New South Wales lines could handle their freight traffic with one-half as many freight train miles per mile as they now run, and thereby make large savings in operating expenses and postpone the time when a large investment in additional trackage will be necessary. Even if they were doubled their freight train loads would be only a little more than half as large as those of the Canadian roads. The Canadian roads handle 63 per cent. more ton miles and passenger miles per mile than those of New South Wales; yet their train miles per mile are 18 per cent. less and their operating expenses per mile are slightly less.

The difference between the rates and operating results of the Canadian and the New South Wales lines, both of them in new and undeveloped countries, show how much more desirable is the application of American methods than of English methods to transportation in such countries. The fact that the New South Wales railways are operated by the government and most of those of Canada by private companies has no small bearing on the matter.

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"KEEPING THE BUNK IN BUNKUM."

IN an article in the *Saturday Evening Post* a few weeks ago, Samuel G. Blythe compared the methods in the English House of Commons and in the American Congress. After many years spent in close contact with the American legislator he went to England to take a close look at the legislator and legislation there. He concluded that while there may be a question historically whether it was the English parliamentarian or the American congressman "who first put the bunk in bunkum," there can be no doubt that at some time or other both put it in and that they are both sedulously keeping it there. Congressmen are being assisted in this country by the state legislatures and many other public officials.

Not long ago the Supreme Court of the United States (212 U. S. 1) criticised the disposition of legislative bodies (Congress, legislatures, and city governments) to dodge their duties and leave it to the courts to decide whether private property is being confiscated. Legislators very often "pass it up to the courts," to employ their own language—that is, enact any measure the notion of the hour or the clamor of the street suggests, notwithstanding they may believe it to be unconstitutional or otherwise invalid. This kind of disloyalty to duty and to country has brought undeserved criticism upon the courts for declaring void laws passed by the representatives of the people.

The crying need of the time in getting actual law to conform to business requirements in some way of taking the "bunk out of bunkum." In the House of Commons they have one advantage over us, viz., that, with few exceptions, no bills can be introduced except by the government; that is by the party in power. In this country every member can introduce "bunk" bills without limit.

* * *

For a number of years men seeking to acquire or desiring to retain office have employed the spectacular means of going after "big business" or "the man higher up." This gives the statesman a position in the limelight, does not detract from the voting power behind him, and consequently has become the most popular course to take.

The spectacular regulation of railways has gone so far as to provoke a protest from the sober people of the country, who see that the present earnings of the companies are inadequate for the good of traffic and the safety of the public. But many a quack statesman went into office and achieved distinction by spectacular assaults upon the carriers. The railway companies were largely defenseless; for, even their employees often voted against their interests down to a year or so ago, when many of them began to see on which side their bread was buttered. So the legislator was free to go through his spectacular performance without suffering a loss of votes. Where his activities would alienate voters, or affect unfavorably the interests of those who control votes, he maintains "a masterly inactivity."

There is no objection to the proper supervision of railways to insure reasonable rates and to prevent discriminations. But regulation of railways illustrates what a thundering emphasis has been put upon what is of comparatively little consequence to the man who pays the monthly bills, while matters of living costs bearing with extreme weight on him and his family have passed and still pass unremedied and, indeed, almost unstudied. So when the cry about the steadily increasing cost of living reached its loudest the legislator was unprepared to discuss or deal with the subject. He was bewildered because his ten-year assault on railway rates had proved the prophecy of railroad managers by producing no effect to the benefit of the man who pays the bills. The statesman was outclassed by the occasion and the opportunity; and nothing definite or practical is being done to correct the wasteful and oppressive methods of business that are a real back-breaking weight on the consumer.

Take, for example, the case of the multitudinous class called "middle-men." Sometime ago a railroad officer bought a pound of California cherries in Chicago for 30 cents. The man who had invested his money in the orchard, taken the risks and performed the labor of production, sold the cherries for four cents. The carrier hauled them 2,500 miles for 1.15 cents. The middle-men got the other 24.85 cents. This is not an extraordinary case. The common carrier's charge which enters into the food and clothing and other necessaries of the average family is trifling. Nevertheless, for about ten years the interest and political activities of a school-bred and college-bred country have been turned toward the hammering down of freight rates. If something had been done about eliminating that 24.85 cents on cherries and a similar part of the cost to the consumer of vegetables, eggs, butter, poultry, meat, fruit, and other necessaries, the cost of living might be quite another matter today.

Recently a case was tried before the Interstate Commerce Commission in which middle-men in Kansas complained of freight rates which were prejudicial to them in "their territory" (as they termed it) in comparison with rates paid by middle-men at St. Louis and at Kansas City. There was the so-called "Topeka territory" the "Wichita territory," the "Salina territory," and the "Hutchinson territory," in which the shippers thought they had a right to interject themselves between the consumer and the seller, and thereby add to the costs of living. The consumer should not be obliged to buy in any of the territories mentioned, or in Kansas City or St. Louis, if the thing he wants is not made at one of those places. The consumer should be helped to buy as far as practicable direct from the manufacturer or the producer. Most of the complaints against the rates of carriers made before the Interstate Commerce Commission and before the state commissions have been made by the middle-men, and most of the decisions of the commissions have tended to strengthen and entrench them. The noise of contention which has all but cracked the firmament during the last ten years has not been, as so many think, the sound of combat between freight-payer and carrier between a people struggling to be free and predatory corporations fighting to maintain a thralldom. The strife has been chiefly of middleman against middle-man, with the carriers and the real freight-payers bearing the burden.

* * *

The monopoly and the largely needless cold storage of eatables has received no adequate attention while the legislator has been "keeping the bunk in bunkum" by clamoring for the head of the man higher up. A lower cost of food and a minimum amount of it that is tainted would do the average worker much more good than he could derive from the presence of a big man in a penitentiary. The grossly inefficient methods of distribution and delivery in the cities have increased as rapidly as the costs of the middle-men. And these costs, unlike railway freight charges, weigh heavily on the individual.

Closely related to the default mentioned in the preceding paragraph is the general uncleanness of food and water. Recently published statistics show that in 50 of the leading cities of Europe the cases of typhoid fever are only one-fifth as many as they are in the leading cities of the United States. In this country anybody has been pretty free to sell anything to anybody else in the way of dirty foods and dirty drinks. Investigations have shown that in many of the kitchens in the cities where food is prepared in large quantities care and cleanness are uncommon. Bread and other foodstuffs are handled and delivered without being wrapped. Formerly Chicago followed the example of the pious Hindoo, who lives where cholera begins, and drank the water from its wash basin and drainage system. Later it constructed a drainage canal and poured its sewage into it; and the cities along the Mississippi complained that it thus kept up to a degree the Saxon practice described by Macaulay of throwing slops and uncleanness out of the windows and into the streets, perchance upon the heads of passers-by. Meantime our legislators have been thundering about railway over-capitalization that cannot be proved and denouncing the lowest freight rates in the world.

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Nor have legislators given relief from the injustice of our so-called "system" of taxation. The burden upon the poor householder and the large corporation is very heavy, while it is relatively light on many that are competent to pay. A good sidestepper need pay nothing. But of course there is nothing political to be lost by "soaking" the small taxpayer; there is spectacularity and popularity to be gained by going after the common carrier; and there is some risk in going after the big local business man.

* * *

The law writers say that as the power to tax is the power to destroy, it should be exercised only to the least degree necessary to support the government. But the question with the modern statesman is not where it *should* be exercised, but where it *can* be; and all the inventive genius of the Yankee has been exercised in devising new ways to lay taxes. In several instances the rivalry of publicans in different states to collect an inheritance tax on the property left by a man has portended that one of these times the corpse will be stripped of its cerement. Everybody is paying more taxes than he ever did before, and yet the Taft administration had to invent the corporation earnings tax to get the country out of the hole into which the Roosevelt reign had put it.

Where does all this money go? There is probably not a city in the country of over 100,000 population with adequate schoolhouse facilities. We do not pay our teachers reasonably, and have often been twitted by foreigners with being the only people in the world that let out the education of their children to the lowest bidders. We don't pay our judges adequately. The management of almost any public institution affords material for a scandal on any dull day that a newspaper wants to look in. We don't enforce our laws against crime. What becomes of all the money raised by taxes? The constant increase of taxes, like the constant hammering of freight rates, does not seem to produce results. Should not actual law be brought up more nearly to such needs of business? There would be no "bunk" in a genuine reform of taxation. Doubtless that is why the dull and difficult subject does not recommend itself to most legislators.

* * *

One of the results of our grossly inefficient government is that over 9,000 homicides are committed in this country in a year. Might not conditions be improved by regulating railway rates a little less and murder a little more? Another result of inefficient government—of the failure to pass and enforce good laws—is that almost 5,500 trespassers are killed on our railways annually. Is regulation to save the lives of passengers so much more important than regulation to save the lives of the fifteen times as many trespassers who are killed?

How much longer will it take the good people of this country to awaken to the fact that the need of the time is for putting more stress on the unimportant and less on the relatively unimportant; that "bunkum" is not good government; that "bunk" is not the corner stone of good government; and that therefore "keeping the bunk in bunkum" is not the first duty of a statesman?

NEW BOOKS.

Regulation, Valuation and Depreciation of Public Utilities. By S. S. Wyer, consulting engineer, Columbus, Ohio. Published by the Sears & Simpson Co., 116 West Spring street, Columbus, Ohio. Flexible leather binding; India paper; 313 pages. Price, $5.

This book is a discussion and compilation of the pertinent, economic and legal facts relating to the valuation of public utilities. The book is intended not as an argument for or against valuation, but rather an attempt to establish a code for valuation. No attempt will be made here to discuss the author's theory of valuation, since it is sufficient to say that no two engineers agree exactly as to the details of the basis on which a valuation should be made. The book is well gotten up. It contains, besides 13 chapters on the general subject of valuation, two chapters giving engineering and reference data, and a sixteenth chapter containing a bibliography. The book has 47 illustrations.

Letters to the Editor.

ENTERPRISING STATION AGENTS.

QUEENSTOWN, WIS., March 20, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In your issue of February 21, page 334, in an article on "What Many Station Agents Miss," we are told in an interesting way how station agents could use their spare time to assist the company by getting new industries located at their stations; giving some instances of what had been accomplished in that line. The agent's time belongs to the company employing him and it is his duty to do all in his power to use his spare time outside of his regular duties to secure extra business.

There are two sides to this question. I prefer the station I am appointed to rather than the one I have worked up to a good business. It is one thing to get in new industries, but it is a decidedly different matter to take care of them after you get them into your town. I think that the main reason that more agents do not keep awake in that line is that the railway companies do not seem to realize that the increased business means increased work on the part of the agent. If some man before him has managed the station without the increased business, they will work the life out of him; and if he cannot do the work, after having been the means of getting the increased business, they will appreciate his work by removing him and getting someone else to take the position, at the same salary and no more help. My experience and observation have convinced me that this is the way it goes. Such an appreciation doesn't offer much inducement for a man to "let out his belt" and work hard.

I am telling you plain facts. It seems to me that in handling different men, each case should be considered in a class by itself, as much as possible. The straight edge of a rigid rule should not be applied to all cases indiscriminately. I believe that, if each case were considered on its own merits, far greater justice and efficiency would be accomplished. If a station is in real need of additional assistance, and does not get it, the surplus business will many times be lost or driven away through inattention or intentional neglect. It does not take much increase in earnings to pay another clerk's salary. M. L. D.

SUITABLE STUDIES FOR STATION AGENTS.

THREE LAKES, WIS., March 17, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Our modern magazines abound with advertisements of correspondence schools guaranteeing to teach everything from Law to Engineering, and from How to Sell Real Estate to How to Speak French. It has been my observation that railroad men, especially station and office men, are great consumers of these so called courses of instruction; and, while for one already somewhat acquainted with the subject which he essays to study they might be of some assistance, I believe that in the majority of cases they are soon dropped, leaving the purchaser out of pocket the amount he has paid, and his employer out the time and energy he has wasted on it.

It is my belief that most of the railroad employees taking up these courses do so, not because they really want to study law, banking, civil engineering, or the dozen and one things they take up, but simply because they are ambitious to fit themselves for a higher and more remunerative position; and the advertisement, with its alluring literature, is the only way they see open. If the railroads would make it possible for them to get in touch with good railroad literature, and books giving instruction on railroad matters they would not waste their money, nor their employers' time, on instructions pertaining to outside occupations; and both the company and the employee would be ahead.

I believe that if some department of the railway made it a

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point to keep in touch with all books published pertaining to the railway business, reporting on each as to its merits; and to assist railway employees to any possible reduction in rates of subscription to the better class of railway magazines, such as the *Railway Age Gazette*, much good could be accomplished, and much assistance given to the rank and file of employees in gaining proficiency in their work.

D. E. LAMON,
Agent, Chicago & North Western Railway.

SLOVENLY WHISTLING.

BRADFORD, Pa., March 8, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

While much has of late been written upon the very commendable "Safety-First Movement," I do not recall having read anything on one subject which might properly come under this head—that of the proper use of the locomotive whistle in conveying signals.

To illustrate, the book of rules prescribes two long followed by two short blasts of the whistle on approaching a road crossing. Stand for a couple of hours at a road crossing on some busy main line—or, better yet, at a place like Depew, N. Y., where the New York Central, the Lehigh, the Lackawanna and the Erie parallel each other within a comparatively short distance—and listen to all of the various interpretations of that rule. You hear two blasts followed by two shorter ones, all consuming from one to three seconds; and, all being quiet and weather conditions perfect, the whistle is heard; with conditions unfavorable it is not heard. Then there is the whistle blown with such poor spacing of the blasts that at a distance it may sound like one long and two short blasts, or like two long and one short. Next you may hear two reasonably long followed by two short blasts, all full, clear and nicely spaced. And so on; as each train comes along there is a different style to the signal, some good and some not.

This applies to other whistle signals as well. Several years ago while spending the night on a farm midway between Dunkirk and Brocton and about half a mile from the Lake Shore tracks I heard a limited train on that road whistle in a manner that sounded good. The two long blasts were each of about three seconds' duration, and the two short ones of about one and one-half seconds and about a two-second interval between the blasts. Have you heard the station whistle of one short blast of less than one second's duration? A blast of from five to ten seconds would have clearly advised the train crew as well as the agent at the station of the train's approach to the station, while it is extremely doubtful if the "less than a second" blast does.

I believe that more care should be exercised in handling the whistle than is now the general practice. The blasts should be sufficiently long and fully spaced to clearly, distinctly and definitely communicate the signal intended. While it may be technically complying with the law to blow the whistle any old way, yet equitably and ethically it is not a reasonable compliance unless the results for which the law is intended are fulfilled.

W. R. SHAW.

[We print this rather long letter because it brings up a subject to which more attention should be given. The title which we have put on the letter expresses an idea which must arise in the mind of the careful railroad officer very frequently on the great majority of roads. We have touched on this subject editorially now and then. The few superintendents who have responded to what we have said have reported their experiences in such a way as to indicate that most superintendents and trainmasters are too much engrossed, with matters deemed more important, to give more than occasional and superficial attention to this one. Our correspondent commends the artistic performance of the engineman of the Lake Shore Limited who cheered the farmers of the "grape belt" with a signal which aroused the echoes of the night for about 15 seconds. We can readily understand that in a lonely farm house, half way between Dunkirk and Brocton, especially if not situated too near the railway, one might be glad, in the silent watches of the night, to hear this evidence that the world was still alive; but, unfortunately for this innocent theory of life, there are thousands of people, all along the railroads of America, who make a very rational demand for less noise instead of more. It is not always easy to adjust the equities with precision, for where trains are very numerous the briefest whistle blasts become a nuisance by their frequency. The only reasonable rule, therefore, is to make every blast as short as is practicable. Two seconds is long enough for the highway crossing signal; three seconds should be called very long. To require every engineman to rightly proportion the length of all the sounds is the duty of every superintendent. In many situations it is a plain duty to the public not only to shorten blasts, but to use softer whistles.—EDITOR.]

SECTIONAL CROWN FIREBOX.

NEW YORK, March 11, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The article on "Impressions of Hungarian Railway Practice," by Henry W. Jacobs, in your issue of March 7, illustrates a firebox having a crown built up of channel sections and designated as the Polonco sectional crown firebox. The statement is made in a foot note that: "The first one was built 30 years ago by the late Herr Polonco, an Austrian engineer," from which the natural implication is that the design was originated by the party named.

As a matter of fact, it is that which has been applied to some extent in Europe, under the title of the "Polonceau firebox," having been patented by Monsieur Polonceau, a *French* engineer. (French patent No. 124,069, April 25, 1878.) It will be found illustrated in *Organ fur die Fortschritte des Eisenbahnwesens in Technicher Beziehung*, Band 16, 1879, Taf. III, Figs. 13 and 14, and in *La Chaudiere Locomotive et son Outillage*, by G. Richard, Paris, 1886, Figs. 24 to 27, and the following statement (literal translation) is made regarding it: "The entirely recent invention of M. Polonceau has not yet received the definitive sanction of a prolonged practice, but it seems difficult to foresee, for this logical simplification of the firebox of locomotives, anything other than a full success."

In both these publications, strips of metal are shown interposed between the channel sections. It is clear that Mr. Jacobs' informant has, doubtless inadvertently, misled him, and as to "Herr Polonco, an Austrian engineer," I think that "there never was no sich person."

However, this may be, the credit of originality of this design cannot be awarded to either Monsieur Polonceau or "Herr Polonco," nor was it first *built* by either of them, as will appear by reference to the illustrated article entitled "Locomotive Boiler, Designed by Joseph A. Miller, C. E., Boston, U. S.," in *The Engineer*, London, March 3, 1871, page 142, from which I make the following excerpt: "The boiler, illustrated in the accompanying engraving, unites two of Mr. Miller's patents, each of which has been tested by practice. Fig. 1 is a longitudinal section of a locomotive boiler, 15 ft. long with 4 ft. 6 in. barrel. . . . The crown chest (sic) is made up of flanged sections 6 in. wide and 6 in. deep. They are arched, and besides having great strength, Mr. Miller claims that they conduct heat into the water." See also *Eisenbahnwesen*, Band 8, 1871, Taf. K, Fig. 15.

Another application of the same principle is shown in the U. S. patent of H. S. Bryan, No. 198,342, dated December 18, 1877, the channel sections being, in this case, disposed longitudinally, instead of transversely, as in the Miller and Polonceau designs, and it has been carried to its logical development in the Jacobs-Shupert firebox, in which the roof or wrapper is similarly built up of channels, connected to those of the crown by interposing stay sheets.

J. SNOWDEN BELL.

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BALDWIN LOCOMOTIVES BUILT DURING 1912.*

Tendencies In Design and Construction of Freight and Passenger Power as Shown by a Survey of Last Year's Output.

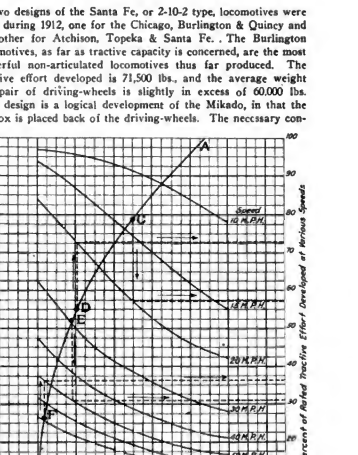
Locomotive development is influenced principally by traffic requirements, and the locomotives built during 1912 clearly illustrate the fact. Increasing train weights, the need for higher operating efficiency, and more stringent regulations with a view to promoting safety in travel, all combined to influence the types of locomotives placed in service. To meet these conditions has required locomotives of increased average weight and a more general adoption of such fuel saving devices as superheaters and brick arches. As a result, the increase in weight and nominal capacity has been accompanied by an increase in efficiency, rendering the locomotives more reliable in service and reducing the amount of double heading formerly required in order to maintain difficult schedules. The observance of stringent speed regulations at curves, junctions and other points where accidents are specially liable to occur, has contributed to the necessity for using locomotives of improved efficiency, capable of maintaining schedules without running at excessive maximum speeds.

FREIGHT LOCOMOTIVES.

In studying the product of The Baldwin Locomotive Works for the year, the most conspicuous feature, as far as freight locomotives are concerned, is the development of the non-articulated locomotive. Comparatively few heavy consolidation locomotives were built, practically all the eight-coupled engines for through traffic on trunk line railways being of the Mikado type. The principal superiority of the latter over the consolidation type lies in its increased relative steaming capacity, as illustrated in the accompanying diagram. The line *AB* shows the average relation between the percentage of total weight on driving-wheels and the ratio of rated tractive effort to heating surface for a large number of locomotives of different types. It is evident that the lower the value of this ratio, the greater will be the steaming capacity in proportion to the tractive effort developed. The point *C* indicates an average value for locomotives of the consolidation type, and the point *D* for locomotives of the Mikado type. The transverse lines indicate the percentage of the rated tractive effort developed at various speeds by locomotives having different relative steaming capacities. These percentages are read on the right hand side of the diagram. At a speed of 20 miles an hour, for example, the consolidation locomotive develops 57 per cent. of its rated tractive effort, while the Mikado develops 72 per cent. This illustrates a fundamental difference between the two types. The Mikado is further favored because of its larger firebox volume, which is a feature of special value when burning high volatile coal. Locomotives of this type are making excellent records in heavy, slow-speed service and also in fast freight service where high horse-powers must be developed. Under favorable conditions, such locomotives, equipped with superheaters, are hauling 30 per cent. more tonnage than the saturated steam consolidation type engines formerly used in the same service, with no increase in actual coal consumption.

The following table contains the leading dimensions of nine heavy Mikado type locomotives built during the year.

Two designs of the Santa Fe, or 2-10-2 type, locomotives were built during 1912, one for the Chicago, Burlington & Quincy and the other for Atchison, Topeka & Santa Fe. . The Burlington locomotives, as far as tractive capacity is concerned, are the most powerful non-articulated locomotives thus far produced. The tractive effort developed is 71,500 lbs., and the average weight per pair of driving-wheels is slightly in excess of 60,000 lbs. This design is a logical development of the Mikado, in that the firebox is placed back of the driving-wheels. The necessary con-



Point C—2-8-0 type. Point E—4-6-0 type.
Point D—2-8-2 type. Point F—4-6-2 type.

Relation Between Percentage of Total Weight on Drivers, Relative Steaming Capacity, and Tractive Effort at Various Speeds.

sequence is a long boiler barrel; but a combustion chamber is used, and the length of the tubes is 22 ft. 7½ ins., which is not abnormal. These locomotives are equipped with automatic

*The following locomotives built by the Baldwin Locomotive Works were described and illustrated in the *Railway Age Gazette* during 1912: January-June—Erie, 2-8-2 type, Page 241; Chicago, Burlington & Quincy, 2-10-2 type, Page 1006. July-December—Virginian, 2-8-2 type, Page 20; Chicago, Rock Island & Pacific, 2-8-2 type, Page 352; Great Northern, Mallet type, Page 572; Chicago, Burlington & Quincy, 2-8-2 type, Page 1045.

HEAVY MIKADO LOCOMOTIVES.

Road.	Cylinders, In.	Drivers, In.	Steam Pressure, Lbs.	Grate Area, Sq. Ft.	Water Evaporating Surface, Sq. Ft.	Superheating Surface, Sq. Ft.	Weight, Total Engine, Lbs.	Weight on Drivers, Lbs.	Tractive Effort, Lbs.
Wabash	25 x 30	64	200	63	4,473	...	262,700	202,800	49,800
Union Pacific	23½ x 30	57	180	73.5	4,181	895	365,700	296,500	45,500
Chicago Great Western	27 x 30	63	185	70	4,105	880	283,100	217,900	54,800
Illinois Central	27 x 30	63	175	70	4,100	886	280,000	217,000	51,700
Baltimore & Ohio	26 x 32	64	190	70	3,968	833	276,000	219,000	54,500
Woodward Iron Company	24½ x 30	55	200	75	6,036	...	285,000	220,000	55,000
Virginian	26 x 32	56	185	57	4,359	910	297,500	229,600	60,800
Chicago, Burlington & Quincy	28 x 32	64	180	78	4,627	961	303,400	231,000	60,000
Chicago, Rock Island & Pacific	28 x 30	63	180	63	4,264	905	318,850	243,200	57,100

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stokers and Emerson superheaters. With driving-wheels 60 in. in diameter, it is impossible to put the necessary amount of counterbalance in the main wheel centers, and two cast steel counterweights are accordingly mounted on the main axle between the frames. In this way a satisfactory arrangement of counterbalance is secured. Five of these locomotives were built for handling heavy coal traffic in Illinois. In many respects the Mikado type locomotives previously referred to, are similar to them; and interchangeable details have been used where practicable.

The locomotives for the Atchison, Topeka & Santa Fe, of which 20 were built, are lighter than the Burlington engines, and are a development of the 2-10-2 type locomotives built for this road during the years 1903-1907. These engines used saturated steam in tandem compound cylinders, whereas the new ones use superheated steam in single expansion cylinders. The superheaters are of the Schmidt type, and the locomotives use oil for fuel. In this design the firebox is placed above the rear pair of driving wheels, and the rear truck is of more value as a means of guiding the locomotive when running backwards, than for providing increased boiler capacity. The principal dimensions of the Santa Fe and Burlington locomotives are given in the following table:

MALLET LOCOMOTIVES.

Road.	Cylinders, In.	Drivers, In.	Steam Pressure, Lbs.	Grate Area, Sq. Ft.	Water Evaporating Surface, Sq. Ft.	Superheating Surface, Sq. Ft.	Total Weight, Engine, Lbs.	Weight on Drivers, Lbs.	Tractive Effort, Lbs.	Wheel Arrangement.
Missouri, Oklahoma & Gulf	21 & 32 x 30	55	210	53.4	3,407	685	315,800	277,100	60,800	2-6-6-2
Pennsylvania	25 & 39 x 30	56	205	78	4,936	1,020	408,700	408,700	82,000	0-8-8-0
St. Louis, Iron Mtn. & Southern	26 & 40 x 32	55	200	84	5,763	890	435,000	393,000	94,500	2-8-8-2
Southern Pacific	26 & 40 x 30	57	200	68.4	5,626	900	436,200	400,900	85,500	2-8-8-2
Great Northern	28 & 42 x 32	63	210	78.4	6,446	1,368	450,000	420,000	100,000	2-8-8-0

The locomotives for the Atchison, Topeka & Santa Fe, of which 20 were built, are lighter than the Burlington engines, and are a development of the 2-10-2 type locomotives built for this road during the years 1903-1907. These engines used saturated steam in tandem compound cylinders, whereas the new ones use superheated steam in single expansion cylinders. The superheaters are of the Schmidt type, and the locomotives use oil for fuel. In this design the firebox is placed above the rear pair of driving wheels, and the rear truck is of more value as a means of guiding the locomotive when running backwards, than for providing increased boiler capacity. The principal dimensions of the Santa Fe and Burlington locomotives are given in the following table:

SANTA FE TYPE LOCOMOTIVE.

Road.	Cylinders, In.	Drivers, In.	Steam Pressure, Lbs.	Grate Area, Sq. Ft.	Water Evaporating Surface, Sq. Ft.	Superheating Surface, Sq. Ft.	Weight, Total Engine, Lbs.	Weight on Drivers, Lbs.	Tractive Effort, Lbs.
Atchison, Topeka & Santa Fe	28 x 32	57	170	58.5	4,367	910	293,900	248,900	63,800
Chicago, Burlington & Quincy	30 x 32	60	175	88	5,161	970	378,700	301,800	71,500

A notable order for Mallet locomotives was filled for the Great Northern, which received 25 engines of the 2-8-8-0 type. These exert a tractive effort of 100,000 lbs. working compound, and are fitted with Emerson superheaters. A device is used, controlled by a hand-wheel and screw, for changing the cut-off in the low pressure cylinders independently of the high pressure. With this arrangement the power developed in the front and back engines may be equalized when running at various speeds. Seventeen of these locomotives are coal burners, while the remaining 8 use oil for fuel. All have boilers of the Belpaire type, with tubes 24 ft. long and combustion chambers 58 ins. long.

The Southern Pacific received 15 Mallets of the 2-8-8-2 type. These are oil burners, and in their general features follow the well-known design first introduced in 1909 on the Central Pacific. The separable boiler with feed-water heater is retained in the new locomotives, but the smokebox reheater is omitted and a Schmidt superheater applied. The superheater is placed in the chamber between the feed-water heater and the boiler proper. This places the header close to the high-pressure cylinders, and the superheater steam pipes are so short that there is but little opportunity for the steam to lose its heat. These locomotives are arranged to run with the cab end leading.

A Mallet locomotive of the 0-8-8-0 type, specially adapted to pushing service, was built for the Pennsylvania. It has a boiler of the Belpaire type, with tubes 23 ft. long, and is fitted with a Schmidt superheater. Another locomotive for special service, with the 2-8-8-2 wheel arrangement, was built for the St. Louis, Iron Mountain & Southern. It is intended for the heaviest class of hump-yard service and is fitted with a separable boiler, feed-water heater and Schmidt superheater. The starting-valve is of the type used on Baldwin two-cylinder compound locomotives, and allows steam to pass direct to the high pressure cylinders at starting, and subsequently changes the engine to work compound entirely.

Five Mallet locomotives for heavy, slow-speed road service were built for the Missouri, Oklahoma & Gulf. These operate on 70-lb. rails, and have a hauling capacity of 3,000 tons on a grade of 0.6 per cent. They are fitted with Schmidt superheaters, and illustrate the suitability of the Mallet type for heavy service on comparatively light tracks.

In all these locomotives special attention has been given to simplifying the arrangement of the steam piping as far as possible, and to providing ample strength in the structural parts. Cast steel has been used to excellent advantage. The high-pressure cylinder saddle is formed with a suitable cavity in which the ball-joint of the receiver pipe is seated. The center line of the ball-joint coincides with that of the articulated frame connection. With this arrangement there are no variations in the length of the pipe when the locomotive is traversing curves. The table above shows the principal dimensions of the Mallet locomotives referred to.

PASSENGER LOCOMOTIVES.

All the locomotives for through passenger service built during the year were six-coupled, the Pacific type predominating. No engines of the Atlantic type were constructed. Traffic requirements today frequently necessitate hauling passenger trains weighing from 600 to 800 tons, and wheel load limitations are such that if double-heading is to be avoided, six-coupled locomotives must be used. With large driving-wheels and high steaming capacity Pacific type locomotives are suitable for high speed service; and some very fine work has been placed to their credit. Superheaters have been applied to the majority of locomotives of this type built during 1912.

Referring again to the diagram, the point *E* has been plotted on the line *AB* for the ten-wheel type, and the point *F* for the Pacific type. It is seen that at a speed of 50 miles an hour, the ten-wheel type develops 31 per cent. of its rated tractive effort, and the Pacific type 36 per cent. This represents an advantage for the latter type, of nearly 12 per cent. Individual cases may be found in which the advantage is materially greater than this, because there are many locomotives in successful service whose proportions differ matterially from those indicated by the line *AB*.

The table on the following page contains the principal data of nine recent Pacific type locomotives. The locomotive for the Seaboard Air Line, with 63-in. wheels, is specially designed for freight service; and engines of this type, with wheels of moderate diameter, may often be used with equally satisfactory results in either fast freight or heavy passenger service.

The locomotives for the Santa Fe are of the balanced compound type. All the main-rods are connected to the second pair of driving-wheels, and the inside (high-pressure) cylinders are inclined, so that their rods pass above the first driving axle. These locomotives are fitted with Schmidt superheaters, and represent the highest development of the balanced compound as

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used on the Santa Fe. With extensive experience acquired in the operation of balanced compound locomotives of the Atlantic, Pacific and Prairie types, the builders and the railway company, acting conjointly, were in a position to design a particularly satisfactory locomotive, eliminating such features as had proved unsuitable in previous engines.

The locomotives for the Central of Georgia are notable in that they are fitted with the Gaines firebox. In this design a furnace of exceptional length is employed, and the front part is utilized as a combustion chamber. A thorough mixing of the

and such features as driving and truck boxes, stub brasses, axles, and a large number of fittings, can be made alike in the two classes. This was conspicuously carried out in the case of four Pacific and eight Mikado type locomotives which were built for the New Orleans, Mobile & Chicago. Practically all the parts of these locomotives subject to wear, except the driving tires and a few smaller details, are interchangeable. The engines weigh less than 200,000 lbs. each, and are not included in the tables.

From present indications, a further increase in the capacity of existing types of locomotives may be effected only by increasing

PACIFIC TYPE LOCOMOTIVE.

Road.	Cylinders, in.	Drivers, In.	Steam Pressure, Lbs.	Grate Area, Sq. Ft.	Water Evaporating Surface, Sq. Ft.	Superheating Surface, Sq. Ft.	Weight, Total Engine, Lbs.	Weight on Drivers, Lbs.	Tractive Effort, Lbs.
Seaboard Air Line	23 x 28	71	185	53.1	2,794	575	211,600	133,900	32,800
Seaboard Air Line	22 x 28	63	180	53.1	2,794	575	218,350	139,150	32,800
Southern Pacific	22 x 28	77	200	49.5	2,658	580	221,100	141,500	30,000
Central of Georgia	23 x 28	69	180	58.3	2,689	605	222,300	134,850	32,800
Atlantic Coast Line	22 x 28	72	200	54.2	2,917	590	225,900	139,800	32,000
Southern	24 x 28	70½	185	54	3,058	660	233,000	142,300	35,000
Wabash	24 x 26	74	200	63	4,473	...	245,950	158,450	34,400
Atchison, Topeka & Santa Fe	17½ & 29 x 28	73	210	73	3,443	619	268,500	163,500	33,400
N. Y. Central & Hudson River	23½ x 26	79	200	56.5	3,427	803	269,350	171,300	30,900

gases is effected by a baffle wall, which separates the combustion chamber from the firebox proper. Provision is made for admitting a supply of pre-heated air in a rearward direction, at the top of the wall. In the new Pacific type locomotives, this furnace is used in combination with a Schmidt superheater. Service tests with the Gaines firebox have shown not only material economy in fuel consumption, but also exceptional freedom from leaky tubes and steam failures.

A novelty in the product of the Baldwin Works for 1912 is a geared locomotive for logging service. The first locomotive of this type was placed in heavy switching service at the Eddystone plant, where its performance has been most satisfactory. This engine is carried on two four-wheel trucks, with all the wheels connected as drivers. It is symmetrical in construction, with a central drive to all the axles. The gears run in cast-steel housings, which are kept filled with lubricant so that they require a minimum amount of attention. As far as possible, this engine follows existing locomotive practice in its design; while at the same time, its flexibility permits it to operate over tracks so rough as to be unsnitable for direct connected locomotives.

The locomotives built during 1912 have been notable because of the special attention given to details of design, with a view to improving efficiency and eliminating engine failures as far as possible. This is most noticeable in such parts as the valve motion, frames and frame braces; and in the application, to large locomotives of special equipment such as power operated grate shakers, fire door openers and reverse gears. The Ragonnet reverse gear is now being applied, not only to Mallet locomotives, but to a large number of engines of other types. Not the least important feature of this gear is that the mechanism in the cab takes up very little room—a special advantage on large locomotives where the space available is often so limited that it is difficult to arrange the cab fittings in a convenient manner.

Pressed steel domes, made from a single plate, have been used on a large number of locomotives recently built, and are proving highly satisfactory. These domes can be made in diameters up to 33 in. and in heights up to 26 in. They are simple in construction, have ample strength, and the sizes are so standardized as to require a minimum number of dies for their production. In many boilers the auxiliary dome is now located in front of the firebox, and is placed over an opening in the shell of sufficient size to enable a man to enter. The interior of the boiler can thus be inspected without dismantling the fittings in the main dome.

Interchangeability of locomotive details has been carefully studied during the past year, and several examples of locomotives having a large percentage of interchangeable parts have been built. The Mikado and Pacific types offer exceptionally good opportunities in this respect. Under favorable conditions, they may be designed with interchangeable cylinders and boilers; wheel-loads beyond the maximum limits now permitted. The application of fuel-saving devices, more careful attention to the design of details, and the building of locomotives specially suited to meet definite operating conditions, have all combined to materially improve efficiency. The result of this policy has been most gratifying, and its continuance may be expected; but time alone can tell what new locomotive types will be evolved, when traffic requirements necessitate motive power units of materially greater capacity than the largest now in service.

REPORT ON GLEN LOCH DERAILMENT.

The derailment of passenger train No. 19, at Glen Loch, Pa., on the Pennsylvania Railroad, November 27 last, was reported in the *Railway Age Gazette* December 6 and 13, pages 1086 and 1137. The train was derailed by the failure of a bridge, and 4 persons were killed. The report of the Interstate Commerce Commission, just issued, gives the causes of the bridge failure as embraced in the conclusions of H. W. Belnap, chief inspector, and James E. Howard, engineer. From this report we quote:

Examination of the bridge after the derailment showed that the cover plate of the most northerly column had broken parallel with the south edge of the column, allowing the box girder to settle 16 or 18 inches upon the column. This in turn allowed the rails of track No. 4, on which train No. 19 was running, to settle under the train, causing the derailment. This break probably occurred under the engines of train No. 19. In the middle of the bridge there were flange marks on the south side of both rails. One rail very much bent, was nearly opposite column No. 8, where the depression in the track was the greatest at the time of the derailment. The depression of the box girder measured about 18 in. over this column, while over column No. 7 it was much less, being only a few inches. The greatest lateral displacement of the bridge also occurred in the vicinity of column No. 8 and the bent rail. It is believed that when the engines were suddenly raised out of the depression into which they had dropped, the flanges of the derailed wheels cleared the top of the south rail.

Mr. Howard in his report states that the initial line of rupture appears to have been the completion of a fracture which existed prior to the accident. The cover plate had previously been ruptured through the greater part of its thickness, which was ¾ in. The initial crack extended from the outer surface downward to a depth of about ⅝ in., leaving about ⅛ in. sound metal. The completion of this line of rupture was the immediate cause of the accident.

It would seem that the cover plate of column No. 8 had been repeatedly subjected to bending stresses both from the downward weight of the trains and from their outward centrifugal

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thrust, and that some looseness had permitted of a hammering action of the south web of the box girder upon the cover plate, all of which had resulted in the development of a progressive or detailed fracture. With such a fracture started it was only a question of time when rupture of the plate would be completed and the failure of the bridge consummated.

The formation of a progressive fracture is the result of occasional overloads repeated a greater or less number of times according to their magnitude. If the overload reached a maximum at each application rupture would soon take place, but such is not usually the case under service conditions. Doubtless it was an exceptional incident in the history of this bridge when all the conditions of loading conspired toward developing a maximum stress. In the interval of time since the bridge was built there has been a decided increase in the weights of rolling stock and concentrated loads on wheels, and higher stresses no doubt have been received by the bridge in recent years over those of former ones.

The length of time during which this fracture has been in existence cannot be told. As a matter of judgment it may have been in process of development for a number of years. It could hardly have been developed, however, to any great extent four years ago, the last time the bridge was painted, since paint had not run into the crack. It is not believed to have had its origin within a period of a few months.

During the formation and development of the rupture it would have been visible so far as being covered by any other part of the structure was concerned, but its accessibility for inspection or detection would have been impaired by the double latticing of the vertical webs of the box girders.

On this division of the Pennsylvania Railroad there are from 500 to 600 bridges to be inspected monthly, and the force doing this work consists of six inspectors. In the testimony taken at the investigation conducted by the railroad it was shown that the master carpenter, who has charge of the inspectors, knew prior to the accident that some of the anchor bolts of the main girders were disturbed, and both he and the track foreman were of the opinion that the bolts at the east end of plate girder B were broken off down in the stonework of the abutment.

The bent anchor bolts at three of the corners of the bridge would suggest the kind of forces which were acting to strain the structure, and that the freedom of the floor beams to be moved laterally on the east abutment by centrifugal force [of trains passing rapidly over the 2° curve] leading to the bending of the cover plate, might reasonably have attracted attention. Again, the signs of hammering of the south web of the box girder on the cover plate would suggest that looseness existed prior to the accident. It is believed that these forces led up to the rupture of the cover plate.

To guard against the recurrence of such accidents as this and that at Manchester, N. Y., in August, 1911, examination should be made of all bridges for the purpose of determining whether or not any of their structural members are exposed to overstraining loads under present increased weights of equipment.

FROM THE ENGINEER'S REPORT.

This bridge, No. 43½, was of iron, built in 1891. It is a skew bridge on an angle of about 15 deg. There are two spans of half-through plate girders. The main plate girders were anchored to the abutments by means of two 1⅛ in. bolts at each corner, eight bolts in all. Expansion was provided for at the west end of the bridge. Each main girder was provided with gusset braces, five each for girders designated by the letters A, B, and D, and six for girder C.

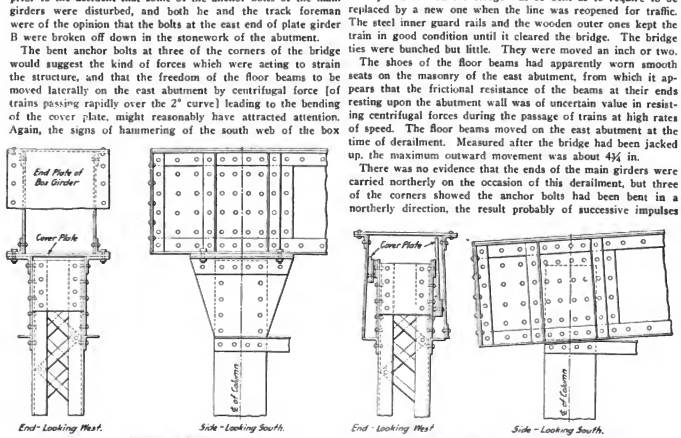
The floor beams, 15 in. I beams, were at their outer ends in part riveted to the webs of the main girders, those, however, which reached to the abutments rested upon the masonry without attachment thereto. Shoes 8 x 10 in. of 2¾ in. plates were riveted to the lower flanges of the I beams and rested directly upon the abutment walls. The inner ends of the floor beams were bolted to the box girder.

Concerning the derailment, the most easterly marks on the ties were found on the bridge about 66 ft. west of the east end of girder B and abreast column No. 8. They were located on the north side of the north rail of track No. 4; that is, the track on which train No. 19 was running. These first marks on the ties were not numerous nor were they very deep. Since the derailed wheels of the two locomotives were found on the opposite side of the rails—that is, on the inside of the curve—it is believed that these most easterly marks represent a secondary occurrence and not a primary one.

Only one rail on the bridge was so bent as to require to be replaced by a new one when the line was reopened for traffic. The steel inner guard rails and the wooden outer ones kept the train in good condition until it cleared the bridge. The bridge ties were bunched but little. They were moved an inch or two.

The shoes of the floor beams had apparently worn smooth seats on the masonry of the east abutment, from which it appears that the frictional resistance of the beams at their ends resting upon the abutment wall was of uncertain value in resisting centrifugal forces during the passage of trains at high rates of speed. The floor beams moved on the east abutment at the time of derailment. Measured after the bridge had been jacked up, the maximum outward movement was about 4¾ in.

There was no evidence that the ends of the main girders were carried northerly on the occasion of this derailment, but three of the corners showed the anchor bolts had been bent in a northerly direction, the result probably of successive impulses



Details of Post No. 8, Bridge No. 43½, Pennsylvania Railroad, Glen Loch, Pa.

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received during the period of time in which the bridge had been in service.

The bolts of the west girder on the north side were partially withdrawn from the stonework. At the southwest corner of the bridge the bolts of the girder were not disturbed. This corner would not be called upon to resist centrifugal forces of trains rounding the curve at speed, on account of the reaction of the west abutment.

. . . The cover plate prior to the disaster was ruptured through the greater part of its thickness.* There was a bending moment at the top of column No. 8, which put the upper surface of this cover plate into tension. From outside to outside of the gusset plates the column measured 13 in., while the box girder which it supported measured 16¼ in. from inside to inside of its web plates, an overhang of 1⅝ in. on a side. There was evidence of looseness at the joint between the cover plate and the web member of the box girder, at least at the south web, which was the ruptured edge of the cover. Repeated hammering of the web plate had indented and slightly grooved the upper surface of the cover plate.

These conditions are believed to have started a progressive fracture in the cover plate, which was promoted by a deficiency in lateral stability of the bridge along its easterly half. Trains passing over the bridge at high rates of speed would tend to move it outward and exert an overturning tendency on column No. 8, such as it might be, while the floor beams would necessarily deflect under the weight of the train and further intensify the stress transmitted through the south web of the box girder. The load transmitted to column No. 8 by the main girder would still further cause this to be a highly stressed member, and tend to rupture the cover plate. In addition the grain of the iron of the cover plate ran lengthwise the box girder, which caused the bending stress on the plate to be crosswise the grain—that is, it was stressed in its weakest direction.

The tendency of the bridge to shift its position in a northerly direction under the influence of the centrifugal forces of the trains is shown by the bent condition of the anchor bolts at three of its corners. The supporting columns of the box girder could easily be overturned by an outward thrust on the track. These columns were tied together in pairs by braces, but such bracing was not in the direction which would materially increase the stability of the bridge. The easterly end of the bridge was retained on its abutment chiefly by the resistance of the anchor bolts at the ends of the main girders, while they were bent in offering such resistance. Attending these conditions it would seem that the cover plate of column No. 8 had been repeatedly subjected to bending stresses, both from the downward weight of the trains and from their outward centrifugal thrust, and that some looseness had permitted of a hammering action of the south web of the box girder upon the cover plate, all of which had resulted in the development of a progressive or detailed fracture. With such a fracture started it was only a question of time when rupture of the plate would be completed and the failure of the bridge consummated.

It appears that the master carpenter was cognizant of the fact that certain of the anchor bolts of the main girders had been disturbed and that both he and the track foreman were of opinion that the bolts at the east end of plate girder B were broken off down in the stonework of the abutment.

This bridge had evidently been inspected at frequent intervals, none of which had disclosed the presence of a detail or progressive fracture in the fatal cover plate.

The deflection of a girder depends upon the modulus of elasticity of the material which goes to make up the girder. That value appears to remain constant in a given structural member, unless there is a very decided overstrain, one in fact which would occasion such deformation as would throw the structure out of service. Over-straining would need to be quite general to produce an observable effect on the deflection of a girder of this type, by reason of the lowering of the value of the modulus of elasticity of the iron. But the lowering of the modulus of elasticity by overstrain is not a permanent effect. The metal recovers its normal value within a few days or weeks, as shown by laboratory tests, hence such indications would be effaced within a short time, and as applied to the deflection of a girder the test might be considered as lacking in exactness. . . . Bridge No. 43½ was certainly a very much inspected structure, but as the result has shown it was not saved from a disastrous failure. Reliance appears to have been confined to inspection for a period of 21 years to furnish assurance of the safety of this bridge for constantly increasing traffic and heavier rolling stock than in use at the time of its construction. No evidence has been presented to show that any critical examination of the plans of the bridge made during that interim led to the discovery of defects in the structure which the wreck of train No. 19 clearly brought into prominence, details which are recognized as undesirable as they are now seen. In the fatal cover plate an unsatisfactory detail is recognized. The discovery or recognition of such a defective detail might properly have been expected of the custodians of the plans of the bridge. The Pennsylvania Railroad has from time to time had occasion to renew its earlier bridges and replace them with stronger structures. Such renewals may have been in part the result of inspection reports on their condition, but generally from engineering knowledge that the working loads were approaching too high limits.

It is obviously futile to look for reliable indications of impending rupture in the results of tests for deflection under passing trains. A more refined and careful analysis of the condition is needed to be serviceable to judge of the approach of danger. . . . The design of the bridge prevented disclosure of the fracture "under the usual inspection." It was inaccessible but in a comparative sense only, that is, as respecting the usual inspection. The cover plate was a short one and easily reached for painting. The double latticing of the box girder prevented direct visual inspection of the plate along its most strained section, which part otherwise was exposed to full view.

Portable apparatus for the inspection of inaccessible surfaces has been in use for many years in other lines of inspection service, consisting merely of a mirror, with a lamp for illumination. It would doubtless be an innovation to introduce such an apparatus in bridge inspection, but in a case like the present one it is a question whether the most vital part of the structure shall go uninspected because the inspector cannot get his head into position to view the critical part or to employ the necessary means to view the same. Vital parts, demanding careful inspection, should be pointed out to the bridge inspectors by the bridge engineers, since the latter have the plans at hand and opportunity to judge by computation what parts are most strained, according to the design of the structure.

The freedom of the floor beams to move laterally on the east abutment in response to centrifugal forces and leading to the bending of the cover plate of the end column under the box girder might reasonably have attracted attention.

The grain of the cover plate was parallel to the length of the box girder, thus straining the iron crosswise the grain. The tensile tests showed low results, only 29,950 pounds per square inch, in that direction, with the elastic limit and tensile strength nearly coinciding. While iron plates would not be expected to be used in the direction found here, there was no assurance that such would not be the case, and both ruptured covers of columns Nos. 7 and 8 were so oriented so that the bending stresses strained the metal in its weakest direction.

Latticed column No. 8, made of 12-inch channels, 83.7 pounds per yard, should have an ultimate compressive strength of about 500,000 pounds total. The strength of the cover plate, unassisted by the 4 by 6-inch angles, assuming a maximum fiber stress of 30,000 pounds per square inch, would be 83,000 pounds total. The angles no doubt re-enforced the cover plate, still leaving, it is believed, a great disparity in strength of this detail over the strength in the body of the column.

*We reproduce the drawings, showing the behavior of this cover plate, which were given with our report of December 13.—Editor.

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ECONOMICAL LIMITS OF GRADE REDUCTION.

Discussion of the Factors Entering into an Analysis of Train Resistances and Their Respective Importance.

By Walter Loring Webb,
Consulting Engineer.

Within the past few years several railroads have adopted ruling grades on certain divisions far lower than would have been dreamed of 50 years ago, at least when the cost of obtaining such low grades is considered. Many thousands of miles of railroads in this country have been located on the basis of maximum grades approximating 60 ft. per mile, with six-deg. curves as the maximum. Recently a realization of the economy of low ruling grades has impelled trunk lines to make large expenditures to reduce these grades, where physically or financially possible, from 1.2 per cent. down to 0.5 per cent., 0.4 per cent., and even 0.3 per cent., and within the past year announcement has been made that the Erie is excavating an average of over 150,000 cu. yds. per mile near Meadville, Pa., in order to establish a 0.2 per cent. grade. About two years ago, President Willard of the Baltimore & Ohio, ordered a maximum grade of 0.2 per cent. established on second track work in Indiana and Ohio.

In constructing a second track along the Mississippi River, between Savanna, Ill., and St. Paul, the Chicago, Burlington & Quincy adopted a 0.2 per cent. grade. Even when these divisions were "river roads," it required a much larger expenditure for grading to obtain these rates of grade than would have been required to make more undulating profiles. The question naturally arises, is there any limitation below which there is no justification for spending any money to reduce the grade, assuming that the traffic is so large that the necessary cost is not in itself a limitation?

It should be clearly understood that this subject is here considered wholly apart from the special question of whether the traffic is or is not sufficient to justify the expenditure, in any particular case, of a certain computed sum. The question is a general one and only refers to whether there is some limitation beyond which the advantage of grade reduction ceases, and therefore does not justify additional expenditure, no matter how small, or how enormous the traffic which may be affected thereby.

The fundamental distinction between ruling and minor grades should be kept in mind. A minor grade adds a small percentage to the consumption of fuel and other engine supplies and an almost inappreciable amount to the expenses of maintenance of way and rolling stock. On the other hand, a ruling grade limits the number of cars which may be hauled by a locomotive. With a reasonably large freight traffic, an increase in the number of cars per train will mean a reduction in the number of trains necessary to handle a certain gross tonnage. Since the revenue received on that gross tonnage is a fixed quantity, a reduction of grade, which will permit that tonnage to be hauled by a less number of trains, will permit a reduction in operating expenses which is largely clear profit. As a general proposition, the very great economy resulting from a reduction of the ruling grade does not need argument. It is only when there is a possibility of reducing a very low ruling grade to a grade still lower, and at a very large expenditure, that the economical justification becomes questionable.

ANALYSIS OF TRAIN RESISTANCES.

The investigation of this subject must evidently include an analysis of all train resistances, the ratio that grade resistance on various grades bears to the total resistance and the economy which would result from reducing the total resistance by a computed proportion. To compare two operating conditions, we may compute the total resistance in pounds per ton under each condition. Any reduction which may be made in the resistance, measured in pounds per ton, and including every form of tax on the power of the locomotive, means a possible increase in the train load which can be hauled by a locomotive of given type, and from this may be computed the possible saving in the number of trains required to handle a given traffic. For the purpose of this discussion the total demand on the locomotive may be divided into four divisions; grade resistance; inertia resistance; the extra tractive resistances which only occur when starting and at very low velocities, and all other resistances.

Grade resistance on a majority of roads is so great that it swallows up and overshadows the others, and yet it is the one form of resistance which may be indefinitely reduced and possibly made zero, provided enough money is spent to accomplish it. It is also exactly computable to the last ounce. It equals 20 lbs. per short ton for each per cent. of grade. For the 1.2 per cent. grade, which was formerly so general as a maximum grade and even now is so common, it is 24 lbs. per ton, while for the 0.2 per cent. limit, referred to above, it is only 4 lbs. per ton.

Inertia resistance is also mathematically computable. The amount of the resistance is controllable and is purely a matter for the operating department. When the elevated roads in New York City were operated by steam locomotives, it was estimated that three-fourths of the fuel consumption was due to this cause. The necessity for a reasonably high average speed between termini, combined with stops every few hundred feet, required abnormal accelerating power. The work of acceleration, using all the power of the locomotive, would be frequently continued to a point at which deceleration would be commenced in order to make a proper service stop at the next station. Of course such a combination of conditions is not applicable to most steam roads, and least of all to through freight traffic. Therefore, this form of resistance is not usually a controlling factor, but it will be shown later that when other forms of resistance have been eliminated as far as possible, operating conditions may require a degree of acceleration which makes its demand on the locomotive a controlling element in the magnitude of the train load. The required accelerative force may be expressed by the formula:

$$P = 70.2\ (V_2^2 - V_1^2) \div s,$$

in which V_2 and V_1 are the higher and lower velocities, respectively in miles per hour, s is the distance in feet and P is the required constant accelerative force in pounds per ton. When the train starts from rest, $V_1 = 0$. A few numerical illustrations will readily show what this force amounts to. If a train must acquire a velocity of 20 miles per hour in a distance of 1,000 ft. and starting from rest,

$$P = 70.2\ (400 - 0) \div 1{,}000 = 28.08 \text{ lbs. per ton.}$$

This is equivalent to the grade resistance on a 1.4 per cent. grade. If the velocity must increase from 20 to 40 miles per hour in the next 1,000 ft., the required force will be

$$P = 70.2\ (1{,}600 - 400) \div 1{,}000 = 84 \text{ lbs. per ton.}$$

This is the equivalent of a 4.2 per cent. grade. Working the problem backward, to find the required distance in which the accelerative force of 28.08 lbs. per ton would increase the speed from 20 to 40 miles per hour, we would have

$$s = 70.2\ (1{,}600 - 400) \div 28.08 = 3{,}000 \text{ ft.}$$

Of course the accelerative force is independent of the other forces, and any change in the other tractive forces due to change in velocity is assumed to be otherwise taken care of.

As before stated, the amount of the inertia resistance or accelerative force is under the control of the operating department. It may be made indefinitely small by adopting a very low rate

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of acceleration, but of course this is not economical, since time is wasted on the road. On the other hand, a quick acceleration cannot be accomplished without a very great reduction from the train load, which might be handled with slow acceleration. A uniform accelerative force of 5 lbs. per ton (beside the force required for other resistances) will produce a velocity of 8.4 miles per hour in the first 1,000 ft., 11.9 miles per hour in the second 1,000 ft., 14.6 in the third, and 16.9 in a total of 4,000 ft. For comparative purposes we will use 5 lbs. per ton accelerative force later on.

The extra resistances which only occur when starting or at very low velocities are here given special prominence because, in the minds of some, their unavoidable occurrence constitutes a limitation on the economical reduction of ruling grade. This extra resistance is most readily observed when a number of freight cars are started up after remaining at rest for a long period in freezing weather. On the other hand, such a high resistance is only momentary and is very quickly reduced to a much lower quantity. During some careful tests on the Rock Island system to determine this resistance, a maximum of 30 lbs. per ton was found for a train which had stood over night and was "frozen up." The weighted mean of 35 tests with trains of 34 to 45 cars showed an average resistance of 14.1 lbs. per ton, with a minimum of 6 lbs. per ton when the stop was only instantaneous. Considering that these figures *include* the regular tractive resistances, which must be considered as 5 to 8 lbs. per ton, depending on the condition of the track, proportion of dead load to live load, and many other causes of variation, we must only consider the *excess* over 5 to 8 lbs. as the amount chargeable to starting. When an engineman finds that his locomotive is unable to start his train in the usual way, he frequently backs the engine for a few feet and then, reversing, starts ahead, and frequently succeeds in starting the whole train. By this method he accomplishes three things; the journals are loosened from their rigid condition and the initial high resistance is greatly reduced; the coupler springs are compressed and their expansion during the following forward movement materially assists in starting the train; and the total coupler compression in a long train is so great that the engine moves forward several feet before the last car starts. The cars are started one by one. The last effect will alone reduce the required draw bar pull by nearly 50 per cent.; the first two effects are not so readily computable, but are evidently of considerable influence. By such practical operating methods the extra resistance during starting, apart from inertia, grade, and the ordinary tractive resistance, may be reduced to a relatively small although somewhat indefinite quantity.

The other tractive resistances, which, for the purpose of this discussion, may be lumped together, are dependent on ratio of dead load to live load, on the number of cars, on the condition of track and weight of rail and on velocity. Since the limitations of ruling grade apply first to freight traffic with comparatively slow speed, and since the variations of resistance for variations in velocity between 5 and 35 miles per hour are so small that they may be here ignored, we need not complicate the discussion on account of variations in velocity. Since the tractive resistance per ton is less for fully loaded cars and since train loads of fully loaded cars are the critical loads to be here considered, we may assume that all of these ordinary tractive resistances may be lumped at 5 lbs. per ton.

The resistance due to curvature may be here ignored on the assumption that the grades on all curves are compensated. On the basis of 0.035 per cent. per degree of curve, even a 0.2 per cent. grade is nearly sufficient to compensate a 6 deg. curve. Any road spending large sums to reduce grade to 0.2 per cent. would certainly reduce 6 deg. curves to something easier, and we may therefore consider that curve compensation is always practicable and that it is done. Of course curve compensation does not eliminate curve resistance, but whenever curve compensation has been accomplished, curve resistance has been eliminated as a possible factor in limiting the weight of trains.

If we assume that all of these resistances occur simultaneously, and that the rate of acceleration is the same for either grade, we would have, for a 0.4 per cent. grade, a total resistance of 5 + 5 + 8 or 18 lbs. per ton, and for a 0.2 per cent. grade, 5 + 5 + 4 or 14 lbs. per ton, with a small addition in each case for the extra resistances when starting. The inverted ratio of these two figures will be a measure, although not in strict proportion of the relative train loads which can be hauled by a locomotive of a given type on the two ruling grades. For our present purpose it is unnecessary to determine mathematically the relative cost of handling traffic on the two grades. It is unquestionable that the economy of operating the lighter grade is very great, even though the reduction in operating expenses is not measured by the 22 per cent. reduction in resistance per ton. It is likewise true that, no matter what variations may be made in the rate of acceleration demanded, nor in the tractive resistances caused by the particular condition of track and roadbed, the relative value of the two grades will not be radically changed when the resistances other than grade are the same. And there seems to be no escape from the necessity of considering that all of these resistances may happen simultaneously provided that regular stopping places, passing sidings, block signals, or even grade erossings, which may require a stop almost anywhere, are located without regard to the grades of the road. This proviso may be inverted by saying—provided that the grades are designed without regard to the places where regular or occasional stops must be made. The designers of elevated railroads have already utilized the advantages of locating stations on a hump, artificially made so by increasing slightly the height of a few columns near the station. Incoming trains transform their kinetic energy into potential energy and thus save in the use of brakes. Departing trains utilize that potential energy to reduce the demand on the locomotive to provide the accelerative energy when starting. The saving is thus two-fold.

When grades have been so reduced that there is a question whether the ruling grade should be 0.4 per cent. or still further reduced to 0.2 per cent., it requires but little change in the grading to create a hump which will more than make up this difference at some regular stopping place or even at a block signal where a train is liable to be held up. A hump 4 ft. high and running out for 2,000 ft. in either direction will change the grade 0.2 per cent. This four-foot hump will consume the kinetic energy of a train moving at a velocity of 10.7 miles per hour, and therefore a train approaching this hump at a velocity somewhat in excess of this need not be stalled. If the train must stop at the summit of the hump, brake action is saved, with the attendant saving of wear on wheel treads and brake shoes. In addition there is the assistance of a virtual 0.2 per cent. down grade, or 4 lbs. per ton when starting. This gain of 4 lbs. per ton will exist irrespective of the actual grade, for the grade on the farther side of the hump will always is 0.2 per cent. more favorable to traffic than the original grade on which the hump is placed.

If a road could be so constructed that all stopping places were on a level; that the level stretches were long enough so that a train could acquire its normal velocity; and that stops would never be required on the ruling grades; there might be justification for a claim that there would be no advantage in anything less than a 0.4 per cent. ruling grade. Under these conditions the only resistances on the grade would be the ordinary tractive resistances and the grade resistance of 8 lbs. per ton. When starting on the level, there is no grade resistance and the 8 lbs. per ton may be used up in the extra resistances during starting and in acceleration. However, a railway manager would not dare to load up a locomotive to the limit suggested by such figures, for there would be no margin left if an unexpected stop should be necessary on the ruling grade, and if the train

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load is cut down to the capacity of the locomotive to start from rest on the ruling grade, then we have the simultaneous combination of all the four classes of resistances, and, as previously pointed out, the reduction of one of these resistances will make a definite and sure reduction in the total resistance and will surely justify a profitable increase in the train load.

Expensive reductions in ruling grade are almost invariably accompanied by a reduction of curvature down to a limit of 3 deg., 2 deg. and even 1 deg. curves. The justification of such reduction is a very different matter from the reduction of the rate of grade. The curvature does not limit the length of trains and cannot therefore have the same importance as ruling grade. It does add something to the resistance, but since this has been determined as the equivalent resistance of 0.035 per cent. grade for each degree of curve, even this is of comparatively slight importance. The real justification for such curve reduction is the safe operation of fast trains. Any railroad having such a traffic that 0.2 per cent. grades can be considered as a maximum, will also wish to operate fast trains, say at 60 miles per hour. The proper super-elevation of the outer rail for even a 2 deg. 30 min. curve, operated at 60 miles per hour, is six inches. Running a train at 60 miles per hour with the track superelevated six inches certainly requires good track construction and good rolling stock and even then its safety is perhaps questionable. A slow order on all curves sharper than 2 deg. 30 min. is therefore imperative for all trains which are to be operated at a speed of 60 miles per hour or faster. Since the engineman's schedule of many of the fast trains of the country include many stretches over which a speed of 60, 65, and even 70 miles per hour must be maintained, it is plain why all projects for grade reduction also include curve reduction, but it should be remembered that the justification has an entirely different basis.

LOCOMOTIVE LABORATORY AT THE UNIVERSITY OF ILLINOIS.*

By Edward C. Schmidt,
Professor of Railway Engineering, University of Illinois.

An accurate knowledge of locomotive performance is as necessary to the railway operating officer and to the locating engineer as to the locomotive designer, and in periods of rapid progress in locomotive development the need of such knowledge becomes the more urgent. In the beginning, such effort had for its chief purpose the improvement of the mechanical features of locomotive design rather than improvement in its economical performance; but in later years, under the demand for decreased operating costs, this effort has been directed chiefly toward developing accurate information about the performance of the locomotive boiler and engines and of the machine as a whole.

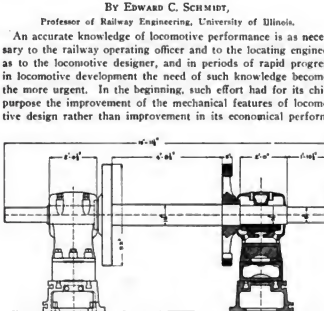

Fig. 1.—One Pair of Supporting Wheels, with Axle, Bearings and Bed Plate.

*Abstract of a paper presented before the Western Railway Club, March 18, 1913.

Until about twenty years ago the only other source of accurate and specific information concerning locomotive performance was the data derived from specially arranged road tests. For certain purposes they will never be displaced. The usefulness of road tests is, however, limited by the fact that on the road many of the conditions of operation are entirely beyond control; and consequently even the most skillfully and conscientiously conducted road tests sometimes fail to produce conclusive evidence.

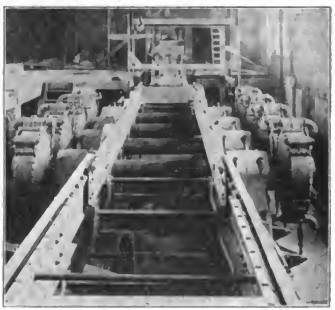

Fig. 2—Rear End of Testing Plt Arranged for a Consolidation Locomotive.

The first locomotive testing plant was built 21 years ago at Purdue University. It was designed by Dr. W. F. M. Goss, who was at that time in charge of the schools of engineering at that institution. At present there are four such testing plants in this country and two in Europe.† The justification for the existence of locomotive testing plants lies in the fact that in them only

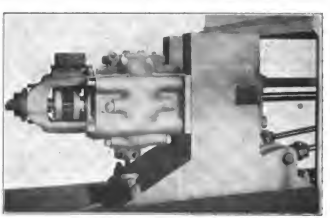

Fig. 3—Weighing Head and Housing of Dynamometer.

†The Purdue plant, erected in 1891, was followed in 1894 by a temporary plant at South Kaukauna, Wisconsin, on the Chicago & North Western, designed under the direction of Robert Quayle. This was succeeded in 1895 by a permanent plant, designed by Mr. Quayle and erected at the C. & N. W. shops in Chicago. In 1899 Columbia University, having been given an Atlantic type locomotive by the Baldwin Locomotive Works, provided a testing plant which is erected in their mechanical engineering laboratory. In 1904 the Pennsylvania Railroad installed at the Louisiana Purchase Exposition at St. Louis, what was at that time the largest and most elaborate plant built. This was removed after the exposition to Altoona, Pa., where it has since been in almost constant operation. In 1904 there was also erected in the Putiloff Works at St. Petersburg, Russia, a similar plant designed by Messrs. M. V. Golobokoff and S. T. Smirnoff. The following year there was erected in England another plant under the direction of G. J. Churchard of the Great Western Railroad, at the Swindon Works of that company.

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can the locomotive be run under conditions which may be rigidly controlled and varied at will. It is also true that in the test plant the difficulty and expense of making tests are both greatly reduced; but this in itself is less important than the control of the operating conditions which test plant service puts in the hand of the experimenter. As a consequence of this control practically all questions relating to boiler performance can be better and more easily settled in the testing plant than on the road and the same is equally true of questions touching engine performance. Supplemented occasionally by road tests made by means of a dynamometer car, the locomotive testing plant makes possible a knowledge of locomotive performance as exact as that which is available concerning the stationary steam engine, the turbine, and the gas engine.

At its last session, the legislature of Illinois included among its appropriations for the University of Illinois the sum of $200,000 to be used for new buildings for the College of Engineering. It was decided to use this fund in erecting a transportation building and a locomotive laboratory for the department of railway engineering.

Any locomotive laboratory consists essentially of, first, a means for so supporting the locomotive that its wheels may be rotated and that the power developed may be absorbed and either dissipated or transferred; second, a means for anchoring the locomotive when so mounted and for measuring the tractive effort developed; third, means for supplying and measuring coal and water; and finally, means for disposing of the gases and steam from the front end.

The supporting mechanism consists in this plant, as in all others, of wheels whose position may be varied to conform to the spacing of the locomotive's driving wheels. In this case the supporting wheels are 52 in. in diameter, provided with plain tires and mounted on 11½ in. axles. The axles and tires are of the highest grade of heat-treated carbon steel and were furnished by the Midvale Steel Company. The use of 52 in. supporting wheels involves rotating speeds as high as 500 r. p. m. in testing high speed locomotives. Such speeds may give rise to difficulty in the operation of the bearings, although they have been designed with regard thereto. In anticipation of such difficulty, however, provision has been made (in the design of the bearing pedestal) for using 72 in. diameter supporting wheels, if it later proves desirable to do so. The axles are supported at each end, just beyond the wheels, in bearings 9½ in. by 20 in. which are provided on the under side of the journal only. These bearings are carried in self-aligning shells which are supported in pedestals of exceedingly heavy construction. Oil is provided at two points in the bearing cap, where it is supplied under head from an elevated supply tank. The bearing pedestals rest on massive cast iron bed plates which run the entire length of the testing pit, and are secured thereto by the bolts whose heads are held in slots running the length of the bed. The pedestals may therefore be shifted to any desired position on the bed. The general design of the axle, wheels, bearings and bed plate is well represented in Fig. 1. Each of these units, consisting of an axle, two wheels, and two bearings, constitutes the supporting element for one pair of locomotive drivers. So supported, the driving wheels may turn; and there remains to be provided a means for absorbing the power developed at the driving wheel rim.

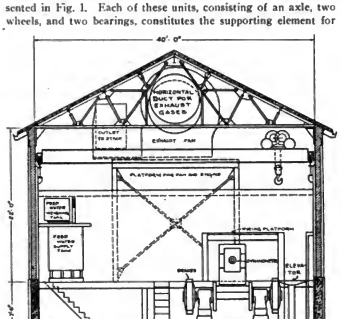

Fig. 5—Cross-Section Through Middle of the Locomotive Testing Plant.

The brakes are of the type used in all other American testing plants, and were designed and furnished by Professor G. I. Alden of Worcester, Mass., under general specifications prepared by the designer of the plant. One of these brakes is mounted on each end of each supporting axle. Each brake consists essentially of three cast iron discs which are keyed to the supporting axle, and which rotate between water cooled copper diaphragms carried in a stationary casing. A cast hub and the three discs form an integral rotating element which is keyed to the axle and turns with it. The casing and its diaphragms are prevented from rotating by means of links attached to the bed plates,

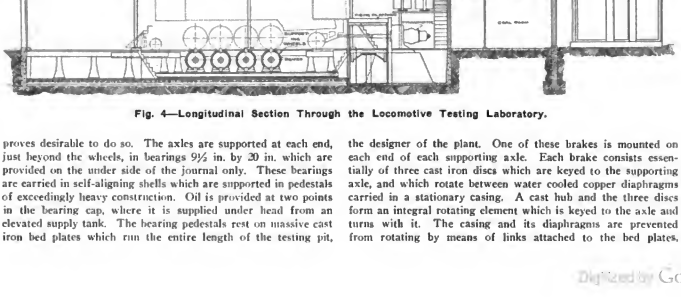

Fig. 4—Longitudinal Section Through the Locomotive Testing Laboratory.

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The diaphragms provide within the casing three compartments within which the cast iron discs rotate. The surfaces of the discs and of the diaphragms are lubricated by oil fed in at the periphery of the discs and taken off at the hub. The diaphragms form also within the casing four water compartments which have no communication whatever with the compartments within which the discs rotate. The pressure existing in these water spaces may be varied at will by means of suitable valves in the brake piping. The operation of the brakes is as follows: Power received from the driving wheels of the locomotive is transmitted through the supporting wheels and axle to the cast iron brake discs; these in turn transmit it by friction to the surfaces of the copper diaphragms against which they rub. By varying the water pressure, the friction between the discs and the diaphragms may be varied in accordance with the amount of power to be absorbed. The entire power of the locomotive is thus dissipated at the surface of the diaphragms and carried away as heat in the water which circulates through the brakes. Each brake is designed to develop a resisting torque of 18,000 lbs.-ft., which is more than is likely to be transmitted to it by the most heavily loaded locomotive driver.

The foundation of the plant is a slab of reinforced concrete 93 ft. long and 12 ft. wide, varying in thickness from 3½ ft. at the front to 5 ft. at the rear. It is surmounted at the rear end by a pyramidal base which serves as the anchorage for the dynamometer. The mounting machinery thus far described is shown in Fig. 2 arranged for the reception of a consolidation locomotive. The locomotive to be tested is backed on to the machine; the drivers run on their flanges leaving the treads free to engage the supporting wheels. When the drivers are properly placed and the locomotive is securely anchored to the dynamometer, the track is removed.

The dynamometer, whose chief function is to permit the tractive effort of the locomotive to be measured, is shown in Fig. 3. It is of the well known Emery type, designed and built by the William Sellers Company of Philadelphia. It consists essentially of the "weighing head" shown at the left, carried on the housing, and of a weighing scale not included in the picture. Within this weighing head is an enclosed oil chamber with a flexible wall, which receives and balances any force transmitted from the locomotive. The pressure of the oil in this chamber varies with the load and is transmitted through a copper tube of small bore to a similar smaller oil chamber, the pressure within which moves the beam of a substantial but very sensitive scale. The force transmitted to the dynamometer is thus weighed. Its capacity is 125,000 lbs., which is 15,000 lbs. greater than the tractive effort of any locomotive in existence. One feature of special interest in the design of the scale lies in the fact that the adjustment of the poise weight on the scale beam is accomplished automatically.

Other details include the weighing tanks, hydraulic elevator (for lifting the coal from the floor to the firing platform), scales, coal room, and firing platform. The general water supply of the university is from driven wells, the demand upon which approaches at times their full capacity. No other source of cooling water for the brakes is available. Water from the brakes could not therefore be wasted, and provision has been made for cooling and recirculating it. A supply pump for the brakes draws water from a reinforced concrete reservoir of 100,000 gal., pumps it through control valves to the brakes, whence it returns through another set of control valves to a sump located in the basement of the laboratory. Another pump returns it from here to the reservoir. The feed water is drawn from this reservoir by a separate pump, passed to the weighing tanks and feed tank and thence to the injectors. This feed water, of course, is wasted and must be restored to the reservoir between tests by drawing on the general university supply.

In the design of the means for disposing of the exhaust gases new problems were presented and new solutions have been reached. In view of the importance of determining accurately the total fuel lost in the exhaust gases, it was early decided to try to incorporate in the design of this plant some means for entrapping *all* of the solid matter contained in the gases passing the locomotive front end. The exhaust gases are discharged into a steel exhaust elbow which carries the gases up and over to the center of the building, where they are received in a horizontal duct running through the center of the roof trusses. The gases are drawn through this elbow and duct by an exhaust fan, located near the roof at the rear end of the building. Probably the heaviest cinders will be dropped in this duct, but the velocity within it is such that all but the heaviest particles of solid matter will be carried on through the fan. Whatever does accumulate here may be removed through traps provided in the bottom of the duct, and weighed. From the fan, the gases and the remaining solid matter are passed through a breeching or flue to a separator in which they pass downward around a sleeve, where they are given a whirling motion which causes the cinders to move toward the wall along which they drop to a hopper below, while the gases pass downward and out to the stack through the mouth of the sleeve. The cinders collecting at the bottom of the hopper are drawn off and weighed. This separator is surmounted by a 45 ft. radial brick stack from which the gases are finally discharged 81 ft. from the ground.

The corrosive nature of the mixture of exhaust gas and steam has made it necessary to avoid the use of metal throughout this exhaust system. The exhaust elbow within the building necessarily has been made of steel, and will need occasionally to be renewed. The duct, however, is of asbestos board (Transite) which will resist corrosion. It is 7 ft. in diameter, and made up of separate sections so that its length may be varied. The fan has a runner 6 ft. in diameter, and will pass, at maximum speed, 140,000 cu. ft. of gas per minute. The breeching between fan and separator is built of transite, and has a minimum cross sectional area of about 24 sq. ft. The outer shell of the separator is built of reinforced concrete. To protect the shell from corrosion, it is lined throughout with a hard burnt red brick. Between this lining and the shell is a 2 in. air space to act as an insulator to protect the shell from undue heating. Any leakage of gas through the lining into this space is vented to the outside air through openings which are provided in the shell, and which serve also to circulate cool air through the air space. The inside sleeve and hopper are both built of reinforced concrete. The stack itself is unlined, but is laid up in acid proof cement. It is expected that this whole system will not only permit the collection of all solid matter and thus enable front end losses to be determined in a manner beyond criticism; but that it will also dispose of the smoke so that it will be unobjectionable and at the same time act as a muffler and eliminate objectionable noise from the locomotive stack discharge.

The building which houses this equipment is 40 ft. wide and 115 ft. long, with a height under the roof trusses of 22 ft. A basement with a 6 ft. 9 in. clear depth extends throughout all but 22 ft. of its entire length. The construction is fireproof throughout. The walls are laid up both inside and out with red faced brick, the roof is of reinforced concrete covered with slate, and all floors are of reinforced concrete also. The building is unusually well lighted by windows in the side walls which extend nearly the full height of these walls and occupy almost two-thirds of the wall area. All portions of the building, except the space occupied by the coal room in the west end, are served by a 10-ton traveling crane.

The whole plant has been designed with the intention of making it suitable to test new designs as they appear, in the confidence that the railroads and builders would be willing to keep upon the plant locomotives of recent design, concerning whose performance all railroad officials desire information. The first locomotive to be tested is one of the consolidation type owned by the Illinois Central Railroad.

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REGULATION OF UTILITIES BY COMMISSION.*

Principles That Should Be Applied and Methods Used in Dealing with Service, Rates and Financial Return.

By Halford Erickson,
Member of the Wisconsin Railroad Commission.

The earlier systems of regulation were in the latter part of the eighteenth century superseded by the well known *laissez faire* policy under which competition was mainly relied upon for the establishment of fair prices and adequate service. While the policy is well adapted to the subduing of the forest and the prairie, it does not seem to be well fitted for the regulation of public utilities. It has, in fact, been found to be entirely inadequate for the proper regulation of the prices and other conditions of such services. And this fact has in turn led to a well-developed sentiment in favor of abandoning the competitive policy in the public utility field and to substituting therefor government regulation. In fact, in America and England the competitive or let alone policy has never been fully adopted for such facilities as water or canal transportation, toll bridges and turnpikes.

This demand and need for the return to government regulation of industries and services that are fraught with public interest has grown very rapidly during the past fifty years or more and this development has been brought about by the great changes that have taken place in economic and social conditions.

REGULATION OF SERVICE.

As the services rendered by public utilities are necessities, it is of great importance that they should be adequate or up to a reasonable standard. Poor service is uneconomical, irritating and a fruitful source of dissatisfaction and complaint. It is often responsible for the greater part of the ill feeling between the public and the utility, that exists in so many places. Such service, however, can as a rule be furnished at lower cost to the utility than good service, and it is in this fact that the incentive to poor service is found. To furnish inadequate service, especially when the rates charged are high enough to cover the cost of adequate service, is an unjust imposition upon the public. For the consumers are as much entitled to get what they pay for as the utilities are in charging reasonable rates for adequate service.

In the railway field, service questions involve the regularity and speed of trains, connections at junction points, the stoppage of a sufficient number of trains at the smaller stations, the proper care and maintenance of both trains and stations, the prompt and equitable distribution of cars among shippers, the equipment of the line with approved signaling and safety devices, and many other every day matters connected with the operation of trains. Under this head, also, though less directly connected with the comfort and safety of the users of railway service, is the proper protection of highway crossings, and the elimination of grade crossings. Not only are such matters as these investigated when brought to the attention of the commission by complaints and accidents, but the initiative is taken to a considerable extent by the commission itself, by means of frequent inspections by its experts of roadways, bridges, rolling stock, stations and yards, etc. Unless the defects of service are so intolerable as to make an order for their elimination almost a matter of course, the determination of railway service matters involves the consideration of a large number of questions. Where train or station service is being investigated, the population to be served, the amount of business likely to arise from the improved service, the operating difficulties involved, the actual cash outlay required in making the improvement, and many similar facts are to be considered. The maintenance of passenger train schedules which will enable the railway company to meet competition between its terminals may have a bearing on the propriety of requiring the regular stoppage of a train. Another service matter which is the subject of commission supervisions is the construction of spur tracks for the accommodation of industries along railway lines. The Wisconsin law on this subject requires the commission, on application, to order the construction of such spur track not more than three miles in length, when its construction is found to be practically indispensable to the business of the applicant, and is not unreasonably dangerous to the general public.

VALUATION AND REGULATION OF RATES.

With respect to rates our experience varies. In many cases the rates have been found to be unreasonably high as well as unjustly discriminatory. In other instances again, though less frequently, the rates have been found to be unreasonably low. Rates that are thus too high and that under similar conditions are higher for some persons and localities than for others are harmful and against public policy. They result in unequal distribution of wealth. They mean that money is unjustly transferred from one set of pockets to another set of pockets, and that a few are enriched at the expense of the many. They retard industrial development and commercial growth, and, in the same line of business, tend to build up some at the expense of others. They also lead to results that are bad, from a rural and ethical point of view.

Rates that are too low may also be harmful. They usually stand for poor equipment and poor service. When so low as not to provide means for the proper upkeep of the plant they may even lead to the entire ruin or loss of the service. Instances where conditions of this kind prevail are met with from time to time. They are detrimental not only to those who are directly affected, but to the public as a whole. Losses from poor service may be as great as losses from rates that are too high or discriminatory.

The law provides that the rates must be reasonable. The courts have held, in substance, that under normal conditions of a plant when taken as a whole, the rates in order to be reasonable should be high enough so that the revenues therefrom are sufficient to cover reasonable amounts for the operating expenses of a plant, including depreciation thereon and interest and profit on the fair value of the property used and useful for the convenience of the public.

The sum of the operating expenses and fixed charges is thus made the legal basis for rates. The first problem of the rate maker therefore consists of determining what constitutes reasonable amounts for these expenses and charges.

The first step that is necessary in the determination of such rates is to find the fair value of the property upon which the investors are entitled to interest and profit. In this determination one is at the very outset met with conflicting opinions of all kinds, not only as to what should be included in the term "property," but as to what is meant by "fair value." Some insist that the term property includes only the physical property that is used and useful in serving the public. Others again hold that besides the physical property it also includes the cost of developing the business. There are some who argue that the fair value is represented by the original cost, and others again that it is represented by the cost of reproduction at the time of the appraisal. A careful analysis of the facts indicates that the cost of both the physical property and of the business should be

*Abstract of a paper read before the Western Society of Engineers, Chicago, March 24, entitled "The Regulation of Public Utilities in Wisconsin." Mr. Erickson's discussion dealt with regulation of public utilities in general. The abstract here presented is confined chiefly to those parts of the paper dealing with regulation of railroads.

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included in the appraisal, and that the original cost as well as the cost of reproduction not only of the physical property, but of the business as well, constitute evidence of value.

The original cost of the physical property includes the cost of all the land, labor, material and equipment of all kinds that are required in order to obtain a complete plant ready for operation. It also covers such overhead charges in connection therewith as organization, legal expenses, engineering and superintendence of construction, insurance and contingencies of all kinds, interest during construction period on the capital used, etc. When a plant is needed and cannot be had on better terms, the original cost may also have to include something for discounts on bonds and for promoters' expenses. In fact, the original cost of the physical property should include all necessary expenditures that were judiciously made in obtaining the plant. Before it can be effectively and economically operated, such a plant must also be provided with a working capital.

The true original cost is difficult to determine. The probable and reasonable cost, however, is not inaccessible, for many items can be closely estimated from the facts obtained from examinations of the present plant, its design, location, growth, character, size, the prices of labor, material and other elements which prevailed when built, and comparisons with similar plants of which the cost is known. Thus in the end a very close approximation of the actual cost of the physical property of the plant can ordinarily be obtained.

The next measure of value is obtained by determining what it would cost to reproduce the plant rather than by what the plant actually cost. In thus determining the cost of reproduction new of the plant, it is necessary to obtain complete inventories of every element that enters into such cost, as well as detailed statements of the prices at which these elements can be had, installed and shaped into an operating plant. The prices so used are the results of most careful and extended studies and compilations of market quotations and of prices at which sales were actually made. In order to avoid the abnormal effects of sudden fluctuations in such prices and to obtain results that are more nearly normal, the prices chosen may be said to represent average conditions for a considerable period, rather than the prices as of any particular date. When the elements which are thus included in the cost cover such overhead expenses as those incurred for organization, for legal and engineering service, for superintendence of construction, for interest and the capital used in construction, for insurance and contingencies, then this cost would seem to fairly represent what the plant would actually have cost. In this case, as in determining the original cost, it may be necessary at times to also consider certain bond discounts and promotion expenses in arriving at the probable total cost of reproducing the plant.

Neither the original nor the reproduction cost new of a plant is a fair measure of its present cost value unless the depreciation that has taken place in the plant has been provided for and goes with the plant. The present values as thus obtained, even when the one is greater than the other, furnish good evidence as to the present fair value of the physical property.

When the value of the physical property of the corporation has finally been determined, there remains still another cost which often is legitimately a part of the investment on which reasonable returns should be permitted. This is the cost of developing a paying business. The most perfectly equipped utility plant in existence is useless if it has no customers. The acquisition of customers is a costly process. It involves not only the expense of advertising, solicitation, free experimental service, and other actual outlays, but it may include the entire amount by which the plant during the first few years of its operation fails to pay operating expenses and a reasonable return on the investment. This latter amount may be to some extent offset by exorbitant profits after the plant reaches a paying basis, or by the fact that failures to earn a return may be in part due to poor management or lack of ordinary business judgment. But when all deductions have been made for such circumstances, there will usually be found, at least for some utilities, a steadily decreasing deficit for the first few years, which is fairly chargeable to the cost of developing a paying business. This deficit, being a large part of the cost of a successful public utility plant, is, as a rule, properly added to the present cost value of the property. It is sometimes termed "going value," but is more properly the cost of building up the business.

Just as in the case of the physical property of the corporation, the cost of the building up of the business may be ascertained by finding what it would cost under present conditions to reproduce the present business. This is done by determining from all the available data as to the amount and density of population, familiarity of the people with the use of the service in question, etc., what time would be required for a new plant to build up a paying business. The operating expenses and revenues during such period being capable of estimation, the total deficit for the period may be taken as the cost of reproduction of the business of the plant. This reproduction cost and the actual original cost of the business can then be compared, and the determination of the going value or cost of the business then depends upon the exercise of a sound judgment, based upon these two costs.

The original cost and the cost of reproduction of the plant and of its business ordinarily constitute the best evidence as to what constitutes the fair value of the property. In some instances these two costs are far apart, but in most cases they seem to approach each other quite closely. When far apart, the difference is mostly due to variations in the general price level of the elements, which enter into the construction of the plant and the development of its business as between the time when the plant was first built and the time of the reproduction, although contingencies, mistakes of judgment and errors of various kinds may play important parts. The tendency today, in appraisals, seems to be to attach greater importance to the cost of reproduction than to the original cost. As to which of these factors is the most important is a matter that is greatly dependent on conditions.

When the fair value of all the property that is used and useful has thus been determined the question arises as to what constitutes reasonable amounts for interest and profit on this value, as well as for depreciation and other operating expenses. These outlays, as stated above, may be said to make up the total cost of the service.

The returns to be allowed to the investor usually consist of two elements: The ordinary rate of interest for the use of his money, and a compensation for the risk he has undergone. Both of these items vary with differences in time and conditions. Bare interest, or compensation for the use of money, is largely a question of market rates, and is determinable by a study of the investment market generally, of local conditions. The second element, or the profit to be returned to the investor as a compensation for his risk, and, to a certain extent, for the business ability and management required to look after the investment, is the resultant of many conditions, such as the location of the plant, the prospects of the municipality or region in which it is situated, the circumstances tending to make operating costs high or low, and numerous other factors. Generally speaking, the risk is greater in a new than in an established enterprise. All of these matters when taken together indicate how far the investor is entitled to a return above ordinary interest for the mere use of his money. The best results are secured by fixing rates of return that will cause an unobstructed flow of capital into the public utility field.

Depreciation also is an element in the cost of the service and must therefore be covered by the rates charged for such services. That this is the case is quite obvious not only from the nature of the depreciation, but from ordinary business conditions. Depreciation is incurred because of the service and must therefore, like the other costs of this service, be borne by the takers. Unless it is so borne it would not be possible to obtain capital at such rates of interest as those which are accepted when it is understood that the property is to be kept up.

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The operating expenses of the plants also must be audited, examined and carefully analyzed. The reason for this is that only amounts that are reasonable and necessary under the circumstances should be included in the expenses upon which rates are based. These examinations cannot safely be limited to the expenses alone, but must frequently be so extended as to cover all other records of a plant, its methods of operation, the efficiency of its management and many other factors.

When the total cost of the service has been determined, it is necessary to so classify and apportion the various items therein that proper costs per units can be obtained. Such unit costs are one of the requisites for scientific rate making.

In the railway service, the expenses and fixed charges are first apportioned between passenger and freight traffic. When the total cost of the freight traffic has thus been ascertained, it is further apportioned as between the cost of handling the freight at the stations and the cost of moving it between stations. The latter apportionments are necessary because the terminal cost depends on the number of tons handled, while the movement cost depends on the length of the haul. With these costs, together with other necessary operating and traffic statistics at hand, it is possible to determine, for the average loading per car, the gross and net cost per ton of the terminal expenses and the gross and net cost per ton per mile of haul of the movement expenses. These costs per units under average loading are further modified by the effect upon these costs of the respective loadings per car, by the effect of the weight that is and should be given to the value of the articles in rate making, and by the effect of such differences in the cost as are usually found between local and through transportation; the figures or unit costs so obtained are certain to be of the greatest aid in establishing just and reasonable rates. In fact, these figures are indispensable in rate making, even in cases where they may have to be further modified because of competitive and commercial conditions.,

The loading per car greatly affects the cost per unit of transportation. One reason for this is that switching and other terminal expenses per car are about as great for a car that is lightly loaded as for a car that carries a heavy load. Another reason is that in moving the freight between the stations, the cost per ton is as great for the car itself as for the freight in the car, and that in light loading, this cost of moving the car alone must be borne by a smaller quantity of articles or pay freight, while under heavy loading this cost per car alone is distributed over larger quantities of articles. Owing to these facts, the net costs per unit are often several times as great under light as under heavy loading.

Local or way freight trains, owing to the frequent stops that are necessary in handling traffic from station to station, make less mileage than trains which handle through traffic. They also, as a rule, carry lighter loads. The result of this is that the costs per unit of traffic are often somewhat greater for local than for through traffic.

The value of the articles is a recognized element in rate-making. While it costs no more, when other conditions are the same, to transport more costly than cheaper goods, the former involve greater risks, and can bear much higher charges. Rates that cover their proportion of the operating expenses, including interest and profit, at the rate of say 30 per cent., may be less of a burden on high grade traffic than is the case of rates which cover their share of the operating expenses, including interest and profit, at the rate of say only 3 per cent. for low grade traffic. To charge higher rates for more costly than for cheaper commodities is in line with public interest, for it is only at lower than average rates that many low grade materials will move at all.

Competitive and commercial conditions must also be recognized. While, owing to consolidations, active competition is less important than formerly, it is yet a force that must receive consideration in rate-making. To meet conditions of this nature, it is often best for all concerned to accept competitive business at rates which are high enough to cover the additional cost of handling such traffic, plus a small amount above this for fixed charges, provided, of course, that such low rates can be put into effect without unjust discrimination in other respects.

Few subjects are more complex than these which involve rates that are equitable and just to all concerned, and few are also of greater importance to the public. Rate schedules under which each department and each customer are made to bear their just share of the total cost of the services do away with unjust discrimination in rates. They provide like rates for like services under similar conditions. This is of special importance in the transportation field, and in the case of power rates, wherever slight advantages or disadvantages stand for success or failure, not only among industrial enterprises, but among localities as well. The value to the public of the elimination of rates that are too high and of discriminatory practices of this kind and of the establishment of equal conditions in these respects, is many times as great each year as the cost of maintaining the commission.

UNIFORM ACCOUNTS AND REPORTS.

Whether the principles which govern public utility regulation are violated, is largely a question of facts. It is in order to find the facts that the service of such utilities is inspected and other activities investigated. To this end also it is necessary that their accounts and records should be kept on some basis that is uniform, that discloses the integrity of the various items, and under which they are so classified and arranged that they may be subjected to the proper analyses. In fact, effective regulation is largely, if not entirely, dependent upon the degree to which the actual facts involved are known and understood.

The Wisconsin law provides that every public utility shall keep such uniform accounts and records of all the business transacted and make such reports thereon as may be required by the commission. In accordance with this, the commission has prescribed classifications and forms of accounts, records and reports for each class of utilities of the same kind. They have now been in effect for some years and have brought good results.

Accounts so kept and reports so made enable comparisons of like facts for the same utility from time to time as well as between different utilities. They show all changes that take place in the various items and enable one to judge of their integrity. They disclose whether plants are efficiently operated and point out ways of improvements in the operation. They enable the various items to be grouped with reference to the causes from which they emanate as well as in accordance with proper units upon which for one purpose or another they may have to be apportioned. They disclose maximum, minimum, average and normal costs per unit, as well as other elements that are of the greatest importance. In fact no statistical compilations and no unit costs could be secured that would be of real value unless the financial and the operating reports were compiled upon a uniform plan of this kind.

Even when so kept, the accounts and reports often require careful checking and auditing. No important rate case, for instance, is passed upon without the examination of books and records.

CAPITALIZATION.

Another important duty of the commission is to supervise the issuance of securities. Under the Wisconsin law, public utilities cannot issue stocks and bonds without a certificate of authorization from the commission, and they can be issued only for cash, property or services. If the payment is in property or services, an appraisal of their value is made by the commission, so that in no case will the security issues exceed in amount the value paid into the corporation. The commission also takes care that the bonds shall not constitute an unduly large proportion of the security issue. The purpose of all this is to establish as close relations as possible between the investment and the securities issued, and also to keep the management of the property in the hands of those financially interested in it.

The evils of overcapitalization of public utilities are many.

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It makes the securities a speculative instead of an investment proposition. It contributes toward keeping the small local investor out of the public utility field, because the small investor will not risk his capital unless the securities offered to him are not only placed on a safe basis but are fairly demonstrated by some trustworthy authority to be so placed. This exclusion of the local investor from the public utility field is a great loss both to the investor and to the public utility. It deprives the former of a better paying investment than the savings bank, and as to the latter, it prevents that community of interest and harmonious relation between the utility and its customers which is likely to be present if the customers have a financial interest in the utility. This point, though generally overlooked, is exceedingly important, especially under the conditions of public sentiment toward public utilities that are generally prevalent today. A fairly general local holding of public utility securities would go farther in preventing the unpleasant and often expensive controversies that now so frequently arise between utilities and their patrons than almost anything else that can be mentioned.

Furthermore, since overcapitalization increases the risk to investors, it must also tend to increase the rate of return which must be allowed on their investment, for as has already been explained, the element of risk is of much importance in determining the reasonable rate of return. That many utilities, because of their financial methods, find it difficult to obtain needed funds at reasonable rates of interest, is only too well known, and the result is an economic waste that could easily be avoided. Overcapitalization also tends, in the absence of strict regulation of rates, to keep the utilities' rates higher than they would otherwise be, for strong pressure is exerted upon the management to pay dividends on the inflated capitalization, and reductions in rates are vigorously opposed by the 'security holders. Another result of this pressure is that earnings, which should be used to provide for repairs and depreciation, are often paid out to the security holders in interest and dividends, and the service of the plant naturally deteriorates. Failure to provide needed extensions to the plants is another important result of this policy.

Overcapitalization also has a bad moral effect on officers, employees and the public, because it represents both efforts and training in receiving something for nothing. It is often a means for covering up excessive earnings and an excuse for bad service.

All reasonable expenditures in promoting, financing and constructing the plant and developing its business are proper subjects of capitalization. If such items only are capitalized, then it would also follow that the outstanding securities would agree quite closely with the amounts invested and with the amount upon which investors are entitled to reasonable returns for interest and profit, at least under normal conditions.

As the utilities are managed or operated by the stockholders or their representatives, it is of the utmost importance that there should be a proper relation between the stock and bond issues by which the investment is represented. When, as is often the case, the bonds represent practically the entire cost of the plant and its business, and the stock little or nothing in the way of actual investment, it necessarily follows that the business may be managed and the operations controlled by those who have no actual investments of their own to look after, and who may therefore have more to gain from a reckless than from a proper and honest management.

One of the most effective means, therefore, to bring about honesty and effectiveness in managements is perhaps the one that has been suggested, namely this, that no stock should be issued which does not represent outlays either in cash or property or in performing needed service. Experience teaches that properties and business are, as a rule, much better managed by owners than by those who are not owners. The proportion of the equities in a plant that should thus be represented by stock is a matter that must largely depend on the circumstances in each particular case. Ordinarily, however, it should not be much less than one-third.

Applications for security issues must be accompanied by detailed statements showing the purposes for which the issues are desired as well as statements showing the assets and liabilities and the earnings and expenses of the plant. These statements are closely examined by the commission. When the issues are made for other property than cash, such property is also carefully appraised. In addition to this the plants are also required to make subsequent reports upon how the securities issues were exchanged or the proceeds therefrom expended. These reports are also examined and verified by the commission. In this and other ways security issues are closely regulated.

Economic theory and public policy demand that in cases where monopoly conditions prevail there should be close relation between the amounts judiciously invested and the securities by which this investment is represented. Any other course in the public utility field is, in the long run, almost certain to result in poorer service to their customers and in losses to their investors. In other words, the gains which come to the few from improper financial practices are inequitable and in the end are also certain to have to be unjustly borne by the public.

REGULATION OF CAPITAL EXPENSES.

There is one more field in which the commission has an important function in promoting the highest effiency and lowest cost of public utility service. This is in the prevention of duplication and waste in the establishment and extension of both railway and municipal utility plants. It is recognized by the railroad and public utility laws of Wisconsin that public service corporations are in their nature monopolies, and that the interests of the public are best conserved by protecting monopoly in these industries and at the same time supervising and regulating them in the public interest. To carry out this purpose, competition among public service companies in the establishment of new lines and plants is prohibited except under such conditions as make its existence a benefit to the public.

In the case of railway companies, the Wisconsin law provides that before new lines are built or extensions are made, a certificate must be obtained from the commission stating that public convenience and necessity require the construction of the new line. The problem here is somewhat different than in the case of most municipal utilities, for no two railways serve exactly the same territory, and although the terminals and some of the intermediate stations may be the same, it may well be that the remainder of the territory traversed is so badly in need of railway facilities that the authorization of the entire line may be warranted. In such cases the amount of population, its tendencies as to growth and industry, the availability of existing facilities, and many similar facts are material and require careful consideration. It is also important to determine whether the new line is likely to be capable of profitable operation, for a railway line which cannot make expenses is likely to be more of a burden than a benefit to the community.

By keeping fairly close rein on the investment of capital where another investment has already been made for the same purpose, and at the same time permitting such extensions and even duplication as will result in the greatest development of profitable business and the widest diffusion of needed services among the public, the commission's regulation of capital expenditures is capable of producing very beneficial results to investors and a permanent advantage to the consuming public.

THE WIDE FIELD FOR REGULATION BY COMMISSION.

It appears from what has thus been said that there is a widespread need for effective regulation of the services, rates and financial practices of public utilities, and that such regulation, when fair, is in line with public policy; that such regulation should be largely governed by existing conditions, and that it should be flexible enough to properly adjust its activities to such conditions; that it is more concerned with preventing future wrongs than with redressing past offences; that the wrongs it is designed to prevent are comparatively small when considered individually but large when taken in the aggregate; and that

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since many of the individual wrongs are small, it is of the greatest importance that some method should be devised under which they can be adjusted at the lowest possible costs to those who are thus harmed.

We thus find that the work of regulation is of such a character that it does not fit in with the work of the courts. Courts deal with what has happened rather than with what may happen. They redress wrongs already committed and the precedents they establish serve the same purpose. They are not prescribing, establishing and enforcing rates and regulations to be complied with in the future. Not being equipped with trained staffs for this purpose they are not in position to gather the facts that are required for intelligent regulation nor to exercise the necessary supervision in connection therewith. Their methods of procedure are slow, formal, and costly to the litigants. They are adjusted to work of a character different from that which is involved in the regulation of public utilities.

Franchise and other legal provisions fall short of providing such regulation as is needed. Provisions of this sort are seldom based on actual conditions, the data needed for this purpose not being available. Fair rates and adequate services can only be determined by such processes as those outlined above and this work can hardly be continuously carried on except by bodies which are organized for this purpose. Conditions by which such regulation must largely be governed are also constantly changing. Rates, for instance, which are fair when put into effect may be unjust shortly thereafter or long before franchise and other provisions expire. This is also true of service and other regulations. Methods of regulation which are inflexible and which remain the same regardless of conditions are more likely to be harmful than beneficial. In such matters it is seldom safe to rely on guesses as to future conditions. Franchises and other laws of this sort are also as a rule ineffective for lack of proper enforcement.

It is because effective regulation of public utilities cannot be had either from the courts or from franchise and other provisions of this kind and because competition is also ineffective for this purpose, that people in this country are turning to the public utility commissions for relief. From such experiences as we have so far had in this matter, it also seems that such commissions, when provided with such power and such equipment as those conferred by such laws as the public utility law of Wisconsin, are the very tribunals that can best meet this demand.

Public utility commissions of this kind are established and organized for the very purposes of such regulation. They are therefore provided with the employees and other facilities that are needed for the establishing of reasonable rates and standards of service and of seeing to it that these rates and standards are actually complied with. They are also required and equipped to perform much other work in the same line. In addition to that they have all the power that is necessary to carry their work into effect. The inspection and supervisory power which such commissions have are among the most important features of the work. It seems to contribute more towards establishing equitable and fair conditions in the public utility field than almost anything else.

Such commissions being appointed for a long term of years, and charged with important duties of a highly technical character are also likely to be taken almost entirely out of politics. This means that politics alone will not shape their policies; that irrelevant and disturbing influences of all kinds are gradually being eliminated from their work, and that they are able to adopt sound policies and to determine the question before them on their merits. The importance of all this is much greater than is generally realized.

There is perhaps no more important feature of commission regulation than the fact that it affords an inexpensive and, for the most part, prompt remedy for such grievances as are constantly arising between individuals and the public on one hand and utilities on the other. In Wisconsin, for instance, by far the greater proportion of the complaints of all kinds are settled either through correspondence or in informal conferences. All the aggrieved party does in most of these cases is to write the facts to the commission. The commission thereupon investigates the matter. In fact it does practically all the work that is necessary for settlement of the same upon the facts.

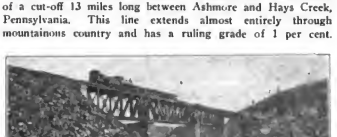
While state regulation through commissions in the form in which it exists in Wisconsin and a few other states dates back only a few years, it has probably been in existence long enough so that the experience under it will disclose whether it fairly meets the purposes for which it was created and whether it yields results that are in line with public policy. On the one hand it can be said that regulation has resulted in better service at lower rates and that it has done away with most forms of unjust discrimination. The direct benefits thereof to the public have been great. These benefits have also been obtained without injustice to the utilities or their owners. The indirect benefits therefrom, such as accrue from the facts brought to light and published in all work of this kind are also important. Such facts have become the basis for demands for improvements in the conditions as well as the means by which unjust suspicion and unfair agitation have been allayed. Publicity is always an important factor in all matters affecting public interests. This system of regulation has also in a measure taken the utilities out of local politics.

On the other hand, it must be admitted that it has not brought the millennium. Many are much more critical of the service and exacting in their demands in this respect than they were before regulation was ushered in. Others again are much disappointed because the reductions in rates have not been greater and because the values placed on the plants have not been lower than those so far ordered. Some are also more or less disgruntled because the cases they may have started, cannot be decided immediately, or because they cannot always be safely passed upon until the plants have been appraised, their accounts audited, their other records checked, the hearings held and the reports upon the law and the facts prepared. Most of the complaints against regulation of the kind in question here are without foundation. They are much more frequently actuated by personal or political interests than by questions of public policy.

A NOVEL DESIGN FOR A HIGH ABUTMENT.

By E. F. ACKERMAN,
Assistant Engineer, Lehigh Valley, New York City.

The Lehigh Valley has recently completed the construction of a cut-off 13 miles long between Ashmore and Hays Creek, Pennsylvania. This line extends almost entirely through mountainous country and has a ruling grade of 1 per cent.



The Completed Structure.

compensated for curvature, descending from Ashmore to Hays Creek with a total fall of 437 ft. Among other advantages, the cut-off effects a saving in distance of 10¼ miles in the movement of coal from the Hazleton coal region to points in the west. Work on this line was started about August 15,

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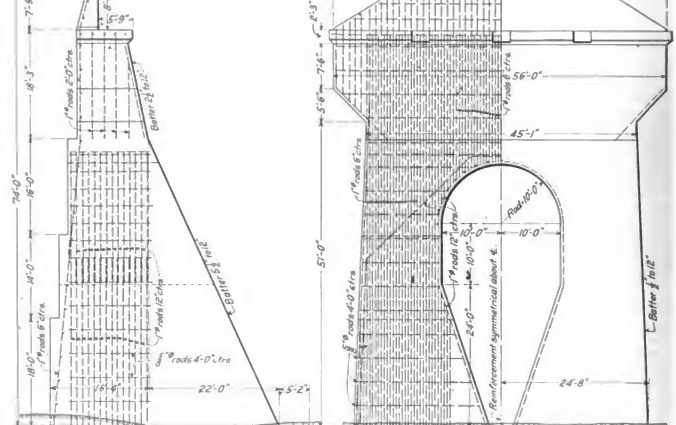
1910, and the line was opened for operation December 26, 1911.

There are three bridges on the line, of which the most important is the one over the main line of the Central Railroad of New Jersey and the Lehigh river. This bridge is 632 ft. long over all, and consists of two deck girder spans over the railway and three riveted deck truss spans over the river, all built for single track. The base of rail is 87 ft above low water. The substructure, which was built for double track, is of concrete and consists of two abutments and four piers, one of which is located in the middle of the river.

One of the abutments was of rather unusual design and was known as the pier abutment, because of the fact that the embankment was allowed to slope about and practically bury it. The abutment was located on the river flat which was inacter resting on yielding ground, it was decided to build a structure that would eliminate as far as possible the thrust of the embankment. This was accomplished by filling entirely around the abutment to neutralize to a certain extent the earth pressures, and by placing an arch opening in the structure, thereby reducing the back area by about 18 per cent. The design of the structure is shown by the accompanying plan.

The arch opening was further effective in reducing the foundation pressure by an amount represented approximately by the difference in the relative weight of the concrete replaced by the earth fill. The arch opening represents a volume of 602 cu. yds., or 30 per cent. of the total yardage of concrete above the foundation footing, which amounted in all to 1,995 cu. yds.

The foundation footing containing 640 cu. yds. of concrete



Side and Front Elevations of High Abutment.

undated years ago by a dam then existing about a quarter of a mile down stream. Sawdust from the various saw mills of that period collected and settled over the flat for a depth of about 6 ft. Test pits to a depth of 12 ft. disclosed a mixture of silt and sawdust, very fine river sand, soft red clay and some boulders and deeper tests with a Calyx drill indicated soft clay and numerous boulders. Although ledge rock outcropped along the right shore of the river at a point about 250 ft. up stream from the bridge, it was impossible to test to rock with the apparatus at hand.

It was originally intended to carry the foundations to rock, but as this was out of the question and as there was to be an embankment 73 ft. high built of material of unknown char-

consists of a slab 6 ft. thick and 45 ft. wide by 45 ft. 4 in. long, with a toe in front designed to resist any sliding action, and the base was designed for a uniform pressure of about 2.7 tons per sq. ft. Tests of the bearing value of the foundation material indicated approximately 3.8 tons per sq. ft., at which load practically no settlement was observed in 24 hours. Check levels made during the progress of the work showed very slight settlement, not exceeding 0.02 ft., and after the completion of the structure and embankment around it, there was no settlement whatever, neither was there any evidence of movement due to the action of the embankment. In order to economize in the amount of concrete, and at the same time provide against the embankment running around the backwall and covering the

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lower chords of the truss, wings or ears were cantilevered out at each end of the bridge seat, thereby lowering the slope line in front of the abutment.

The abutment was constructed during the winter with excellent results. Although freezing weather prevailed, the temperature sometimes falling to zero and below, the work was carried on by placing a steam jet in the mixer and by heating the sand, gravel and stone piles with a system of steam pipes placed underneath. Although the concrete was mixed about 1,500 ft. from the bridge, its temperature when placed in the form was approximately 75 deg. F., and when quitting work for the day, the temperature of the air in the form was approximately 35 deg. F. in zero weather. At night the top of concrete was protected with a covering of tar paper and tarpaulin, and next morning the protective covering would be white with frost, although the concrete was still warm. Three days after filling, the forms would be moved up for the next lift and the supporting rods removed. These rods, when withdrawn were too hot to handle with bare hands.

The accompanying photographs show the masonry during construction. The six rails placed about 4 ft. below the springing line were put in by the contractor to support the centering for the arch and were not provided for in the plans.

The embankment was dumped from narrow gage cars on

The High Abutment Before Forms for the Last Course Were Removed.

trestle placed back of the abutment, rehandled in wheelbarrows and deposited in front of the abutment for a height of about 20 ft. The balance of the fill was made by dumping from the completed bridge, the material being discharged over timber aprons which prevented the dumped material from striking the steel trusses. A gang of laborers rehandled the material, as dumped, so as to conform with the desired slopes. As a precaution against scour by floods, the toe of the slope was protected by a dry stone wall, or rip rap, about 4 ft. thick and 8 ft. high.

The river pier was started late in December, 1911, the first work consisting of the building of a squared timber coffer dam. This dam was constructed on the ice and then sunk through it. Before the work of driving sheeting around the dam was completed, there was a sudden thaw and a rise of water, causing the total loss of the coffer dam. The contractor abandoned the idea of replacing the timber dam and resorted to a bag dam consisting of about four rows of gunny sacks filled with fine loamy sand and piled about six rows high. Excavated material was banked on the outside of the dam and the water which was about 3 ft. deep was pumped out. The excavation work was done during severe winter weather and it was possible to excavate to a depth of 12 ft. below the bed of the stream without resorting to sheeting as the seeping water froze as fast as it appeared on the interior of the excavation, practically preserving nearly vertical excavation faces.

The Completed Abutment.

A 6 in. centrifugal pump readily unwatered the foundation by working about four hours daily.

As a second track may be built at an early date, the down stream line of trusses of the three spans over the river were designed and built to carry one entire track, so that when the second track is required it will only be necessary to add a third truss on the down stream side without moving or changing in any way, the three trusses already built, which will then be center trusses between the two tracks. The plate girder spans on the south side of the river were built for single track, as their spacing permits of building the separate spans. However, the inside column of the bent carrying the long plate girder span was also built to carry the additional weight of the second track.

The work was done under the direction of E. B. Ashby, chief engineer; F. E. Schall, bridge engineer, designed the masonry and the superstructure, and the writer was in charge of the construction.

RAILROAD CONSTRUCTION IN PARAGUAY.—The concession for constructing the Northeast Paraguay Railway has been extended one year by the government. Its construction should have been started in 1912, and according to the concession the line is to run from Asuncion to the Guayra Falls, joining up there with the Brazilian line to Sao Paulo. It is estimated that by the end of 1915 the line will be completed both in Paraguay and Brazil, thus giving Asuncion direct communication with the cities of Sao Paulo and Rio de Janeiro. Before the close of 1914 the railway known as the Trans-Paraguay will be open to traffic, thereby connecting the Paraguay Central Railway with the Brazilian line at the Iguazu Falls, thus bringing Rio de Janeiro within 60 hours of Asuncion.

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TRAIN ACCIDENTS IN FEBRUARY.[1]

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of February, 1913:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
4.	Grand Trunk.....	Edwardsburg.	rc.	P. & F.	2	4
*6.	St. Louis, I. M.....	Collinston.	ac.	P. & F.	0	3
*16.	N. Y., N. H. & H.....	New Haven.	rc.	P. & F.	0	0
20.	Boston & Albany.....	Bondville.	re.	P. & F.	0	2
21.	Penn. Lines.....	New Alexandria.	re.	F. & F.	1	0

Derailments.

Date.	Road.	Place.	Cause of Derailm't.	Kind of Train.	Kil'd.	Inj'd.
1.	Houston & Tex. Cen..	Benebley.	d. track.	P.	2	9
2.	Illinois Central.....	Seward.	b. rail.	P.	0	0
4.	L. & J. Bridge.....	Louisville.	ms.	F.	1	0
26.	Atch., T. & Santa Fe.	Weitzer.	unx.	P.	0	0
27.	Ches. & Ohio.....	Stepstone, Ky.	unx.	F.	0	1

The trains in collision near Edwardsburg, Mich., on the fourth, were eastbound freights. The caboose and three cars of the leading train were wrecked and the engine of the other was badly damaged. Six trainmen and other employees riding in the caboose of the leading train were injured, two of them fatally. The second train should have been held at Edwardsburg, but it is said that by reason of a snow storm the engineman did not see the flag which had been displayed to stop him.

The collision at New Alexandria, Ohio, on the 21st occurred on a side track. A standing freight was run into by a following freight and the flagman of the standing train, who is believed to have been asleep in the caboose, was killed. Failure to protect the standing train and excessive speed in bad weather by the other train are given as the causes of the collision.

The passenger train derailment which occurred near Benchley, Tex., on the first, occurred about 3 a. m. The train was No. 17, and it was running about 40 miles an hour. The engineman and fireman were killed and six passengers and three trainmen were injured, the passengers not very seriously. The derailment was due to irregular track, caused by continuous heavy rains.

The train derailed on the road of the Louisville & Jeffersonville Bridge Company, at Louisville, Ky., on the morning of the fourth about one o'clock, was a switching freight moving backward. A brakeman jumped off or fell off one of the cars and was run over and killed. The cause of the derailment seems to have been a misplaced switch.

The train derailed near Weitzer, Col., on the 26th was southbound passenger No. 568. The derailment is believed to have been caused by the loosening of a tire of one of the wheels of the locomotive, and the engine was overturned. The trainmen and fifty passengers on the train escaped with slight injuries.

The train derailed at Stepstone, Ky., on the 27th was eastbound freight No. 92; and 14 loaded cars were wrecked. A trespasser riding on one of the cars was injured. The cause of the derailment has not been determined, but seems to have been excessive speed with a top-heavy car—a refrigerator loaded with beer.

Electric Car Accidents.—Of the accidents to electric cars recorded in the newspapers as occurring in the United States in the month of February, only one is reported as having been attended by fatal results, a collision between a passenger car, fully loaded, and a freight car, near Cheshire, Conn. About 40 persons, altogether, were injured, but only one fatally.

[1]Abbreviations and marks used in Accident List:
re, Rear collision——be, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc, Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

ARBITRATION OF THE FIREMEN'S WAGE CONTROVERSY.

W. J. Lauck* was the last witness called by the firemen in the arbitration proceedings. After one day's recess the railroads opened their case on Friday morning last. Before calling the first witness, Elisha Lee, chairman of the conference committee of managers, made a statement from which we quote as follows:

"With the indulgence of this board, I should like to say a few words as to the general theory which will underlie the evidence we shall present and ask you to consider. The railways appear before this tribunal as institutions built up by the investment of private capital and yet unable to control the price at which they may sell their transportation, to produce which is the purpose of their existence. We believe that it is wise and in the public interest that the people should, through properly constituted commissions, protect themselves against unreasonable or discriminatory charges or practices by public utilities. But the railroads constitute institutions which not only cannot control the price of their product, but they have not the privilege of getting, in the cheapest market, the labor with which that product is largely manufactured. They must keep the transportation machine moving. The public has given unmistakable evidence of a disposition highly to disapprove of any interference with railroad operation, no matter by whom caused.

"It was in recognition of our responsibility to this public that we consented to abide the arbitrament of this board. We conceded that the firemen were faithful and hard working. We offered to apply the conclusions of the fair and able board which adjudicated last summer the case of the engineers, but the demands of the men were so far beyond what we felt we could in reason concede, that an impasse was created which, to prevent the public inconvenience of a strike, your honorable board was constituted to dissolve.

"This board represents the public in a peculiar sense. It embodies primarily the widespread and justifiable view that strikes on public utilities should not be permitted to take place. It gives visible evidence of the principle that public convenience is paramount and that to that end all interests must bow. To such sentiment the railway companies feel a keen sense of responsibility. Their corporate character renders them peculiarly subject to a belief on the part of the public that responsibility for any cessation of traffic rests solely upon the railway managers. To our firemen friends, however, this sense of responsibility does not seem to be so acute. They represent no one but themselves, not even their fellow-workmen in other lines of railway employment; they cannot experience the direct results of public displeasure. Railway employees have come to know that a strike which would tie up traffic is well nigh unthinkable. They know that if a strike doesn't take place the railways must give way. The men make large demands upon railway managers, not expecting those demands to be granted but believing that arbitration must take place, and that in the end the splitting of the difference between what they demand and what the railways offer will result in their favor. In thus stating the case we but paraphrase the observations of the representative court which adjudicated the case of our engineers but a few months ago.

"The plan of labor leaders has been to get the roads paying lower wages to raise them, then apply pressure to those paying higher wages to re-establish the previous differential. Step by step, the campaign has proceeded. Thus, today, the railways are face to face with large demands from their trainmen.

"We are likewise confronted with constantly increasing demands through mandatory legislation. The New York Central estimates that the cost to them, and the waste to the public, of the extra crew bill now pending in New York, will be over $700,000 per year. The purpose of these citations is to place before this tribunal something of the stale of mind and the feeling of un-

*See *Railway Age Gazette*, March 21, 1913, page 667. The arbitration proceedings thus far have been reported in the *Railway Age Gazette*, issues of March 14 and March 21.

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certainty of railway managers in their dealings with their labor.

"In the presentation which the railways will make to this court, therefore, we shall ask you to bear in mind these somewhat intangible, but nevertheless essential elements in the situation. All the roads concerned in this movement do not plead poverty or impending bankruptcy as a reason why even the whole of the demands of the firemen should not be granted. The basis of our contention, the theory which has pervaded all our negotiations is this: Appreciating our responsibility to the public to provide an adequate and efficient transportation machine, menaced upon every side with growing burdens making it constantly more difficult for us to obtain adequate capital with which to finance needed improvements, unable to estimate either our revenues or upon what basis of cost we shall be permitted to earn them, we have felt it our duty not only to our shareholders, but to the public whom it is our duty to serve, to resist to the breaking point those demands of labor which we believe are extravagant and entirely out of accord with our obligations as a whole. We now propose to show that these men are today well paid for the services rendered and the rules and working conditions are such that they do not require the radical changes requested."

In reply to a question from Judge Chambers, Mr. Lee said that there may be some roads in the conference whose wages to firemen are too low, but he questioned if this were the best way to raise them. He also objected to the basis of weight on drivers as being unfair, and cited the case of a small freight locomotive and a large passenger locomotive, the former often earning more for a railroad than the latter.

W. H. Holbrook, a road foreman of engines on the Pennsylvania Lines West, was the first witness called. He said that in case of a slacking off in business, the firemen are almost invariably the ones to ask for a reduction in the number of men. There are about 40 mechanical stokers in use on his division which are a great help and lighten a fireman's work very appreciably. One fireman told him of making 50 trips with heavy passenger trains and never having to do any hand firing after leaving the terminal. It is necessary to fire about 500 lbs. of coal by hand in preparing the fire. From his experience, he estimated that a stoker at present will do about 70 per cent. of the firing on any locomotive, and that with a few improvements it will do 100 per cent. all the time. He said the firemen were friendly to the stokers, and were glad to fire locomotives equipped with them. He did not consider the filling of a lubricator dangerous work if the instructions which are issued are carried out.

J. H. de Salis, chief road foreman of engines of the New York Central & Hudson River west of Syracuse, N. Y., was the next witness. He said that, in his opinion, firemen do not have as hard a time now as in 1902, considering all conditions. On the Mallet compounds used on the Pennsylvania division an extra man is provided to help over certain hard pulls in the summer months. He told of what are called split runs on the New York Central, in which one engineer runs a locomotive over the entire division but the fireman goes only half way and is then relieved. Going west this results in the company's paying firemen for 180 miles when only 152 are run, and going east they are paid for 200 miles, or $5.90. Mr. de Salis said that his understanding of the schedule now asked would raise this to $10.05 for two firemen in each case, or four over the whole distance. This refers to article nine of the firemen's request, which states, "Rates of wages that are higher and conditions of employment that are better than specified will remain in effect. . . ." Mr. Carter and Mr. Lee discussed this point for some time, but Mr. Carter claimed that it was not the intention to place four men on this run. Mr. Lee said that there was nothing in the article to indicate that four men would not be required. Mr. Carter suggested that any difference later could be referred back to the commission for adjustment and Judge Chambers asked if he would make that a ten-year proposition and attach a salary. Continuing, Mr. de Salis said he did not consider weight on drivers a fair basis for paying the men, and also that locomotives equipped with superheaters greatly decreased the firemen's work.

Mr. Merkle, assistant road foreman of engines on the Cumberland division of the Baltimore & Ohio, followed. He said that the Mikados on his division are equipped with Street stokers and that as soon as a fireman becomes accustomed to the use of the apparatus he has no trouble. He previously ran a locomotive equipped with a stoker and said there was no reason why a fireman could not familiarize himself with one, and that the older firemen asked for the locomotives so equipped. He estimated that with the Street stoker not over 5 per cent. of the coal has to be fired by hand and also said that, personally, he would just as soon fire a large locomotive as a small one. He did not know about men being paid $1.00 a day extra to go to the Cumberland division, as a fireman witness had previously stated, but said that they had no more trouble keeping men there than elsewhere.

The next witness was J. S. Cavey, of the Baltimore & Ohio. He gave figures for a number of tests which he conducted on Mikado type locomotives in through freight service between Philadelphia and Baltimore. The conditions were as nearly as possible the same, except that in one series the firemen were instructed in the method of firing and in the corresponding series they were not. An average of six trips, instructing the men, showed 12,700 lbs. of coal burned, while without instruction the average was 16,500 lbs. In another case the average of four trips with instructions was 14,600 lbs., and of eight trips not supervised, 20,400 lbs. Mr. Cavey said that, in his opinion, firemen commonly burn much more coal than is necessary.

S. G. Wise, assistant road foreman of engines on the Middle division of the Pennsylvania Lines East, gave the results of a number of tests made to compare superheated with saturated steam locomotives. For consolidation type freight locomotives, one of these tests gave the following results:

	Weight on Drivers.	No. of Cars.	Tons in Train.	Coal Burned.
Saturated	211,000 lbs.	72	5,106	22,000 lbs.
Superheated	219,900 lbs.	82	5,900	18,800 lbs.

Mr. Wise also gave figures to show that firemen make, as a rule, as great a monthly mileage as engineers. In the cross-examination Mr. Carter did not succeed in shaking the witness in any way. Instead of getting him to admit that firemen are poorly paid, he brought out that Mr. Wise, while a fireman at less wages than are paid now, bought his own house and some others which he rents. Asked how he could live today on $60 per month, the witness said that their firemen now make over $100 per month, and that it does not, in his present position, cost him $100 per month to live and pay the expenses of a son at college.

M. C. M. Hatch, superintendent of fuel service, Delaware, Lackawanna & Western, followed Mr. Wise. He gave the following results of tests made on the Buffalo division with consolidation type locomotives with two firemen and Mikados with one:

	Consolidation.	Mikado.
Coal per locomotive mile, lbs.	187.6	182
Coal per hour, lbs., about	2,400	2,100
Average speed, miles per hour	13	15
Average coal per trip, lbs.	26,450	20,000

He said that the second man had practically nothing to do between shifts but take water.

Two of the same class of consolidations, one with a superheater and brick arch and the other without, under the same conditions showed a saving, per locomotive mile, of 11 lbs. of coal in favor of the superheater and arch. Mr. Hatch stated that by actual count, the number of scoops of coal fired on a Pacific type locomotive between Scranton and Hoboken in 3½ hours was 395. He also gave the following figures for passenger locomotive tests, the train and speed being the same in both cases:

	Ten-wheel type. (Wt. on drivers, 171,000 lbs.)	Pacific type. (Wt. on drivers, 180,000 lbs.)
Coal per trip, lbs.	18,350	12,850
Coal per locomotive mile, lbs.	135	94.5

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Mr. Staub, statistician of the Delaware, Lackawanna & Western, gave figures to controvert the testimony of a witness on the firemen's side regarding the use of a second man on locomotives on the Buffalo division.

At the opening of the session on Monday Mr. Carter read a telegram from the chairman of the firemen's committee of the Toledo, St. Louis & Western saying that he had been informed by the superintendent that the conference committee had not been authorized to represent this road in agreeing to arbitrate, and that the road would deal directly with its employees. Judge Chambers remarked that if the road ever had been in, the board would attend to their staying in.

Daniel McBain, superintendent of motive power of the Lake Shore & Michigan Southern, presented figures to show that the work of the firemen had not increased to the extent that the testimony of the firemen's witnesses would lead one to believe. Mr. Carter read from the minutes of the convention of the American Railway Master Mechanics' Association at Atlantic City in June, 1912, a statement by C. H Hogan, assistant superintendent of motive power of the New York Central & Hudson River, that it was "almost beyond human endurance" for a fireman to fire one of the new, big freight locomotives at her maximum capacity and with a maximum tonnage. Mr. Carter presented a statement, which was reported as having been made by Mr. McBain at the master mechanics' convention in 1910, to the effect that in the last few years there had been "a tremendous increase" in tonnage with efforts to make better speed, and that it was difficult to get a man who could put into the fireboxes enough coal, and that he recommended mechanical stokers. Mr. McBain agreed that this was true.

The next witness was A. Seiders, road foreman of engines on the Philadelphia & Reading. He said that firemen on the Philadelphia & Reading made as great or greater mileage than enginemen.

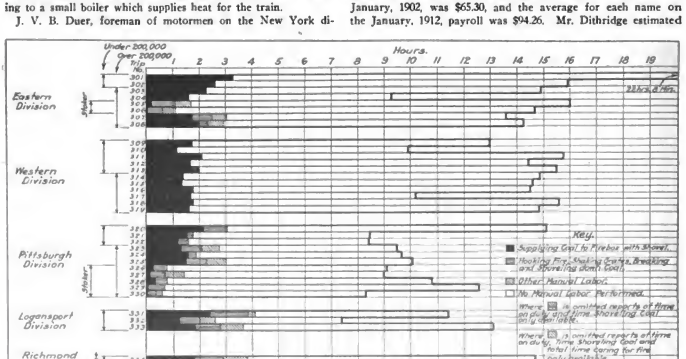
S. A. Bickford, road foreman of engines on the electric division of the New York Central & Hudson River, described the work of a fireman on an electric locomotive as consisting largely in looking out for signals, ringing the bell, and in winter attending to a small boiler which supplies heat for the train.

J. V. B. Duer, foreman of motormen on the New York division of the Pennsylvania Railroad, confirmed Mr. Bickford's statements and said that firemen on the electric locomotives on the Pennsylvania got the same scale of wages as firemen on steam locomotives.

J. F. Carroll, assistant general superintendent of motive power on the Baltimore & Ohio, described the successful use of mechanical stokers on the B. & O.

W. C. Hayes, superintendent of locomotive operation of the Erie, told of his experience with putting two firemen to a locomotive. He said that two men had been put on the Erie's heavy locomotives in response to demands of the firemen, but that the second man had been taken off after it had been discovered that although two men were assigned to a locomotive, only one was in many cases on the locomotive, the men taking turns at laying off and playing pool in the Y. M. C. A. building at the foot of the hill. In cross examination Mr. Carter tried to bring out a statement as to the heat in an attempt to show that the second fireman had remained at the bottom of the hill to get his feet cooled. Mr. Carter himself made the statement that it was 140 deg. 6 in. above the deck of the engine.

On Tuesday morning E. B. Dithridge, chief clerk in the general manager's office of the Pennsylvania Lines West, was the first witness. He said that he worked for nearly 20 years for the Pennsylvania and had been chief clerk in the general manager's office for nearly 11 years. He made a comparison of conditions and rates in 1902 and 1912 on the 100 miles on the Pittsburgh division between Dennison and Columbus. He said that in 1902 there were 24 H-4 engines and 25 H-6 engines in service on this division, and in 1912 13 H-4's and 68 H-6's. He said that just previous to the increase of wages which was made in January, 1902, the trip rate for the H-4's and H-6's was $2.14, with overtime after 11 hours, and that the trip rate today between the same points for the same class of service was $3.05, an increase of 42 per cent. Overtime today is at 30 cents or 30½ cents an hour, as compared with 19 cents in 1902, and overtime now begins after 10 hours. Previously men were allowed 30 minutes preparatory time, and are now allowed an hour. The average earnings for each name on the payroll in January, 1902, was $65.30, and the average for each name on the January, 1912, payroll was $94.26. Mr. Dithridge estimated



Length of Time on Duty and Time Occupied by Firemen in Various Ways on the Pennsylvania Lines West in Freight Service, February and March, 1913.

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that firemen as a whole, including yard, freight, passenger and all firemen on the Pennsylvania Lines West, are getting 42.57 per cent. more money for their services now than they would have been paid under the rates and conditions in effect at the end of 1901.

T. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West, was the next witness. He said that he had had no college education, had begun work as an apprentice in the Altoona shops, and had worked his way up through the ranks to his present position. Mr. Crawford presented statistics and diagrams to show that the effect of putting in service larger locomotives was not to increase the manual labor of the fireman. One of the diagrams introduced is shown herewith. Mr. Crawford said that in his opinion the figures which he introduced and those shown on the various diagrams, including the one shown herewith, demonstrate that there is no relation between the manual labor required from the fireman and the size of the locomotive. The following table shows a comparison of the average tractive power per locomotive in pounds; the average weight on drivers per locomotive in pounds; the average pounds of coal per locomotive mile, and the average wages paid firemen per locomotive mile in passenger service on a percentage basis, using 1910 as 100 per cent. and taking the information from 40 roads:

	Tractive power.	Weight on drivers.	Coal.	Wages.
1910.....	100.0	100.0	100.0	100.0
1911.....	103.8	104.0	101.3	104.2
1912.....	106.7	107.2	103.2	106.0

Mr. Crawford's figures showed that while the average tractive power per locomotive in passenger service had increased from 14,890 in 1900 to 22,300 in 1912; the average weight on drivers, from 65,114 in 1900 to 109,400 in 1912, and the average pounds of coal consumed per locomotive mile, from 69.6 in 1900 to 108.3 in 1912, the average wages paid firemen per locomotive mile had increased from 1.82 cents in 1900 to 2.64 cents in 1912. In freight service the average tractive power per locomotive had increased from 22,830 in 1900 to 34,743 in 1912; the average weight on drivers, from 102,630 in 1900 to 150,453 in 1912; the average pounds of coal consumed per locomotive mile, from 133 lbs. in 1900 to 195.2 lbs. in 1912, and wages per locomotive mile from 2.68 cents in 1900 to 4.26 cents in 1912. Mr. Carter asked whether if, instead of taking the average tractive power per locomotive mile they had taken the total tractive power in service, the increase in 1912 over 1900 would not have been a very much larger percentage. Mr. Crawford agreed that this was true. He said that the way his figures had been arrived at were as follows: The total tractive power of all locomotives had been divided by the total number of locomotive miles, and that the same method had been used in 1900 as in 1912. Mr. Carter tried to show that while Mr. Crawford's figures were correct insofar as being a proper exhibition of his method if he had used some other method the results would have been very different; but the witness would not admit that any other correct method could have been used. What Mr. Carter was apparently trying to show was that the percentage of increase of total tractive power was greater than the percentage of increase of total wages paid firemen. As a matter of fact, however, he did not ask the witness this question directly. Mr. Crawford submitted figures showing in detail the way in which the diagrams, similar to the one shown herewith, were compiled.

In redirect examination Mr. Crawford said that in his opinion the firemen had not contributed anything to the greater hauling power of locomotives and to the handling of the heavier tonnage in 1912 as compared with the tonnage handled in 1900. On cross examination he specifically stated that this statement was made not from the point of view of the employers, but actually as a matter of fact and of observation.

On Wednesday morning the cross examination of Mr. Crawford was completed. The questions dealt largely with the use of automatic stokers, and Mr. Crawford said that in his opinion there was no necessity whatever of having two firemen on one engine where a successful stoker was in use, regardless of the size of the engine. Men who have no knowledge of stokers are frequently called upon to fire stoker engines and have been known to make perfect records on their first trips under these conditions. The firemen have a more comfortable time where stokers are used, as the firedoor is closed during the greater part of the time and the coal dust annoyance is practically eliminated.

J. G. Walber, assistant to the third vice-president of the Baltimore & Ohio, presented detailed statistics showing the rates paid firemen for various classes of service by eastern, southeastern and western roads. In general the rates were higher for through freight service than for any other service exclusive of passenger service. The firemen asked for rates on the through freight service basis for these classes of service.

In their second amended proposition the firemen asked that firemen on all freight runs that load or unload freight, and firemen on all freight runs that set out or pick up cars, or do switching at four or more points between their initial and final terminals, be considered as in local freight, way freight, pick-up or set-out service and be paid 25 cents per day in addition to through freight rates. Mr. Lee contended that there should be no uniform rule governing all roads, and that local conditions should continue to determine this practice. Rules of a large number of roads regarding this practice were cited to show that at present they differed widely. Mr. Carter thought that a uniform rule was essential.

In their second amended proposition the firemen also asked that the following rule in regard to terminal delays be adopted: When the actual departure of any train is delayed to exceed one hour after a fireman is required to report for duty, or when a train has reached its final terminal limits and is then delayed from any cause so that the fireman is not relieved from duty within 30 minutes after having reached the final terminal limits, the firemen will be paid an additional compensation for all such delays over one hour at the initial terminal, and for all such delays over 30 minutes at the final terminal. Under this rule the fireman on a train which was due to start on a 100 mile run at 8 o'clock, but which did not start until 10 o'clock, due to unavoidable circumstances, and which arrived at its destination at 2 o'clock, where the fireman was again held 45 minutes, due to unavoidable circumstances, the fireman would be paid for a full day's work or ten hours plus one hour and fifteen minutes terminal delay. In other words he would be paid for eleven hours and fifteen minutes' work when he was only on duty six hours and forty-five minutes. Mr. Carter said that this rule was intended to penalize the roads for keeping the firemen on duty when their services were not wanted. Mr. Lee said that if the roads were to be penalized in this manner the firemen should receive less when their run of 100 miles was compelled in less than ten hours. Mr. Carter said that firemen were kept waiting at terminals when the officials knew that they would not be needed for hours. Mr. Lee said that they received pay for these waits. Mr. Carter replied that the firemen preferred not to work over ten hours a day, regardless of overpay. He said further that yardmasters frequently prevented trains from entering yards, claiming that there were no tracks available, but when those yardmasters found that the ten hour limit of the trip was approaching, they speedily found clear tracks. Mr. Carter thought that this rule would have the effect of allowing trains to enter the yards more promptly. It was shown that the Chesapeake & Ohio had adopted the practice of having the engines made ready by hostlers, so that the firemen were not needed until immediately before the train was due to leave. Mr. Carter advocated the adoption of this practice.

Under the provisions of the Erdman act a decision would be due on April 6. Both sides have, however, agreed to an extension of time and have left it with the board to decide how much more time will be needed. The board will fix a date later on.

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General News.

On April 1 the general offices of the Chicago & Alton, now located in the Railway Exchange Building, will be removed to the Transportation Building, 608 South Dearborn street, Chicago.

The United States has begun suit in the federal court at Freeport, Ill., against the Illinois Central to collect penalties amounting to $6,200, for alleged failure to report violations of the hours of service law.

In New York City this week, the New York, New Haven & Hartford was fined $500 for violating the smoke ordinance. The offenses occurred some time ago in the yard at Harlem river, where electric locomotives are now being introduced.

The St. Louis & San Francisco now runs through trains, both passenger and freight, to and from New Orleans over the Yazoo & Mississippi Valley, a contract for the use of these tracks for 99 years having gone into effect on the 16th of this month. The contract covers a distance of 85 miles, the connections being made at Baton Rouge on the north, and Shrewsbury, about 5 miles from New Orleans, on the south. From Shrewsbury to the terminal in the city, the trains of the Frisco will use the tracks of the New Orleans Terminal Company, which is controlled jointly by the St. Louis & San Francisco and the Southern Railway. South of Baton Rouge the Frisco trains have run heretofore over the line of the Louisiana Railway & Navigation Company.

A special committee appointed by the Michigan legislature to investigate the financial history of the Pere Marquette has been holding sessions at Detroit. F. W. Stevens, formerly general counsel of the road, and now connected with J. P. Morgan & Co., produced statements showing that increases in wages, in cost of materials, and in interest and rental charges, had caused a deficit of $1,800,000 in 1911, and a slightly larger deficit in 1912, after the company had earned a surplus of $469,000 in 1910. He said that the wage increase alone in 1911, as compared with 1910, amounted to $1,022,000; that the gross earnings decreased $18,000, and the higher prices of materials cost the company $492,000. He also stated that proposed legislation now pending in the legislature, if enacted, would cost the road $818,000 annually, without giving it anything in return, and that the Michigan legislature had been particularly active in passing laws to increase the road's "cost of living." Even if the Interstate Commerce Commission had allowed the proposed advance in rates in 1910, the Pere Marquette would have received only $500,000 in increased revenue per year.

Large Capacity Wrecking Crane.

In an article describing a wrecking crane used on the Norfolk & Western in our issue of March 14, the weight in working condition was incorrectly stated. It should read 123 tons.

Law Against Stealing from Cars.

One of the measures recently passed by Congress makes it a felony to break the seal of a railroad car containing interstate or foreign shipments of freight, express or baggage, or to enter such a car with intent to steal, or to steal, conceal or by fraud or deception obtain from any railroad car, station-house, depot or platform any goods or chattels which are part of an interstate or foreign shipment of freight, express or baggage. Breaking into or stealing any part of the contents of a piece of baggage also comes under the provisions of the act, which applies with equal force to any person who shall buy, receive or have in his possession any freight, express, baggage or other goods or chattels so stolen, knowing the same to be stolen. The punishment for any of these offenses is a fine up to five thousand dollars or imprisonment up to ten years, or both, and prosecutions may be instituted in any district where the crime shall have been committed.

The carrying or transporting by a person of any such freight, express, baggage or goods or chattels from one state or territory into another, knowing it to have been stolen, constitutes a separate offense for which the same punishment is prescribed. Prosecutions for such transporting of stolen property may be instituted in any district into which the goods or chattels may have been removed or into which they may have been brought.

The making of these acts federal offenses, together with the severity of the punishment provided, is expected to prevent much crime of this character, as all offenders have a wholesome fear of United States courts and the promptness and certainty with which they mete out punishment.

Report on Gothenburg Collision.

The board of inquiry appointed by the Union Pacific to investigate the rear collision at Gothenburg, Nebraska, March 14, between train No. 12, the Denver Special, and train No. 4, the Atlantic Express, which caused the death of four persons, and injury to several others, has submitted a report placing the responsibility for the accident. The board finds that at the time of the accident an extraordinary and unusual blizzard prevailed in the vicinity; that the safety appliances were operating perfectly at the time; and that the cause of the accident was the failure of the engineer, John Weinberger, of train No. 12, to properly observe the signals and place his train under control, when passing the second block signal west of Gothenburg, the distant signal, and the failure to stop at the block signal located 1,100 ft. west of the point of the accident. The report is signed by Charles Ware, general manager, and W. R. Cahill, superintendent of the Union Pacific, and by the general manager of the Gothenburg Telephone Company, and the cashier of the Gothenburg National Bank. Train No. 4 had stopped at the water tank near Gothenburg when it was struck by No. 12, which, according to the testimony of the conductor, was going at the rate of about 10 miles an hour, having slowed down at the caution signal. The coroner's jury which investigated the accident reported that the collision was due to the very unusual severity of the storm, making the observation of signals very difficult.

Proposed New York-New Jersey Bridge.

The Interstate Bridge and Tunnel Commissioners appointed jointly by the authorities of New York and New Jersey have made a report of their doings for the past year; and they propose a bridge across the Hudson River from 58th street, New York City, to Weehawken, N. J., the central span of which is to be 2,880 ft. long. The eastern terminus of the proposed bridge would be near the south end of Central Park. Three miles south of here, at Canal street, there would be the New York terminus of a tunnel, for wagon traffic, beneath the river, which also is proposed by the commission. Preliminary plans and estimates for the bridge have been made by Boller, Hodge & Baird, of New York City, and estimates of the cost of the tunnel have been made by Jacobs & Davies, of New York. The engineers estimate that the bridge would cost twenty-nine millions, to which would be added five millions for land, five millions for interest charges and three millions for engineering and contingencies, a total of $42,000,000.

The length of the bridge entire would be 8,300 ft. It is proposed to carry all of the traffic on one level; two driveways, two tracks for subway railroads, two for elevated railroads, and two for surface street cars. The plan calls for a bridge 170 ft. above the surface of the river, which is 35 ft. higher than any of the bridges across the East river; and the towers supporting the main span would be 545 ft. high.

Railway Legislation.

The Oklahoma legislature has passed a full crew law. It provides that freight trains of thirty cars or more shall have three brakemen.

Fines aggregating $4,300 have been assessed against eight railways in Indiana for violations of the safety appliance act and the ash pan act.

The governor of Missouri has approved the bill passed by the legislature abolishing the railroad and warehouse commission, and creating the office of state warehouse commissioner. It is announced that Commissioner Bradshaw will be appointed to the office of warehouse commissioner, and that Commissioners Knott and Wightman will be made members of the new utilities commission for the period of their unexpired terms on the railway commission.

The Missouri legislature has passed a senate bill providing that no railroad corporation, rail, steam, street, electric, trans-

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fer or terminal, except those incorporated and chartered in and under the laws of Missouri, shall be authorized or permitted to carry passengers or freight of any kind between points within the state, under a penalty of from $2,000 to $10,000 for each violation. As mentioned in last week's issue, the house passed a bill for similar purposes, but it has since concurred in the senate bill as noted above.

Disastrous Floods in the Central West.

Abnormal weather conditions throughout the central and western states during the past week have caused hundreds of deaths and destroyed many millions of property. A tornado in Nebraska, which did great damage in the western part of Omaha, wrecked buildings in that city on Sunday by the hundred and resulted in over two hundred deaths and many injuries. This was followed on Monday and Tuesday by heavy rains, causing floods in Illinois, Indiana, Ohio, and western Pennsylvania. The governor of Ohio reported that that state had suffered the worst disaster in its history, and including the floods, fires and deaths in Indiana he believed it would be the greatest tragedy in the history of the republic. From the brief and inconclusive reports published up to the time of going to press, we make the following notes:

Dayton, Ohio, was flooded throughout the business section of the city, and the deaths were estimated all the way from two to five thousand. The flood was followed by great fires.

Columbus, Ohio, suffered enormous damage and railroad traffic was almost completely suspended early on Tuesday. The bridge over the Miami river at Middletown, Ohio, fell. At Louisville, Ky., great damage was done by wind, as well as by rain, the wind blowing at sixty miles an hour.

At Makanda, Ill., a freight train of the Illinois Central was blown off the track. At Delaware, Ohio, twenty or more persons were reported drowned as a result of the flood. Bridges were washed out in hundreds of places throughout the flood district.

A passenger train of the Pennsylvania lines was caught between two floods at West Liberty, Ohio, and one sleeping car fell into the Mad river, but the passengers all escaped with slight injuries, the train having been running at very low speed.

Fort Wayne, Ind., had the highest water in twenty years. Peru, Ind., was submerged throughout the business section of the city, and the number of deaths was estimated at 300.

A passenger train of the Cleveland, Cincinnati, Chicago & St. Louis was derailed at a washout near St. Paul, Ind. A freight train of the Wheeling & Lake Erie was derailed at a trestle bridge near Wellington, Ohio, and the engineman, fireman and one brakeman were killed.

Every creek and river in the state of Indiana was reported as overflowing, and the same was true in Ohio except in the northern part. The property loss in these two states was estimated at scores of millions. The people who were driven out of their homes in the principal cities of Indiana and Ohio were numbered by hundreds of thousands.

The Lake Shore & Michigan Southern was not seriously affected, but no line between this and the Ohio river was open to Chicago. All other lines had to send their passengers and perishable freight over the Lake Shore. The Pennsylvania was open from Pittsburgh to Alliance and from Pittsburgh to Dennison. The Norfolk & Western was reported on Thursday as open from the Ohio river to Columbus. By reason of the almost complete paralysis of telegraph and telephone lines scores of towns had not been heard from, on Thursday morning. Numerous despatches have contained estimates of losses of railway bridges and roadbeds aggregating many millions of dollars, but none of them can be confirmed.

Switchmen's Wage Controversy Under Mediation.

A dispute between the 19 roads serving the Chicago district, and yardmen, members of the Brotherhood of Railway Trainmen, who have made demands for a new scale of wages, and a revision of working conditions, has been submitted to mediation under the Erdman law by Acting Commissioner of Labor G. W. Hanger, and Martin A. Knapp, presiding judge of the Commerce Court. Mr. Hanger arrived in Chicago on Sunday, and at once went into conference with two committees. The demands of the men include time and one-half for overtime, Sundays and holidays, continuous time and one hour penalty for failure to give 30 minutes for meal time, semi-monthly pay, one day's pay if called and not used and pay for time consumed in investigations. The switchmen were represented by a committee headed by Vice-President Whitney of the Brotherhood of Railway Trainmen, and the roads by a committee of managers, of which T. J. Foley, general manager of the Illinois Central, is chairman.

Following the failure of negotiations with the managers a strike vote was announced on March 20, and conferences were resumed. The managers' committee proposed that the men withdraw the items involving payment of time and one-half and that the investigations be continued as to the remaining rules with a view to affecting a settlement by mutual concessions. When this proposal was declined by the brotherhood committee the managers proposed the calling in of mediators, which was accepted. The managers have published as an advertisement in the newspapers, a letter to Vice-President Whitney, which includes the following:

"Your request for time and one-half for overtime and for Sundays and holidays is declined, because it would penalize the roads for conditions they cannot prevent. The principle of time and one-half for overtime for Sundays and holidays for yardmen is wrong, for the reason that it cannot accomplish the purpose for which you intended it, i. e., elimination of overtime. The establishment of such a high rate for overtime would be an incentive for men to work longer hours, and it would result in increasing rather than decreasing the men's day. It cannot be contradicted that a certain amount of yard work must be performed Sundays and holidays, and railroads do not receive any greater compensation for traffic handled on those days than at any other time, and therefore would not be justified in increasing the rates for such days."

Western Railway Club.

A special meeting of the Western Railway Club was held in the Assembly room of the Karpen building, Chicago, on Tuesday evening, March 25, to consider the report of the committee appointed to suggest necessary changes in the rules of interchange. The proposed changes are to be submitted to the arbitration committee of the Master Car Builders' Association.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

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BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 3d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—J. G. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren K. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1913, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May, 1913, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. C. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, June 26-29, 1912, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Railway Business Association.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York City.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—T. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. G. Anderson, Penna. R. R., Pittsburgh; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, June 10-14, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. Collingwood, 1442 Rockwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Amer. Telegraph Supt.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W. Sterling, Ill. Convention, September 10-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 1868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwick, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. C. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly, Detroit.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The spring meeting of the National Industrial Traffic League will be held at the Iroquois hotel, Buffalo, N. Y., on Tuesday, April 15. A number of important subjects will come before the meeting and a large attendance is expected.

The Secretary of Agriculture has declared a quarantine against interstate traffic in Parlatoria scale and Phoenicococcus; but only from certain counties in southern California, in Arizona and in Texas. These things are insects which do damage to date palms. All shipments of date palms from the territory named must be inspected by government inspectors.

Eight wholesale liquor dealers of Winthrop, Mo., across the Missouri river from Atchison, Kan., have been notified by the railroad and express companies that they will accept no shipments of liquor consigned to Kansas points. This action was taken as a result of the enforcement of the new federal liquor traffic law in Kansas. This is expected to put the Winthrop dealers out of business, as they have been selling most of their output in Kansas.

On Sunday, March 23, the Illinois Central and the Nashville, Chattanooga & St. Louis re-established their former fast freight train No. 51 from Chicago to Nashville, Chattanooga, Atlanta and other southeastern points. This train will carry principally perishable freight, through merchandise cars and other high class tonnage. The time will be 50 hours Chicago to Atlanta, which, for the distance, 850 miles, makes it practically the fastest long distance freight service in the world. The route will be via Cairo, Ill., and Martin, Tenn. The schedule provides for leaving Chicago at 11:00 p. m. daily; Martin at 12:30 a. m. second day; Nashville, at 7:45 a. m. second day; Chattanooga, at 5:45 p. m. second day; arriving at Atlanta at 1:30 a. m. third day.

"Salmon Day," March 14, was celebrated this year for the first time. Throughout the northwestern states, and to some extent in other parts of the country, it is declared by its promoters to have been a great success; and they propose to do the same thing again next year. About forty railroads are represented in Seattle, the center of the salmon industry, and all of these lines joined in the movement, and had salmon served on their dining cars. The northern transcontinental lines served portions of the fish to diners free on that day. J. M. Norton, general agent of the Missouri Pacific, at Seattle, was chairman of the committee, and the Seattle Transportation Club, of which he is one of the prominent members, gave a dinner to the salmon packers, at which 300 guests assembled.

The Southern Railway has appointed two assistant live stock agents. They are to assist and instruct the farmers of the southern states in raising beef cattle and other animals, in the most successful way. Dr. Walter Farrell is to be stationed at Greensboro, N. C., and Dr. C. D. Lowe at Chattanooga, Tenn. Both have had years of experience in animal husbandry and have been in the service of the United States government. It looks as though railroad functions and railroad nomenclature were in danger of becoming very much confused. Ordinarily, the live stock agent of a railroad has been supposed to devote his energies mainly to hastening the death of animals, that is, in getting them to the slaughterhouse; but these men, with the selfsame title, are going to promote the life and happiness of the animals on the farms which they visit. What conflicting emotions must agitate the breast of a steer, when he sees the "agent" coming!

Traffic Club of Chicago.

At the annual election of the Traffic Club of Chicago, Tuesday evening, March 25, the following were elected as officers for the ensuing year: President, Guy S. McCabe, general western freight agent, Pennsylvania Company; first vice-president, W. M. Hopkins, manager traffic department, Chicago Board of Trade; second vice-president, Frank W. Smith, member, Uniform Classification Committee; third vice-president, I. Richards, traffic manager, Quaker Oats Company; secretary, W. H. Wharton, commercial agent, Nashville, Chattanooga & St. Louis; treasurer, Charles B. Hopper, general freight agent, Goodrich Transit

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Company; directors for two years: C. E. Finch, general agent American Express Company; V. D. Fort, assistant freight traffic manager, Illinois Central; H. K. McEvoy, assistant general passenger agent, Chicago & Alton; F. B. Montgomery, traffic manager, International Harvester Company.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 139-A, giving a summary of car surpluses and shortages by groups from December 6, 1911, to March 15, 1913, says: The total surplus on March 15 was 57,998 cars; on March 1, 1913, 58,529 cars; and on March 13, 1912, 46,028 cars.

Compared with the preceding period; there is a decrease in the total surplus of 531 cars, of which 1,735 is in flat, 172 in coal, 289 in miscellaneous, and an increase of 1,665 box cars. The increase in box car surplus is in all groups, except, 4 (the Virginias and Carolinas), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), and 11 (Canadian Lines). The decrease in flat car surplus is general, except in groups 2 (New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania), and 5 Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida. The decrease in coal car surplus is shown in groups 3 (Ohio, Indiana, Michigan and Western Pennsylvania), 5 (as above), 6 (Iowa, Illinois, Wisconsin and Minnesota), 9 (Texas, Louisiana and New Mexico), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona). The decrease in miscellaneous car surplus is shown in groups 2, 4, 5, 7, 9, 10 and 11 (as above).

The total shortage on March 15, 1913, was 20,223 cars; on March 1, 1913, 27,148 cars; and on March 13, 1912, 42,985 cars

Compared with the preceding period; there is a decrease in the total shortage of 6,925 cars, of which 4,994 is in box, 1,767 in flat, 585 in miscellaneous, and an increase of 421 coal car shortage. The decrease in box car shortage prevails in all groups, except 4 and 11 (as above). The decrease in flat car shortage is shown in groups 2, 3, 4, 6 and 8 (as above). The increase in coal car shortage is shown in groups 3, 5, 6 and 9 (as above). The decrease in miscellaneous car shortage is shown in groups 1 (New England Lines), 3, 5, 6 and 8 as above.

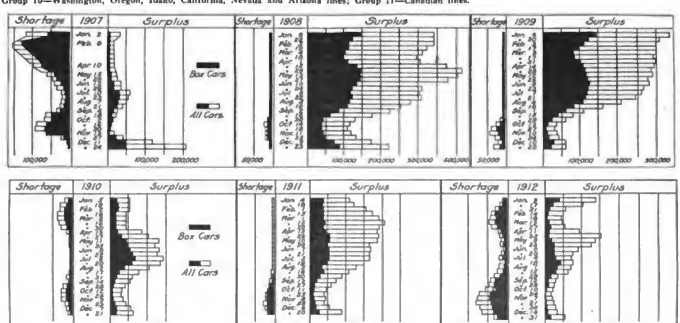
Compared with the same date of 1912; there is an increase in the total surplus of 11,970 cars, of which 4,722 is in box, 8,023 in coal, 2,311 miscellaneous, and an increase of 3,086 flat car surplus. There is a decrease in the total shortage of 22,762 cars, of which 12,938 is in box, 7,933 in coal, 2,846 in miscellaneous, and an increase of 955 flat cars

The accompanying table gives car surplus and shortage figures

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses — Box.	Surpluses — Flat.	Surpluses — Coal, gondola and hopper.	Surpluses — Other kinds.	Surpluses — Total.	Shortages — Box.	Shortages — Flat.	Shortages — Coal, gondola and hopper.	Shortages — Other kinds.	Shortages — Total.
Group *1.—March 15, 1913	7	50	0	79	7	136	457	159	0	577	1,193
" 2.— " 15, 1913	35	1,113	71	1,279	238	4,701	152	0	1,454	15	1,821
" 3.— " 15, 1913	32	328	530	3,434	1,824	6,116	1,813	13	260	539	2,625
" 4.— " 15, 1913	11	4,162	84	1,004	594	5,844	1,297	516	462	58	2,333
" 5.— " 15, 1913	26	155	17	663	600	1,455	2,564	339	835	56	3,994
" 6.— " 15, 1913	31	2,276	267	2,099	3,456	8,098	2,653	205	496	129	3,483
" 7.— " 15, 1913	6	54	29	764	608	1,455	60	0	40	0	100
" 8.— " 15, 1913	19	1,817	230	3,026	3,004	8,077	149	6	0	38	193
" 9.— " 15, 1913	15	2,893	224	438	634	4,189	0	16	4	37	59
" 10.— " 15, 1913	25	4,289	1,226	3,061	8,024	16,599	387	32	23	212	654
" 11.— " 15, 1913	7	496	237	0	595	1,328	3,119	370	0	279	3,768
Total	214	17,632	2,915	17,867	19,584	57,998	12,651	1,856	3,776	1,940	20,223

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

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by groups for the last period covered in the report, and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

Car Location.

The accompanying table, which is taken from the car location bulletin No. 4 of the American Railway Association, gives a summary of freight car location by groups on March 1, together with surpluses and shortages on the same date.

of three cents per 100 lbs. on carload and five cents per 100 lbs. on less than carload traffic handled by the Chicago River & Indiana lighterage and float service to and from points on the Chicago river front.

The commission has suspended from March 22 until July 19 the schedules in a supplement to the tariff of the Southern Pacific, which propose to advance rates for the transportation of lumber from points in California to stations in Nevada by the cancellation of established commodity rates and the applica-

CAR LOCATION ON MARCH 1, 1913.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., Ala., No. & Ga., Fla. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla. Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Cana-dian Lines.	Grand Total.
Total Cars Owned	90,412	677,408	284,157	200,090	171,967	471,526	16,092	149,730	30,807	129,856	129,695	2,351,680
Home Cars on Home Roads	44,537	351,118	90,081	103,862	72,691	283,920	3,162	67,106	13,150	65,421	80,300	1,175,368
Home Cars on Foreign Roads	45,855	326,290	194,076	96,228	99,216	187,606	12,930	82,624	17,657	64,435	49,395	1,176,312
Foreign Cars on Home Roads	56,013	314,381	211,715	101,770	88,997	207,959	12,009	78,703	25,290	64,135	62,974	1,223,956
Total Cars on Line	100,580	665,499	301,796	205,632	161,688	491,879	15,171	145,809	38,440	129,556	143,274	2,399,324
Excess or Deficiency	10,168	*11,909	17,639	5,542	*10,219	20,353	*921	*3,921	7,633	*300	13,579	47,644
Surplus	145	4,142	4,945	7,501	2,221	8,880	1,737	6,337	3,738	17,651	1,421	58,918
Shortage	1,727	4,608	4,259	2,078	3,896	5,632	212	572	71	872	3,221	27,148
Shop Cars—												
Home Cars in Home Shops	5,812	26,629	15,383	9,081	10,514	21,448	407	7,996	1,551	4,163	4,110	107,094
Foreign Cars in Home Shops	825	8,041	6,508	2,451	2,517	5,538	579	2,364	1,037	2,634	689	33,183
Total Cars in Shop	6,637	34,670	21,891	11,532	13,031	26,986	986	10,360	2,588	6,797	4,799	140,277
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	49.28	51.83	31.70	51.91	42.29	60.21	19.65	44.82	42.69	50.38	61.91	49.98
Total Cars on Line	109.21	98.24	106.09	102.77	94.06	104.32	94.28	94.78	124.78	99.77	110.47	102.03
Home Cars in Home Shops	5.81	3.93	5.41	4.54	6.12	4.85	2.53	5.34	5.03	3.20	3.17	4.61
Foreign Cars in Home Shops	.91	1.19	2.29	1.22	1.46	1.25	3.60	1.47	3.37	2.03	.53	1.43
Total Cars in Shops	6.72	5.12	7.70	5.76	7.58	6.10	6.13	6.81	8.40	5.23	3.70	6.04

*Denotes deficiency.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended from March 20 until September 20 certain schedules in Agent F. W. Gomph's tariff, which contain increased rates for the transportation of tin cans and other commodities between points in the State of California and interstate points.

The commission has suspended from March 25 until September 20 the supplement to the tariff of the Union Pacific, which contains increased rates for the transportation of plaster, gypsum rock, stucco and plaster board from Blue Rapids and Irving, Kan., to interstate points.

The commission has suspended until July 8 certain tariffs, which name similar increased rates for the transportation of grain and grain products from points in Illinois to interstate points as are named in other tariffs previously suspended by order issued in same docket.

The commission has suspended from March 19 until July 17 the schedules in certain tariffs which proposed to increase rates for the transportation of cement, in carloads, from Iola, Kan., and other points in what is known as the Gas Belt district to Memphis, Tenn., 6 cents per 100 lbs.

The commission has suspended from March 25 until July 8 the operation of the supplement to the tariff of the Chesapeake & Ohio, which contains advances in rates for the transportation of grain and grain products similar to those suspended by previous orders in the same docket.

The commission has suspended until July 19 the items in certain tariffs, which advance from 7 to 19 cents per 100 lbs. rates for the transportation of fresh meats in carloads, from St. Louis, Omaha and other points to Oklahoma. As an example, the present rate from Omaha to Chickasha is 66 cents and the proposed rate 85 cents per 100 lbs.

The commission has suspended from March 25 until July 23 the schedules contained in a supplement to the tariff of the Chesapeake & Ohio, which cancel through rates on coal, in carloads, from mines in Kentucky and West Virginia to Milwaukee, Wis., via the Grand Trunk and car ferry across Lake Michigan, leaving no through rates in effect via this route.

The commission has suspended until July 12 the schedules in certain tariffs, which proposed to cancel the absorption by certain roads entering Chicago of lighterage and floatage charges tion of class rates. The proposed rate from New Castle, Cal., to Verdi, Nev., is $5.40 per net ton and the present rate is $2 per net ton, making an increase of $3.40 per net ton. Other points are affected in a like manner.

The commission has suspended from March 25 until September 25 the operation of the schedules contained in a supplement to the tariff of the Kanawha & Michigan, which propose to cancel through rates applying to the transportation of coal in carloads, from mines in Kentucky and West Virginia to Milwaukee, Wis., and other points via Ludington, Mich., and Pere Marquette car ferry.

Complaints concerning westbound rates on freight imported at Boston, New York, Philadelphia and Baltimore are again under investigation by the Interstate Commerce Commission, and a hearing was held at Washington on Tuesday of this week. Mr. Ives, speaking for Boston, claimed that under the present adjustment, Baltimore is getting an increased share of import traffic, while Boston is suffering a decrease.

The commission has suspended from March 25 until July 23 the schedules contained in a supplement to Agent F. A. Leland's tariff, which cancel through rates applicable to the transportation of lumber from points located on the Fourche River Valley & Indian Territory Railroad in Arkansas to points in Oklahoma which were established, effective January 1, 1913, in compliance with an order of the commission in the Tap Line case.

The commission has issued an order, the answers to which are wanted by April 30, calling for information, so far as it can be had from the railroad companies' accounts, showing operating expenses divided as between passenger service and freight service. The totals for the year ending June 30, 1912, are prefered; but any other twelve months will answer, if that year be not available. This part of the commission's work is in the charge of Commissioner Meyer; and it is said that he will be in charge of the work of valuation of railways, under the new law.

Two Thousand Complaints.

Sixty different railroad companies are represented in the reports of violations of the hours of service act which the Interstate Commerce Commission has transmitted to the United States district attorneys since June 30, 1912. Each report is accompanied by a recommendation that the companies be prosecuted for disobedience of the law. In these sixty cases the aggregate number of counts is 2,127.

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1913.—CONTINUED FROM *Railway Age Gazette* OF MARCH 14, PAGE 522.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Maintenance—Way and structures.	equipment.	Total.	Operating expenses—Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit), net.	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
St. Louis, Iron Mountain & Southern	3,318/$2,210,382	$538,250	$2,928,999	$381,345	$402,026	$54,837	$963,811	$70,238	$1,872,235	$1,056,764	—$5,707	$88,651	$962,362	$305.894
St. Louis Merchants' Bridge Terminal	9	393	179,016	25,311	11,776	790	98,019	5,771	141,667	37,349	.....	5,600	31,749	11,233
St. Louis, San Francisco & Texas	244	99,906	28,807	135,870	18,126	15,662	2,504	55,871	5,512	97,675	38,195	.....	1,225	36,970	25,195
St. Louis Southwestern of Texas	703	267,207	81,967	378,303	87,431	64,283	17,158	177,648	22,813	369,335	—11,032	—238	11,256	—22,499	—45,357
San Antonio & Aransas Pass	727	254,515	102,550	378,002	66,832	59,225	6,722	190,209	11,611	334,599	43,403	.....	12,000	31,403	511
San Pedro, Los Angeles & Salt Lake	1,135	525,539	256,376	839,844	90,639	163,347	28,888	295,575	19,209	597,650	242,194	—2,215	34,000	205,979	173,824
Seaboard	3,107/0	1,461,956	447,253	2,164,511	289,421	288,138	65,593	806,988	56,566	1,463,696	670,813	—2,295	81,000	587,528	298,719
Southern	7,036	3,651,681	1,462,023	5,547,839	812,581	970,623	182,899	2,081,960	172,083	4,220,146	1,327,693	19,743	212,303	1,135,133	116,966
Southern in Mississippi	281	61,252	35,055	105,000	29,607	10,947	2,702	50,197	4,440	97,893	7,137	.....	8,180	—1,043	—5,518
Southern Kansas Ry. of Texas	125	87,680	16,980	108,896	10,465	25,346	2,412	38,140	3,846	80,209	28,687	.....	2,328	26,359	32,367
Southern Pacific Co.	6,332	3,891,948	2,512,330	6,904,362	874,333	1,096,199	170,289	2,347,777	234,520	4,723,118	2,181,244	129,241	373,491	1,937,494	115,345
Spokane, Portland & Seattle	556	319,001	106,133	496,613	54,236	60,418	6,260	115,833	12,701	239,488	257,125	—124	53,400	203,601	132,160
Tennessee Central	294	91,237	29,723	128,970	26,004	16,028	5,329	46,152	7,310	100,823	28,147	.....	4,264	23,883	22,955
Terminal R. R. Ass'n of St. Louis	34	8	285	253,324	41,064	18,871	968	185,948	5,574	272,426	80,914	.....	26,596	65,393	18,266
Texas & New Orleans	458	222,911	94,990	339,831	76,843	80,721	9,193	143,842	15,582	326,181	13,650	—11,779	12,672	—10,801	—6,353
Texas & Pacific	1,885	1,046,499	353,406	1,488,306	139,975	243,313	32,761	744,920	50,647	1,211,636	276,670	—838	51,704	224,128	—19,833
Toledo & Ohio Central	443	355,818	50,012	423,708	64,920	101,330	6,599	177,522	9,103	359,474	64,234	—826	21,737	41,671	—15,564
Toledo, Peoria & Western	248	79,156	37,114	122,657	19,725	27,890	2,363	48,418	3,529	101,125	21,532	.....	5,900	15,632	—3,506
Toledo, St. Louis & Western	451	344,192	25,156	390,528	24,592	40,657	14,594	150,892	9,220	239,955	150,573	.....	14,800	135,773	72,117
Trinity & Brazos Valley	463	186,076	38,257	235,690	41,153	35,705	10,583	150,329	12,015	254,335	—18,333	.....	3,500	—17,833	—14,141
Union Pacific	3,575	2,554,259	755,376	3,702,168	466,556	573,702	96,869	1,216,427	118,674	2,472,228	1,229,940	—8,461	168,271	1,053,208	303,835
Union R. R. of Baltimore	9	134,944	21,797	158,517	8,313	.....	958	5,585	2,635	17,391	141,126	.....	5,527	135,599	36,186
Union R. R. of Pennsylvania	31	.....	.....	287,420	25,529	90,057	100	144,577	2,003	263,107	24,313	4,527	24,500	—20,240	13,572
Vandalia	827	655,271	193,186	950,103	114,127	206,762	25,217	383,073	19,260	748,439	201,664	.....	30,359	171,305	22,280
Vicksburg, Shreveport & Pacific	171	86,922	40,841	141,040	28,622	25,944	3,787	50,091	5,496	113,994	27,046	.....	12,000	15,046	—1,303
Virginia & Southwestern	240	136,304	13,250	153,729	24,807	34,856	1,833	42,722	3,598	107,816	45,913	.....	.....	45,913	—2,393
Virginian	503	564,105	25,087	602,399	68,879	106,104	5,326	132,089	9,140	321,538	280,861	4,201	17,600	267,462	117,413
Wabash	2,515	1,705,044	530,035	2,350,920	264,472	439,311	90,419	1,197,809	69,554	1,961,972	363,028	—2,844	75,900	281,234	—38,599
Washington Southern	36	38,045	43,716	112,500	14,550	15,172	1,330	46,818	2,864	80,734	31,766	—269	3,290	28,207	3,823
West Jersey & Seashore	356	136,350	1,196,630	359,750	90,960	68,114	10,900	210,932	12,453	396,830	—36,841	—6,341	3,500	—47,682	—52,904
Western Maryland	543	554,334	56,154	649,142	71,992	92,318	16,295	309,578	12,501	502,684	146,458	.....	20,000	126,458	7,591
Western Pacific	937	300,802	70,705	382,821	73,915	43,380	23,410	192,292	26,837	359,834	22,987	—2,088	25,601	—4,702	32,311
Western Ry. of Alabama	133	70,721	49,998	129,980	23,080	24,014	6,393	34,072	5,658	93,195	36,614	63	4,750	31,882	29,005
Wheeling & Lake Erie	459	489,834	49,446	575,325	63,657	129,613	7,838	220,534	19,759	441,401	133,924	5,217	29,671	109,470	—27,874
Yazoo & Mississippi Valley	1,374	636,410	233,703	941,285	166,719	141,656	14,662	389,154	24,455	736,646	204,639	225	37,000	167,864	158,343
SEVEN MONTHS OF FISCAL YEAR, 1913.															
Alabama & Vicksburg	143	$724,927	$304,303	$1,101,993	$142,260	$211,351	$23,845	$377,263	$39,944	$796,601	$305,392	—$1,303	$43,086	$261,003	$39,647
Alabama Great Southern	309	2,004,658	709,568	3,069,150	356,445	661,834	89,890	958,908	66,035	2,133,102	936,048	—3,756	102,834	829,458	64,061
Ann Arbor	292	814,795	351,877	1,249,046	162,900	160,527	29,552	439,118	53,006	845,103	403,943	289	97,509	306,723	—54,675
Arizona Eastern	366	1,272,154	353,843	1,729,016	153,840	307,163	21,644	412,540	32,511	1,023,738	707,030	589	70,000	637,619	—72,371
Atchison, Topeka & Santa Fe	8,305	39,486,403	15,185,089	59,056,020	9,957,722	9,492,126	1,912,196	16,711,838	1,142,514	38,825,949	20,230,071	.....	2,979,134	17,250,937	2,252,145
Atlanta & West Point	93	377,419	300,573	750,368	93,856	133,098	38,571	241,561	35,506	543,592	207,776	1,173	44,408	164,541	—23,982
Atlanta, Birmingham & Atlantic	649	1,309,706	417,808	1,921,768	316,006	296,863	118,089	453,362	81,456	1,165,856	364,607	.....	94,427	270,180	—49,597
Atlantic & St. Lawrence	167	686,070	198,945	961,148	188,035	154,530	31,678	487,313	26,543	888,099	73,049	.....	68,873	4,176	24,535
Atlantic City	62	453,560	848,791	1,378,128	124,605	178,230	30,164	698,777	10,581	1,026,356	—26,864	.....	63,000	—89,864	—33,203
Atlantic Coast Line	4,612	13,600,011	5,128,101	20,233,589	2,811,873	3,191,292	358,129	7,169,868	530,856	14,062,018	6,171,571	.....	875,000	5,296,571	—28,948
Baltimore & Ohio Chicago Terminal	27	.....	14,219	1,082,246	156,856	165,232	5,060	486,120	31,517	644,985	237,261	6,212	133,387	109,666	56,157
Baltimore & Ohio—Staten	4,456	47,891,342	9,257,637	60,853,134	8,896,586	10,047,727	1,143,243	21,285,115	1,165,440	42,737,284	18,115,850	18,124,243	—5,283	18,110,467	15,974,121
Bangor & Aroostook	631	1,307,980	396,334	1,810,398	325,662	219,580	24,219	574,591	84,820	1,228,872	581,526	.....	73,500	508,026	—126,785
Belt Ry. Co. of Chicago	204	.....	.....	1,477,717	115,668	243,583	2,489	788,178	39,511	1,190,369	687,413	.....	273,000	414,413	62,496
Bessemer & Lake Erie	204	5,184,224	233,424	5,495,181	565,840	941,638	66,505	1,300,861	80,356	2,955,200	2,539,981	.....	78,000	2,461,981	235,516
Boston & Maine	2,244	17,317,644	10,061,458	29,389,405	3,521,262	4,386,074	244,622	13,521,018	705,172	22,378,148	7,011,257	106,448	1,255,943	5,861,762	399,621
Buffalo & Susquehanna R. R.	265	966,671	61,015	1,057,664	207,375	152,640	8,503	359,203	41,364	769,087	288,577	.....	15,400	273,177	73,518
Buffalo & Susquehanna Ry.	91	293,447	70,656	381,425	78,782	190,097	3,313	157,627	18,586	450,455	—69,030	125	10,700	—79,605	—31,596
Buffalo, Rochester & Pittsburgh	574	5,537,999	700,793	6,496,134	953,932	1,276,854	82,981	2,080,217	129,996	4,523,900	1,962,234	—2,040	121,000	1,839,194	135,048
Butte, Anaconda & Pacific	46	614,760	84,053	767,680	100,433	153,787	5,276	371,854	21,096	651,436	115,644	.....	14,500	101,005	—27,542
Canadian Pacific Lines In Maine	233	475,445	187,783	721,409	107,160	141,466	41,413	311,996	34,901	709,883	9,420	.....	70,000	—60,580	—42,604
Carolina, Clinchfield & Ohio	238	1,294,847	110,574	1,435,474	97,063	145,000	47,798	246,588	51,258	587,343	848,131	.....	54,000	794,131	178,519
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	79,121	12,087	95,687	5,042	642	2,727	12,790	1,850	32,601	59,286	.....	3,500	55,786	16,866
Central New England	277	1,911,262	211,380	2,225,952	310,236	189,116	8,520	617,684	23,969	1,149,525	1,076,427	—304	70,000	1,006,123	109,034
Central of Georgia	1,915	5,325,298	2,404,651	8,472,543	1,211,254	1,490,932	248,106	2,843,195	223,540	6,057,067	2,415,516	44,382	352,121	2,107,792	—129,172
Central of New Jersey	669	12,874,207	3,397,714	17,175,968	1,478,493	2,418,624	215,936	5,018,957	297,073	9,449,083	7,726,915	40,325	869,188	6,898,052	781,096
Central Vermont	411	1,598,967	211,270	2,503,732	299,957	441,234	58,428	1,226,261	63,588	2,089,468	414,264	1,735	88,544	325,455	—106,277
Charleston & Western Carolina	141	813,243	227,756	1,097,436	199,996	174,896	23,406	417,149	32,083	847,532	249,904	.....	35,000	214,904	—55,627
Chesapeake & Ohio Lines	2,374	16,417,471	3,579,660	20,943,909	2,473,250	4,418,635	392,291	6,466,792	460,420	14,211,388	6,732,521	28,088	740,085	6,020,524	—170,615
Chicago & Alton	1,026	6,176,395	2,596,553	9,443,855	1,413,338	2,154,361	294,066	3,358,508	226,490	7,450,763	1,993,092	—16,534	268,700	1,707,858	—261,929
Chicago & Eastern Illinois	1,275	7,150,191	1,855,197	9,768,382	1,241,840	1,963,779	175,712	3,598,876	297,269	7,277,476	2,490,906	—19,178	306,045	2,165,583	—1,000
Chicago & Erie	270	2,564,732	455,671	3,322,562	579,604	697,579	146,730	1,657,904	76,490	3,158,307	164,255	—8,521	92,019	63,715	—197,604

Average mileage operated during previous period—7,089; m 3,537; m 457; ff 3,314; gg 1,116; hh 3,054; ii 6,195; jj 551; kk 35; ll 475; l 7,731; l 662; l 4,526; l 628; m 572; a 4,434; b 672; c 2,281.

— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

SEVEN MONTHS OF FISCAL YEAR, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues—Freight	Passenger.	Total, inc. misc.	Operating expenses—Maintenance—Way and structures.	Equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Chicago & Northwestern	7,976	$51,706,457	$11,745,174	$66,572,818	$6,309,259	$6,913,548	$690,552	$18,991,858	$3,008,778	$34,010,995	$16,261,823	$10,202	$2,121,000	$14,151,025	$3,350,557
Chicago, Burlington & Quincy	8,250	39,350,309	14,799,966	58,336,946	5,918,119	9,292,640	926,869	17,742,036	1,360,910	35,487,094	22,849,852	62,619	1,936,780	20,850,333	4,085,949
Chicago Great Western	1,436	5,799,131	1,958,386	8,364,837	969,910	1,166,217	323,161	3,252,104	240,685	5,954,127	2,410,660	812	245,671	2,164,177	305,564
Chicago, Indiana & Southern	87	1,442,005	164,856	1,669,020	134,751	449,998	7,072	854,704	63,054	1,959,746	647,352	2,969	118,998	531,383	206,163
Chicago, Indianapolis & Louisville	517	2,709,649	1,063,161	4,172,253	583,261	548,764	128,013	1,542,693	107,912	2,909,761	1,262,512		75,107	1,100,405	80,841
Chicago Junction				1,168,580	178,858	82,321	8,268	547,427	25,464	791,888	376,692		11,268	365,452	59,676
Chicago, Milwaukee & Puget Sound															
Chicago, Milwaukee & St. Paul	10,242	41,670,135	11,543,345	57,585,409	6,286,371	7,893,964	1,134,762	20,578,037	706,067	36,509,201	21,276,208	141,794	2,193,336	19,225,166	7,802,630
Chicago, Peoria & St. Louis															
Chicago, Rock Island & Gulf	422	1,308,531	439,631	1,961,622	234,941	164,017	61,240	783,520	56,467	1,234,565	826,057	4,314	49,971	774,702	126,886
Chicago, Rock Island & Pacific	4,736	27,143,2	11,747,243	41,557,011	6,170,174	5,847,073	1,098,063	16,233,707	947,300	30,317,116	11,239,895	109,976	1,672,883	9,457,826	1,342,134
Chicago, St. Paul, Minneapolis & Omaha	1,744	9,599,5	3,138,526	13,401,171	1,470,253	1,990,593	253,951	4,604,246	223,977	7,186,618	3,353,355	883	492,256	2,861,982	436,598
Chicago, Terre Haute & Southeastern	581	3,041,03	1,128,316	4,900,063	393,047	225,632	21,919	570,911	34,531	1,245,446	3,328,023	1,127	128,023	2,200,446	54,227
Cincinnati, Hamilton & Dayton	1,003	4,664,648	1,014,354	6,339,319	722,192	1,076,611	140,677	2,596,925	128,009	4,675,414	1,663,804	29,913	203,913	1,412,991	10,598
Cincinnati, New Orleans & Texas Pacific	337	1,613,1	1,013,181	2,761,301	569,000	367,643	71,872	1,014,272	134,253	2,256,857	504,444	2,709	105,000	1,397,153	83,131
Cincinnati Northern	345	719,968	136,466	898,749	130,547	164,887	18,990	356,176	23,675	692,815	205,934		38,362	167,572	67,203
Cleveland, Cincinnati, Chic & St. Louis	2,016	14,190,955	4,389,475	20,247,4	2,360,970	3,134,224	494,553	7,840,012	486,854	14,836,503	5,910,921	6,812	724,043	5,180,066	584,760
Colorado & Southern	1,060	4,098,715	2,430,700	7,319,926	706,207	1,150,606	74,371	1,557,668	153,998	3,646,952	1,672,974	5,175	205,163	1,462,464	48,746
Colorado Midland	338	963,491	1,63,122	1,257,923	133,854	240,029	50,218	534,926	39,157	1,018,184	234,437	922	61,608	173,759	15,228
Cumberland Valley	146	1,552,093	1,004,294	2,650,258	407,167	284,532	31,416	696,727	57,764	1,357,010	668,238	524	47,278	620,034	114,494
Delaware & Hudson Co. & R. R. Dept	1,647	13,918,870	1,990,521	14,388,241	1,748,444	3,024,095	168,936	4,786,465	589,359	9,517,799	5,870,442	60,278	335,567	5,454,597	355,076
Delaware, Lackawanna & Western	959	10,040,947	4,031,867	15,389,166	2,844,867	3,607,453	465,838	7,382,765	461,707	14,762,450	9,826,716	384,003	923,340	9,287,378	1,649,574
Detroit & Mackinac	280	1,324,6	1,040,401	2,454,903	1,005,270	1,242,653	4,9,515	1,496,199	131,864	4,386,289	1,931,386	1,289	56,290	1,494,124	925,965
Detroit, Toledo & Ironton	515	3,111,312	2,31,691	5,45,426	111,000	116,823	13,558	239,762	31,666	514,869	230,557		24,258	206,857	35,247
Detroit, Toledo & Milwaukee	343	1,442,063	215,544	1,714,951	110,461	129,452	15,750	257,477	20,823	501,764	213,187	1,340	61,581	152,926	32,959
Detroit & Toledo Short Line	75	277,114		279,137	27,217	43,271	4,226	215,317	16,433	350,364	73,357		33,150	365,414	39,660
Detroit, Grand Haven & Milwaukee	191	910,997	417,284	1,544,263	413,382	43,756	49,956	754,275	34,988	1,436,422	107,841	450	20,621	86,720	168,539
Detroit River Tunnel				1,257,240	115,088	39,451		59,476	771	98,494	1,158,746		31,508	586,238	108,508
Duluth, Tuluth & Iron Range	441	5,73,05	100,941	1,049,935	219,112	117,552	19,002	499,352	37,374	892,392	157,533	11	42,009	113,522	7,699
Duluth & Iron Range	97	4,430,270	150,485	4,647,008	525,453	415,752	6,766	929,431	92,260	2,019,702	2,627,306	21,633	224,367	2,424,572	15,100
Duluth, Missabe & Northern	439	7,0,0,0	29,665	5,406,247	536,096	262,697	14,561	1,195,101	93,161	2,101,614	3,139,673	18,141	247,589	2,870,225	46,477
Elgin, South Shore & Aylesford	61	1,378,530	604,287	1,979,964	417,276	226,408	70,979	764,162	27,334	1,556,359	423,605	6,074	125,914	303,765	102,593
Elgin, Joliet & Eastern	1,0	1,3,4,0	40	2,2,,03	307,07	1,1,1,8,2	31,764	2,100,552	128,112	4,211,998	3,527,196	152,253	1,352,193	3,369,963	1,210,774
Erie & Southwestern	1,0	3,146,356	6,33,876	4,197,398	345,812	651,052	93,923	1,224,258	113,672	2,428,717	1,768,681	1,145,246	1,913,552	1,261,875	1,106,173
Erie	1,9	28,840,025	5,726,780	32,337,396	5,715,549	5,393,842	669,749	10,569,538	601,192	21,171,875	11,165,511	1,380,628	1,026,908	9,957,853	1,086,173
Fonda, Johnstown & Gloversville	64	1,761,761	950,500	2,873,663	460,598	311,338	34,762	1,023,486	84,601	1,914,785	958,878	8,505	108,500	397,878	136,961
Fort Wayne & Jackson Line	1	2,0,,550	905,101	3,366,332	316,004	556,581	48,950	1,673,159	104,790	2,099,484	1,266,848	1,701	79,397	1,183,860	47,810
Galveston, Harrisburg & San Antonio	53	5,418,15	1,977,782	7,869,600	678,281	1,535,430	231,865	2,806,501	219,079	5,471,456	1,898,144	41,276	228,255	1,628,613	276,732
Georgia	1,2	4,150,648	1,313,113	1,930,000	1,229,400	1,301,918	81,661	917,241	52,631	2,486,537	1,181,429		100,000	760,469	4,196,046
Georgia, Florida & Alabama	27	1,029,987	1,173,173	2,370,393	417,458	494,403	62,011	1,370,017	109,702	2,473,591	896,804	179	166,980	730,123	98,435
Grand Trunk Western	347	3,910,640	1,403,009	5,581,097	719,066	602,190	153,899	1,785,912	113,248	3,163,315	1,217,782	10,119	209,140	998,523	41,472
Great Northern	7,4	36,2,1,0	7,5,0,0	48,2,,,6	6,167,302	5,419,103	1,015,025	14,211,996	1,023,846	28,929,672	19,272,344	1,227,225	2,247,706	20,810,363	3,127,786
Gulf & Ship Island	308	1,870,083	253,496	1,704,935	168,056	212,786	18,961	320,181	58,392	783,378	921,557	43,258	378,329	178,298	
Gulf, Colorado & Santa Fe	1,0	6,2,,,,0	1,910,979	8,2,1,241	1,36,,3	1,200,760	174,871	2,616,857	241,599	5,021,128	3,220,113	281,264	2,413,120	481,606	
Hocking Valley	4	3,828,798	578,898	4,709,779	474,135	944,540	62,366	1,362,479	98,752	2,942,262	1,767,517		225,100	1,492,417	59,353
Houston & West St. Paul	71	800,921	2,7,211	870,215	175,960	112,996	14,763	261,688	26,518	591,725	278,582		24,574	203,013	23,960
Houston & Texas Central	7,1	3,0,,,,2	1,,,,,,,1	4,2,,,,0	5,8,,,,3	4,2,,,,6	2,,,,,,6	1,,,,,,,1	1,,,,,,,1	3,,,,,,,4	1,,,,,,,3		9,914	1,,,,,,,1	1,,,,,,,2
Houston, Central	4,7	25,39,626	8,30,,,76	39,31,577	5,,60,683	8,234,010	681,939	14,242,998	882,338	29,922,018	8,591,759	62,321	1,664,250	6,864,198	2,617,868
Indiana Harbor Belt	1			1,,,,,,,0	1,,,,,,,0	1,,,,,,,1	18,987	787,200	44,119	1,,,,,,,4	1,,,,,,,8	16,881	39,054	535,255	179,956
Intermediate & Michigan	27	1,,,,,,,9	2,,,,,,,4	1,,,,,,,2	2,,,,,,,4	2,,,,,,,0	1,,,,,,,5	1,,,,,,,6	1,,,,,,,3	1,,,,,,,4	1,,,,,,,3	1,,,,,,,4	1,,,,,,,2	1,,,,,,,1	1,,,,,,,2
Kansas City Southern	8	4,,,,,,,8	1,,,,,,,8	6,,,,,,,5	6,,,,,,,8	7,,,,,,,0	1,,,,,,,6	2,,,,,,,4	2,,,,,,,5	3,,,,,,,8	2,,,,,,,7		2,,,,,,,9	1,,,,,,,6	1,,,,,,,1
Kansas City Southern	1,0	5,,,,,,,3	1,,,,,,,3	7,,,,,,,0	1,,,,,,,4	1,,,,,,,5	1,,,,,,,2	2,,,,,,,1	2,,,,,,,5	5,,,,,,,1	2,,,,,,,9		2,,,,,,,6	1,,,,,,,3	1,,,,,,,1
Lake Erie & Western	1,0	5,,,,,,,3	1,,,,,,,3	7,,,,,,,0	1,,,,,,,4	1,,,,,,,5	1,,,,,,,2	2,,,,,,,1	2,,,,,,,5	5,,,,,,,1	2,,,,,,,9		2,,,,,,,6	1,,,,,,,3	1,,,,,,,1
Lake Shore & Michigan South	1,5	22,8,,,,6	7,,,,,,,1	34,,,,,,,9	4,,,,,,,1	5,,,,,,,2	580,341	10,,,,,,,1	961,012	21,,,,,,,7	12,,,,,,,1	148,488	1,,,,,,,1	11,,,,,,,6	1,,,,,,,7
Lehigh & Hudson River	1	1,,,,,,,7	3,,,,,,,1	1,,,,,,,2	1,,,,,,,2	1,,,,,,,0	1,,,,,,,6	1,,,,,,,6	1,,,,,,,7	1,,,,,,,2	1,,,,,,,0		1,,,,,,,0	1,,,,,,,2	1,,,,,,,4
Lehigh Valley	1,0	7,,,,,,,1	3,,,,,,,3	2,,,,,,,4	3,,,,,,,2	4,,,,,,,1	5,,,,,,,4	8,,,,,,,1	6,,,,,,,0	1,,,,,,,7	1,,,,,,,7		1,,,,,,,2	1,,,,,,,9	1,,,,,,,4
Long Island	3	2,,,,,,,0	4,,,,,,,4	7,,,,,,,1	1,,,,,,,1	1,,,,,,,3	2,,,,,,,5	2,,,,,,,7	1,,,,,,,3	4,,,,,,,4	2,,,,,,,1	1,,,,,,,3	1,,,,,,,5	1,,,,,,,2	1,,,,,,,4
Louisiana & Arkansas	1	2,,,,,,,6	1,,,,,,,2	4,,,,,,,1	1,,,,,,,1	1,,,,,,,2	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	2,,,,,,,1	1,,,,,,,1		1,,,,,,,1	1,,,,,,,1	1,,,,,,,1
Louisville & Nashville	4,3	886,964	1,,,,,,,5	1,,,,,,,8	1,,,,,,,3	1,,,,,,,4	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1		1,,,,,,,1	1,,,,,,,1	1,,,,,,,1
Maine Central	7	1,,,,,,,6	1,,,,,,,6	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1		1,,,,,,,1	1,,,,,,,1	1,,,,,,,1
Midland Valley	2	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1		1,,,,,,,1	1,,,,,,,1	1,,,,,,,1
Minneapolis, St. Paul & Sault Ste. Marie	1,7	14,,,,,,,8	4,,,,,,,5	21,,,,,,,1	2,,,,,,,9	3,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1	1,,,,,,,1		1,,,,,,,1	1,,,,,,,1	1,,,,,,,1
Missouri, Kansas & Texas System	3,4	13,393,706	5,748,762	20,,1,,35	2,675,554	2,406,940	432,304	7,163,071	600,583	13,278,457	7,003,383		47,385	765,451	6,200,347
Missouri Pacific	1,0	13,816,278	3,,57,919	17,,63,701	2,737,163	3,036,020	421,805	7,082,398	475,076	13,752,712	3,610,989		20,208	663,330	2,946,951
Mobile & Ohio	4	5,862,253	904,501	7,189,168	824,260	1,359,196	262,402	2,540,131	219,057	5,205,561	1,983,607		9,437	299,844	1,763,926
Monongahela	65	941,695	17,357	970,986	114,985	63,730	2,469	184,494	14,139	379,817	591,169		16,243	574,926	202,840

† Merged with Chicago, Milwaukee & St. Paul Ry. Company, January 1, 1913. ‡This road taken out of the hands of the Receivers on January 1, 1913. No cumulative figures shown.
Average mileage operated during previous period—7 919; 9,074; 2,551; 1,053; 2,734; 342; 902; 586; 176; 886; 1,775; 1,450; 4,705; 9,570; 2,012; 852; 2,545; 358; 624; 841; 1,995; 1614; 7,274; 1,597; 333; 1,204; 3,770; 3,395; 3,915. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTHS OF FISCAL YEAR, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Operating expenses—Maintenance—Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue or deficit.	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) over corresponding period.	Increase (or decr.) since beginning (or loss). since last year.
Morgan's La. & Tex. R. & S. S. Co...	404	$2,005,922	$671,757	$2,829,392	$488,686	$446,935	$89,665	$1,149,547	$75,906	$2,250,739	$578,653	—$13,298	$130,789	$434,566	—$330,126	
Nashville, Chattanooga & St. L...	1,231	5,349,148	1,867,453	7,769,687	1,119,145	1,374,696	276,737	2,945,806	204,821	5,996,405	1,773,282	—4,536	577,912	1,590,834	110,008	
Nevada Northern	165	789,802	110,875	976,774	105,994	105,952	2,901	199,187	24,360	438,394	488,380	.....	43,005	445,375	56,157	
New Orleans & North Eastern...	196	1,660,948	384,852	2,143,662	228,322	414,477	69,251	836,512	86,438	635,005	508,657	—129	88,681	419,847	—128,662	
New Orleans Great Northern...	243	697,172	214,063	989,191	155,356	107,201	16,997	376,040	46,241	622,195	366,996	—460	14,861	351,675	57,296	
New Orleans, Texas & Mexico...	576	731,517	177,332	950,296	169,412	81,600	23,493	406,349	43,406	724,260	226,036	.....	17,108	208,928	82,610	
New York Central & Hudson River	3,597	40,136,427	20,544,458	67,693,330	9,081,905	12,254,647	1,799,929	23,935,576	1,604,479	48,176,769	19,516,561	+ 324,782	3,545,144	16,296,199	1,186,984	
New York, Chicago & St. Louis...	3649	6,359,108	2,077,101	9,115,642	1,175,293	1,332,697	362,558	3,104,104	118,384	5,263,994	2,152,648	—11,320	233,583	2,107,745	260,757	
New York, New Haven & Hartford...	2,091	20,565,747	16,874,258	41,323,675	4,616,692	5,236,427	721,508	15,757,952	1,117,193	26,949,872	14,373,803	—764,142	2,275,000	12,862,746	634,435	
New York, Ontario & Western ...	566	4,329,231	1,142,895	5,775,486	720,811	823,006	78,006	2,262,761	131,161	3,852,991	1,922,495	—427	167,067	1,774,901	403,764	
New York, Philadelphia & Norfolk...	112	1,664,909	311,346	2,143,277	172,443	376,649	28,365	916,275	88,828	1,583,060	560,717	.....	55,400	505,317	48,526	
New York, Susquehanna & Western...	154a	1,151,858	345,589	1,692,644	207,200	210,396	53,193	721,470	32,614	1,184,853	507,771	—5,263	111,636	3,908,872	—206,360	
Norfolk & Western	2,019a	19,417,412	4,998,210	25,962,508	3,255,587	3,090,082	392,005	7,247,119	472,067	14,359,000	11,603,508	—19,438	842,000	3,298,237	93,484	
Norfolk Southern	562	1,298,602	300,033	1,905,712	234,615	258,466	33,961	593,141	105,204	1,225,387	680,325	—8,754	52,569	619,002	41,525	
Northern Central	417a	3,599,201	1,496,501	5,282,155	1,045,012	1,490,812	111,505	3,701,091	114,116	6,391,417	1,109,159	—4,925	280,872	1,298,237	119,884	
Northern Pacific	6,440	37,359,630	9,703,219	44,956,055	5,694,812	4,979,670	714,601	13,951,609	610,763	25,957,455	18,998,600	269,014	2,221,554	17,046,060	2,682,852	
Northwestern Pacific	401a	901,807	1,205,868	2,266,748	317,037	267,592	25,318	801,650	91,387	1,502,984	763,764	.....	88,053	675,711	57,222	
Oregon Short Line	1,914	9,925,942	3,802,784	13,779,726	1,775,193	1,452,610	207,307	3,370,083	285,989	6,693,184	7,086,542	9,008	930,177	6,165,173	582,130	
Oregon-Washington R. & N. Co...	1,919	7,774,499	3,133,088	11,110,554	1,420,192	1,192,434	326,414	3,922,605	333,597	7,195,242	3,915,312	—25,996	670,091	3,219,225	396,161	
Pecos & Northern Texas	311	1,041,842	310,192	1,563,989	186,066	289,203	25,558	472,408	43,709	1,017,155	546,734	.....	52,585	514,149	248,216	
Pennsylvania R. R.	1,721	30,715,508	9,707,966	40,493,050	6,110,731	7,125,752	581,133	13,539,385	699,014	28,144,936	12,348,114	—23,106	1,710,295	10,614,713	2,108,095	
Pennsylvania R. R.	4,405	78,047,255	32,040,419	107,269,172	13,648,412	22,515,723	1,361,923	37,760,466	2,436,834	77,723,358	29,545,814	—579,860	4,372,356	24,593,598	2,668,846	
Peoria & Eastern	241	1,992,824	1,009,124	3,214,153	361,490	384,000	31,098	806,340	40,345	1,534,105	1,680,048	.....	90,000	1,590,048	1,311,405	
Pere Marquette	2,330	7,176,627	2,608,398	10,065,041	1,590,079	1,782,469	239,463	4,332,412	252,625	8,196,048	2,468,993	7,423	391,811	2,084,605	115,831	
Philadelphia & Reading	1,015	24,544,966	12,681,580	38,273,943	2,734,811	4,803,669	293,899	9,408,527	429,554	17,670,460	12,603,483	243,516	603,861	12,243,138	2,673,261	
Philadelphia, Baltimore & Wash'gton	713	8,139,476	4,599,109	13,411,466	2,063,255	1,353,796	196,386	3,098,256	307,263	7,239,126	3,672,760	.....	1,004,689	2,667,071	1,040,405	
Pittsburgh & Lake Erie	223a	10,238,288	1,035,706	11,693,937	1,105,232	1,660,976	101,577	2,536,898	172,390	5,582,063	6,111,874	—1,886	222,989	5,886,999	1,554,684	
Pittsburgh, Cincinnati, Chic. & St. L.	1,472	16,785,650	5,077,412	27,169,674	4,093,427	5,103,670	497,815	9,530,039	497,136	19,720,103	7,459,971	—4,917	998,709	6,446,345	596,527	
Pittsburgh, Shawmut & Northern ...	179	1,304,654	68,342	1,517,238	194,104	141,259	8,355	349,120	26,490	772,425	1,059,903	41,125	108,778	4,951,127	.....	
Port Reading	21	94,365	.....	960,777	69,654	2,478	213	248,247	1,132	321,724	639,053	47,370	56,000	630,423	189,501	
Richmond, Fredericksburg & Potomac	86	382,409	549,991	1,609,037	175,296	193,382	20,886	584,550	47,459	1,021,595	587,042	—1,043	5,148	580,812	112,940	
Rutland	468	1,287,710	768,378	2,264,494	342,469	259,027	881,291	45,821	1,501,240	763,254	—1,313	94,766	474,636	—20,132		
St. Joseph & Grand Island	319	845,795	247,895	979,380	200,833	135,379	34,178	420,283	39,096	829,669	149,711	—1,313	42,797	105,601	—2,913	
St. Louis & San Francisco	4,474	24,017,272	6,569,000	26,317,958	3,316,909	3,139,599	1,146,746	9,310,716	710,650	17,090,921	9,020,037	.....	1,189,883	7,830,154	—6,548	
St. Louis, Brownsville & Mexico ...	518	1,025,531	533,725	1,604,403	266,580	179,733	33,490	777,027	64,320	1,316,150	348,311	.....	40,947	307,364	—82,579	
St. Louis, Iron Mountain & Southern ...	3,318	17,235,125	3,959,843	20,609,643	3,608,767	3,027,742	377,585	6,386,642	481,137	13,881,873	6,727,770	—32,971	631,365	6,063,434	1,130,640	
St. Louis, Merchants' Bridge Terminal ...	9	2,561	1,200	1,279,794	4,813	57,855	4,743	14,956	4,954	134,040	1,145,754	—1,250	50,000	1,095,754	1,095,754	
St. Louis, San Francisco & Texas ...	244	678,079	227,308	955,343	162,598	113,613	17,675	371,170	38,128	703,284	255,059	.....	7,213	247,846	102,994	
St. Louis Southwestern of Texas ...	1,240	3,197,721	1,000,217	4,357,129	554,499	605,151	71,414	1,386,763	112,134	2,844,961	1,444,168	.....	74,934	1,369,234	—56,289	
San Antonio & Aransas Pass	727	2,284,961	878,047	3,313,301	464,630	384,637	43,017	1,163,290	73,522	2,129,086	1,184,215	.....	84,000	1,100,215	198,931	
San Pedro, Los Angeles & Salt Lake ...	1,135	3,760,028	1,834,734	6,020,559	668,218	994,040	213,541	1,918,098	134,134	3,926,531	2,092,063	—12,266	229,333	1,850,464	1,336,335	
Seaboard Air Line	3,070	18,744,944	3,028,199	13,019,781	1,839,216	1,895,216	1,145,202	5,007,267	444,285	10,329,383	2,690,398	—67,200	567,000	2,056,198	1,303,672	
Southern	7,036	26,500,427	11,161,514	40,297,858	5,332,450	6,703,096	1,174,838	13,577,038	1,169,628	27,955,050	12,342,808	44,016	1,451,276	11,435,548	630,075	
Southern in Mississippi	291	1,442,982	327,351	2,334,619	191,371	63,803	16,972	390,423	29,151	681,852	1,132,767	.....	46,750	1,040,017	—45,588	
Southern Kansas Ry. of Texas ...	125	761,448	133,930	929,270	68,135	181,444	15,578	271,792	25,420	562,369	366,901	.....	14,530	352,371	229,061	
Southern Pacific Co.	6,335	34,931,930	19,109,925	57,940,718	6,110,068	7,779,716	1,179,383	15,900,886	1,493,484	32,363,437	25,577,281	1,055,943	2,621,639	24,011,585	2,564,299	
Spokane, Portland & Seattle	471	3,579,711	1,379,217	5,297,418	581,188	771,243	73,901	1,588,804	88,804	3,136,132	1,761,285	2,130	373,000	1,390,415	140,692	
Tennessee Central	294	667,540	262,971	984,048	209,515	101,867	41,571	338,683	49,734	741,370	242,678	.....	29,853	212,825	49,640	
Terminal R. R. Ass'n of St. Louis...	344	b	1,997	1,804,702	223,794	114,758	6,445	657,892	48,095	1,100,984	703,718	77,724	192,095	589,357	124,944	
Texas & New Orleans	458	1,605,116	687,890	2,419,644	434,509	568,654	55,824	1,044,933	104,693	2,104,054	345,592	816	84,220	257,188	12,640	
Texas & Pacific	1,885	7,840,446	2,836,945	11,395,376	1,409,433	1,745,391	236,401	3,036,470	227,733	8,755,428	2,639,948	—20,844	391,391	2,227,713	—674,294	
Toledo & Ohio Central	443	2,279,548	400,154	3,367,671	470,715	620,986	48,219	1,144,851	63,902	2,346,778	1,018,492	—5,364	149,200	864,428	4,026	
Toledo, Peoria & Western...	246	699,128	301,360	1,147,470	134,205	170,330	17,293	403,251	24,430	751,509	395,961	.....	34,700	151,261	31,543	
Toledo, St. Louis & Western ...	451	2,126,282	276,710	2,503,224	332,217	322,087	83,840	859,359	64,437	1,671,940	831,284	.....	103,600	727,684	161,864	
Trinity & Brazos Valley	362	1,264,762	1,935,180	3,546	227,814	70,781	40,242	445,826	45,867	814,241	1,042,472	.....	76,013	966,458	131,405	
Union Pacific	3,575	23,006,021	6,582,917	32,331,544	3,336,600	3,674,066	613,964	8,409,375	768,067	16,802,072	15,529,472	—14,245	1,286,048	14,229,179	1,984,174	
Union R. R. of Baltimore	9	853,010	160,939	1,025,545	68,411		5,766	37,181	18,961	130,219	895,326	.....	39,368	855,958	136,877	
Union R. R. of Pittsburgh	31	.....	.....	1,319,026	81,836	599,058	804	1,084,244	29,179	1,232,811	86,215	78,726	95,000	69,941	131,405	
Vandalia	837	4,730,468	1,465,457	6,879,104	864,143	1,306,165	177,726	2,474,344	129,866	4,952,244	1,926,860	.....	217,586	1,709,274	508,818	
Vicksburg, Shreveport & Pacific ...	171	664,669	322,036	1,014,828	206,447	172,754	23,243	398,086	35,852	746,762	268,066	—2,997	40,735	224,034	37,471	
Virginia & Southwestern	207	908,680	107,029	1,044,266	161,111	242,243	13,366	288,815	24,290	732,455	311,811	.....	37,100	277,341	—43,184	
Virginian	503	3,005,698	185,963	3,279,505	476,194	617,669	37,376	781,998	61,608	1,924,845	1,354,660	41,597	123,100	1,273,157	241,459	
Wabash	2,515	13,135,726	4,576,619	19,304,964	2,470,222	3,244,471	604,761	7,212,978	456,729	14,489,161	4,815,803	—27,810	508,180	4,279,613	402,846	
Washington Southern	36	267,294	267,957	726,341	94,424	86,224	8,533	283,042	19,822	492,045	234,296	—1,678	24,064	208,554	15,521	
West Jersey & Seashore	356	1,129,986	2,675,290	4,064,122	559,254	602,201	106,936	1,586,084	90,406	2,945,281	1,118,842	—26,680	148,179	943,983	291,032	
Western Maryland	543	2,593,314	615,903	4,441,437	687,866	626,987	109,755	1,858,175	93,994	3,376,777	1,064,660	.....	140,000	924,660	—430,968	
Western Pacific	937	2,813,471	798,140	3,723,341	553,231	311,627	204,106	1,411,721	177,047	2,657,732	1,065,609	—5,027	147,444	913,138	335,507	
Western Ry. of Alabama	133	434,080	339,103	841,251	118,298	151,044	40,906	230,329	39,744	600,321	241,430	131	33,571	207,990	—2,879	
Wheeling & Lake Erie	459	4,266,005	410,770	4,943,063	635,090	909,062	57,351	1,536,473	112,480	3,251,056	1,692,007	20,346	213,908	1,498,445	77,224	
Yazoo & Mississippi Valley	1,374	4,498,459	1,673,163	6,625,668	1,200,684	934,253	107,461	2,561,269	187,421	4,991,288	1,634,380	564	259,000	1,375,944	244,268	

a Average mileage operated during previous period—*y* 562; *z* 473; *ab* 6,034; *ac* 4,018; *ad* 2,333; *ae* 278; *af* 7,089; *ag* 3,537; *ah* 457; *ai* 1,230; *aj* 152; *ak* 2,014; *al* 404; *am* 1,762; *an* 1,920; *ao* 1,760; *ap* 215; *bb* 1,467; *cc* 83; *dd* 4,732; *ee* 510; *ff* 3,314; *gg* 1,116; *hh* 3,054; *ii* 6,195; *jj* 551; *kk* 35; *ll* 475. — Indicates Deficits, Losses and Decreases.

Secretary McGinty.

The new secretary of the Interstate Commerce Commission, succeeding John H. Marble, who has been promoted to the position of commissioner, is George Banks McGinty. He has been assistant secretary during the past year. Mr. McGinty has had several years' experience in railroad work, having served in clerical departments of the Atlantic Coast Line, the Georgia Railroad and the Southern Railway.

He was born September 8, 1878, in Monroe county, Ga., and was educated at Emory College, Oxford, Ga. After leaving college he commenced the study and practice of law, but he left that to go into the railroad service. On the Atlantic Coast line he was in the soliciting agent's office, at Atlanta. On the Georgia Railroad, he was in a local freight office, and he began on the Southern Railway in the maintenance of way department. During the last two years of his service on this road, he was private secretary to the vice-president and general manager.

George B. McGinty.

In 1906, when the meat inspection bill was passed, he entered the government service, his first position being in the Bureau of Animal Industry, Department of Agriculture. Here he handled correspondence with carriers respecting conformance by meat shippers and carriers with regulations promulgated by the department governing the transportation of meat and meat products. In November, 1908, he entered the service of the Interstate Commerce Commission, in the division of statistics and accounts. Subsequently he served as confidential clerk to Commissioner Clements. When Secretary Moseley died the duties of the secretary's office to a great extent fell to the office of the chairman, which brought much of this work into Mr. McGinty's hands. He was appointed by the commission as special examiner in October, 1911, but was retained in the chairman's office throughout the chairmanship of Commissioner Clements, and likewise served in a similar capacity to Chairman Prouty. When Mr. Marble was appointed secretary on February 10, 1912, Mr. McGinty was made assistant secretary, as before indicated.

Weighing Investigation.

The weighing investigation on which the Interstate Commerce Commission has been at work for over a year, will be assigned for argument at Washington on April 16, at which time all interested parties will be heard upon any subject covered by the investigation. The following matters are particularly suggested by the commission for discussion:

1. Should the federal government assume jurisdiction over the installation and operation of railroad track scales, and if so, to what extent?

2. In what manner should track scales be inspected and tested, and within what limit should variations in weight be permitted before the scale is announced inaccurate?

3. Should cars be weighed in motion? Should they be weighed coupled at either end or at both ends?

4. The tare weight of cars. In what manner should the stenciled weight be ascertained and corrected? In correcting tare weights what tolerance should be allowed?

5. When should the loaded car be first weighed, and to whom should notice of the weight be given?

Under what circumstances should the original weight be changed, and to whom and how should such notice be given?

What tolerance should be permitted before correcting the original weight, and should this be the same as applied to all commodities?

To what extent may platform scale weights or estimated weights be used in correcting track scale weights?

Is there any distinction between those instances where the weight is first ascertained upon the track scales of the carrier and those where that weight is furnished by the shipper under a weighing agreement or otherwise?

The commission will not at this time undertake to formulate rules in detail as to the weighing of carload freight, but will hold that subject over pending present negotiations between carriers and shippers looking to an agreement upon such rules.

Reparation Awarded.

Lindsay Brothers v. Chicago, & North Western. Opinion by the commission:

In this case the complainant contends that the defendant's rates of 19.5 cents per 100 lbs. in less than carloads and 11.4 cents per 100 lbs. in carloads for the transportation of tank heaters, litter carriers and shoveling boards from Harvard, Ill., to Milwaukee, Wis., are unreasonable to the extent that they exceed 12 cents and 6 cents per 100 lbs. respectively. Reparation was asked. The commission found that the rates now in effect on this traffic are unreasonable to the extent that they exceed 15 cents per 100 lbs. on less than carload shipments and 8 cents per 100 lbs. on carload shipments and prescribed those rates for the future. (26 I. C. C., 329.)

Transit Privilege Denied.

Michigan Cereal Company v. Pere Marquette et al. Opinion by the commission:

The complainant contends that the withdrawal by the defendants of the privilege of splitting peas in transit at Port Huron and Ubly when destined to the Pacific coast is discriminatory and seeks the re-establishment of this transit privilege. It was argued that as grain, including corn, barley, wheat, etc., moving to the Pacific coast was accorded milling-in-transit privileges, those privileges should also be extended to split peas, as that commodity was in fact a grain and was shown as such in certain other tariffs. The commission found that there was not sufficient similarity or competition between peas and grain to warrant an order extending the transit privilege to peas. The defendants stated that they had not been aware of a transit privilege on peas until immediately prior to the date on which that privilege was withdrawn. The commission found that the transit privileges were not extended to split peas in transcontinental territory and decided that there was not sufficient ground for granting the relief sought. The complaint was dismissed. (26 I. C. C., 320.)

Rates on Smokeless Powder Reduced.

United States v. Wharton & Northern et al. Opinion by the commission:

The complainant contends that smokeless powder and nitrocellulose-wet are safe to handle and transport, and that as classified in official classification territory smokeless powder is unjustly and unreasonably assessed double first-class rates for lots under 10,000 lbs., and first-class rates for lots of 10,000 lbs., or over, and nitro-cellulose-wet is unjustly assessed first-class rates, any quantity. The commission found that smokeless powder was not as dangerous as some other explosives, and that it had in a large measure displaced some of the more dangerous varieties and thereby contributed to the increased safety of railroad traffic. The commission decided that smokeless powder should not be classified higher than one and one half times the first-class rates in less than carload lots and second-class rates in carloads with a minimum of 20,000 lbs., per car. As the use of nitro-cellulose-wet is rapidly diminishing, and as it was susceptible to detonation by the explosion of another high explosive nearby, no change was made in the classification of that commodity. (25 I. C. C., 309.)

Equipment of Insufficient Capacity.

Atlas Lumber & Shingle Company v. Northern Pacific et al. Opinion by the commission:

The complainant ordered a 30-ton box car, but the initial carrier was unable to furnish a box car and offered instead a flat car which the complainant was obliged to accept. When loaded

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to its full carrying capacity with fir lath the car furnished contained only 44,500 lbs., though the car minimum was 60,000 lbs. A car of the character ordered would have been loaded to or beyond its full minimum weight by this commodity. The complainant was charged 50 cents per 100 lbs., based on a car minimum of 60,000 lbs., for the transportation of this shipment from Tacoma, Wash., to Omaha, Neb. The complainant contends that it was unjust to charge for more than the actual weight of the shipment, and asked for reparation. The tariffs of the defendants provide that when a car of the size ordered by shipper cannot be furnished, and a larger car is furnished, the larger car may be used on the basis of the minimum weight of the car ordered, or on the basis of actual weight of the shipment if greater than such minimum. There was no rule to govern the use of a flat car furnished in lieu of a box car ordered. The defendants were willing to make reparation on the basis claimed, but were not willing to publish a rule to meet similar conditions that might arise in the future. The commission decided that reparation should be awarded, and also that the defendants should be required to amend their tariff to make reasonable and proper provision to meet such conditions in the future, as the fault for not furnishing the desirable equipment lay with the carrier. (26 I. C. C., 313.)

Complaint Dismissed.

Evens & Howard Fire Brick Company v. Wabash. Opinion by the commission:

The alleged excessive charges on a carload shipment of fire brick from St. Louis, Mo., to Detroit, Mich., was found to have been due to the complainant's error in making out the shipping ticket. (26 I. C. C., 152.)

Through Water and Rail Route Restored.

Augusta & Savannah Steamboat Company v. Ocean Steamship Company of Savannah et al. Opinion by Commissioner Prouty:

The complainant operates a line of steamboats between Augusta, Ga., and Savannah. The Ocean Steamship Company and the Merchants & Miners Transportation Company, two of the defendants, operate steamship lines between Savannah and New York, Philadelphia and other north Atlantic points. The remaining defendants are railroad companies leading from these various north Atlantic points to interior destinations. Prior to 1903 joint rates were in force on traffic moving from Augusta to Savannah via the line of the complainant, then to north Atlantic ports by the defendants' steamships and finally to the interior destinations by rail. A joint rate of this character is still in effect between Augusta and North Adams, Mass., upon cotton piece goods. The commission decided that as the defendants had voluntarily subjected themselves to the jurisdiction of the commission with respect to the traffic destined to North Adams, it had the power to compel the filing of similar tariffs with respect to other points similar to North Adams and in competition with it. At present the traffic moves from Augusta to Savannah by rail, thence to the northern Atlantic ports by the steamship lines of the defendant and finally to the interior destinations by rail. The commission found that the complainant had ample facilities for transferring its freight to the steamships of the defendants at Savannah, and ordered that through routes should be established between the same points over which they were in effect previous to their withdrawal by the defendant in 1905. With regard to the rates the commission found that they ought to be slightly less than the present rail-water-and-rail rates, but could not decide as to the precise amount. The case will therefore be held open until satisfactory rates shall have been established. (26 I. C. C., 380.)

Through Routes and Joint Rates Denied.

Blakely Southern v. Atlantic Coast Line et al. Opinion by Commissioner Meyer:

The Blakely Southern is a 22-mile line extending from Blakely, Ga., on the Central of Georgia, to Jakin, Ga., on the Atlantic Coast Line. The complainant asks that the defendants be required to establish through routes and joint rates on interstate traffic to Jakin over the Central of Georgia and the complainant's lines, and to Blakely over the Atlantic Coast Line and the complainant's lines, equal to rates now in effect over the Atlantic Coast Line to Jakin and over the Central of Georgia to Blakely. The Blakely Southern was built as a plant facility by the Flowers Lumber Company, at Jakin, and the Flowers Brothers Lumber Company, at Blakely.. This line was subsequently taken over by the Blakely Southern Railroad Company. One of the clauses of the contract provides that if equal rates are offered, all the business of the lumber company is to be delivered to the Blakely Southern. The connecting carriers have voluntarily established joint rates both intrastate and interstate to and from all local points on the Blakely Southern, but have refused to establish joint rates to and from Jakin and Blakely. The Georgia Railroad Commission recently required the defendants to establish joint intrastate rates from Jakin via Blakely and from Blakely via Jakin. The commission found that if the complainant's petition were granted, all of the lumber now moving out by the Atlantic Coast Line would move under the same rate via the Blakely Southern and the Central of Georgia and the Atlantic Coast Line would be compelled, by a competition benefiting only the Blakely Southern, to reduce its reasonably low rate in order to retain traffic to which it was properly entitled. The commission found further that the shippers at Blakely and Jakin now enjoyed adequate transportation service. In nearly every instance class rates to points on the Blakely Southern are higher than the rates from the same points of origin to either Blakely or Jakin. This indicates that if competitive rates at Blakely and Jakin were established, the fourth section of the act would be violated by charging a higher rate for the shorter distance to one of the local stations than for the longer distance to one or another of the termini. The commission decided that the granting of the complainant's petition would not materially benefit the shippers and dismissed the complaint. (26 I. C. C., 344.)

STATE COMMISSIONS.

The Illinois railroad and warehouse commission has issued supplement No. 8 to its official express classification No. 21, effective April 1.

The Indiana railroad commission has entered an order reducing the freight rates in Indiana on crushed lime stone used for agricultural purposes.

The Texas railroad commission has announced a public hearing on April 8, on a plan of revising the demurrage rules. A number of detailed changes in the present rules have been proposed by shippers concerning the notice to be given consignees, and similar matters.

The chairmen of the Michigan railroad commission, the public service commission of Ohio, and the railroad commission of Indiana, will appear before the Interstate Commerce Commission at Washington on April 4 to present oral arguments in support of the petition filed by the three commissions asking for the addition of one or more classes to the Official Classification, and the arrangement of classes so that the rates applicable on commodities named in the lowest class shall not exceed 10 per cent. of the rates on commodities named in the first class.

The Missouri railroad and warehouse commission has served notice on the railways operating in Missouri that the approval of Western Classification No. 51 by the commission is denied, and that on all intrastate traffic Western Classification No. 50 remains in force and effect. This action follows shortly after the decision of the Interstate Commerce Commission allowing Western Classification No. 51 to go into effect with modifications suggested by the commission, after a year of investigation, during which the new classification was suspended.

COURT NEWS.

The Supreme Court of Indiana has rendered a decision affirming the action of the Marion county superior court, denying an injunction asked by the Vandalia to prevent the enforcement of the headlight law of 1909.

Judge Pollock, of the United States district court at Kansas City, Kan., has denied an injunction asked by five railway companies for the purpose of preventing the Kansas oil rate law of 1905 from going into effect. The injunction was denied on the ground that the law has been effectively repealed by the law creating the public utilities commission.

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Railway Officers.

Executive, Financial and Legal Officers.

C. S. Snow has been appointed auditor of the St. Louis, San Francisco & Texas, and the Ft. Worth & Rio Grande, with headquarters at Ft. Worth, Tex., succeeding E. B. Pierce, resigned.

J. D. Nettleship, auditor of freight accounts of the St. Louis & San Francisco, has been appointed assistant general auditor, succeeding W. P. Newton, promoted; R. S. Hoxie, first assistant auditor of freight accounts, succeeds Mr. Nettleship; F. C. Freiburg, second assistant auditor of freight accounts, takes the place of Mr. Hoxie, and C. Goehausen succeeds Mr. Freiburg; all with headquarters at St. Louis, Mo.

A. T. Hardin, assistant vice-president of the New York Central & Hudson River, at New York, has been appointed vice-president in charge of operation, maintenance and construction of the New York Central & Hudson River and the Ottawa & New York, with headquarters at Grand Central Terminal, New York. Abraham Tracy Hardin was born in 1868, in South Carolina, and graduated from the University of South Carolina with the degree of civil engineer in 1894. He had been a telegraph operator in 1882 on the Richmond & Danville, and from 1882 to 1890 he was agent and stenographer on the same road. He attended college from 1890 to 1894, and then for four years was in the maintenance of way department of the Southern Railway. From 1898 to September, 1899, he was supervisor and division engineer of the Eastern division of the New York Central & Hudson River, and was then to February, 1903, engineer of track, on the same road. He was promoted in February, 1903, to engineer of maintenance of way, and from July, 1903, to June, 1906, was assistant to the general manager, becoming assistant general manager in June, 1906, which position he held until April, 1912, when he was promoted to assistant vice-president. His appointment as vice-president takes effect April 1.

J. J. Bernet, assistant vice-president of the Lake Shore & Michigan Southern, Lake Erie & Western, Cleveland, Cincinnati, Chicago & St. Louis, Michigan Central, Peoria & Eastern, Cincinnati Northern, Toledo & Ohio Central, Zanesville & Western, Chicago, Indiana & Southern and the Indiana Harbor Belt, has been appointed vice-president of those roads, in charge of operation, maintenance and construction, with headquarters at Chicago, effective April 1. Mr. Bernet was born February 9, 1868, at Brant, Erie county, New York. He was educated in the public schools of Buffalo, and began railway work in 1889 as telegraph operator for the Lake Shore & Michigan Southern. He was advanced to train despatcher in March, 1895, was trainmaster of the Eastern division from April, 1901, to March, 1903, when he became assistant superintendent of that division. On February 1, 1905, he was made superintendent of the same division, and in November of that year he was promoted to assistant general superintendent of that road, which position he retained until October 1, 1906. He was then advanced to the general superintendency, with headquarters at Cleveland, Ohio. Mr. Bernet subsequently, on June 1, 1911, was made assistant to vice-president of the New York Central lines west of Buffalo, and was appointed assistant vice-president of the same lines on April 15, 1912. He now becomes vice-president of those roads, in charge of operation, maintenance and construction, with headquarters at Chicago, as noted above.

J. J. Bernet.

Operating Officers.

W. D. Jenkins, private secretary to President Freeman of the International & Great Northern, has been appointed inspector of transportation and stations of that road and the Texas & Pacific, with headquarters at New Orleans, La.

C. F. Smith, assistant superintendent of the Idaho division of the Oregon Short Line at Nampa, Idaho, has been appointed superintendent of the Montana division, with headquarters at Pocatello, Idaho, succeeding W. R. Armstrong, resigned.

Traffic Officers.

George J. Holder has been appointed traveling freight agent of the Lake Erie & Western, with headquarters at Spokane, Wash.

H. O. Post, city passenger agent of the Chicago Great Western at Des Moines, Ia., has resigned to go with the Star Land Company of Kansas City, Mo.

E. C. Ferguson has been appointed commercial agent of the Toledo, St. Louis & Western, with headquarters at Kansas City, Mo., in place of F. A. Eisminger, resigned.

Daniel J. McCarroll has been promoted to soliciting freight agent, of the Buffalo, Rochester & Pittsburgh, with office at Rochester, N. Y., succeeding W. A. Hammer, resigned to accept service with another company.

G. R. Bierman, traveling passenger agent of the Union Pacific system, with office at Chicago, has been transferred to Pittsburgh, Pa., as traveling passenger agent, in place of W. G. Carmichael, who has been appointed to a similar position at Chicago.

R. H. De Treville, traveling passenger agent of the Louisville & Nashville, at Evansville, Ind., has been appointed city passenger and ticket agent with office at Evansville succeeding L. C. Wolfe, resigned. W. M. Wood, traveling passenger agent at Nashville, Tenn., has been appointed traveling passenger agent succeeding Mr. De Treville, but with headquarters at St. Louis, Mo. W. H. Mustaine, city passenger agent at Nashville succeeds Mr. Wood, and D. R. Murray succeeds Mr. Mustaine.

George B. Haynes, whose appointment as general passenger agent of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has already been announced in these columns, was born August 22, 1871, at Ainsworth, Iowa. He was graduated from the Omaha (Neb.) high school in 1890, and began railway work March 16, 1891, with the Union Pacific at Omaha. He entered the employ of the Chicago, Milwaukee & St. Paul, December 28, 1892, as a clerk in the office of the general western agent at Omaha, and was promoted to passenger agent June 1, 1893, being made city passenger agent in 1897. On June 1, 1903, Mr. Haynes was appointed traveling passenger agent, with headquarters at Chicago; from October 1, 1907, to July 15, 1911, he was immigration agent, and on the latter date he became assistant general passenger agent, which position he held at the time of his recent promotion to general passenger agent, as above noted.

Engineering and Rolling Stock Officers.

J. H. Roach has been appointed assistant engineer of construction of the Lake Shore & Michigan Southern, with headquarters at Cleveland, Ohio.

Samuel W. McClure has been appointed resident engineer of the Lake Shore & Michigan Southern at Erie, Pa., in place of H. W. Fenno, transferred.

C. F. W. Felt, chief engineer of the Atchison, Topeka & Santa Fe Railway proper, has been appointed chief engineer of the system, with headquarters at Chicago, succeeding C. A. Morse, effective April first.

Frank Hopper, division master mechanic of the Chicago, Rock Island & Pacific at Estherville, Iowa, has been appointed master mechanic of the Duluth, Winnipeg & Pacific, with headquarters at West Duluth, Minn.

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J. E. Saunders, assistant signal engineer of the Atchison, Topeka & Santa Fe, has resigned to become office engineer in the signal department of the Delaware, Lackawanna & Western, with headquarters at Hoboken, N. J.

R. L. Stewart, master mechanic of the Missouri division of the Chicago, Rock Island & Pacific at Trenton, Mo., has been appointed master mechanic of the Chicago Terminal and Illinois divisions, with headquarters at Chicago, in place of L. A. Richardson, promoted. E. J. Harris, master mechanic of the Kansas City Terminal division at Armourdale, Kan., succeeds Mr. Stewart. J. C. Rhodes, road foreman of equipment at Trenton, Mo., has been appointed master mechanic of the Dakota division, with headquarters at Estherville, Ia., succeeding Frank Hopper, resigned.

OBITUARY.

P. J. Tapp, commercial agent of the Southern, at Kansas City, Mo., died suddenly in that city on March 20, aged 50 years.

Howard W. Rogers, traveling freight agent of the Illinois Central, with headquarters at Kansas City, Mo., died in that city on March 14, aged 30 years.

E. A. Peck, superintendent of the St. Louis Southwestern, with headquarters at Pine Bluff, Ark., was found dead near Hot Springs, Ark., on March 20. It is stated that he committed suicide owing to continued ill health. Mr. Peck was 61 years old and had been superintendent at Pine Bluff since June, 1901. From June, 1893, to April, 1901, he was general superintendent of the St. Louis, Iron Mountain & Southern, and previous to December, 1892, he had been with the Cleveland, Cincinnati, Chicago & St. Louis for some years as an assistant general superintendent and general superintendent.

Abraham Fell, formerly general western freight agent of the Delaware, Lackawanna & Western at Buffalo, N. Y., died at his home in that city on January 19. He was born in England in 1832, and at the age of 13 began work on the London & North Western, remaining with that company until 1858, when he came to America and became superintendent of the Buffalo & Lake Huron, of Canada, with headquarters at Buffalo. He was subsequently made general manager. After the road was leased to the Grand Trunk, he became general agent of the Merchants' Despatch Transportation Company at Detroit, and later he went to Buffalo to establish that company's foreign freight business. He then returned to Detroit to go with the Detroit & Milwaukee, now a part of the Grand Trunk. In 1873 he was appointed eastern freight agent for the Michigan Central and the Great Western, with headquarters at Rochester, N. Y. Subsequently he represented the Great Western, at Buffalo, and later the Blue Line, Fast Freight Line, at Philadelphia, Pa., and at Scranton. When the Delaware, Lackawanna & Western completed its road from Binghamton to Buffalo, he was made general western freight agent of that road, with headquarters at Buffalo. He was instrumental in building up the freight business for the Lackawanna, also in establishing a line of steamboats on the lakes in connection with that road, the Lackawanna Transportation Company. After 20 years' service with the Lackawanna, and completing 51 years of railway service, he retired from active work.

ELECTRIFICATION OF LONDON'S SUBURBAN RAILWAYS.—The London, Brighton & South Coast Railway, England, which since 1909 has electrified some 70 miles of its suburban lines, has recently decided upon a further electrification to include, when completed, at least 170 miles of additional trackage. The work will be commenced as soon as the plans are completed and will extend over four years. The lines to be transformed will be divided into sections and the work will be proceeded with accordingly. Under the scheme the whole of the company's suburban system comprised within the area extending from London to Croydon, Purley, and Coulsdon, and from London to Sutton and Cheam, is to be electrified. This action has been decided upon in view of the satisfactory results of the company's electric service now in operation and of the steady growth of competition from other forms of transport, notably the street car and the motor bus.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE REPUBLIC IRON & STEEL COMPANY has ordered 1 six-wheel switching locomotive from the Baldwin Locomotive Works.

THE NORFOLK SOUTHERN has ordered 4 consolidation locomotives and 10 ten-wheel locomotives from the Baldwin Locomotive Works.

THE MAC A MAC CORPORATION has ordered 1 mogul locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 26 in.; the diameter of the driving wheels will be 56 in., and the total weight in working order will be 133,000 lbs.

THE BUFFALO, ROCHESTER & PITTSBURGH, mentioned in an unconfirmed item in the *Railway Age Gazette* of March 14, as having ordered 15 locomotives from the American Locomotive Company, has ordered 12 mikado locomotives and 3 Pacific type locomotives from that company.

THE INTERCOLONIAL has ordered 5 consolidation locomotives and 4 Pacific type locomotives from the Montreal Locomotive Company. The dimensions of the cylinders of the consolidation locomotives will be 24 in. x 32 in.; the diameter of the driving wheels will be 63 in., and the total weight in working order will be 236,000 lbs. The dimensions of the cylinders of the Pacific type locomotives will be 23½ in. x 28 in.; the diameter of the driving wheels will be 73 in., and the total weight in working order will be 245,000 lbs. All of these locomotives will be equipped with superheaters.

CAR BUILDING.

THE HOCKING VALLEY is in the market for 1,000 freight cars.

THE NEW JERSEY ZINC COMPANY is in the market for 12 dump cars.

THE ILLINOIS CENTRAL has ordered 1,000 fruit cars from the American Car & Foundry Company.

THE HAVANA CENTRAL is closing contracts as follows: American Car & Foundry Company, 450 flat cars; Standard Steel Car Company, 250 box cars; Wason Manufacturing Company, 12 passenger cars. This company is still in the market for 50 coal cars.

THE BUFFALO, ROCHESTER & PITTSBURGH has ordered 27 all-steel passenger cars from the Pullman Company. This order will comprise 2 café observation cars, 3 combination passenger and mail cars, 3 baggage cars, 2 combination baggage and mail cars, 10 coaches and 7 combination baggage and passenger cars.

IRON AND STEEL.

THE CHICAGO & ALTON has ordered 7,000 tons of rails from the Illinois Steel Company.

SIGNALING.

The Southern Railway is to install automatic block signals on the line between Alexandria, Va., and Orange, Va., 78 miles. With the automatic block system of the Washington Terminal Company, the entire line from Washington, D. C., to Orange, Va., on the completion of this work, will be operated under automatic signals.

RAILROAD TO CONNECT SPAIN AND FRANCE.—Construction work is under way on the Trans-Pyrenean Railway, which will connect Ax, in the southeastern corner of France, with Puigcerda and Ripoll, in the province of Gerona, in the northeastern portion of Spain. The distance from Ripoll to Puigcerda is about 22 miles, and the distance from Puigcera to Ax is about 25 miles. Work on the Tosas tunnel, about half way between Ripoll and Puigcerda, which will be 3.1 miles long, has been commenced. This tunnel is being driven from both sides and on the southern side about 200 yds. have already been completed.

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Supply Trade News.

F. A. Mazzur & Co., 141 Milk street, Boston, Mass., have been appointed New England representatives for the Kerr Turbine Company, Wellsville, N. Y.

The Beaver Dam Malleable Iron Company, Beaver Dam, Wis., has moved its New York office from 30 Church street, to the Grand Central Terminal building.

The Galena Signal Oil Company, Franklin, Pa., has declared a common stock dividend of,50 per cent. This distribution will increase the company's common stock from $8,000,000 to $12,000,000, as has been authorized by the stockholders.

The Railway Steel-Spring Company, New York, has declared a dividend of 2 per cent. on its common stock. This is the first dividend on the common stock paid by this company since 1908. Last year the company earned nearly 6 per cent. on the common stock, compared with about one-quarter of 1 per cent. in 1911.

Chrome-vanadium steel, made by the American Vanadium Company, Pittsburgh, Pa., has been specified for the main axles and main crank pins of the 60 mikado locomotives and 30 Pacific type locomotives recently ordered by the Baltimore & Ohio. The tires of the 10 Mallet locomotives recently ordered by that road will be made of the same material.

The Universal Portland Cement Company has started work on the construction of a new plant at Duluth, Minn. This plant will cost about $1,700,000, and will have an output of 1,400,000 bbls. of Universal Portland cement a year. The plant will be electrically operated throughout, requiring about 5,000 h. p. Work will be pushed as rapidly as possible, and it is expected that the plant will be in operation in 1914. With its present plants at Chicago and Pittsburgh this will give the company a total output of 45,000 bbls. a day, or 13,500,000 bbls. a year. During the year 1912, the banner year of the company, the shipments of Universal Portland cement amounted to 10,047,499 bbls.

W. H. Foster has resigned as master mechanic of the Hudson division of the New York Central & Hudson River, to accept a position with the Ashton Valve Company, as representative in the railroad department, with headquarters in New York Mr. Foster was born June 29, 1873, and entered railway service in June, 1889. After considerable experience in shop work, and as fireman and locomotive engineer, he became air brake instructor for the American Magazine Company, and later became connected in the same capacity with the International Correspondence Schools. In February, 1902, he was appointed supervisor of air brakes for the New York Central, and in 1907 his jurisdiction was extended over the Boston & Albany, which placed him in charge of air brake instruction on all divisions of the New York Central lines east of Buffalo. On January 1, 1908, he was promoted to master mechanic.

Announcement has been made of a plan for the reorganization of the Allis-Chalmers Company, following the sale of the properties of the old company in Wisconsin to the reorganization committee, pursuant to the order of the United States district court of Milwaukee. The new company has been organized under the name of the Allis-Chalmers Manufacturing Company. It is expected that the remaining properties in Illinois, Pennsylvania and California also will shortly be acquired on behalf of the reorganization committee. The properties will be taken over by the new company and operations conducted under the new management at an early date. The board of directors of the new company has been elected as follows: Otto H. Falk, president, Milwaukee; Oliver C. Fuller, president Wisconsin Trust Company, Milwaukee; J. D. Mortimer, president Milwaukee Light, Heat and Traction Company, Milwaukee; Gustave Pabst, president Pabst Brewing Company, Milwaukee; Fred Vogel, Jr., president First National Bank of Milwaukee; Max Pam, Chicago; F. O. Wetmore, vice-president First National Bank, Chicago; John H. McClement, chairman of the board, New York; Arthur W. Butler, of Butler, Herrick & Kip, New York; Charles W. Cox, of Robert Winthrop & Co., New York; Oscar L. Gubelman, of Knauth, Nachod & Kuhne, New York; R. G. Hutchins, Jr., vice-president National Bank of Commerce, New York; Arthur Coppell, of Maitland, Coppell & Company, New York; William C. Potter, vice-president Guaranty Trust Company of New York; and James P. Winchester, president Wilmington Trust Company, Wilmington, Del. The board of directors has appointed an executive committee consisting of Mr. Vogel, chairman, and Messrs. Falk, Fuller, Mortimer and Pabst.

Samuel T. Fulton, general sales agent of the Railway Steel Spring Company, New York, with office in that city, has been made a vice-president of that company, with office in New York.

S. T. Fulton.

Mr. Fulton was born at Topeka, Kan., January 11, 1856, and after receiving a public school education entered railway service as messenger in the telegraph office of the Kansas Pacific at Topeka on July 1, 1879. During the next four years he was telegraph operator and agent at various stations on the Kansas Pacific and Union Pacific and for the following two years telegraph operator for the Western Union Telegraph Company at Topeka. He went to the Atchison, Topeka & Santa Fe as secretary to the superintendent of machinery in 1885; and in 1888 was made secretary to the general superintendent at Chicago. In 1889 he went to the Chesapeake & Ohio as train despatcher, and in 1890 he was made secretary to the freight traffic manager of the Cleveland, Cincinnati, Chicago & St. Louis. He became a stenographer to the chairman of the Central Traffic Association of Chicago in 1891 and in the following year was made secretary to the freight traffic manager of the Kansas City & Memphis. In 1893 he became chief clerk to the general superintendent of the same road; in 1895, chief clerk to the president and general manager, and in 1899, assistant to the president of that road. He was made chief clerk to the vice-president and general manager of the St. Louis & San Francisco at St. Louis in August, 1901, and from January, 1902 to February, 1903, he was general manager of the Crowe Coal & Mining Company, of Kansas City. On resigning that position he returned to railway service as assistant to the vice-president of the St. Louis & San Francisco, and in April, 1904, he went to the Chicago, Rock Island & Pacific as assistant to the president, which position he held until December 1, 1909. After the segregation of the Rock Island and the Frisco, Mr. Fulton entered the railway supply business as western manager of the Railway Steel Spring Company, with office at Chicago. On March 1, 1912, he was made general sales agent of that company, which position he held until his appointment to the vice-presidency, as mentioned above.

TRADE PUBLICATIONS.

CHICAGO & NORTH WESTERN.—The passenger department has issued an interesting illustrated pamphlet on "How to Grow Sugar Beets."

BLACKSMITHING.—Tate, Jones & Company, Inc., Pittsburgh, Pa., has published a small instructive folder on Blacksmithing and drop forging.

BATTERY CHARGING.—The General Electric Company has devoted bulletin No. 4085 to its battery charging motor generator sets for railway signaling.

MOTOR CARS.—The Buda Company has issued a folder devoted to its various types of section motor cars, inspection motor cars and track velocipede cars.

DENVER & RIO GRANDE.—The passenger department has issued an interesting folder describing the attractions of its route to the Pacific coast in connection with the Twenty-sixth annual convention of the United Society of Christian Endeavor, to be held in Los Angeles, July 9 to 14.

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Railway Construction.

ARTESIAN BELT.—This company has given a contract for building an extension, it is said, from Christine, Tex., southwest to Crowther, and work will be started at once.

BIG BLACKFOOT.—See Chicago, Milwaukee & St. Paul.

BIG SANDY & KENTUCKY.—An officer is quoted as saying that a contract has been given to John O'Kelley, Ashland, Ky., to build a section of 10 miles from Stafford station south. This company was incorporated last year to build from a point on the Chesapeake & Ohio in Johnson county, Ky., south to coal and timber lands, in all about 31 miles. W. H. Dawkins, president, T. N. Fannin, vice-president, Ashland, Ky., and L. N. Davis, treasurer. (September 27, p. 598.)

BIRMINGHAM & TUSCALOOSA RAILWAY & UTILITIES COMPANY.—Incorporated in Alabama, it is said, to build from Gadsden southwest via Attalla, Ashville, Birmingham and Bessemer to Tuscaloosa, about 130 miles, and to operate a belt line in Tuscaloosa county. The incorporators include C. R. Carter and C. A. Gannon of Birmingham.

BRYAN & COLLEGE INTERURBAN.—This company will extend its line, it is said, from Bryan, Tex., to Stone City, 6 miles.

BUFFALO, ROCHESTER & PITTSBURGH.—This company will let contracts at an early date, it is said, for laying second track between Rochester, N. Y., and Scottsville, 12 miles. Contracts will also be let for the construction of a classification yard on the south side of the barge canal, two miles outside the city of Rochester. Ten miles of track will be laid in the yard.

CAMBRIDGE & CHESAPEAKE.—This company will build a 25-mile line, it is said, from Cambridge, Md., southwest via Church Creek and Taylors Island, to Fox Creek. V. C. Carroll, Cambridge, may be addressed.

CANADIAN PACIFIC.—Contracts for building the final section of the Kootenay Central through the Windermere valley in British Columbia are reported let as follows: To Burns & Jordan, Spokane, Wash., for work on 60 miles. Another contract for work on 20 miles has been let to Boomer & Hughes, also of Spokane.

CHICAGO, MILWAUKEE & ST. PAUL.—According to press report the Big Blackfoot Railway, a subsidiary of the Chicago, Milwaukee & St. Paul, has asked permission to change its articles of incorporation in Montana, to allow it to extend from the south line of section 20, township 14 north, range 11 west, in Powell county, Mont., near Ovando, northeast through Lewis and Clark county, to a point on or near Sun river in township 21 north, range 1 west, near Fort Shaw, in Cascade county, about 110 miles. John R. Toole, president.

GAINESVILLE & NORTHWESTERN.—This road is now in operation from Gainesville, Ga., north to North Helen 37 miles.

INDEPENDENCE, NEODESHA & TOPEKA TRACTION.—Surveys have been made for a line, it is said, from Neodesha, Kan., south to Independence, about 20 miles. Dr. T. Blakesley, president, Neodesha.

INTERNATIONAL & GREAT NORTHERN.—President T. J. Freeman is quoted as saying that the International & Great Northern and the Texas & Pacific will carry out a large amount of improvement work during the present year. The entire eastern division of the T. & P. will be re-ballasted from Texarkana, Ark., to Fort Worth, Tex. New rails are also to be laid on sections of the T. & P. and the I. & G. N.

INTERSTATE DEVELOPMENT COMPANY'S LINES.—An officer writes that the company was organized, to promote and construct about 982 miles of main and branch lines. A point on the Gulf of Mexico in Texas will be one of the terminals. All preliminary reports, estimates of cost of construction and equipment have been approved and accepted by the financial backers. The company expects to develop a traffic in lumber, cotton, live stock, agricultural products and mineral products. Dr. R. B. Bledsoe, president, and Colonel C. A. McCarthy, secretary and chief engineer, both of Lufkin, Tex. (See Texas Roads, March 14, p. 530.)

INTERSTATE RAILROAD & TRACTION.—Incorporated in Kansas with $500,000 capital, and headquarters at Blackwell, Okla., to build from Arkansas City, Kan., south via Chilocco, Okla., Blackwell and Tonkawa to Ponca City, about 50 miles. O. L. Brown, president, Arkansas City, Kan., J. M. Van Winkle and C. B. Harold of Ponca City, Okla., and W. L. Cunningham, Arkansas City, Kan., are incorporators.

IOWA NORTHERN.—Incorporated in Iowa, it is said, to build from Clinton, Iowa, northwest to Turkey river in Clayton county. S. G. Durant, president, Clinton.

LEHIGH VALLEY.—A contract has been given to F. H. Clemmens & Company, for excavation work and putting in an additional track, at the entrance to the Bethlehem Steel Works, South Bethlehem, Pa. The cost of the work is $50,000.

MILWAUKEE, PEORIA & ST. LOUIS.—According to press report financial arrangements have been made and work will probably be started next June on the line projected some time ago from Peoria, Ill., north to Rockford, 120 miles. F. W. Cherry, Princeton, Ill., is back of the project, and B. Schreiner is chief engineer. (January 26, 1912, p. 176.)

MISSOURI, KANSAS & TEXAS.—President C. E. Schaff is quoted as saying, that the company will not begin work at an early date constructing the extensions that are provided for in the bill authorizing the merger of several of the company's lines in Texas into the M. K. & T. system. Improvements to cost more than $2,000,000 will be made this year on the Texas lines. The construction of the gap between the main line and the Trinity-Colmesneil line will be carried on as rapidly as possible. (March 14, p. 529.)

PACIFIC & IDAHO NORTHERN.—An officer is quoted as saying that the company is planning to build the extension this year from New Meadows, Idaho, north along the Little Salmon river to Riggins, 35 miles. (November 29, p. 1063.)

RICHMOND, PORTLAND & FORT WAYNE (Electric).—Incorporated in Indiana with $100,000 capital, and principal office at Portland, Ind., to build from Fort Wayne, south via Decatur, Berne, Geneva, Portland, Winchester and Lyon to Richmond, about 90 miles. G. S. Straub, C. F. Harbison, R. J. McCarty and C. H. Frank are directors.

SAN ANTONIO & AUSTIN INTERURBAN.—Surveys are being made for the line from San Antonio, Tex., northeast to Austin, with a branch to Seguin, and construction will be started within a few weeks. W. B. Tuttle, of San Antonio, is at the head of the project. (January 24, p. 191.)

SAVANNAH & SOUTHERN.—An officer of this company, which operates a line from Norden, Ga., southwest to Willie 13 miles, and 4 miles of spur lines, writes that surveys are being made for an extension from Willie southwest to Glenville, about 20 miles. The company plans to eventually build an extension east via Clyde to Savannah.

SEATTLE, PORT ANGELES & LAKE CRESCENT.—A contract has been given to the C. J. Erickson Construction Company to build from Oak Bay, Wash., via Sequim and Port Angeles, thence west via Lake Crescent. The work is now under way, and includes a trestle over the Elwah river. There will also be a two-mile sea wall at Port Angeles bay. Michael Earles, president; M. C. Morrow, secretary, and C. J. Erickson, chief engineer, Downs building, Seattle.

SIOUX VALLEY & NORTHERN.—Incorporation will be asked for soon by this company, with a capital of $1,000,000 and headquarters at Watertown, S. Dak. The plans call for building through Codington, Grant and Roberts county to the north line of South Dakota, about 100 miles. The incorporators include F. T. Heathcote, C. T. Jones, T. N. Bergam, J. E. Mitchell and Mark Johnson.

SOUTHERN PACIFIC.—An officer writes that all the contracts are let for building the Willamette-Pacific from Eugene, Ore., west to a point on the Pacific coast near the Suislaw river, thence south to Marshfield, about 123 miles. Twohy Bros., and McArthur, Perks & Company, Ltd., are the contractors.

SOUTHERN TRACTION.—This company is building between Dallas and Waco and between Dallas and Corsicana, a total of 158 miles. The Waco division will eventually be extended south to Austin, about 100 miles. The line is in operation between Dallas and Waxahachie and the section to Waco will be completed

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about July 1. The line to Corsicana is under contract to be finished by August. (January 10, p. 88.)

SOUTHWESTERN TRACTION.—This company is planning to build an extension, it is said, from Temple, Tex., northeast to Marlin, about 30 miles.

TEXAS & PACIFIC.—See International & Great Northern.

TEXAS ROADS (Electric).—The Stone & Webster Engineering Corporation, Boston, Mass., is making plans, it is said, to build an interurban line between Dallas, Tex., and Terrell, about 30 miles, and between Beaumont and Port Arthur, 25 miles. It also owns the Rio Grande Valley Traction, which was organized to build between El Paso and Fabens, about 30 miles.

A syndicate of Houston, Tex., and Beaumont men, represented by John W. Maxey, an engineer of Houston, is said to be promoting the construction of an interurban line between Austin and San Antonio, via Lockhart. The plans also call for extending the line east to Houston.

Joseph A. Davidson, of Indianapolis, Ind., and associates, are reported back of a project to build an interurban line between Austin, Tex., and Smithville via Lockhart, Stowall and Bastrop, about 40 miles.

E. P. Turner, of Dallas, Tex., and associates are promoting the construction of an interurban line, it is said, between Dallas and Wichita Falls via Denton, about 150 miles, and between Dallas and Glenrose, about 60 miles.

WILLAMETTA-PACIFIC.—See Southern Pacific.

RAILWAY STRUCTURES.

CATASAUQUA, PA.—The Central of New Jersey has given a contract to the American Bridge Company, New York, for putting up a through riveted truss over the Lehigh canal in Catasauqua.

FAIRBURY, NEB.—The Chicago, Rock Island & Pacific has announced that appropriations have been made for the enlargement of its shops at this point, the erection of a $30,000 passenger station, and additional freight facilities.

FRANKFORT, IND.—The Lake Erie & Western is to begin work shortly on the erection of a new station and freight house.

MILLER, IND.—It is reported that the Baltimore & Ohio will expend $800,000 in leveling the sand dunes, and constructing yards and a terminal at this point.

MUSKOGEE, OKLA.—The Missouri, Oklahoma & Gulf has let contracts for the erection of new shops and other improvements at this point, to cost about $250,000.

NEWNAN, GA.—The Central of Georgia and the city officers of Newnan will jointly put up a 125 ft. span steel truss over the tracks of the Central of Georgia, with trestle approaches in Newnan. The bridge construction is being carried on by the railway company's forces, and the approaches by the city officers.

SOUTH BEND, IND.—The Grand Trunk has announced that work will be started immediately on the erection of a new $50,000 passenger station.

SYRACUSE, IND.—The Baltimore & Ohio has given a contract to the Youngstown Construction Co., New York, to build a passenger station at Syracuse. It will be of pressed brick and red tile construction with tile floors, 69 ft. x 21 ft. The improvements will cost about $13,000.

WALKERTON, IND.—A contract has been given by the Baltimore & Ohio to P. Farrell, Cincinnati, Ohio, to build a passenger station at Walkerton. It will be of pressed brick construction, with red tile roof and tile floors, 55 ft. x 30 ft. The platforms will be of brick with concrete curbs. The cost of the station will be about $10,000.

SPECIFICATIONS FOR NEW LINE IN ECUADOR.—Specifications for the construction of the Babahoya-to-Balzapamba railroad, Ecuador, will be loaned on application to the Bureau of Foreign and Domestic Commerce at Washington. This is to be a 37½ mile line from the city of Babahoya, capital of the province of Los Rios to the village of Balzapamba.

Railway Financial News.

ATLANTIC & NORTH CAROLINA.—*The Commercial & Financial Chronicle* says that E. C. Duncan, vice-president of the Raleigh, Charlotte & Southern, has offered to all stockholders of the Atlantic & North Carolina to buy their stock at 75. The state of North Carolina owns $1,266,500 of the total $1,797,200 stock. The state has appointed a special committee to make recommendations to the legislature in regard to this offer.

CANADA SOUTHERN.—The New York Stock Exchange has listed $22,500,000 consolidated guaranteed 5 per cent. bonds of 1912-1962, guaranteed principal and interest by the Michigan Central.

CHICAGO & ALTON.—The $2,500,000 3-year 5 per cent. notes which matured March 15 were paid in cash at the United States Mortgage & Trust Company, New York.

MEXICAN UNION.—This company, which took over the Torres & Minas-Prietas Railway, has authorized an issue of prior lien debenture bonds to pay for completing the line to Ures. The first mortgage debenture bondholders have voted to accept a reduction in interest on their bonds from 6 per cent. to 3 per cent., making the agreement retroactive and effective August 12.

NEW YORK CENTRAL & HUDSON RIVER.—Stockholders are to vote on April 16 on the question of consolidating with the New York Central, the Rome, Watertown & Ogdensburg and other subsidiary companies. The plan will call for an increase in capital stock outstanding of the N. Y. C. & H. R. of $2,851,700.

NORFOLK & WESTERN.—The subscriptions for the new issue of Norfolk & Western convertible 4½ per cent. bonds closed Tuesday. The stockholders very generally took their allotments and of the $18,353,000 offered approximately $17,500,000 or 95 per cent. was subscribed. Of this subscription about $11,000,000 was first instalment paid and $6,500,000 was full paid.

PENNSYLVANIA RAILROAD.—The directors have approved of the long term lease of the railroad property and franchise of the West Jersey & Seashore on the terms prescribed by the latter company, namely:

1. A guaranteed rental of 6 per cent. per annum on the common stock.
2. The interest on its bonds, taxes and other fixed charges.
3. The lease to become effective July 1, 1913.
4. On July 1, 1913, when the new lease goes into effect a dividend of 1½ per cent. in cash is to be paid to the common stockholders.

The lease will be submitted for approval by the stockholders of the W. J. & S. S., at a special meeting to be called for that purpose on April 30, 1913.

PERE MARQUETTE.—At the sale of the $16,000,000 5 per cent. 50-year improvement and refunding mortgage bonds on Thursday of last week, mentioned in the *Railway Age Gazette* of March 21, the bonds were bid in by the committee representing the $8,000,000 6 per cent. noteholders under which notes these bonds were deposited as collateral. The price bid was $6,400,000.

TOLEDO & CHICAGO INTERURBAN.—The superior court of Allen county, Ind., has ordered the sale of this electric road at an upset price of $550,000.

RAILWAY DEVELOPMENT IN CHILE.—The Chilean government's railway extension program very thoroughly covers the country and when completed will be one of the most complete systems in Latin America. At the close of 1912 there were 2,893 miles of government railways in operation, with 1,337 miles under construction, and 3,008 miles of projected railways, making in all 6,738 miles. The government has under consideration the making of a loan sufficient to equip the railways properly with rolling stock and to double track certain portions of the lines where the traffic is exceptionally heavy, as between Valparaiso and Santiago.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

Published Every Friday and Daily Eight Times in June, by the SIMMONS-BOARDMAN PUBLISHING COMPANY, 83 Fulton Street, New York.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

E. A. Simmons, *President.*
L. B. Sherman, *Vice-President.* Henry Lee, *Sec'y & Treas.*
The address of the company is the address of the officers.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	10 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,100 copies were printed; that of those 8,100 copies, 6,686 were mailed to regular paid subscribers and 150 were provided for counter and news companies' sales; that the total copies printed this year to date were 121,400—an average of 8,678 copies a week.

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* Illustrated.

JAMES McCREA died at his home in Haverford, Pa., on March 28. His death, following so shortly after his retirement from the presidency of the Pennsylvania Railroad, is a severe loss to the higher councils of the railroads of the country, as well as to his own board of directors. Coming as it does only about four months after his retirement from a position which lays so heavy a burden of daily labor on the man who occupies it, it is rather tragic evidence of the force of will power that kept James McCrea in the harness almost to the very last. Mr. McCrea's railroad work was commented on in the *Railway Age Gazette* at the time of his retirement. A brief account of the events of his life is given in another column in this issue. During his presidency of the Pennsylvania Railroad from 1907 to 1912, he devoted his energies to an intensive development of the greatest railroad property in the world, making it possible to reap the benefits of A. J. Cassatt's policy of farsighted expansion and leaving the property enriched and ready for future development.

MANILA is on the other side of the world, but a letter from there, printed in another column, presents a couple of questions that bear very directly on life—railroad life—right here in New York, Pennsylvania and Illinois; also in Arizona, Maine and elsewhere. Our correspondent rightly emphasizes the need of exposing the officer who winks at bad practice. But, to cover the case, his argument should also deal with the negligent or incompetent officer. Winking is an elusive thing; but the officer who knows of misconduct or neglect and does not correct it; and those who do not know, and so cannot take action, may perhaps be classed as all alike. Mr. Scholes' second suggestion is eminently practical. It ought to be carried out by twenty-five railway presidents at once. But usually it is very difficult to formulate in satisfactory shape a charge against the grievance committee which grieves beyond reason, keeping inefficient men in service; and it must be recognized, also, that there is still greater difficulty in making such matters public in a way to benefit the public. But every president would do well to have some cases of this kind formulated for filing in his own office. Putting such cases in systematic shape, as a district attorney would do if he expected to prosecute them in court, would be a very useful service. It would be a great benefit to the railway world if a hundred examples of bad labor-union influence could be aired, in the way that the railway presidents of New York state have this week aired the bad labor-union influence in the matter of the full-crew bill.

THE full crew bill went through the New York legislature regardless of all protests and by the governor's approval is now a law. Governor Sulzer held a hearing and most of the principal railway presidents appeared and showed him the utterly irrational character of the proposition, but all to no effect. It is proper to remind people outside of New York State that nearly all reasonable measures fare this way in the Albany legislature this year. Tammany Hall controls the legislature and the governor seeks popularity with "the masses." He went through the form of respecting public opinion by filing with his approval of the bill an explanatory memorandum, but in this he only stultified himself by accepting the brotherhoods' claim that the presence of the extra brakeman would add to the safety of employees, a claim for which, under the railway managers' challenge, the labor leaders were unable to bring even a shadow of reasonable foundation. The governor's other reasons were weaker even than this one. The people of the country now have before them three shining examples of the drift of public opinion. In the matter of valuation of railway property the country is willing to approve an expenditure of from two to ten millions for the purpose of proving technically, what is already proved morally, that the railways do not use false figures of capitalization for the purpose of extorting high rates for carrying freight. In the arbitration of firemen's wages the public—as represented by the press—weakly allowed the railways' demand for three or five impartial arbitrators to go unheeded because, forsooth, a matter of a few million dollars' loss from the railways' treasuries was less important than to sustain "labor" in its extraordinary respect for "law" as embodied in the makeshift Erdman act. And now the appeal of the New York railroads to be saved from a useless expenditure of $2,000,000 annually is contemptuously ignored for no other reason, really, than that the politician is in duty bound to favor the side which controls the most votes. This last is the underlying reason in all these examples, of course.

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IN compliance with the recommendations of the Interstate Commerce Commission and the Public Utilities Commission of Connecticut, the New York, New Haven & Hartford has ordered the lengthening of 78 crossovers to No. 20 in addition to similar lengthening of 12 important switch leads not included in crossovers on its main line between New York and Boston. Besides the actual track work incident to the replacing of the frogs and the lengthening of the switch leads, this will necessitate the rebuilding of 36 interlocking plants. This work will cost $750,000, with an additional outlay of $350,000 for changes in signals, or $1,100,000 in all, which is at the rate of nearly $5,000 per mile of line. If this large expenditure would really insure safety to trains passing through turnouts at high speeds, it would be justified and would receive the approval of all railway men. But, this is not the case in spite of the popular belief based upon statements of the Connecticut commission that a No. 20 crossover is safe for high speeds. Railway engineers fully realize the fallacy of this idea. It will still be necessary to reduce speed through the No. 20 crossovers, although not to the same extent as through No. 15 crossovers. When engineemen disregard signals and attempt to pass through turnouts at speeds such as resulted in the two recent accidents on the New Haven, accidents are certain to occur as they did on the shorter turnouts, and may be more serious, for with the higher speeds permitted in operation over long crossovers the risks in case of disregard of signals are greater. Contrary to general belief, the benefit derived from these longer crossovers will not be so much an increase in safety as an increase in regularity of operation due to the possibility of maintaining higher normal speeds through the crossovers. Whether this advantage will justify the cost is doubtful.

UNIQUE is the concern or class of concerns that does not today feel the teeth of the muckrake and the lash of the reformer. The chief promoters of the current nation-wide movement for the regeneration of business are the newspapers and magazines. The main objects of their objurgations and condemnations have been the railways and other large corporations. When the corporation managers have been disposed to remind the publishers and editors that reform, like charity, should begin at home, many of our esteemed contemporaries have in effect retorted that their case was different from that of the railways, as they are engaged in a purely private business. The public shows an inclination to take a different view; and at Denver a "Citizens' Protective League" has been formed to suppress "vicious journalism" in Colorado. It includes two ex-mayors, the president of the Rotary Club, the president of the Real Estate Exchange, the president of the Ministerial Alliance, the president of the Denver Bar Association, the president of the Denver Women's Club, and numerous other persons prominent in the business, professional and social life of the city, and it has issued a pamphlet bitterly denouncing the local newspapers and saying that it intends to wage war until they are reformed. One of the planks in its platform sets forth that "fake stories, misrepresentations and exaggerations of all kinds should be eliminated." The *Railway Age Gazette* has no special comment to make on the newspapers of Denver. It would seem, however, that every good citizen not only of Denver, but of the United States, might well subscribe to the plank quoted and join a crusade to make American publishers and editors live up to it. It has come to pass that "fake stories, misrepresentations and exaggerations of all kinds" are served up by many newspapers as the staple of daily "news;" and the railways of the United States have been among the greatest sufferers from this practice. Among the very worst sinners against decency and truth are the class of newspapers and magazines that hold up the highest standards for railway officers and other business men; and the very biggest liars of all are the professional muckrakers. The public should apply to the press the same standards of honesty, fairness, good service and good citizenship that the press has successfully insisted on having applied to public service corporations. When rebating prevailed most railway traffic men wanted to obey the law against it, but were driven into breaking it by their unscrupulous competitors. A majority of publishers and editors are in the same relative position now that most railway traffic managers were then. They would prefer not to fill their papers with the sensational and the false, and would welcome a reform; but in the newspaper as in the railway business, the effective pressure for reform must come from the public. As no class of men or concerns has suffered more from yellow journalists and journalism than railways and railway officers, so none will more heartily welcome any movement that may tend to abate them.

J. P. MORGAN.

PROBABLY the three men who have exerted the most influence on the development, operation and financial results of the railways of the United States have been James J. Hill, E. H. Harriman and J. P. Morgan. Each of them has exerted an influence, having various phases. Yet the influence of each has had a distinctive character. Mr. Hill has done the most to teach railway managers how to develop the natural resources of their territories and to operate economically. Mr. Harriman's characteristic work was the taking of physically moribund properties and developing them into highly efficient transportation machines. Mr. Morgan's great work was that of teaching—and sometimes compelling—railway managements to conserve their resources by living in peace with each other instead of mutually destroying one another by wasteful, cut-throat competition.

Mr. Morgan, whether dealing with industries or railways, was first, last and all the time, what he always termed himself, a banker. In that capacity he invested other people's capital. Having invested it, he felt a heavy responsibility for seeing that they profited by their investment. Many millions of early investments in railways were destroyed by competitive construction and rate-cutting. Such competition did few people any good, and many besides investors immense harm. Having, in his capacity of a banker, become interested in the welfare of various railways, Mr. Morgan resented and opposed the destruction of values resulting from excessive competition; and many years ago he was largely, if not chiefly, instrumental in bringing about the early "community of interest" arrangements—arrangements that restrained competition by the device of securing for rival railways ownership of more or less of each other's stock and representation on each other's boards. From then to the time of his death Mr. Morgan's influence in the affairs of the railways of the United States was not only one of the most potent, but one of the most salutary. It was potent, not so much because his own direct financial interest in the railways was large—although it was—not so much because the financial interest in them which he represented was great—although it was very great—but because his direct and indirect financial interests were reinforced by a mighty intellect, a powerful will and a reputation for immovable integrity—an intellect, a will and an integrity which inspired the greatest confidence in investors in all classes, and which thereby became the cause and secret of his enormous power.

His power, like that of all great men, in whatever line, was the power of a personality. It was his personality that commanded men's confidence; and it was men's confidence that enabled him to become the possessor, and far more the representative, of a large capital. He insisted on being paid well for the services he rendered in reorganizing railways and other concerns, and putting them on a stable basis; but his aggregate compensation was a drop in the bucket compared with the enormous amounts that his organizing ability and his conservative, honest influence added to the wealth of the United States.

The power of a responsibility dies with its possessor. There will be no successor to J. P. Morgan. Fortunately, conditions in the railway field are now such that it apparently needs no

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successor to him. The day of cut-throat competition and financial legerdemain in railway affairs seems to be past. The work of Mr. Morgan and his associates and public regulation have together made them impossible in future. The very fact, that in the transportation field at least, Mr. Morgan needs no successor is perhaps the highest tribute to his ability, integrity and personality, and the wonderful influence they exerted—an influence for good that will continue to be felt for many, many years.

MORAL CHARACTER IN THE ADMINISTRATION OF DISCIPLINE.

In selecting trainmasters, roundhouse foremen, road foremen of engines, master mechanics and other officers who are to be the superintendents of the future, a railroad manager should put a premium on integrity of personal character. This pregnant truth was forcibly set forth by a Southwestern superintendent of long experience, in our issue of March 7, page 425. In a private letter he stated the case even more strongly; he would sacrifice experience, if need be, to make sure of high moral character. And in the letter published (page 426, near the bottom of the first column) he indicates that this sacrifice may not be a great detriment after all. Men of strong moral character learn the essentials of the railway profession quickly. In the railway world, the worship of experience has become so general that the word is really a dangerous shibboleth. It is high time that the other side of the truth were given more attention.

The New York report, to which our correspondent referred, points out two important features, in some respects the most important, in the "character" which is so vital an element in efficient railway operation; (a) justice, (b) fearlessness. The division officers referred to should be "capable of dealing justly and fearlessly" with their subordinates; and "the authority of these officers should be sustained by the officers above them; they should be secure in their positions." (*Railway Age Gazette*, January 17, p. 105.)

Any one interested in these matters will confirm the view here expressed, from his own observations and experience. The foreman who knows nothing but his machinery has a constant deadening influence, and the officers who have made or approved his appointment, soon regret their choice. His mistakes with the employees may be due either to prejudice and favoritism or to mere weakness as a manager; the result is much the same, either way. The foreman, on the other hand, who is fair minded and courageous, but not good in the technical part of his work will have much to learn, and will make mistakes; but he will correct the mistakes, if he sticks to the job, and the value of his moral qualities will be such a constant satisfaction to the higher officers, in the relief that they will experience in dealing with appealed questions of discipline and efficiency, that they will, if they are wise, give ample opportunity and assistance for the correction of mistakes. In short, if the man who is strong minded and high minded can once get over the period of ridicule, outspoken or covert, which is the lot of all who enter a railway office without the time-honored certificate of "experience," he has the opportunity, in the positions which we are here considering, of a most useful and honorable career.

We have said that justice and courage must be the two chief ingredients in the ideal officer's mind and conduct. For all practical purposes, we may simplify our theme by concentrating attention on courage alone. The elements of justice are so well known and the rules for their application so easily mastered, that no one need have much difficulty with this part of his problem. There is not much trouble in seeing the issue. The courage to do what is clearly seen to be needed is the final desideratum. We are not going into a general dissertation on how to cultivate courage. Every one will agree, however, that our correspondent has pointed out one of the first fundamentals of courage in the administration of discipline when he shows the need of a clean moral life. Another thing in this connection, quite obvious, perhaps, yet needing reiteration, is that the principles of character referred to apply in many small things, as well as great. The operating officer needs these qualities not alone in dealing with gamblers or drunkards, but in countless other situations. Such commonplace faults as laziness, petty dishonesty and concealing bad practices demand of the officer the constant exercise of moral strength, wisdom and all the fundamental virtues—courage in its highest form.

The letter of a New Mexico correspondent in this issue, telling of favoritism and poor judgment, furnishes another "exhibit" which goes well with our present topic. Favoritism is injustice, when it impairs the efficiency of train service so as to make lives and property less secure; and, as everybody knows, there are many obscure and apparently small weaknesses in train-service discipline which directly, if not visibly, affect the safety of trains. Favoritism, of this kind described by "M. M." is not confined to New Mexico. This letter may also appropriately be considered in connection with that of March 7, before referred to, because of the different aspect of the same question here presented. In the earlier letter we are reminded that on occasion it may be well to choose (for example) a trainmaster who cannot be marked 100 per cent. in all the details of railway operation; the candidate may be so desirable on other grounds that this point can be waived or modified. In the letter of "M. M." on the other hand, we are shown cases where men were appointed who seem to have lacked both the experience and the necessary strong moral qualities. A situation like this need not confuse the issue. First-class men are not always easy to find, whether one looks for experience or looks for character. The only sure way to get either, of a satisfactory quality, is to begin early enough to be able to train young men for a period of five years or more in your own service. The ideal officer is the one who stands high in both of the respects here referred to, and the railway that is so fortunate as to have trainmasters and foremen of this kind should see that their younger employees are trained, as effectively as possible, to imitate the ideal.

We have been speaking chiefly to division superintendents. Any individual superintendent can carry out these universally-approved principles. We are not telling him anything new, only calling attention to things which he knows already. His success will be measured by his physical and mental strength and his independence of character. But whether in New Mexico or Missouri, New York or Montana, the cure of the defects which are here discussed will be noticeable and widespread only as some general officer sets things agoing.

NEW BOOKS.

Digest of the Decisions Under the Interstate Commerce Act. Compiled and published by Herbert C. Lust and Ralph Merriam of the Chicago Bar. 1100 pages. 6 in. x 9 in. Buckram. Price, $8.

This volume is a continuation of the Digest compiled and published in 1908 by E. B. Peirce, late general solicitor of the Rock Island Lines, which covered the decisions from 1877 to 1908, and covers every case arising under the Interstate Commerce Act from January 1, 1908, to date. Every point of fact and law arising in these cases since that time has been digested in full, including all decisions of the Interstate Commerce Commission (reported and unreported) and of the various United States and state courts. The need for such a compilation is felt not only by lawyers engaged in traffic cases, but by railroad and industrial traffic men, members of state and interstate commissions, students of and writers on railroad subjects, and all who are interested in traffic matters. The book is arranged alphabetically according to such subjects as are the ordinary and accepted divisions in which the principles governing interstate traffic would naturally classify themselves, as indicated by a Table of Contents, covering about 10,000 points of traffic law, which occupies 31 pages. All the cases on any one point are grouped together and frequent cross references are inserted to points which may not be logically classified under a particular heading, but may nevertheless have some bearing on it. In all

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cases where it is possible to do so, a so-called "fact point" has been made. These fact points show tersely, but completely, the evidence on which the Interstate Commerce Commission or the court bases its decision in the particular case. The authors have attempted to summarize in easy, readable style ton-mile revenues, distances, commodities, rate comparisons and other evidence presented in the particular cases. Not only, therefore, have the traffic principles been classified, but also the economic principles and facts governing each particular case.

The decisions are arranged chronologically under each section, the most recent decision being placed first. If the decision of the Interstate Commerce Commission has been modified or reviewed by any court, rehearing denied, or dissenting or concurring opinion filed, such fact is noted. At the back of the book are indexes to the cases, commodities and localities involved. A reader interested in any particular case, by referring to the index, will find references to every page of the book on which that case is mentioned, and also references to the fact points on each case.

Practical Locomotive Operating. By Clarence Roberts, Assistant Road Foreman of Engines, Pennsylvania Railroad, and Russell M. Smith, Air Brake Instructor, Pennsylvania Railroad. Bound in cloth, 292 pages, 6 in. x 8½ in. 92 illustrations and 5 inserts. Published by J. B. Lippincott Company, Philadelphia, Pa. Price $2.

This book is intended for the use of locomotive engineers and firemen, its specialty being the running, firing and care of locomotives in service. No attempt has been made to go into the questions of design and shop repairs, and where formulas are used they are given as briefly as possible, without any involved mathematics. No attempt has been made to describe the air brake system or its operation, the authors leaving that subject to those books which are devoted entirely to it, and no description of appliances which are in experimental use only is included in the book.

Part one deals with horse power, tractive effort, train resistance and locomotive efficiency. Part two takes up the systems of locomotive classification most in use and gives illustrations of prevailing types, with tables of dimensions and characteristics. Part three is devoted to useful notes and tables, and deals briefly with such subjects as physics, mechanics and chemistry. Part four considers steam and its properties, saturated and superheated. Part five deals with boilers and related devices, while part six covers the subject of lubrication. Part seven takes up cylinders, valves and valve gears. Part eight deals with the running and firing of locomotives, part nine with disorders and breakdowns, and part ten with parts and appliances, such as injectors, lubricators, etc. Part eleven is devoted to qualifications and responsibilities and deals with operating conditions, selection of engineers and firemen, etc., and concludes with a series of questions on the locomotive. Part twelve gives a summary of the federal laws pertaining to locomotives. The book is well printed and the illustrations clear.

The Practical Railway Spiral. By L. C. Jordan, principal of civil engineering department, Hefley Institute, Brooklyn, N. Y. 4 in. x 7 in., 155 pages, illustrated, leather binding. Published by D. Van Nostrand Co., 25 Park Place, New York. Price, $1.50.

The author states in his preface that "The Practical Railway Spiral" is intended to clear up and modify the theory and to eliminate the existing inconsistencies of spiral curves. It has been his aim to secure a curve which approaches as closely as possible the perfect easement, which is complete in theory, simple and practical in construction, elastic in its adjustment to speed and curvature and readily applicable to all classes of location and revision work. There are no approximations in the theory and development of this spiral. The book includes tables showing deflection angles for four different lengths of spirals for all degrees of curvature ordinarily employed. Spirals for other degrees may be worked out from the formulæ included in the development of the spiral.

Letters to the Editor.

PUBLICITY AND DISCIPLINE.

MANILA, February 17, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

There is no doubt but what most railway men will endorse what Mr. Kruttschnitt, of the Union Pacific and Southern Pacific, has to say in reference to the value of publicity in increasing safety on railways, as quoted in your issue of December 27; but there lurks in one's mind the feeling that, on one important side of the question, he has not laid much stress. That is, the joint responsibility of the subordinate officer for an accident caused by disobedience of a rule, when, to use your own phrase, he had "for a long time been winking at chronic disobedience of exactly the same kind," and the concurrent responsibility of the executive officer who does not take steps to ascertain whether his subordinates are winking at chronic disobedience of the rules. It is all right to spare "neither talent, time nor money" to place the responsibility on the flagman or brakeman who has been derelict in his duty, but why stop the light of publicity at that point? The public is loath to condemn the employee too severely for a disastrous failure to observe an operating rule when it has a suspicion that his superior officer has made no effort to enforce compliance with that rule and may even have encouraged him in its violation in the past. The officer is paid a higher salary than the flagman, presumably because he is a man of greater intelligence and ability; and in the case of an accident due to the failure of both to do their duty, the public is apt to place the larger share of responsibility on the man who is supposed to have the greater intelligence.

There is another direction in which publicity would tend to increase the safety of transportation on railways. That is, the full and complete publication of *specific instances* where labor unions or other organizations have prevented or attempted to prevent the proper administration of discipline in the case of flagrant violations of the rules, whether accident resulted therefrom or not.

The first duty of the Safety First Committee is to ascertain the state of discipline on each division, as measured in terms of daily obedience to orders and compliance with the rules of operation, *before* the accident, not after.

R. T. SCHOLES,
Inspecting Engineer of Railways, Department of Commerce and Police, Government of the Philippine Islands.

JACOBS-SHUPERT BOILER TESTS.

URBANA, Ill., March 27, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

My attention is called to an editorial discussion appearing in your issue of February 28, under the title of "The Jacobs-Shupert Boiler Tests." This discussion is based on certain facts presented by me in a formal report rendered the Jacobs-Shupert United States Firebox Company. The article presents diagrams in which the coal burned and the water evaporated are plotted in terms of draft. It appears from these diagrams that for a given draft, both the weight of coal burned and the weight of water evaporated are less for the Jacobs-Shupert boiler than for the radial-stay boiler, and it is concluded that "if this were to hold it might mean that, while boiler efficiencies were the same, there would be a great reduction in engine efficiency [in the case of the Jacobs-Shupert boiler] as a direct result because of the increase of back pressure required to maintain the heavy draft."

In further discussion of the question thus raised, I would say, first of all, that the presentation of data set forth by your editorial is entirely correct, and the spirit with which the author approaches the discussion is a matter which I greatly appreciate. The defect in the presentation arises from the fact that the data do not sustain the conclusion.

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Draft values are sensitive to a variety of influences. For example, increasing the thickness of the fire normally increases the draft, all other things, including the energy of the exhaust jet, remaining the same. Differences in damper areas are at once reflected in the draft values. Neither of these is a matter of general application in a study of boiler efficiencies, except as it must be taken into account in analyzing the data.

In preparing the Jacobs-Shupert and radial-stay boilers for the comparative tests referred to, every precaution was taken to have

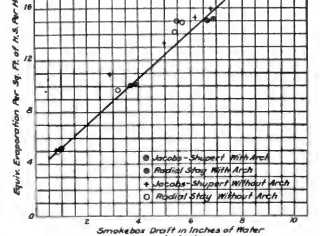

Fig. 1.

the openings under the grate of equal area for both boilers. In the attempt to maintain equal thicknesses of fire, the same fireman served for both boilers. It was intended to have the diaphragm in the front end of the boilers set to provide an equal area under them; but it happened that in some inexplicable way, the diaphragm in the front end of the Jacobs-Shupert boiler was set lower than that in the radial-stay boiler. Evidences of this will be seen by comparing the draft values in front of the diaphragm with the draft values behind the diaphragm for both boilers. If

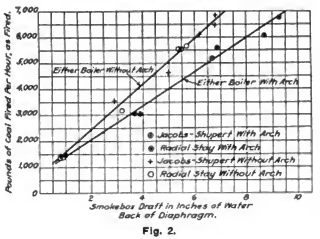

Fig. 2.

in your editorial study, comparisons had been based upon draft value as observed behind the diaphragm instead of those observed in front of it, the performance of the Jacobs-Shupert boiler would not have appeared inferior to that of the radial-stay boiler. Such a comparison is shown by Figs. 1 and 2 accompanying. These figures are similar to those presented in the editorial discussion, except that the draft values are those observed behind the diaphragm. Obviously, the difference in the comparisons made by you and those presented herewith merely discloses the effect of the diaphragm. As it was not the plan of the tests to make the front end arrangement a detail receiving especial attention in the study, all of the comparisons presented in my report are properly based upon draft values as observed behind the diaphragm. The experimental data rightly interpreted contain nothing which suggests the inferiority of the Jacobs-Shupert boiler as compared with the radial-stay boiler.

W. F. M. Goss,
Dean and Director, College of Engineering and Engineering Experiment Station, University of Illinois.

EVILS OF FAVORITISM.

New Mexico, March 15, 1913.

To the Editor of the Railway Age Gazette:

The article published in the *Railway Age Gazette* of January 17, in regard to the wreck at Corning, N. Y., and especially the statement that there should be greater care exercised in the selection of roundhouse foremen, traveling engineers and trainmasters, must have impressed every well-informed reader.

While we are preaching safety let us remember that though the employees can bring about wonderful improvement by exercising greater care, still the railroads themselves—the officers "higher up"—must put their shoulders to the wheel if they ever expect to accomplish the results desired.

No one disputes that we have in our railroad service a lot of big, brainy, broad minded, capable officers at the helm. But at the same time it is impossible to conceive of any set of men at the head of our large financial and mercantile institutions making selections of heads of departments as these selections are made in railroad work. A bank president would not be selected because he had merely served as paying teller, nor would a man be chosen for the managership of a large wholesale house because he had worked a few years in the shoe department.

In regard to roundhouse foremen: This officer, if, happily, he be a good one, should be highly prized. But, getting right down to brass tacks, how many really good roundhouse foremen are there in the country today? This is one of the most trying positions. Before a man is considered competent to fill it he must have served at least four years as machinist apprentice. The natural inference then is that he worked several years at the bench, as gang foreman and possibly as assistant roundhouse foreman before he finally becomes roundhouse foreman. It is, therefore, safe to say that he has spent at least ten years fitting himself for a roundhouse foremanship; and when the time comes he is "promoted" to such a position at the munificent salary of, say, $115 a month, which is much less than he could earn working at the trade. But, on the other hand, some dude who wears kid gloves, a high collar and a $40 suit of tailor made clothes, and whose entire railroad experience consists of three or four years spent in an office, is promoted to the position of transportation inspector, trainmaster, or something else, at a salary of from $125 to $200 a month. Lots of consolation in this for the poor roundhouse foreman, isn't there?

Now, the traveling engineers. Generally speaking they are men of a high order of intelligence as, in selecting men to fill such positions the brighter men among the runners are chosen. They are at least practical men, and this is more than can be said of a great many who are filling other official positions on our railroads. But, at the same time, it is a well-known fact that many of these traveling engineers were not a brilliant success when they were running engines. How, then, can they be expected to be successful as traveling engineers?

The selection of trainmasters is a most important matter. On a certain road five trainmasters were formerly chief despatchers; two others had been chief clerks to general superintendents and had never put in a day's practical experience at railroading, outside of an office, until they were appointed trainmasters. Another began railroading as stenographer to a division superintendent; was appointed assistant yardmaster, then general yardmaster and finally trainmaster. Still another who is holding down a trainmaster's job was a station agent before his promotion. Now

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imagine this galaxy of brainy (?) officials trying to elucidate the rules for the benefit of a company of engineers and conductors who have been up against the grind for twenty years! It is a good deal like having a justice of the peace interpret the law for a supreme court judge.

Not long ago a vacancy occurred in a trainmaster's position and the appointment of a conductor was urged. There was nothing against the man. He had been in the service a good many years and had worked up to a passenger run. That he was qualified to be a trainmaster no one disputed. But the company said they were not making trainmasters out of conductors! No; they will probably give the place to some pencil pusher who is a particular friend of some officer "higher up."

It has often been charged, and not altogether without justification, that too much favoritism is shown in the selection of railroad officers. There is an old saying that "there is plenty of room at the top." That is true in a way, and many men reach the top because they are so energetic and practical that they cannot be kept down. But as a general thing it has been my observation that, in most cases, the top is reached much quicker if you have some fellow up there to give you a helping hand now and then. Promotion in railroad work is not always made on merit. In fact, the opposite is too often true, and it is the fellow who has the most influential friends higher up that gets ahead.

Let us have better roundhouse foremen; but pay them in keeping with the responsibility of their position. Let us have better traveling engineers. Let us have better trainmasters, for God knows we need them; but let us select the right kind of material, conductors or traveling engineers. Make promotions entirely upon merit and fitness for the position. Get away from this favoritism and use some common sense. The railroads, if they ever expect to escape criticism for the annual slaughter of passengers, must wake up to the needs of the hour. If this is not done how can they expect to escape criticism and how will they ever be able to stem the time of anti-railroad legislation?

The foregoing remarks are not intended to reflect on "pen pushers" and clerks. They are an important cog in our great railroad machine, and very few of them are appreciated as they should be. They are generally underpaid and enjoy less privileges than any other class of railroad employees. But you can't take a clerk and make a successful railroad official out of him. That's the point I am trying to make. M. M.

DESIGN OF UNDERFRAME FOR CARS.

Chicago, Ill., March 7, 1913.

To the Editor of the Railway Age Gazette:

Recently in looking over some diagrams of underframing for cars, I was impressed with the fact that the paneling (horizontal plane) was generally quadrangular in form. As the quadrangle will always collapse without altering the length of the members, its strength is limited generally by its corner connections without reference to the individual members. The triangle is the only rigid polygon and a truss is necessarily composed of triangles. This fundamental principle has been taken into consideration to good advantage in designing car bolsters and sills to resist vertical forces. We have fish bellied girders and truss rods in endless variety.

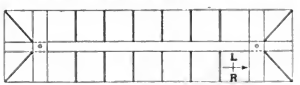

Fig. 1.

The horizontal projection, or plan, is generally somewhat like Fig. 1. There are two center and two side sills with bolsters between them. About the only variation found is in the diagonal strut in the end panel. This is sometimes taken out altogether, and sometimes is placed between the other two corners. The pull and thrust is taken care of by the two center sills, unless the end member is stiff enough to transfer part of the load to the sides.

If, for the purpose of this demonstration, we assume that the two center sills carry all of the load, they will be in tension when the car is pulled, and in compression when the car is pushed with a load ahead, or is bumped in switching. When

Fig. 2.

the latter happens we have a long column, as shown in Fig. 2. When the car is loaded heavily enough to bend the sill downward, these forces will only add to the deflection in the vertical plane. When the bending takes place in the horizontal plane we will have a bending moment at all points which would be proportioned to the deflection. As this curve would probably be a parabola or a hyperbola it will not be necessary to go into the details at this time. The maximum effect would be produced when this force is concentrated at the center of the column. This force would be a load on the center of the top chord of the right hand truss and on the bottom of the left hand one. If now for purposes of illustration we turn this truss through 90 deg., so that it takes a vertical position, we will have the situation shown in Fig. 3. The style of construction required would be a deck Pratt truss supported at *A* and *B*. The number of panels, shown as five, would be increased to seven

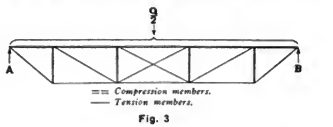

Fig. 3

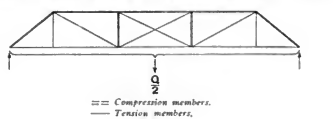

Fig. 4

for a long car. For the left hand side, the style of framing best suited to carry the load would be a through Pratt truss, as shown in Fig. 4. When the bending is in the opposite direction to that shown, we would have similar diagrams with the diagonals in opposite directions.

When the four diagrams are placed so that those for the left

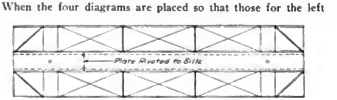

Fig. 5

are over each other, and those for the right are similarly placed, we will have the diagram marked Fig. 5. The compression

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members are shown where there are both kinds. This all looks simple enough when based on fundamental principles. The form of truss with vertical struts was selected for the reason that they have to carry vertical loads in any case and sections suitable for bending stresses will be suitable for struts in most cases. If we wish to regard the whole system as a column with the loads uniformly distributed at the ends, we would then have a column with the lattice system now in common use for compression members.

When the train is on a curve, the car ahead and the car behind

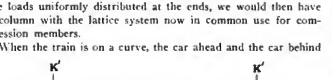

Fig. 6

pull the ends sideways. This brings a lateral thrust on the king bolt of the truck which must be distributed through the floor system. If the speed is greater than that for which the curve is elevated, there will be an outward thrust, which will be applied at the king bolt, but will be in the opposite direction from the preceding. Their algebraic sum will be applied to the floor system, as shown in Figs. 6 and 7. There will be two loads at

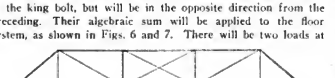

Fig. 7

the panel points, and the same form will be required as in the foregoing. When the speed is less than that for which the curve is elevated, the thrust will add to that of the pull of the train, in front and behind the car in question.

There has been no attempt in the foregoing to take into account the question of elastic distention, etc., but simply to find out if there is any objection to using the truss principle. The truss has been shown to be the most economical for similar forms of construction, and it seems odd that competent designers have not gone into the matter. If they have, I have not been fortunate enough to find their ideas in print, and so cannot tell what have been the objections to the truss in times past. If the material now used is necessary to withstand the lateral stresses, it would appear that a lesser amount can be used to accomplish the same purpose, by making a careful analysis and a scientific design.

PAUL M. LA BACH,
Assistant Engineer, Chicago, Rock Island & Pacific.

THE CONDUCTOR'S AUTHORITY AND RESPONSIBILITY.

SAN FRANCISCO, Cal., March 25, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The letter in your issue of March 7, entitled, "The Captain of a Freight Train Crew," is interesting and logical. I do not think, however, the writer gave full expression to the points he had in mind. Particularly, it appears to me the conductor's judgment of and authority over his men is not accorded the rating it deserves, considering his responsibilities, and assuming that he is, fundamentally, a man of good judgment.

He does not have authority to employ or discharge, and when on the road or in a yard with a man who proves indifferent or incompetent the only remedy he may adopt is to relieve the man of responsibility, and reapportion the work; perhaps assume some of the duties himself, and report by wire or in person. Often, however, conditions oblige him to work the man into terminal or to the end of the shift, after which the latter may be superficially questioned by an officer, and, perhaps, with mere reprimand or warning, continued on the run, or assigned to another. Although an inexperienced man may be sent out as a student two or three trips and be approved by the conductor under whom he works, the conductor's judgment of him cannot be other than superficial, as the traits of men cannot be fully studied in so short a time. Aside from this, if the man is accepted after trial he may be assigned to a conductor other than the one with whom he was tried and who, therefore, to some extent is expected to abide by the judgment of others. Brakemen and switchmen are often assigned to work with a conductor with whom they are neither psychologically or mentally fitted to join in responsibilities.

In the army a captain does not recruit his men, ordinarily, but he does have practically unlimited authority over them during engagements on the field; and in times of stress, if he is beyond the range of superior authority, conditions may justify him in exercising the power of life and death; subject to review, of course, by his superiors at any time. From the standpoint of averting disaster the responsibilities of the conductor are as great in their way as are those of the captain. The duties of a train crew are varied and many during the day or trip, while the units of a military organization are, generally, only expected to act in unison in a given action or direction.

Brakemen and switchmen at times are indifferent to duty because of lack of full respect for the orders or judgment of the conductor, knowing the limits of his authority and also knowing that the conductor is invariably involved in the results of failures of his men; and indifference is often the primary cause of accident or disaster. The conductor often handles switches, makes couplings, gages clearances, etc., merely because he realizes his ultimate responsibility, and therefore partially undertakes the duties of his men, fearing to fully trust them under complex or hazardous conditions. Individual instances have occurred where men have damaged equipment or track, or hazarded lives, after the conductor had properly cautioned them to be alert as regards the position of switches, watching clearances, etc. Often, I think, conductors are jointly disciplined with their men when it is not morally just to do so.

Trainmen or switchmen are employed by officers or their office representatives, and the conductors, individually and as a body, can exercise no judgment until on the road or in the yard with the men, and then their estimate, generally practical and fair, can be emphasized by emphatic action if necessary, but only through action by an officer whose judgment, fundamentally, may not be as sound as that of the conductor. Surely, this is no reflection when we recall that many conductors have been appointed to office and have proved themselves effeient.

Would it not be well if conductors were allowed some degree of joint participation in the selection and discipline of men who are to assume responsibilities under their direction? Undoubtedly, it is difficult to determine equitable and practical measures for governing their authority. Nevertheless, this feature is one of the most important and far reaching in the conduct of transportation, and deserves keen study by officers from practical and psychological viewpoints. Generally, the practical phase is given more study than the psychological, although the latter should be regarded equally important with the former.

EDWIN SWERGAL.

EFFICIENCY OF FREIGHT HOUSE FORCES; DAMAGED FREIGHT.

KANSAS CITY, March 10, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Within the past two or three years practically every railway of importance in this country has inaugurated a campaign to reduce its loss and damage account. While the details may vary somewhat on the different lines, the general principle involved is one of education and instruction among all classes of employees who have to do with the handling of freight, in order that they may better appreciate the causes contributing to loss and damage and thus be in a position to prevent it.

The result, as is frequently the case with reforms of this na-

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ture, is for a time extremely gratifying; but after a year or two it is apparent upon analysis that while a substantial improvement has been effected along certain lines, the showing in other directions is very unsatisfactory; and it is felt that the progress made has not been commensurate with the efforts put forth by those who were directing the campaign. Much effective work has been done to better the physical condition of freight cars, to induce shippers to improve the character of their packages and to supervise the handling given freight by train and yard crews; but the most prolific source of loss and damage, in the case of less than carload freight, is the improper handling it receives at freight stations, and the result of the campaign so far as it relates to this feature is in many respects discouraging.

This is due to a variety of causes, but the chief one of them is that we have been unable to develop in certain classes of employees a feeling of personal responsibility for their work. It is only by instilling this into the minds of our employees who handle freight that we can ever hope to bring about the results we are after. This attitude of the employee toward his work may be developed by appealing to his self-interest, or by fear of discipline or loss of position; but, regardless of how it is accomplished, he must have it, if there is to be efficient service obtained from him.

It is apparent to any one who has studied the results of such a campaign as I have mentioned that the employees who have gained the most and whose services have correspondingly improved, have been the ones who had the most to lose and who were therefore the most susceptible to discipline. Unfortunately, however, in the case of station service the handling of the freight is delegated to subordinates, who are hard to reach, and who cause the most trouble.

Our over, short and damage statistics show that from 60 to 70 per cent. of the errors made which result in either loss or damage occur at the transfer stations. I mean by this the district or division terminals where merchandise cars are worked and where platform forces are maintained; and it is at such places that our efforts to improve the service meet with the most discouraging results, because of the changes that are continually taking place among the men and the impossibility of developing and maintaining anything like a satisfactory organization.

These changes are brought about by fluctuations in labor conditions along the line. When farmers or manufacturing industries are in need of men they are in a position to offer better wages than the railroad company, whose scale is far less elastic; and the railroad gets what is left. We are continually breaking in new men in the freight houses whose only idea is to hold the job until something better turns up. In the struggle to keep pace with the demands of a few well organized classes of employees and still operate their roads at a profit, executives have been slow to meet the need for better pay among the great body of unorganized employees; and with the granting of each succeeding demand to the former, the prospects of the latter appear to become more and more remote. The result is that men of fair intelligence and capability who were willing to work formerly for the wages paid station help have forsaken this field for employment that offers better pay and in most cases shorter hours; so that, generally speaking, we are no longer able to secure the same class of help in our freight houses that we did a few years ago.

The wages paid freight-house help at the present time approximate those paid track repairers, and if the railroads of this country are finding it hard to secure good foremen for their sections it is not surprising that they are experiencing similar difficulty in keeping up the standard of their freight-house foremen and check clerks; and when the burden of responsibility for the correct and careful receiving, inspecting, checking, handling and stowing of freight, together with the interpretation and application of numberless rules and regulations pertaining to special commodities, is placed upon these men, it is not difficult to see why we continue to have the same loss and damage troubles year after year. The agent who is face to face with the problem of trying to build up an efficient freight-house organization out of this material is frequently placed in the position of being obliged to retain men whom he knows to be careless and incompetent, through sheer inability to get new men in case he should discharge the present force.

The position of freight-house foreman is one of no little importance. To my mind it demands an equal amount of intelligence and responsibility with that of chief clerk or cashier; and yet we pick up foremen without any regard to their qualifications and pay them lower wages than the average unskilled laborer commands in the same community and then expect them to possess the executive ability necessary to keep things running smoothly on the freight platform. The wonder is that we succeed as well as we do. We pay good salaries to our cashiers and revising clerks so as to secure men who are honest and competent in order that our revenue may be protected, but we turn the job of checking valuable merchandise over to a laborer at a dollar forty a day. Where the incompetent revising clerk may lose a couple of dollars of revenue the incompetent check clerk is more likely to cost us a couple of hundred dollars by delivering a box of household goods with the wrong shipment, or receipting for something he did not get. I believe it is just as vital, if not more so, for us to have honest, competent and reliable freight-house foremen, check clerks and stowmen, as it is to have these same qualities in our chief clerks and cashiers; and the only way I know of to secure and retain such men is to pay them salaries that are somewhere in proportion to the qualifications we expect them to have.

The objection has been raised that to make a general increase in the pay of all station help would mean such an enormous sum in the aggregate that it would be impracticable, and also that in the event that this was done the railroads would still be competing with industries along their lines for the labor of substantially the same individuals at higher wages but with no corresponding improvement in the character of the services obtained. This would doubtless be true if such a horizontal increase were made, but, in my opinion, such a step is by no means necessary to accomplish the desired result. I believe that by judiciously expending a comparatively small percentage of the amount we are now paying out annually in loss and damage claims, we could increase the salaries of foremen, check clerks and stowmen at the more important stations, where most of the errors are now being made, to a point where they would attract into these positions a better class of young men who would not only take an intelligent interest in their work and fill these places efficiently, but would also be capable of being advanced to more responsible posts.

Anyone who has handled O. S. & D. investigations must realize what a tremendous reduction could be made in loss and damage if it were possible to make the man who handles the freight take the same interest in its welfare that he would if the goods belonged to himself; and while perhaps it is not within human nature to attain this degree of perfection, much can be accomplished through appeal to a man's self interest by making his job mean something to him and then holding him strictly responsible for results.

The question of truckers under this scheme becomes a simple one. By taking from them all responsibility except that of pushing a truck we are then getting just what we had a right to expect when we hired them—common unskilled labor—and when we expect anything more from this class of help we are simply deluding ourselves. Truckers can come and go, but if we have competent foremen, checkers and stowmen who are interested in their work and who are held strictly to account for all errors that are made, the changes among the truckers will not affect the efficiency of the freight-house force in the least, and we shall then be able to accomplish results through the placing of individual responsibility in connection with an effective system of discipline that will go a long ways toward eliminating what I believe is at present by far the largest contributing cause of our loss and damage payments. K. J.

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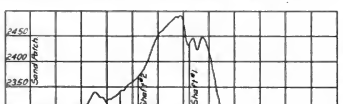
THE SAND PATCH TUNNEL IMPROVEMENTS.

Additional Facilities Just Completed by the Baltimore & Ohio In Crossing the Summit of the Allegheny Mountains.

The Baltimore & Ohio has just completed the construction of a 4,000 ft. double track tunnel alongside its present single track bore at Sand Patch, Somerset County, Pa., on the Connellsville division. This is an interesting piece of heavy railroad tunnel construction and rock excavation which was complicated by two unusual and disastrous slides, involving 200,000 cu. yds. of solid rock, and the resulting eave-in and tie-up of the existing tunnel, adjacent to the new work.

Sand Patch is located on the main line of the Baltimore & Ohio, from Cumberland, Md., via Pittsburgh to Chicago, at the summit of the Allegheny mountains, at elevation 2,273. It is 23 miles west of Cumberland and 117 miles east of Pittsburgh. The situation at this summit was an especially difficult one from an



Profiles of New and Old Tunnels.

operating standpoint, owing not only to the long and heavy approach grades of 1.5 per cent. from the east and 1 per cent from the west, but more particularly to the old Sand Patch tunnel, located on the steep east approach, which in addition to being on a 1.0 per cent. grade, is only built for single track, restricting the running track facilities of the division from double track.

The old tunnel is 4,777 ft. long, on a tangent, and is located with its west portal 700 ft. east of the actual summit. It was completed in 1871, after an interrupted period of construction of 17 years, during eight years of which work was actually under way. Although constructed for single track, provision was made wherever permanent stone lining was installed, for a future second track, the arch being placed on a bench at the springing line. Dry ashlar masonry was used for lining; this was, however, used only in a relatively few places, where the original builders thought necessary. Owing to the treacherous character of the rock it has since been necessary to timber all the unlined parts, except one section of 100 ft. and to under-timber the stone lined portion as well, thus reducing the overhead clearance to 16 ft. above the rail. Four shafts were built at irregular intervals along the old tunnel; of these one is closed, and the other three provide the only means of artificial ventilation.

The train movements through this tunnel were very numerous, comprising an average of 57 trains per day—16 passenger, 8 fast freight and 35 tonnage freight—as well as numerous switching and pusher movements. This heavy traffic had resulted in considerable congestion, with the incidental delays to trains and train crew over-time. Indeed, so congested had the traffic been that at times for an entire day the tunnel was used to its maximum capacity.

In the face of these conditions—the adverse grades, the single track, poorly lined and poorly ventilated tunnel, and the magnitude and nature of the traffic—the operating difficulties were obvious. They had their most pronounced effect on tonnage freights, which require two pushers both east and west bound. One of the westbound pushers was forced to cut off at the east end on account of the sulphur fumes in tunnel, while the other had to work up the grade through the tunnel using forced draft for the entire length. Both eastbound pushers cut off at the summit at the west end. Aside from the congestion and the resulting costly operation, there was the element of inconvenience in operating through the tunnel due to scant clearance and poor ventilation. Added to this, trainmen have been overcome by the gases, so that, in short, the old tunnel presented a most disagreeable and burdensome feature from every aspect.

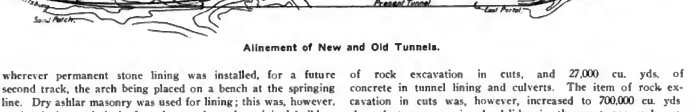
PROPOSED LAYOUT.

Studies and investigations to improve these conditions have been carried on for the last ten years, covering a variety of propositions, including a long low-grade cut-off line, and a low-grade line involving a three-mile tunnel. They culminated in the spring of 1911, in the adoption of a plan providing for the construction of a new double-track line 11,000 ft. long, on the north side of the present tracks.

The proposed new line and its relation to the present one is shown in the plan and profile. It will be noted that the new line involves the construction of a 4,000 ft. tunnel just north of, and making an acute angle with, the present line; an east approach cut of 75,000 cu. yds., and a west approach cut of 425,000 cu. yds. The scheme also provides for a revised alinement of the old line east of the tunnel for 2,600 ft., and on the west for a 200-car capacity set-out yard with wye connections for eastbound tonnage trains.

According to the original figures the quantities involved were 130,000 cu. yds. of rock excavation in tunnel; 500,000 cu. yds. of rock excavation in cuts, and 27,000 cu. yds. of concrete in tunnel lining and culverts. The item of rock excavation in cuts was, however, increased to 700,000 cu. yds through two successive landslides in the west approach cut, which will be described later.

The maximum grade on the new line is 1.5 per cent. on the east approach to the new tunnel; the same as the existing maximum grade. Through the new tunnel, however, the grade is 0.5 per cent., the ruling road engine grade on the division which will eliminate all pusher service through the tunnel. Because of its short length, the new line will not permit of an increase in the loading of tonnage trains on the division; in fact, the line was not designed, even as a connecting link, to



Alinement of New and Old Tunnels.

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View of Slide of July 9 from Above West Portal.

View of Slide on August 15, Showing Shaft in Center Above Old Tunnel.

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afford permanent relief from the adverse grades in this territory; but, its purpose is primarily to relieve the congested and restricted conditions through the old tunnel.

Outside the limits of the improvement the operating methods on the division will remain practically unchanged, except as to the return trips of the pushers and the loading of eastbound trains. Within the changed district, the contemplated scheme of operation proposes the use of the two new tunnel tracks for westbound traffic only. The old tunnel, after being enlarged and relined, is to be used for all eastbound trains, its grades in this direction being favorable to the traffic.

East and westbound trains will have their tonnage increased somewhat by the use of heavier pushers. Eastbound pushers will cut off at the west end and lighten the trains for safe operation down the long and steep east slope, placing the surplus cars on the eastbound set-out tracks previously mentioned. Westbound pushers will cut off at the east end of the tunnel. When necessary they will bring along extra crews, run light to the west end, pick up the cars on the set out tracks and haul them eastward. Otherwise westbound pushers will back up as heretofore. In this manner the actual pusher mileage will be somewhat reduced, a considerable light return pusher mileage will be eliminated, and above all, a very large amount of overtime of all engine crews will be saved by the facilitated operation.

shale prevailed. The loose earth made it necessary to timber the shaft for a depth of 25 ft.; below this point timbering was not resorted to, because of the solidity of the rock formation. The timbering consisted of horizontal 10 in. x 10 in. walers placed six ft. center to center; 2 in. x 6 in. lagging, and two intermediate 10 in. x 10 in. struts spaced equally; dividing the shaft into three compartments. While the shafts were provided primarily to expedite the excavation of the tunnel, it is the purpose to use them for ventilation as well. To make them permanently suitable for this, it is proposed to line them throughout with concrete, and carry them above ground level.

VERTICAL SHAFTS.

In the spring of 1911 the contract for the work was let, and about May 1 the work was actively begun. One steam shovel outfit with drills, etc., was placed in the east approach cut. While the approach excavation to the tunnel portals was in progress, two vertical shafts, 12 ft. x 22 ft. in size, No. 1, 200 ft. deep and No. 2, 133 ft. deep, were sunk transversely at points 1,300 and 3,300 ft. from the east portal. As little water was encountered, they presented no unusual features. Table 1 shows the rate of progress attained in sinking these shafts.

TABLE 1.

Shaft.	Depth.	Yardage.	Period of construction.	Lineal feet of progress per day.	Yardage removed per day.
No. 1, East	200 ft.	2,904	68 days	2.96	43
No. 2, West	133 ft.	1,931	52 days	2.56	37

At both shafts a layer of loose earth and soil about 14 ft. in depth was found, from which point to the bottom red sandstone

HEADINGS.

From the foot of each shaft, headings 9 ft. x 16 ft. in size were immediately started in both directions. The two from the east shaft, driven as top headings, were placed so that their base was at the elevation of the wall plate, the roof being nearly at the elevation of the future roof of the completed tunnel.

From the west shaft the procedure was somewhat different. The west heading was driven as a bottom heading, the floor being on the proposed sub-grade line of the completed tunnel; the east heading from this shaft was started in the same way. This was somewhat in the nature of an experiment for this class of rock, the contractor's idea being that the subsequent excavation work within tunnel sections would be more easily performed by blasting the material from above and dropping it down into the heading and then loading, by which method he was counting on no timber. After the west shaft headings had been driven a distance of 700 ft. it was found that this bottom heading plan was inadvisable, as the rock was not self-supporting and required timbering throughout. The east heading was then continued on an upward grade of 5 per cent. until its base was at the wall plate grade, when it was driven in the same manner as the east shaft headings. The west heading from the west shaft was redriven as a top heading.

General View of Concrete Mixing Plant at East Portal.

By the middle of August, 1911, the excavation of the east approach cut was sufficiently low to permit the driving of a top heading toward the east shaft, which made the fifth heading to be worked, shown in Table 2 as No. 1 heading, east portal.

The excavation of the material in the first headings was carried on by the usual method of column drilling and shooting; the muck was loaded by hand into narrow gage 2-yd. end dump

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Oliver cars, hauled to the shafts by mules, elevated to the surface, and wasted on the sides of the mountain. The progress made in this work is briefly given in the following table.

TABLE 2.

Heading from	Length in lin. ft.	Yardage.	Days worked 2 shifts.	Average daily progress. Lin. ft.	Yardage.
No. 1, East portal	700	3,743	75	9.33	49.92
No. 2, Shaft No. 1—East.	594	3,100	81	7.33	38.27
No. 3, Shaft No. 1—West.	979	5,200	113.5	8.63	45.81
No. 4, Shaft No. 2—East.	1,009	5,800	132.5	7.62	43.77
No. 5, Shaft No. 2—West.	694	4,000	106.5	6.52	37.56

The second heading, embracing the enlargement to complete tunnel section of the walls and roof of the first heading, followed closely after the first. The material was handled as that from the first heading.

TIMBER.

The material penetrated by the tunnel is red sand stone shale, the strata of which dips northward rather uniformly at an angle of from 15 deg. to 20 deg. with the horizon and almost directly toward the new tunnel center line. In many places the rock is very solid and stable; in others it is rendered treacherous by transverse and almost vertical seams normal to the dipping plane and approximately parallel with the new tunnel center line.

Under these conditions, and after the change from the bottom to the top heading plan, the contractor decided to timber the tunnel throughout. This proceeded as rapidly as the widening out of the second heading permitted, the average weekly progress being 40 lin. ft. The timberings were spaced on 5-ft. centers and consisted of seven segments of 12 in. x 12 in. timbers sup-

Inside of New Tunnel Showing Brick Facing Over Crown of Arch.

ported on a 12 in. x 12 in. wall plate. Two inch lagging was placed over the timbers, and the space above this to the limits of the excavation was carefully dry-packed.

BENCH.

The bench was broken by simultaneously shooting four vertical holes 17 ft. deep spaced 10 ft. apart, drilled in transverse rows on 14 ft. centers. The outer holes were kept 3 ft. from the wall plate. This spacing, except in several instances, broke the rock practically to complete rock excavation lines without injuring the wall plate. From the east portal to shaft No. 2, a distance of 2,700 ft., this loosened material was loaded from March 1 to June 1, 1912, into narrow gage dump cars by an air-operated Model 40 Marion shovel, which was replaced June 1 by a Model 60 Marion shovel with a special short boom. The cars were hauled to and from the east dump in trains of ten, by 18 ton Porter dinkeys. The dump cars were snatched singly to and from the working face at the shovel by an air hoist and cable. Siding facilities on the dinkey track enabled the switching of these single cars from an empty to a loaded track.

It was originally intended to work a second Model 60 shovel from the west portal eastwardly, but the work in the west approach cut was delayed to such an extent that this proved impracticable. In August, 1912, a Model 40 Marion shovel was brought in dismantled from the west portal through the enlarged

Old Tunnel After Removal of Cave In.

heading, erected at shaft No. 2, and started toward the west portal loading the bench, to expedite this work. The material loaded by this shovel was hauled to shaft No. 2, elevated to the surface and wasted on the mountain side.

The following statement gives the average progress made by each of these shovels, the time worked and the yardage removed.

TABLE 3.

Shovel.	Number of shifts worked (10 hours).	Average progress per shift. Lin. ft.	Yardage.	Maximum progress one shift. Lin. ft.	Yardage.
Model 40.....	107	9.5	109	14	280 cu. yds.
Model 60.....	220	11.0	220	21	420 cu. yds.
*Model 40.....	43	14.0	168	20	240 cu. yds.

*Note: Yardage per foot of Model 40 shovel was reduced on account of bottom heading, 40 per cent. of the material being previously removed.

The figures are not comparative, not only because of the different powered shovels, but because of the different methods employed by each in transporting the muck to the dump. Attention is, however, called to the good, general average attained by the Model 60 shovel, which is considerably higher than the usual, and believed to be a record for this class of work.

A trimming gang followed closely after the shovel. It trimmed the falls to proper section where necessary with jap drills, and reinforced the wall plate by plumb posts wherever it was loosened by the shovel operations.

TUNNEL LINING AND PORTALS.

After considering the various advantages and disadvantages of the common types of lining, all brick, all concrete, and con-

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crete side-walls with brick arch, a somewhat novel design was adopted. It called for a monolithic concrete structure throughout, with a single row of brick inlaid in the arch between the 25 deg. lines, as shown in an accompanying photograph. Each fourth row of brick are laid as headers, to more thoroughly bind the brick to the concrete.

It is considered that this design provides the economy and other advantages due to a monolithic and completely filled structure of concrete over brick, and at the same time eliminates the objection against the former, in that the row of brick will prevent the otherwise rapid disintegration of the concrete from the locomotive gases and blast. Attention is called to the fact that provision is made for a concrete ditch on one side, for two 4-way

The Completed East Portal.

ducts for electric power and telegraph lines, for cable boxes for electrical apparatus, and for the usual refuge niches. In the design of the portals, a massive structure, and one not lacking in architectural treatment, was sought.

CONCRETE PLANT.

To handle, mix and place the materials embraced by the 27,000 cu. yds. of concrete in the tunnel lining required an extensive concrete plant. This it was decided to concentrate at the east end, because of the advanced stage at which the work at that point was maintained. The plant as built along the standard gage delivery tracks on the north side of the east approach cut is shown in one of the photographs. It embraces essentially a set of sand, stone and gravel storage bins, a hoist and cable with elevating trestle for hauling this material to supply bins over the mixing platform and two steam-driven one yard Smith mixers, with the usual provision for cement storage and water supply.

The three storage bins are located about 700 ft. east of the mixing plant, at the foot of the 1:1 slope from the delivery track. Their floor level is from 12 to 16 ft. below rail. They are of wood, having a capacity of approximately 1,500 cu. yds. each, and are supported by posts over a narrow gage track by which the materials are hauled to the mixer, hopper doors in the floor being provided to load the cars. The material coming in standard gage cars is cast down a slope by hand into the binds or placed by a locomotive crane. This method was made necessary by the lack of vertical headroom at any convenient site.

From these storage bins the material was hauled in single 4-yard ordinary dump cars up an incline to the mixer, by cable and steam hoist, where it was dumped into the supply bins, each of which had a capacity of 110 cu. yds. From the supply bins the aggregates were delivered by gravity chutes to the hoppers above the two mixers. The bins were so arranged—the middle one holding sand—that one mixer furnished gravel concrete and the other stone concrete. The cement was wheeled to the hoppers from the adjacent cement house located along the delivery siding on the same level with the mixing platform, while the water was drawn from a 3,000 gal. tank above the bins, to which it was pumped from a nearby stream.

The concrete specified was gravel or stone to the springing line, and stone in the arch. In either case the mixture required was 1:3:5.

FORMS.

Blaw collapsible steel forms were used, which were mounted on wheels running on a rail laid on top of footings previously constructed. The working platform and dumping aprons were placed at the brick line 16 ft. above sub-grade, which permitted of a rapid and efficient method of handling and placing the concrete. A wooden frame incline approach on a 13 per cent. grade, mounted on narrow gage trucks, provided means of elevating concrete materials to the working platform.

The concrete was hauled from the mixer to the foot of the incline in steel Koppel dump cars by Porter dinkey engines; here the cars were cut loose and were hauled up the incline onto the working platform by an air hoist and cable, where they were dumped. In the side walls up to the end of the steel lagging at the brick line, the concrete was passed down the sloping aprons by hand. Between the limits of the brick lines wooden lagging was used on the forms and placed as the work progressed. The brick and concrete work was carried up simultaneously, the brick being placed in one bay, while concrete was

Big Slide at West Portal.

being placed in another. In this manner, the arch was built up from both sides until a 5 ft. key remained to be put in at the crown. This key was placed longitudinally from one end of the form to the other on transverse lagging cut to fit the 5 ft. opening, the lagging being inserted progressively as the arch was sealed.

Three sets of these forms in units 40 ft. long and one incline were installed in June, 1912, and the concreting was begun by July 1. The program by which it was carried out was as follows: Starting with all three forms in place with the incline at form No. 1, the sidewalls and arch were finished at this form in about 3½ shifts; the incline and hoist were quickly moved to form No. 2; where the concreting was immediately begun and

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completed in the same time, No. 1 form being allowed to set; upon finishing at form No. 2 the incline and hoist were moved ahead to form No. 3 and concreting begun there. While this was going on, Form No. 1 was moved ahead and again worked upon the completion of No. 3. In this manner work was carried on continuously, and each arch was given 48 hours in which to set.

On October 1, 1912, a fourth set of forms and two additional inclines were installed to hurry the completion of the work. Up until that time 2,000 ft. of finished lining had been placed with the three forms, an average daily progress with two shifts of 21 ft. having been attained. With the four sets of forms working, this average daily progress was increased to 40 ft.

For the sake of economy in excavation, the north side of the west approach cut was planned on a slope of ¼:1, this being specially favorable from the fact that the strata dips into the hill on that side. The depth of the cut and the broken nature of the rock made a solid face for this slope very essential. Accordingly, the steam shovel excavation was kept about 8 ft. from the final face of the cut, and this 8 ft. ledge was removed by a Sullivan channeling machine and two sets of quarry bars, holes being driven on 9 in. centers. These were set up along a bench and put to work at the final slope line. As only light charges of dynamite were required to loosen this intervening ledge, the rock wall was disturbed very little.

SLIDES IN WEST APPROACH CUT AND CAVE-IN OF OLD TUNNEL.

For a distance of 800 ft. west of the new west portal the new cut, 90 ft. deep on the center line, is separated from the old tunnel by a ledge of rock tapering in width from 185 ft. at the east end to 75 ft. at the west end. This proximity of the old tunnel, combined with the stratification of the rock in this ledge, which dipped at an angle of from 15 to 20 deg. from the old tunnel directly toward the new cut, produced a situation which was, of course, the subject of much thought and speculation. Accordingly, great precautions were taken in regulating the blasting and other work in this district to avoid any possible interference with traffic through the old tunnel.

It was originally proposed to take out the south side of this cut on a ½:1 slope up to the earth line, then provide a 15 ft. berm and continue on a 1½:1 slope. On this basis the cut had been excavated to within 20 ft. of the proposed sub-grade, when, on March 15, 1912, 80,000 cu. yds. of rock broke away and slid into the cut, burying one steam shovel. The break took place along a seam inclined slightly from the vertical into the hill, and left a projecting face whose maximum depth was 28 ft. The break extends over a distance of about 350 ft., and filled the new cut to a maximum depth of 30 ft. The seam occurred north of the old tunnel, fortunately leaving it intact.

By the end of June, the fall of material had been excavated and the cut practically restored to its former level, the south side having been flattened to a 1¼:1 slope. On July 6 a new movement of the south slope was detected, this time extending east 600 ft. from a point directly over the old portal. New openings continued to appear up into the hill, the extreme breakage being 50 ft. beyond the old tunnel. At the same time some of the arch stones in the old portal showed signs of strain and at noon of July 9, a spall broke off just at the south springing line.

In the face of these conditions, the shovels in the danger zone were pulled back and a very thorough watch was maintained. At 6.05 p. m. of July 9, three days after the first cracks appeared, the hillside gave way, and in sliding cut a void in the old tunnel roof, completely filling the old tunnel for a distance of 71 ft. and again partly filling up the west approach cut. The west end of the break within the tunnel occurred about 180 ft. east of the west portal, the intervening portion remaining solid—a very peculiar result, as the breaks indicated trouble would come just where it did not.

Arrangements were immediately made to divert all traffic over the newly completed line of the Western Maryland between Sand Patch, Pa., and Cumberland, Md., a distance of 32 miles. At the same time, it was at once apparent that the only safe and certain method of reopening the old tunnel involved the removal of as much of the overlying hillside as had any effect on the moving portion—a matter of months rather than days.

Accordingly, it was immediately arranged to install all the necessary plant and men. In less than 24 hours, 1,000 men were working continuously, grading and laying a standard gage track up the hill, constructing several narrow gage tracks to nearby dumping grounds, and installing all the available plant. In another day a Model 60 Marion shovel started digging on the side hill, while the following day saw two more Model 60 shovels at work on the overlying material. Thereafter, as rapidly as they could be assembled and shipped, additional steam shovel plants were installed until by July 28 there were three Model 60, one Model 75, one Model 120, one Model 70 and two Model 20 shovels. The five first mentioned were put to work digging away the hillside, the sixth was started casting in the new cut below, because of no available loading track at that point, and the two 20's were held in readiness to enter the tunnel and load the fallen debris.

The plan for reopening the old tunnel that was adopted called for the removal of all material overlying a bench 16 ft. above

View Showing Steel Forms at East Portal and Incline for Bringing in Concrete.

the crown of the old tunnel arch, and the subsequent sinking of a shaft from this bench to the tunnel sub-grade to excavate the fallen material. By August 10, 75,000 cu. yds. of solid rock had been removed and enough of the bench exposed to start the shaft over the cave-in. This shaft was made 110 ft. long and 30 ft. broad. Two stiff-leg derricks with hoists, rigged up 75 ft. apart on the north side, handled the material, loaded by hand into scale boxes, from the pit to dump cars on an adjoining track. In ten days this shaft had been excavated and timbered to the crown of the old tunnel arch, and daylight was let in at both ends of the break. At this juncture the two light model 20 shovels were put in the old tunnel—one at each end—and started loading the fallen debris, hand loading being continued as well where there was no interference.

The ensuing week saw the tunnel cleared of all fallen material, additional timbering put in, and the track relaid and resurfaced, so that at noon, on August 29—after a tie-up of 50 days—the old tunnel was reopened for traffic.

During the construction of the shaft and after its completion, the excavation of the side-hill was continued until the bench

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previously mentioned extended from the west portal eastwardly about 300 ft. beyond the east end of the break. It was carried south into the hill for about 50 ft. to prevent any possible future trouble from that slope, which was finished on a 2:1 basis. The limited working area caused considerable interference with the five shovels, but in spite of this, and some extremely poor weather, 120,000 cu. yds. of rock, most of which had to be shot, had been removed by the time the tunnel was opened. As a result of these slides, and to prevent similar trouble in the east end of the west approach cut, the new tunnel has been extended 200 ft. westwardly from the originally planned west portal, building the tunnel arch in the cut and backfilling over it.

CONTRACTOR'S POWER PLANT.

The contractor's power plant, central supply house and main machine shop was located at the west end of the west approach cut, where convenient access through a delivery siding could be had from the adjacent main line of the Baltimore & Ohio. The boiler house embraced four 100 h. p. Ames locomotive type boilers by which steam was supplied to the compressors and electric generator. The compressed air for the drills, hoists and shovels in the tunnel was furnished by two straight line, two stage Ingersoll-Rand compressors, which supplied 1,750 cu. ft. of free air per minute, at a pressure of 120 lbs. per sq. in. at the power house. The air line consisted of two lines of 6 in. wrought iron pipe, and extended over the mountains to the east end, a total distance of 6,000 ft.

The electric generator supplied current to the contractor's line at 550 volts, which was stepped down by a transformer on top of the mountain to 220 volts, in which shape it was used in the tunnel for lighting purposes, clusters of five lights in series being employed.

The work was planned and constructed under the supervision of Francis Lee Stuart, chief engineer of the Baltimore & Ohio, and was in charge of Paul Didier, principal assistant engineer. Its execution was under the direct supervision of A. D. P. Janney, resident engineer on the ground. H. S. Kerbaugh, Inc., of Philadelphia and New York, was the general contractor, with R. C. Hunt and A. H. MacLennan construction superintendents.

A FULL CREW LAW IN NEW YORK.

The legislature of New York passed last week, by large majorities, a bill to require three brakemen on all freight trains of 25 cars or more; and as regards both passenger trains and freight, the bill specifically mentions firemen; so that on the multiple-unit electric trains of the New York Central and the Long Island roads, an extra man will have to be employed as "fireman," although no fireman is needed on such trains. Governor Sulzer gave a hearing on the bill at Albany on Saturday last, and the presidents of the principal roads of the state appeared before him and presented arguments in detail against the passage of the bill; but he signed it nevertheless.

The arguments presented by the presidents had been summarized in a letter to the governor, which they had published as an advertisement in the principal newspapers on Saturday morning. This letter was in substance the same as that which Mr. Rea and other presidents had sent to the governor a week before, and which was reported in the *Railway Age Gazette* of March 21, page 685. The appeal to the public was displayed in the principal newspapers to the extent of a half page in each. Ia was signed by the presidents of the Pennsylvania Railroad, the New York Central, the New York, New Haven & Hartford, the Delaware, Laekawanna & Western, the Lehigh Valley, the Long Island Railroad and the Delaware & Hudson.

On Monday the presidents issued another advertisement, appealing to the public, and reprinting another letter which had been sent to the governor asking him to veto the bill, the fact of his signing it having at that time not been announced. In this second letter the railroads agreed to comply with any orders which the public service commissions might make in respect to the number of men required on trains, and they also offered to co-operate in securing the passage of a law giving the public service commissions full authority if anybody thought that such authority did not already exist.

The advertisement also contained letters from President Willard of the Baltimore & Ohio; President Thomas of the Nashville, Chattanooga & St. Louis; President Miller of the Chicago, Burlington & Quincy, and Vice-president Wood of the Pennsylvania lines west of Pittsburgh, telling of their experience under full crew laws. Both the house and the senate of the legislature of Tennessee have rejected a full crew bill. The statement had been made that full crew laws had been of benefit in the few states where such laws have been in force. Mr. Miller and others denied this.

On Tuesday another half-page advertisement appeared. It was known at that time that Governor Sulzer had signed the law in New York, but in New Jersey it was still unknown what action the governor would take. In this advertisement Mr. Hughart, general manager of the Grand Rapids & Indiana, Mr. Mohler, president of the Union Pacific and Mr. Bush, president of the Missouri Pacific were quoted. Mr. Mohler said that full crew bills had recently been defeated in Kansas, Nebraska, Colorado, Wyoming and Utah, it having been seen that such a law would produce an additional tax on the people, and on the railroads, without one scintilla of benefit. Mr. Bush reported a similar result in Texas.

The railroads also reprinted a letter sent to Governor Sulzer on March 29, by John B. Olmsted, formerly a member of the New York Public Service Commission, telling the governor that the commission had had two applications before it for orders requiring additional brakemen on trains; and that in one case the order had been issued, while in the other the request was denied. If the number of brakemen could be settled by the legislature, why, asked Mr. Olmsted, should not the legislature also with equal reason require a flagman at every grade crossing? Such a measure would greatly promote the safety of the public and of railway employees, but it would entail an enormous expense. Such far reaching questions should be dealt with by the public service commission, which could handle them with due deliberation and intelligence.

The railroads were not the only interests which appeared before the governor to oppose the bill. The State Grange, the State Agricultural Society and other important interests presented arguments. President E. B. Thomas, of the Lehigh Valley, presented at the hearing a petition, signed by fifty conductors of that road, declaring an extra trainman to be unnecessary. President W. C. Brown, of the New York Central, said that enginemen and conductors generally were opposed to the bill. President Peters, of the Long Island, called attention to the fact that the bill would compel his road to employ firemen on electric locomotives.

The governor in giving his approval to the bill sent also a memorandum in which he declared that a similar bill had been adopted with good results in other states.

The law provides that a freight train of more than 25 cars, running outside of yard limits, and on railroads more than fifty miles in length, must be manned with a crew of not less than one engineer, one fireman, one conductor and three brakemen; any train of five cars or more, other than a freight train, must have one engineer, one fireman, one conductor and two brakemen; and, if it is a passenger or baggage train, it must have a baggageman in addition to the crew; any freight train of twenty-five cars or less must have one engineer, one fireman, one conductor and two brakemen; and any light engine must have not less than one engineer, one fireman and one conductor or brakeman.

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RAILWAYS AND AGRICULTURE COMPARED.*

Carriers' Outputs Increased Much More in Proportion to Facilities than Farmers', and Farm Prices Rose While Rates Stood.

The present study is a comparison of the increases in the plant and output of agriculture with the increases in the plant and the output of the railways. Bushels and bales are so different from ton-miles and passenger-miles that there cannot be any direct comparison between them, but it is fair to compare in a general way the respective ratios of increase. That is, if during an extended period the ton-miles and the passenger-miles per mile of main track have increased at a substantially greater ratio than have the bushels per acre or the bales per acre of a particular crop, it is fair to say that the railways have made greater progress in efficiency than has agriculture as measured by that particular crop. Then, again, it is perhaps true that an acre of even the most fertile soil does not have an elasticity of production comparable with the range of traffic that can be moved over a mile of railway. The practice of European agriculture, however, demonstrates a vastly greater productivity per acre than has been obtained in the United States. Therefore the present comparison of the increase in productivity is well within the limits of practicable achievement.

In the railway industry so large an initial investment in fixed plant is required in order to operate at all, that for a considerable time after being opened for traffic the plant is likely not to be fully utilized, and hence additional applications of labor and equipment are rewarded by a more than proportionate increase in output. In other words, efficiency tends steadily to increase up to the time that the plant is completely utilized. No such large initial investment is required in agriculture, and the point is more quickly reached where there is even a less than proportionate reward for each new application of capital and labor. That the point of diminishing return has been reached in the case of many railways is undoubtedly true.

It is frequently asserted that the farmer suffers from the disadvantage that the quantity of land is fixed, and that he cannot increase it at will. This impression, only in part true, probably arises from the fact that the governmental policy of free land is practically at an end, and that if the farmer wants more land, he must, as does the railway when it extends its lines, invest more capital. There is still opportunity open to the farmer to extend his productive area.

But efforts to develop efficiency meet hampering restrictions not alone in agriculture. Agriculture is not subject to such public regulation as the railways, and in the railway field much in the way of unproductive or relatively unproductive investment is demanded in the public interest. These investments, being to a considerable degree beyond the control of the railway, may hamper that development of physical plant which is best fitted to handle traffic efficiently. Again the output of the agricultural plant, eliminating natural forces, is within the control of the farmer; within a practicable limit he can produce as much or as little as he chooses, and hence the responsibility for a large or a small product per acre within this limit is his alone. The railway, on the other hand, performs a *service*, is, therefore, dependent upon patronage for its output, and hence its output is not under its sole control. The fact that it is a service which the public are obliged to use modifies the force of this contention, but does not remove the fact that the intensiveness of traffic depends largely upon the volume of traffic offered.

These fundamental differences in the character of the agricultural and railway industries would seem on first thought to destroy the value of any comparison of their efficiency. But it must be remembered, as has been said, that the two industries are not being compared directly with each other; rather the *increase in the efficiency* of each is being compared over a series of years. The record for efficiency of each industry is compared at one period with its record at another. Account is taken of the degree in which the plant of agriculture and the plant of the railways have been extended, of the aggregate increases in output of the increases in output per unit of plant, of increases in value in relation to output, and of the relation that extensions of plant and increases in output bear to the growth of population.

COMPARISON OF PLANTS.

The physical plant of the railways of the United States comprised 206,631 miles of main track in 1900. By 1910 this had grown to 266,185 miles, an increase of 59,554 miles, or 28.8 per cent.

Improved land in the farms of the United States amounted to 414,498,000 acres in 1900 and 478,451,000 acres in 1910, an increase of 63,953,000 acres between 1900 and 1910, or 15.4 per cent.

It is evident that the railway plant has increased at nearly double the rate of the agricultural plant. Additional light is obtained by showing the rates of increase separately for the three principal districts of the United States—Eastern, Southern, and Western.[a]

INCREASE IN RAILWAY TRACK MILEAGE AND IN IMPROVED FARM LAND EASTERN, SOUTHERN, AND WESTERN DISTRICTS.

Item.	1900.	1910.	Increase, 1900-1910. Amount.	Per cent.
Eastern district:				
Railway main track...	64,537	75,129	10,592	16.4
Improved farm land..	90,921,000	89,641,000	d1,280,000	d1.4
Southern district:				
Railway main track...	33,117	43,694	10,577	31.9
Improved farm land..	82,061,000	88,353,000	6,292,000	7.7
Western district:				
Railway main track...	108,977	147,362	38,385	35.2
Improved farm land..	241,516,000	300,458,000	58,942,000	24.4

d Decrease.

COMPARISON OF AGGREGATE OUTPUT.

Railway output in the United States in 1900 and 1910, expressed in terms of ton-miles and passenger-miles, was as follows:

	Output in—		Per cent. of increase 1900-1910.
	1900.	1910.	
Ton-miles	141,596,551,000	255,016,910,000	80.1
Passenger-miles	16,038,076,000	32,338,496,000	101.6

The immediate comparison in the case of agriculture will be concerned with the ten principal crops, those which enter into universal use and consumption and constitute over 80 per cent. of the value of all crops—corn, wheat, oats, barley, rye, buckwheat, potatoes, hay and forage, tobacco, and cotton. The area devoted to these ten crops in 1900 aggregated 274,380,000 acres, while in 1910 it was 297,865,000 acres. This area of the ten crops, representing over four-fifths of the total crop area of the United States both in 1900 and 1910, increased 23,485,000 acres during the decade, or 8.6 per cent.

The increases in the respective crops are shown by the following table:

	Production In—		Per cent. of increase, 1900-1910.
	1900.	1910.	
Corn (bushels)	2,666,334,000	2,552,190,000	d 4.3
Wheat (bushels)	658,534,000	683,379,000	3.8
Oats (bushels)	943,389,000	1,007,143,000	6.8

a The Eastern district comprises the New England States, New York, New Jersey, Pennsylvania, Delaware, Maryland, the District of Columbia, Ohio, Indiana and Michigan. The Southern district includes all the States south of the Potomac and Ohio and east of the Mississippi rivers. The Western district comprises the States of Illinois and Wisconsin, and all States west of the Mississippi. As regards railway operation, the Eastern district corresponds very closely to combined Groups I, II and III of the territorial classification of the Interstate Commerce Commission; the Southern district to Groups IV and V combined; the Western district to Groups VI, VII, VIII, IX and X combined. The boundaries of the groups that lie along the borders of these districts do not always follow State boundaries, but the districts specified above so closely correspond to the combined groups of the Interstate Commerce Commission that there is no appreciable variation from strict comparability.

*An abstract of Bulletin No. 45, Bureau of Railway Economics, Washington, D. C.

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	Production in		Per cent. of increase
	1900.	1910.	1900-1910.
Barley (bushels)	119,635,000	173,344,000	44.9
Rye (bushels)	25,569,000	29,520,000	15.5
Buckwheat (bushels)	11,234,000	14,849,000	32.2
Potatoes (bushels)	273,318,000	389,195,000	42.4
Hay and forage (tons)	79,252,000	97,454,000	23.0
Tobacco (pounds)	868,113,000	1,055,765,000	21.6
Cotton (bales)	9,535,000	10,649,000	11.7

d Decrease.

The rate of increase in gross railway output, between 1900 and 1910, is shown to be from 80 to 100 per cent. The increase in the output of the ten crops combined, each crop being assigned a weight proportionate to its acreage, was about nine per cent.

COMPARISON OF OUTPUT PER UNIT OF PLANT.

Agriculture is affected directly and railway operation indirectly by climatic changes, seasonal variations, and calamities of one kind or another—factors that can neither be anticipated nor controlled. The pushing of agriculture into new fields may for a time increase output per unit, while the extension of railway lines into new territory may temporarily decrease output per unit, yet in neither case does this influence play any necessary part in determining for the time being the actual efficiency of operation. With this condition clearly in mind, it will be interesting to compare the output of agriculture and railways per unit of plant.

RAILWAY OUTPUT PER MILE.

	Output per mile of main track in—		Per cent. of increase
	1900.	1910.	1900-1910.
Ton-miles	685,263	958,044	39.8
Passenger-miles	121,617	121,489	56.5

OUTPUT PER ACRE.

	1900.	1910.	Per cent. of increase, 1900-1910.
Corn (bushels)	28.1	25.9	*d* 7.8
Wheat (bushels)	12.5	15.4	23.2
Oats (bushels)	21.9	28.6	*d*10.3
Barley (bushels)	26.8	22.5	*d*16.0
Rye (bushels)	12.4	13.4	8.0
Buckwheat (bushels)	13.9	16.9	21.3
Potatoes (bushels)	93.0	106.1	14.1
Hay and forage (tons)	1.285	1.345	4.7
Tobacco (pounds)	788.1	815.3	3.5
Cotton (bales)	0.393	0.332	*d*15.5

d Decrease.

The rate of increase in railway efficiency from 1900 to 1910, measured by the increase in traffic per mile of main track, is shown to be 39.8 per cent. in respect to ton-miles and 56.5 per cent. in respect to passenger-miles—that is, the increased efficiency of railway operation as a whole was not less than 40 per cent. for the decade. When each crop is given a weight proportionate to its acreage, it will be found that the average of the increases and decreases in the output per acre for the ten crops combined shows a decrease of about one per cent. None of the ten crops shows as great an increase in output per acre as 40 per cent., while the output per acre of four of the ten crops decreased. Without exception the increase in railway efficiency between 1900 and 1910, as measured by increased output per mile, seems to have been greater than the increase in the efficiency in the production of the ten crops. Four of the crops decreased in output per acre, indicating not only that there was no gain in efficiency of production, but probably an actual loss.

COMPARISON BY GEOGRAPHICAL DISTRICTS.

That the same general conclusion is applicable to each of the three great geographical districts of the United States—Eastern, Southern, and Western—is made clear by the comparison given below.

In the Eastern district the gain in railway efficiency ranged above 40 per cent. The efficiency of production of the eight crops, which were raised in sufficient quantities in the Eastern district to warrant comparison with the railways of that district, without exception increased at a lower rate than the 40 per cent. of the railways.

OUTPUT PER UNIT.

	1900.	1910.	Per cent. of increase, 1900-1910.
Eastern District.			
Railways:			
Ton-miles	1,162,810	1,664,134	43.1
Passenger-miles	134,689	191,669	42.3
Agriculture:			
Corn (bushels)	36.9	37.3	1.1
Wheat (bushels)	13.7	17.3	26.3
Oats (bushels)	33.6	29.3	*d*12.8
Rye (bushels)	12.9	13.7	6.3
Buckwheat (bushels)	14.3	17.5	22.6
Potatoes (bushels)	92.0	113.3	23.2
Hay and forage (tons)	1.175	1.305	11.1
Tobacco (pounds)	1004.8	970.8	*d*3.4
Southern District.			
Railways:			
Ton-miles	516,251	774,487	50.0
Passenger-miles	45,340	73,762	62.7
Agriculture:			
Corn (bushels)	15.7	16.8	7.0
Tobacco (pounds)	725.9	767.3	5.7
Cotton (bales)	0.395	0.386	*d*2.3
Western District.			
Railways:			
Ton-miles	453,841	652,486	43.8
Passenger-miles	53,636	99,860	86.2
Agriculture:			
Corn (bushels)	30.9	26.7	*d*13.6
Wheat (bushels)	12.8	15.4	20.3
Oats (bushels)	33.5	29.7	*d*11.3
Barley (bushels)	26.8	22.5	*d*16.0
Rye (bushels)	12.8	14.2	11.4
Potatoes (bushels)	97.5	101.9	4.5
Hay and forage (tons)	1.370	1.404	2.5
Cotton (bales)	0.390	0.272	*d*30.3

d Decrease.

For the Southern district comparison is made between railways and the three principal crops of that district—cotton, tobacco, and corn. Railway efficiency as a whole increased something more than 50 per cent. The corn and tobacco crops show small increases in efficiency measured by production per acre—less than 10 per cent.—while the cotton crop shows a slight decrease in per-acre production, indicating no gain in efficiency of cultivation and handling.

Comparison is offered for the Western district between the railways and eight crops. Railway efficiency as a whole may conservatively be said to have gained more than 45 per cent. Of the four crops showing increased efficiency, no one has as high a rate of increase as this in output per acre, and four crops show decreases in output per acre.

The general conclusion warranted when the importance of each crop is considered in connection with its relative increase in acreage and output, is that the crop production of the United States increased at no greater rate from 1900 to 1910 than did the crop area. The same fact is presented from a different angle by the Census Bureau in the statement that there was practically no difference in the average quantity of crops produced per acre in 1900 and 1910. In contrast is the record of the railways, in which the increase of 28.8 per cent. in miles of main track was far less than the increases of 80.1 per cent. in ton-miles and 101.6 per cent. in passenger-miles; that is, the average output per mile of main track in 1910 was considerably greater than in 1900.

That the efforts put forth by the farmers of the United States during the past decade have only barely maintained the production of crops at the same level, without leading to any appreciable increase in efficiency of production, is the opinion expressed by John L. Coulter, in the article cited in the introduction. He says:

> It is true that the *hope* has been, and I believe I may say that the *belief* has been, that agriculture was increasing rapidly, if not keeping pace with the increase of population. The people of the United States have been more than willing to supply the Department of Agriculture, state agricultural experiment stations, and a great variety of agricultural schools, colleges, and lecturers with all of the funds necessary, believing that all this pointed towards a larger production of goods as a basis for the food, beverage, and clothing supply of our people. Hundreds of millions of dollars have been expended for this purpose. It may seem that this expenditure has been in vain, since the average production of agriculture has not increased. But without it doubtless there would have been far-reaching decreases due to depreciation of the soil and failure of the farmers to maintain the average production secured when they first took charge. Though hundreds of millions of pages of literature have been distributed among farmers, only a small percentage has actually been read, and only a

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small percentage of that read has been put into practice. It has taken almost all, if not all, of the education which has reached the farmers to date to prevent any downward movement in the quantity produced per acre of land actually cultivated.

CROP VALUES AND PURCHASING POWER.

In the light of this agricultural record, which shows an absence of increased efficiency in crop production, it is of interest and significance to note the extraordinary increase in agricultural prices and, in consequence, of the capital value of the agricultural industry.

According to the United States Department of Agriculture the average value of an acre's output of the ten important crops of the United States was $9.13 in 1899 and $15.51 in 1911, an increase of $6.38, or 69.9 per cent.

The details for each individual crop are as follows:

Crop.	Value of an acre's output, 1911.	Per cent. of increase over 1899.
Corn	$14.79	73.8
Wheat	10.96	50.1
Oats	10.98	38.3
Barley	18.38	70.2
Rye	12.96	105.1
Buckwheat	15.29	97.5
Potatoes	24.60	78.1
Hay	11.38	11.8
Tobacco	84.13	61.7
Cotton	20.32	52.3

Compared with the prices of things which farmers buy, the purchasing power of the crop of an average acre was greater in 1911 than in 1899 by 41.6 per cent. In other words, while there has been an increase in the market prices of such commodities as the farmer purchases in considerable quantity, the increase in the prices he receives for his crops has been so much greater that his purchasing power has been increased in considerably greater proportion. Expressing this situation in terms of the several important crops, the purchasing power of an average acre's output of corn in 1911 was 50.7 per cent. greater than in 1899; that of an average acre's output of wheat was 30.2 per cent. greater than in 1899; that of an average acre's output of cotton was 32.3 per cent. greater than in 1899.

This comparison of a farmer's purchasing ability at different periods has been carried a step further by the Department of Agriculture, to apply to specific commodities purchased and used by the farmers of the United States. While many of these commodities vary widely in grade, quality, or size, that grade or quality has in each case been selected which represents what is most generally sold to farmers, and the comparisons from year to year are always of retail prices of the same grades or qualities.

The following table shows the increase in purchasing power in 1911 over that of 1899 of the output of the average acre of corn, wheat, cotton, and of all crops, respectively, in terms of these specific commodities.

PER CENT. OF INCREASE, 1911 OVER 1899, IN THE PURCHASING POWER

Of these Commodities	By an average acre's output of— Corn.	Wheat.	Cotton.	All crops.
Coal-Oil	112	83	86	99
Coffee	11	*d* 4	*d* 3	4
Flour	24	20	18	25
Lard	25	8	10	18
Salt	44	22	26	25
Sugar	37	19	20	29
Tin Pails	63	41	43	53
Overalls	30	13	14	23
Calico	33	15	16	25
Axes	60	38	40	50
Nails	68	45	47	58
Shovels	37	37	38	48
Steel wire	70	42	49	60
Hose	46	26	27	37
Lime	47	28	29	38
Paints	9	*d* 7	*d* 4	4
Twine	71	48	50	61
Stoves	51	30	32	42
Harness	45	20	22	30
Wagons—single	55	34	35	46
Wagons—double	42	23	24	33

d Decrease.

The 21 representative commodities entered in this table were taken from a list of 83 commodities in the report of the Department of Agriculture. Between 1899 and 1911 the purchasing power of the output of the average acre of crops increased in the case of 82 of these 83 staple commodities—that is, the price received for an average acre's crop rose at a greater rate than the price paid for these commodities. The only commodity, the price of which rose faster than the prices of agricultural products, was brooms. This increase in the purchasing power of the farmer took place in face of the fact that the prices of 79 of the 83 commodities advanced.

POWER OF AVERAGE ACRE'S CROP TO PUACHASE TRANSPORTATION.

The amount of transportation purchasable by the output of an average acre of these same crops in 1899 and 1911 is shown in the following table:

	Corn.		Wheat.		Cotton.		All crops.	
	1899.	1911.	1899.	1911.	1899.	1911.	1899.	1911.
Ton-miles	1,175	1,954	1,008	1,448	1,643	2,684	1,261	2,049
Passenger-miles	442	749	379	555	693	1,029	474	786

The percentages of increase in the amounts of transportation purchasable with the average output of an acre are as follows:

	Corn.	Wheat.	Cotton.	All crops.
Ton-miles	66.3	43.7	45.6	62.5
Passenger-miles	69.5	46.4	48.5	65.8

PURCHASING POWER OF 1,000 CROP UNITS AND 1,000 TRAFFIC UNITS.

Taking the purchasing power of the farm value in 1900 of 1,000 bushels of the crops indicated, and of 1,000 bales in the ease of cotton, as 100, the relative quantities of the commodities named below purchasable at wholesale with 1,000 bushels of the same crops and 1,000 bales of cotton in 1910 are as indicated in the following table:

RELATIVE PURCHASING POWER IN 1910

Of these commodities.	By 1,000 bushels of— Corn.	Wheat.	Seven food crops.	Cotton (bales).
Farm products	120.7	114.0	100.1	129.5
Food	146.9	138.7	121.9	157.5
Cloths and clothing	156.7	147.9	130.0	168.0
Fuel and lighting	175.0	165.2	145.1	187.6
Metals and implements	170.2	160.6	141.2	182.5
Lumber and building materials	137.0	129.4	113.7	147.0
Drugs and chemicals	179.4	169.4	148.9	192.4
House-furnishing goods	172.5	162.9	143.1	185.0
Miscellaneous	149.7	141.3	124.2	160.5
All commodities	152.4	143.8	126.4	163.4
Ton-miles	175.7	165.8	145.7	188.4
Passenger-miles	187.6	177.1	155.6	201.1

Taking the purchasing power of the receipts of the railways from 1,000 ton-miles and 1,000 passenger-miles in 1900 as 100, the relative quantities of the commodities named below purchasable at wholesale with 1,000 ton-miles and 1,000 passenger-miles respectively in 1910 are as indicated in the following table:

RELATIVE PURCHASING POWER IN 1910

Of these commodities.	By the receipts from— 1,000 ton-miles. 1900.	1910.	1,000 passenger-miles. 1900.	1910.
Farm products	100	68.7	100	64.4
Food	100	83.6	100	78.3
Cloths and clothing	100	89.2	100	83.5
Fuel and lighting	100	99.6	100	93.3
Metals and implements	100	96.9	100	90.7
Lumber and building materials	100	78.0	100	73.1
Drugs and chemicals	100	102.1	100	95.7
House-furnishing goods	100	98.2	100	92.0
Miscellaneous	100	85.2	100	79 8
All commodities	100	86.2	100	81.2

The purchasing power of the value of 1,000 bushels of corn has risen from 100 in 1900 to 152.4 in 1910, an increase of 52.4 per cent.; similarly the purchasing power of wheat has risen from 100 to 143.8, or 43.8 per cent.; the purchasing power of cotton has risen from 100 to 163.4, or 63.4 per cent.; the purchasing power of the seven principal food crops, covered by earlier tables, has arisen from 100 to 126.4, or 26.4 per cent. The purchasing power of the receipts from 1,000 ton-miles has fallen from 100 in 1900 to 86.7 in 1910, a deerease of 13.3 per cent.; the purchasing power of the receipts from 1,000 passenger-miles has fallen from 100 in 1900 to 81.2 in 1910, a decrease of 18.8 per cent. These statistics have reference to purchasing power in general—i. e., power to purchase all commodities. When specific groups of commodities are considered, such as food, clothing, and the like, it is perceived that the purchasing power of the various crops indicated largely increased during the decade, while the power of the receipts from ton-miles and passenger-miles to pur-

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chase these same commodities with but one exception decreased.

The increase in the purchasing power by crops of transportation is of course explained by the fact that in contrast to the rapid increase in the average value of farm products during the period, there has been no more than a slight variation in average receipts per ton-mile and in average receipts per passenger-mile.

Correlative with the increase in value of farm crops, and in large measure as a direct result of such increase, the value of farm property greatly increased during the decade ending in 1910. This value as a whole, including land, buildings, implements and machinery, and livestock, increased 100.5 per cent., or practically doubled. The value of farm land alone increased 118.1 per cent., an increase in average value per acre of 108.1 per cent. In the same period the cost of road and equipment of the railways increased 40.2 per cent., their gross capitalization increased 60.3 per cent., and their net capitalization increased 63.3 per cent.

OUTPUT OF RAILWAYS AND AGRICULTURE PER 1,000 INHABITANTS.

The next two tables present the increase or decrease in output of agriculture, and the increase in output of the railways, in relation to population, during the decade 1900 to 1910.

OUTPUT OF AGRICULTURE PER 1,000 INHABITANTS.
(Ten Principal Crops.)

	1900.	1910.	Per cent. of increase.
Corn (bushels)	35,985.7	27,749.6	d28.9
Wheat (bushels)	8,665.5	7,430.3	d14.3
Oats (bushels)	12,413.9	10,960.5	d11.8
Barley (bushels)	1,574.3	1,884.7	19.7
Rye (bushels)	336.5	321.0	d 4.6
Buckwheat (bushels)	147.8	161.3	9.2
Potatoes (bushels)	3,596.5	4,231.7	17.7
Hay and forage (tons)	1,042.9	1,059.6	1.6
Tobacco (pounds)	11,423.4	11,479.2	0.5
Cotton (bales)	125.5	115.8	d 7.7

d Decrease.

OUTPUT OF THE RAILWAYS PER 1,000 INHABITANTS.

	1900.	1910.	Per cent. of increase.
Ton-mile	1,863,256	2,772,759	48.8
Passenger-miles	211,042	351,611	66.6

The output of five of the ten crops increased in relation to population during the ten years ending 1910. The largest increase per thousand inhabitants was that of barley, which was 19.7 per cent. Potato production per thousand inhabitants increased 17.7 per cent., and the production of buckwheat, hay and forage, and tobacco less than ten per cent. The remaining five crops decreased in output as related to population, rye showing a decrease of 4.6 per cent. per thousand inhabitants, cotton of 7.7 per cent., oats of 11.8 per cent., wheat of 14.3 per cent., and corn of 20.9 per cent. The output of the railways for the same period increased per thousand inhabitants, ton miles by 48.8 per cent. and passenger-miles by 66.6 per cent.

The value of the output of these ten crops and of that of the railways in relation to population is shown in the next two tables. Value in the case of agriculture is the farm value, that is, the estimated price at the farm for the crops. In the case of the railways value represents the receipts for handling traffic, and is expressed in terms of freight and passenger revenue.

VALUE OF THE TEN CROPS PER 1,000 INHABITANTS.

	1900.	1910.	Per cent. of increase.
Corn	$10,898	$15,641	43.5
Wheat	4,868	7,151	46.9
Oats	2,857	4,509	57.8
Barley	548	1,005	83.4
Rye	162	222	37.3
Buckwheat	76	101	34.1
Potatoes	1,295	1,810	39.8
Hay and forage	6,372	8,959	40.6
Tobacco	750	1,134	51.2
Cotton	4,360	7,650	79.6

VALUE OF OUTPUT OF THE RAILWAYS PER 1,000 INHABITANTS.

Freight revenue	$13,807	$20,936	51.6
Passenger revenue	4,260	6,839	60.6

The average value of the ten crops per thousand inhabitants increased 50.2 per cent. It should be noted that this relative increase in the farm value of crops has been due entirely to the increased prices received by farmers. The five crops that relatively increased in quantity increased in value at a far greater ratio, and the value of the remaining five crops materially increased, notwithstanding the decrease in quantity. In the case of the railways, however, the increase in revenues per thousand inhabitants is about the same as the increase in ton-miles and passenger-miles, indicating that the increased revenues were due almost entirely to the increase in traffic.

ARBITRATION OF THE FIREMEN'S WAGE CONTROVERSY.

On Thursday, John G. Walber, assistant to the third vice-president of the Baltimore & Ohio, again took the stand as a witness for the railroads. He introduced numerous exhibits to show the pay of firemen and to show the length of time they worked before they got advancement. For the number of roads covered by the exhibit there were in service, in 1908, 26,242 firemen; in 1909, 26,009 firemen; in 1910, 29,399 firemen, and in 1911, 29,161. The number promoted in 1908 was 732, or 2.78 per cent.; in 1909, 1,082, or 4.16 per cent.; in 1910, 2,869, or 9.75 per cent.; in 1911, 1,327, or 4.55 per cent.; in 1912, 2,556, or 8.41 per cent.

It was brought out that by promotion is meant the time of receipt by a fireman of his certificate. Many men, receiving certificates, continue, for some little time, to work as firemen until there is a vacancy for them as enginemen. Mr. Carter called attention to the fact that on the Boston & Maine the average time worked as fireman before promotion, in 1902, was 5.2 years, and in 1912, 8.9 years. In answer to a question from Mr. Carter, Mr. Walber said that the number of promotions in 1912 would depend on the number who had been promoted before. Some of the men who were promoted in 1909 and 1910, during the depression of business may have gone back to firing and worked as firemen for a while and when the increase came in business in 1911, these men were taken off as firemen and put on as enginemen, which made it unnecessary to promote new firemen.

Mr. Walber pointed out that on exactly the same class of engines of the Baltimore & Ohio the number of years served was 5.3 in 1908, 5.4 in 1909, 5.1 in 1910, 5.7 in 1911 and 5.4 in 1912. Mr. Carter tried to show that the Baltimore & Ohio had a particularly difficult time in keeping enginemen, but Mr. Walber would not acknowledge this.

Judge Chambers, in questioning Mr. Walber, in regard to these exhibits, said that he did not find anything in the table, on its face, to controvert the testimony that had been offered by the brotherhood that longer apprenticeship was required now and the goal of quick promotion which had been held out to the firemen is less of a goal now than it was in former times.

Mr. Walber then presented an exhibit showing that during 1910 increases in pay amounting to $2,845,681.29 were granted to firemen; in 1911 additional adjustments involving $189,207.41 and in 1912 adjustments amounting to $5,312, a total of $3,040,-200.70, or 14.15 per cent. on the pay of the firemen of the railroads shown.

Mr. Carter brought out the fact that this was increases in pay which included increases due to changing men to different classes of service. He brought out also that the flat rate for certain classes of passenger engines in 1907 was $2.30, and in 1912, $2.40, and in freight service that the rate on a certain class of engines was $2.80, and that in 1912 the rate on the same engines was $3.00, a single increase of 20 cents, or about 7 per cent. Mr. Walber showed that the increases in the percentage of rates of pay amounted, in passenger service, to 9.18 per cent., and for freight to 9.61 per cent., in local and pick-up to 11.77 per cent., and went on to say that it depends altogether on the proportion of different classes of service as to what the

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total increase is going to amount to. He said: "The railroad company pays this money and the firemen get it. The two things are synonymous and the railroad cannot pay unless the men get it, and the dollar paid for the increased size of the locomotive, or the dollar paid for a change for overtime regulations, or a dollar paid in a change for preparatory time buys just as much as any other dollar they get."

In the afternoon further exhibits were submitted showing increases in rates and Mr. Carter objected to these exhibits because they did not show the increases in rates on the same engine over different periods, but showed it only for the same service.

Mr. Atterbury then questioned the witness as follows:

Mr. Walber, I want to find out something here. Are you familiar with Pennsylvania rates?"

Not specifically—generally, Mr. Atterbury.

We have the middle division here.

Mr. Lee: I think, perhaps, I can ask one or two questions on that, sir, I can try to. Now take your Altoona and Harrisburg run, was that $2.05 the rate of the firemen at that time on class E engine?

Mr. Atterbury: Yes, a passenger engine.

Mr. Lee: All engines, yes, sir.

Mr. Atterbury: All right, now is $3.17 your minimum rate today?

Mr. Lee: Yes, sir.

Mr. Atterbury: Then the difference between $3.17 and $2.05, divided by $2.05, would give you the percentage of increase on that road, would it not?

Mr. Walber: 54.6 per cent.

Mr. Lee: For that small engine?

Mr Atterbury: All right, that is exactly the same engine?

Mr. Lee: Yes, sir.

Mr. Atterbury: So there is no question but that there is a 53 or 54 per cent. increase in the rate for firing the same engine on that particular division, is that right?

Getting down to freight service, Mr. Atterbury showed that a man got $2.55 in 1902 if he ran an 113 engine and in 1912, $3.62, an increase of $1.07 on the same engine and $3.81 for an H6 engine. The chairman asked whether the load had increased with the same engine and the witness stated that it had and that in his opinion this increase was due in part to the change in cars and in part to a change in carloading, due to larger cars.

Mr. Walber's examination continued on Friday morning. Considering 175,746 trains run in slow freight service, the average length of the run was 82.6 miles and the average hours on duty for each fireman was 11 hours 39 minutes. The average earnings of the firemen per train were $3.73, and the average per hour on duty 32 cents. Mr. Walber states that the great number of runs of less than 100 miles for which 100 miles are paid, bring about the high average earnings per day and a rate per mile above the rate per mile shown in the schedule. He said that the Baltimore & Ohio is unfortunately situated with reference to short divisions, practically all the divisions leaving the coal districts in both directions being less than 100 miles. This factor, he claimed, made the comparison of the rate per mile entirely inadequate to convey any idea of what the men are getting for the work performed. The sheet showed that on 175,746 freight train runs the men were paid for 14 miles each, which they did not run on a mileage basis. Mr. Carter said at this point that he judged that the statement showed the total trains run by all the roads and from this it would appear that in slow freight service the freight trains only run at an average speed of 7½ miles an hour. Mr. Walber replied that the average time was 11 hours 39 minutes for 86 miles, and explained that the low average speed, as calculated by Mr. Carter, was brought about largely from the fact that the time began so much earlier than the train actually moved.

There then ensued a discussion between Mr. Carter and Mr. Walber. Mr. Carter finally complained to the board that the witness was attempting to browbeat him and claimed that he should answer the questions by either yes or no. Judge Chambers stated that he thought there were some questions which could be answered by either yes or no, and Mr. Lee agreed that such an answer should be given when it was possible.

Continuing Mr. Walber showed that in passenger service, round trip for turn-around, the statement covered 52,588 trains run, including all passenger trains other than suburban, for which one or more trips or turn-around runs constitute a day's work. The average length of all such runs was 123 miles; the average time on duty was 7 hours 17 minutes; the average time from start to finish was 10 hours 32 minutes; and the average time off duty at terminal or turn-around points was 3 hours 15 minutes. The average earnings per train or per day were $3.24, and per hour on duty 44.4 cents. The next sheet covered suburban passenger service and showed 22,487 trains reported; the average time on duty was 7 hours 58 minutes; from start to finish 11 hours 37 minutes; the average time off duty at terminal or turn-around points, 3 hours 39 minutes; the average earnings per day $3.06, or 38.4 cents per hour.

The next statement showed the number of freight trains run, the number of trains exceeding 16 hours, and the number tied up under the 16-hour law. With a total of 309,622 trains run in the months covered by the reports there were 5,634 trains tied up under the law, or 1.8 per cent. of the trains run. The trains exceeding the 16 consecutive hours were 1,627, or three-quarters of 1 per cent. of the trains run. The average time on duty per train in excess of 16 consecutive hours was 2 hours 17 minutes. In a table which followed it showed that of the trains exceeding 16 hours, 769 were between 16 and 17 hours on the road, 624 between 17 and 18 hours, and 379 between 18 and 19 hours.

In a discussion with Mr. Carter, Mr. Lee showed that of all the cases exceeding 16 hours, 69 per cent. were in December. There was some discussion between Mr. Carter, Mr. Lee and Mr. Walber regarding the accuracy of the latter's figures and the method used in their preparation. It was brought out that a circular had been sent out to each one of the roads concerned and they had sent in the information. During this time Mr. Carter made the statement that one of the firemen's witnesses had, since he had testified, been taken out of service because of the character of his testimony. Mr. Lee stated in reply that perhaps Mr. Carter had special knowledge in this particular case which he had not, but he said that no man who honestly believed that he was testifying to the truth had any reason to fear being so disciplined or discharged, but that if he wilfully testified falsely, no matter what his situation in life, he had something to fear.

Mr. Carter afterwards went into a discussion at some length as to whether the railroads' testimony was or was not correct, and again discussed the matter of their reports to the Interstate Commerce Commission. The point he seemed most anxious to bring out was that while he believed Mr. Walber was testifying to the best of his knowledge, he was in doubt as to what the clerk who prepared the statistics might have done. Mr. Lee replied that while it would be practically impossible to bring all those who worked in the preparation of the reports to testify at the hearing, he was willing to bring as many as the board desired. When asked by the chairman if there was, on the Baltimore & Ohio, any one accountant who could come and swear to the accuracy of the statement furnished by the Baltimore & Ohio, Mr. Walber replied that the chief timekeeper, under whose direction the compilations were made, was competent to do so. Mr. Carter here explained that what he meant was that the clerks in compiling the figures showed that the increased rates would mean an increase in overtime, while the firemen claimed that with the two firemen on the large engines the overtime would be decreased.

Continuing, Mr. Walber showed that the total increase involved by the schedule requested by the firemen would be $10,-363,439, or 35.5 per cent. Of this 35.5 per cent., 10.11 per cent.

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would be for second firemen; 2.52 per cent. for keeping coal within reach and 2.54 per cent. for cleaning.

The last statement shown by Mr. Walber on Friday was a comparison of the firemen's daily compensation in the eastern district for 1900 and 1911, which showed an increase of 40.5 per cent., while the increase in the retail price of food was given as 38.8 per cent.

On Saturday Mr. Walber again took the stand and submitted various exhibits, the first one showing wages paid various classes of skilled workmen according to the report of the Bureau of Railway Economics. In these exhibits certain rates of wages for bricklayers and others in building trades were shown. This exhibit agreed with a previous exhibit of the firemen. Mr. Atterbury pointed out that in Mr. Walber's exhibit he did not show blacksmiths, machinists or boilermakers, but in general his exhibit agreed with Mr. Carter and that in Mr. Carter's exhibit it would appear that blacksmiths, machinists and boilermakers are getting from 45 to 50, 55 and 60 cents an hour in the same towns where men in railroad shops are getting from 33 to 39 cents an hour. He asked Mr. Walber how he accounted for this difference. The only explanation Mr. Walber could give was that the employment is steadier in railroad work than in outside shop work. The way the exhibits were prepared was explained at some length.

On Tuesday Judge Chambers announced that a stipulation had been signed, postponing the date of final agreement from April 2 until April 23. Under the Erdman Act arbitration expenses are paid by the government, and this extension of time made it necessary to include in the stipulation an agreement that all expenses incurred after April 2 would be defrayed equally by the railroads and the firemen. It was also agreed that the award should be accepted as binding, both sides waiving the right to appeal.

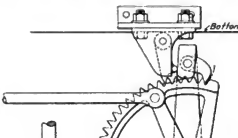
At the hearing on Tuesday a number of witnesses were called by the firemen to refute specific statements previously made by the railroads. One of the witnesses stated that instead of discouraging the use of mechanical stokers, as claimed by the railroads, the firemen had favored them in every way.

On Wednesday more witnesses were called by the firemen. One fireman from the Pennsylvania Lines West stated that in some instances automatic stokers were credited with a higher per cent. of efficiency than they really deserved. He said, further, that these reports were often exaggerated at the request of the engineer. He explained that firemen favored the mechanical stoker in the hope that it would be perfected and so reduce their labors. Other firemen testified that it was more difficult to fire a stoker engine than a stokerless one.

AUTOMATIC BRAKE SLACK ADJUSTER.

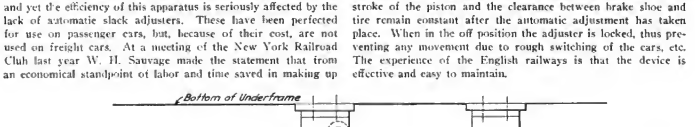
Providing air brakes for freight cars involves a heavy expense, and yet the efficiency of this apparatus is seriously affected by the lack of automatic slack adjusters. These have been perfected for use on passenger cars, but, because of their cost, are not used on freight cars. At a meeting of the New York Railroad Club last year W. H. Sauvage made the statement that from an economical standpoint of labor and time saved in making up long trains, and properly and uniformly adjusting the brakes, the investment required to equip cars with automatic slack adjusters would pay for itself quickly. The discussion at the same meeting indicated that there was no adjuster on the market at that time of simple construction and reasonable cost suitable for general application to freight cars.

It is interesting to note that a brake slack adjuster which is said to meet these requirements is reported to be widely used on many of the leading British railways for freight equipment as well as for that in the passenger service. The same apparatus is also being used on the Indian and South American railways. The illustrations show the application of the Monarch patent automatic block adjuster made by the Monarch Controller Company, Limited, of London, England, and also the arrangement of the device as used in conjunction with the Westinghouse air brake on foreign cars. The adjuster is designed to ensure that the maximum stroke or travel of the piston in the brake cylinder does not exceed a certain distance, and immediately this stroke is completed any slack due to wear on the tire, brake shoes, etc., is taken up, thus giving a constant short travel and a more effective pull on the brake rods. It is a feature of the Monarch system that the brake shoe should be placed above the horizontal center line of the wheel in such a position that the shoe clearance and piston stroke are the same for light and loaded vehicles.



An Ordinary Form of Brake Shaft on an English Car Operated by Either Hand Lever or Vacuum Cylinder, to Which Is Attached the Quadrant Type of Monarch Brake Slack Adjuster.

One of the difficulties to contend with in adjusting brake shoes automatically is that of keeping the clearance between shoe and tire normal, after adjustment has taken place. In the device illustrated the controlling pawl is arranged so that the normal stroke of the piston and the clearance between brake shoe and tire remain constant after the automatic adjustment has taken place. When in the off position the adjuster is locked, thus preventing any movement due to rough switching of the cars, etc. The experience of the English railways is that the device is effective and easy to maintain.



A Horizontal Type of Adjuster for Use on English Cars Fitted with Air Brakes.

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REGULATION OF THE STOCK OF MATERIAL.

The Relation of Accounting to this Problem. The Form of Such Accounts and Ends to be Served by Storehouse Accounts.

By George G. Yeomans.

The chief problem confronting the officer who is managing the supply department of a railroad is the regulation of the stock of material in such a way that while the work of all the different departments may proceed without interruption, the unproductive investment in idle material shall be made and kept as small as possible. A stock of material is nothing more or less than a policy of insurance on the continuity of work, and any money expended in excessive premiums on this insurance is money wasted.

The proper regulation of the stock embraces those other problems of procuring the material, of warehousing it when necessary, of distributing it expeditiously and economically, of accounting for it accurately, and of exercising at all times and places a proper police supervision over it.

Procuring material for a railroad means a great deal more than buying what is required. It means, in the first place, the originating of the requisitions on which the purchasing agent acts, the decision as to the quantities to be bought, and the time when it should be delivered; and in the second place, it means the actual control of the product of those sources of supply which the company itself may maintain and operate, so far as that product is intended for distribution and future consumption.

In other words, the operations of the machine shops, planing mills and foundries belonging to the company, with respect to their function of manufacturing any articles for future use, must be governed by the chief supply officer as effectively as he governs the operations of the purchasing department by means of the requisitions which he draws upon the purchasing agent. Where such internal sources of supply have no other function than the production of material for distribution and future use it is better that he should wholly control their operation. This applies to such facilities as the brass and iron foundries and rolling mills, which are frequently maintained by railroads in preference to procuring such supplies from commercial manufacturers, but which, as a matter of fact, produce no finished material and are sources of supply pure and simple. It does not require argument to show that if any individual is held responsible for regulating the amount of material carried in stock, he must effectively control the sources of supply, and this can be accomplished with less friction and better results if he is entrusted with their actual operation.

The manufacturing of material for future use in the regular repair shops is only incidental to their true functions, and here there can be no question of the control of their operations, except in so far as the establishment of an inflexible rule that no articles of any kind should be provided for shipment to any other point, or to be reserved for future use, without the written instructions of the officer who is directly responsible for the quantity of material in stock. In other words, this is one of the means at his command for procuring material, and his orders on the shops should be just as definite and just as binding as his requisitions on the purchasing agent, and the production of material at the shops without his sanction should no more be tolerated than the shipment of supplies by a commercial manufacturer without the written order of the company.

Having thus secured the necessary authority for procuring the requisite supplies, the first step towards a proper regulation of the stock has been taken.

The next, and perhaps even more important, step is the accounting for it in such a manner that the records may form an accurate guide to future performance. Here a distinction should be drawn between bookkeeping and storehouse accounting.

Bookkeeping contents itself with setting forth the final results of operation, eliminating in the process those factors which offset or balance each other. It shows, perhaps correctly enough, the balance on hand at the close of the month's operations, but it does not disclose all of the computations by which that balance was reached. The balance on hand is no more important than the actual consumption; indeed, a comparison of the amount of material on hand with the amount that was in stock at some previous period is a very imperfect guide to the efficiency with which the stock is handled, because the operating conditions may be totally dissimilar; but a comparison of the material available for use with the actual current consumption is a definite and certain measure of results.

Storehouse accounting, on the other hand, must set forth in detail the steps by which those results and monthly balances are reached, so that any mis-step may be immediately detected. In order to accomplish this in the most economical manner, the methods employed must be simple, uniform, concise and accurate; and precisely to the extent which the methods employed approach these four requirements can any exact regulation of the necessary stock of material be reached.

The simplest form of accounting is manifestly a single account. In other words, there should be but one channel through which all material acquired by the company must be accounted for.

No department, save the supply department, should be permitted to carry any material in stock or to have a material account.

The entire connection of the other departments with accounting for material should consist in making the necessary requisitions on the local storekeeper; in stating on the requisitions the account to which it should be charged, or the purpose for which it is to be used; and in returning any released material or unused surplus promptly to the custody of the storekeeper and receiving from him in turn a requisition crediting its value to the account originally charged. The result of this system is a single account to which all material is debited when acquired; in which it is carried when it is not in actual service; and from which it is charged direct to the proper account when it is used, sold or otherwise finally disposed of.

The accounts must be uniform. That is, they must be in precisely the same form at all storehouses, and on all divisions, and they must apply to all material alike. While this would seem to be self-evident, it is amazing how often local irregularities creep into this feature of the work, and what incessant vigilance is required to prevent subordinate local officials from modifying the prescribed methods in a way which will tend to improve their own apparent performance when compared with that of others who are more scrupulous. The best method of insuring uniformity in the accounts is the printing of all the fundamental storehouse records, such as material classifications, stock books, price books and inventory blanks, from a single plate, so that no item will be inadvertently omitted, and so that every record will be precisely like all other records of a similar nature, wherever it is in use.

This has the added advantage of making it a simple matter to transfer a storekeeper or a clerk from one division or office to another, as he can take up the work where his predecessor left it without any hesitation or uncertainty.

While the initial outlay under such a system is comparatively large, the cost of reproduction is so materially reduced that it is cheaper in the end.

The accounts should be concise. It seems almost a misnomer to use that word in connection with any accounting system which embraces such a multiplicity of detail, but it is used in

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the sense of avoiding all duplications of work. No word or figure should be written twice where once will suffice, and much can be accomplished in that respect by a carefully systematized use of the carbon sheet, and the preparation of the forms which are used in the daily transaction of the business in such a way that the original entry may be made to serve more than one purpose.

Here again the absolute uniformity of the printed page in the storehouse records comes into play, and with it should be combined a filing system so complete and so uniform, that the original authority for any entry can be produced instantly on demand.

The accounting methods must be accurate. This embraces the correctness of entry and extension, but they must also be accurate in the sense of being comprehensive and definite. It is upon the records of actual consumption and available supply that the chief supply officer must mainly rely in order to base his action in procuring material upon precise knowledge, instead of on estimates and guesswork.

Obviously, the first requisite of such a record is that it must cover all unapplied material of every nature that is in the possession of the company—not merely part of it. It is the uncharted rocks that bring disaster to many a valuable cargo, and this is one of the most prevalent causes of surplus and unproductive investment in material at the present day.

But it is not sufficient that he should have this definite information with respect to material as a whole. The chief supply officer must also have a fairly accurate knowledge of the comparative rate of consumption of different classes of material so that, in procuring it, he may assort his stock intelligently and not have the same quantity of two different kinds, when the consumption of one kind, in a given time, is double that of the other.

It is manifestly impracticable that the chief supply officer should deal, in this way, with each individual item entering into the total stock of material, but each local storekeeper should have this itemized knowledge and record, for the territory which he serves. This is obtained from his periodical inventories of all unapplied material under his charge, but primarily from his stock books, which, if properly kept, furnish exact information of the actual consumption as well as the available quantity of each particular article.

Further, such records show the fluctuations in the consumption of different materials, and the season of the year in which the use of certain articles reaches its maximum and those in which it becomes a negligible quantity, and enables him to prepare in advance to meet the demands of the service and to curtail his expenditures, also in advance, when necessity ceases to exist.

In order that the chief supply officer may have this information at his command, in sufficiently definite shape upon which to act, the various items should be classified according to character and use and combined into groups or classes of kindred articles, and a monthly classified stock report should be compiled at each storehouse, showing in general outline the exact transactions with reference to each class of material during the month.

In order to aid in securing uniformity among different railroads in this important particular, the Railway Storekeeper's Association, after mature deliberation, devised a "Standard Classification" of material which is based upon the Interstate Commerce Commission's classification of operating expenses, and it would be well if this general form could be universally adopted and followed. It contains one serious defect, however, which should be corrected in the interest of accurate stock regulation. This defect is that no distinction is made between those classes of material for which the chief supply officer can be held directly responsible, and those other classes, the quantity of which is determined by the policy of the management, or by other causes which he is powerless to regulate or control. This defect can easily be remedied by a simple rearrangement of the classes, so that the material for which the storekeeper can be held accountable appears in one group, and that which he cannot altogether control in a separate group. In this way the performance of the individual storekeepers may be correctly gaged, and the proper assortment and regulation of the stock may be simplified.

It is evident then that there are four things which are essential to a systematic and precise regulation of the investment in material:

The first is an effective control of the sources of supply.

The second is a concentration of the accounting for all material into one channel, so that the entire situation is disclosed and there is no cross accounting or duplication of work.

The third is a uniform, concise and accurate system of accounting, from which a correct knowledge of the available supply and the actual consumption of all materials can be obtained.

The fourth is a clear and definite division of all material into a sufficient number of classes to form a reliable guide to the relative consumption of the different kinds of material, so that the total stock may be properly assorted.

The extent to which some or all of these essential features are lacking in current railroad practice very largely measures the extent of their unproductive investment in surplus and unnecessary material.

TRANSCONTINENTAL COMMODITY RATES INCREASED.

Interstate Commerce Commissioner Clements has handed down a decision in the case involving the investigation and suspension of advances in rates by carriers for the transportation of various commodities from eastern shipping points to points in California, Oregon, Washington, and British Columbia. The full decision was as follows:

In this proceeding is involved the reasonableness of proposed transcontinental commodity rates, westbound. The rates are contained in three tariffs—Countiss's I. C. C. 952; I. C. C. 953; and I. C. C. 956. The points of origin are the same in the first-named two tariffs and embrace all points between Colorado common points and the Atlantic seaboard north of the Ohio and Potomac rivers. The only substantial difference between them is that I. C. C. 952 names rates to California terminals, such as San Francisco, and I. C. C. 953, rates to north Pacific coast terminals, including Portland and Seattle. These two tariffs contain practically the same items and rates, except that certain rates in the north coast issue are affected by the intermediate adjustment at Spokane, and therefore vary slightly from the California terminal rates. The third tariff, I. C. C. 956, names rates both to California and north coast terminals, but the territory of origin is south of the Ohio and Potomac and east of the Mississippi rivers. All three of these tariffs, which were filed to become effective September 2, 1912, have been, upon numerous protests from shippers, both from the east and on the Pacific coast, postponed in their effective dates by the commission to July 3, 1913, pending inquiry into their reasonableness. Certain other shippers at intermediate points, like Reno and Fresno, petitioned that the advances be permitted to become effective.

The territory of origin in the two tariffs first named is divided into groups from west to east. Formerly group C embraced all points east of Chicago with the exception of certain New York piers owned by the rail lines and with the exception also of New England, which were in groups A and B, respectively. The proposed tariffs make some changes in this grouping, and without reciting these changes in detail, it will suffice for this report to say that, generally speaking, group A will now embrace all points east of the Buffalo-Pittsburgh line; group B all points east of Cincinnati and Detroit to and including Buffalo and Pittsburgh; group C east of Chicago to and including Cincinnati and Detroit; group D the territory east of St. Louis to and including Chicago; and that by similarly marking these group lines farther west, St. Louis will be found to be in group E; Kansas City and Omaha in group F; Nebraska and Kansas in group G; Oklahoma, New Mexico, and parts of Texas in group

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H; and Colorado and Wyoming in group J. The territory of origin in I. C. C. 956 is grouped numerically, but apparently without reference to the geographical location of each group.

It has been for many years the practice of the transcontinental rail lines to meet the rates of the steamship lines via Panama and transshipment across the isthmus by rail. Prior to the amendment of the fourth section of the act in 1910, which placed the burden of justifying a higher rate to an intermediate point included within a longer haul upon the carriers, the carriers themselves were the judge in the first instance of whether this competition existed in sufficient degree to warrant a departure from that section of the act. The transcontinental lines, therefore, upon the fact or assumption that this competition affected most commodities in some degree, or in order, perhaps, to meet some commercial or other conditions under this guise on certain of them, added commodities by a gradual process to this competitive list until they had, prior to these suspended tariffs, practically no rates to their terminals which were higher than to Reno and Spokane, and but comparatively few terminal rates as high as to the interior, the latter being cases in which the terminal rates were applied as maxima to the intermediate points.

Recently the Commission passed upon the reasonableness of rates to Reno and Spokane under the amended fourth section, and one of the main purposes of these suspended tariffs is, the carriers state, to realine their intermediate rates in substantial accordance with those findings by increasing their terminal rates to the same or a higher basis than applies to the interior on articles which do not or cannot move by water and as to which there is not therefore any real necessity for the lower rate to the terminal. The result of the carriers' expressed policy in this respect has been to thus increase by the tariffs under suspension their terminal rates principally on nonwater-competitive freight, but in certain cases also on competitive articles, as will more fully appear hereinafter. It is not to be understood, however, that only strictly nonwater-competitive articles are included in these advances, which, it may be explained at this point, can be in a general way summarized under five heads: *First.* Certain increases in minimum weights, the carriers contending that this action is justified on the commodities so affected by the increased carrying capacity of modern equipment. *Second.* Increases due to the cancellation of the commodity rate on certain less-than-carload (and a few carload) articles, the volume of rail movement of which has been in the past so small as to not justify an exception to the classification, to which such articles are accordingly returned. *Third.* Advances on certain articles which have always been and are now subject to acute competition of the steamship lines, but the rates on which, while originally low enough to secure a fair share of the traffic to the rail lines, are not now sufficiently low, in view of the more intense steamship competition in recent years, to secure to them a reasonable proportion of the transcontinental traffic. It is argued that in view of the present low rates via the water lines such articles are doubtless offered to the rail carriers for other reasons than the difference in rate, and would therefore probably be offered in practically the same volume if the rail rates were to be slightly advanced. The rates on these commodities are, however, blanketed east of the Missouri river in accordance with the practice of the carriers with respect to nonwater-competitive freight. *Fourth.* An advance on certain commodities which are not to any appreciable extent, if at all, water competitive, and which accordingly are graded up from the Missouri river east according to the group of origin, and graded also from Reno and Spokane to the final or maximum rate at the terminal. The terminal rate on these articles is blanketed also at the western end to include practically the whole state of California in the California tariff and all points west of the Columbia river in the north coast issue.

It may be explained in this connection that prior to these suspended tariffs transcontinental commodity rates were blanketed in points of origin east of the Missouri river under the water-competitive basis which obtained, as explained, on practically all commodities, but that now, as will appear from the foregoing, while water-competitive freight is still so blanketed, the rate on noncompetitive traffic varies with the eastern group in which the point of origin is located.

It thus appears from the foregoing that the carriers will in future recognize the force of water competition only when it is actually present or reasonably to be apprehended on a given commodity and will then recognize it only in proportion to its degree. The carriers frankly admit, however, that the exact effect of this actual or potential competition is not now definitely ascertainable, and that many of the proposed rates are, therefore, experimental and will be canceled if it is found that mistakes of judgment have been made in this respect, as reflected in the future volume of the individual articles offered to them. The carriers, in fact, recognized during the progress of the hearings that such mistakes had been made on certain commodities and gave assurance that those items would be given further consideration. In this connection they also suggested that the shippers, not only of such commodities, but those interested in any of the suspended items, meet them in conference in further consideration of the entire schedules in the hope that by mutual concessions a satisfactory and equitable readjustment in the nature of a compromise could be agreed upon as to many, if not all, of the advances and such items be eliminated from controversy. Such a conference was accordingly held, and the rates on the commodities so represented at the conference were further discussed informally. Certain modifications were there agreed to by the carriers and the protests as to them accordingly withdrawn by the shippers. There still remained, however, a few commodities as to which no agreement had been reached, and these were the subject of a second informal conference between the parties before the commission at Washington. Certain of these latter items were at that conference also adjusted satisfactorily to the shippers, who accordingly withdrew their protests as to them. The result is that by this commendable co-operation on the part of both shippers and carriers there now remain but a few items as to which the parties have not agreed and the protests been eliminated. And as to these, the carriers have submitted their final suggestions, but have agreed to abide by the decision of the commission without the necessity of its making a formal order.

We shall not discuss the various rates involved in this proceeding in detail. That the changes in these tariffs are numerous follows from the mere statement that the proceeding involves a comprehensive general revision of all the transcontinental commodity rates westbound. To discuss the individual items would, therefore, but unduly lengthen the report. It may be said, however, that all parties have been given an opportunity to present evidence in support of their protests at hearings held in Washington, Portland (Ore.), and San Francisco; that opportunity has been given to present written argument on the voluminous record that has accumulated; and that oral argument has been waived by both parties.

Of the articles finally left to the commission for determination after these informal conferences referred to, furniture, tin cans, and lard pails constitute the chief items. All of these items come within the class alleged by the carriers to be nonwater-competitive, referred to under one of the previous headings, and are graded up in rate according to the proximity of the group of origin to the eastern seaboard in accordance with the practice of the carriers with respect to nonwater-competitive freight.

Most of the items of furniture have been adjusted satisfactorily to the shippers and the protests as to them withdrawn. There is one item, however, which was discussed at the hearings and in the subsequent informal conferences referred to, which, in view of the inability of the parties to agree, is now referred to the commission for determination. This item is the general furniture mixture. Taking Grand Rapids as a representative point of origin, the proposed increase is from $2.20 to $2.52, the

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latter being in fact the third-class rate, except that it is subject to a flat minimum instead of a changeable minimum under rule 6-b of the classification. This mixture is of furniture of the better class, many of the articles being of the highest grade and price in the trade. Upon careful consideration of the evidence on this item we are not convinced that the proposed rates are unreasonable. It is therefore our opinion that they should be permitted to go into effect.

The proposed advance on tin cans is from 85 cents to $1.15 under the suspended tariffs, but the carriers as the result of these informal conferences now voluntarily suggest, finally, a rate of $1, minimum 22,000 pounds. The principal protestant against this advance concedes that $1 is a low rate, but contends that on account of the low margin of profit on the commodity his sales on the coast, which now amount only to about 5 per cent. of the gross sales, will be practically eliminated. It is contended that under a rate of 95 cents some of this coast trade could be retained. The principal basis of this specific protest is the fact that the 85-cent rate has been in effect for many years and business built thereon. While we recognize some merit in the latter contention from a commercial standpoint, we do not feel justified in finding that a rate of $1 is excessive on this traffic. It is true as pointed out by this protestant, that the proposed advance on tin plate is only from 66⅔ cents to 70 cents. It appears, however, that the average carload of tin plate weighs at least 60,000 pounds, many cars weighing 100,000 pounds, and that the per-car earnings are much in excess of the earnings on cans, even under the proposed rates. It also appears that tin plate is not only water competitive from the eastern seaboard, but that there is substantial commercial competition from Wales.

The situation as to lard pails is closely analogous to that on cans. The principal protestant is located in Pittsburgh territory, from which the proposed advance is from 85 cents to $1.25. The carriers now finally suggest as a compromise a rate of 95 cents, minimum 24,000 pounds. Our general remarks in reference to tin cans apply equally to lard pails.

In addition to the foregoing there are certain items on which testimony has been presented and written arguments had but which have not been represented at any of the informal conferences referred to and upon which no compromise agreement has been reached by the parties; also a few which were protested against by letter without representation at any of the proceedings before the commission. The advance proposed on some of these items has not in our opinion been justified. These items are as follows:

Fruit jars have been carried at a rate of 85 cents from Pittsburgh and 75 cents from the Missouri river both to California and north coast terminals. It is proposed to advance the rate to 85 cents from the Missouri river to the north coast, but not to advance the rate to California from the same points. There has been shown no difference in conditions at the respective terminals to warrant this discrimination.

Rope is advanced from 95 cents to $1.10 from St. Louis to Portland and Seattle. The rate in the reverse direction is 60 cents, minimum 30,000 pounds, as carried in item 565 to Cowtiss's I. C. C. 958. The rate is the same in either direction between St. Louis and California terminals. We find that this advance is not warranted.

Brass rods to California terminals are reduced from $1.25 to $1, with an added requirement that they shall be crated, which, protestants state, increases the rate 33⅓ per cent because of the additional weight of the crate. Brass beds made from these rods are reduced from $1.50 to $1.25, with no requirement as to crating. The practical result is a higher rate on the beds than on the rods from which made. The carriers concede that brass beds are nonseagoing freight and that brass rods do move via the steamship lines and that the former rate was reduced in order to permit the eastern manufacturers to compete with manufacturers on the coast. This is a discrimination which is unwarranted by the facts of record, and which we shall leave to the carriers to correct in a suitable manner.

The minimum weight on roofing paper and felt is increased from 30,000 to 40,000 pounds in the north coast tariff, while the former minimum is retained to California. This is also a discrimination which should be removed.

Wooden washboards are advanced from $1, minimum 24,000 pounds, to the woodenware mixture at $1.50, minimum 16,000 pounds, from Saginaw, Mich., and Memphis, while metal washboards are retained at the former rate. We find that this advance constitutes an undue discrimination against wooden washboards.

The carriers also propose an advance of 10 cents per 100 pounds on steel products from Denver and on cement-coated nails from Chicago to north coast terminals. They state that this action was taken against their best judgment, but was necessary in order to secure a better relative adjustment at Spokane. It is stated that this advance will be voluntarily canceled if the Supreme Court decides in the cases involving the proper interpretation of the amended fourth section now before it that terminal rates lower than to the interior are lawful. It is our opinion and recommendation that this proposed rate should be suspended until the status of the Spokane and terminal rates is definitely defined by the Supreme Court.

With the exceptions noted above and of those rates voluntarily modified by the carriers following the informal conferences referred to, it is our opinion that the proposed rates are not shown to be unreasonable and that they should be permitted to become effective. It is manifest, however, from what we have said that we are not justified upon this record in expressing a final affirmative approval of every rate involved in this proceeding. But we feel, in view of what has been voluntarily done by the carriers in the way of concessions and compromise, and in view of the further modifications herein, that the proposed rates as now modified are not shown to be unreasonable as a whole.

In conclusion, we deem it appropriate to say that the action of the shippers and carriers alike in freely meeting each other in the discussion of the questions involved, with a view to a fair adjustment of differences within the requirements and provisions of the law, is gratifying.

Upon the filing of tariffs, which may be made effective upon one day's notice, containing both the modifications of these tariffs which have been voluntarily proposed by the carriers and those specifically directed herein, the order of suspension will be vacated. (26 I. C. C. 456.)

RAILROAD CONSTRUCTION IN KOREA.—The construction of two railroads in southern Korea has recently been authorized. One will run from Taiden southwest to the port of Mokpo, with a branch to the port of Kunsan. The other will run from Keijo northeast to the port of Genzan. The former line will be 175 miles long, and it is estimated that it will cost $6,421,000, excluding rolling stock, which will cost about $2,040,000. The other line will connect the port of Genzan with the line from Fusan to Keijo at Ryusan, a suburb of Keijo, via Giseifu, Tetsugen and Heiko. The total length of this line will be about 136 miles, and the cost is estimated at $7,165,000, in addition to $1,022,000 for rolling stock. It was at first intended that these lines should be completed by 1921, but it was later decided to complete them by 1916.

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DAMAGE BY FLOODS TO RAILROADS.

The railways operating through the flooded districts of Ohio and Indiana experienced during last week the greatest disaster in their history. Bridges and tracks were washed out, yards and stations partially submerged, and the lines so cut up by passenger trains are now being operated on something like regular schedules, it is even yet impossible to obtain any comprehensive statement as to the extent of the damage suffered by the roads. It is conceded that it will reach into many millions of dollars, but during the early part of the week, on account of the impairment of telegraph and telephone service, and

Underwood & Underwood.

Track Undermined by Flood at East Akron, Ohio; Baltimore & Ohio.

the floods that train service was entirely abandoned in many districts for several days, being resumed after the floods had subsided only by detouring. Although the conditions had begun to improve on Thursday and Friday of last week, and through the widespread character of the devastation, it was difficult to obtain accurate information as to the situation.

The northern lines, including the Lake Shore, Michigan Central, Grand Trunk and the Wabash line to Detroit, suffered

Underwood & Underwood.

Derailment at Yosts, N. Y., on the New York Central.

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comparatively little damage and were used to detour trains of the other roads. On account of the extent of their trackage in southern Ohio and Indiana, the Pennsylvania lines and the Baltimore & Ohio-Cincinnati, Hamilton & Dayton system sustained the greatest damage, and the Big Four and Monon were almost completely tied up for several days, while parts of the Erie line from Hammond, Ind., to Meadville, Pa., were out of commission.

PENNSYLVANIA LINES.

On Tuesday and Wednesday of last week nearly all trains through Indiana and Ohio were annulled, except on the northern lines. On the Baltimore & Ohio the trouble extended from Chicago Junction, O., to Wheeling, W. Va., and both the northwest and southwest systems of the Pennsylvania lines were affected, the worst damage being at Piqua, Dayton, Columbus, Indianapolis and Logansport, and on lines approaching those cities. On the northwest system two through passenger trains were operated each day by detouring, although the 20-hour train westbound, due to arrive in Chicago on Tuesday, was nearly 26 hours late. This train had gone as far as Columbus when it was necessary to take it back to Pittsburgh, and it finally arrived in Chicago via the Lake Shore tracks from Toledo. Since Thursday, March 27, all through passenger trains on the northwest system have been operated, except the Broadway Limited, although several trains have been consolidated. For several days the Lake Shore tracks were used from Clark Junction, Ind., to Cleveland, but by Thursday the line from Chicago to Mansfield, O., was opened, and the Erie tracks were used to Akron. For three days there was no service on the Panhandle out of Chicago, but by Monday service had been resumed to Indianapolis, Piqua, Dayton, Columbus and Louisville. A train for Columbus via the Lake Shore to Crestline was operated on March 27.

BALTIMORE & OHIO.

The Baltimore & Ohio succeeded in operating one through train between Chicago and the east every day, detouring over the Nickel Plate, and part of the time via the Erie, Cleveland, Akron & Columbus, and Pennsylvania lines to Ravenna, Ohio. On Monday of this week all through trains out of Chicago were resumed via Pittsburgh, and the company's own rails were used for service to Washington and New York. No. 8 out of Chicago, which had been running via Newark and Wheeling, left on Monday on its regular time for New York via Pittsburgh. Except for No. 6 between Chicago and New York through service had been practically abandoned for several days. The Cincinnati, Hamilton & Dayton has probably been the most seriously affected of all lines, although specific reports have been few, because of lack of telegraph service.

ERIE.

The main line of the Erie Railroad between New York and Chicago was closed from March 19 to March 21 inclusive. On the morning of March 22 this line was opened to traffic. Not a bridge was lost on the entire system and the only serious damage to any bridge was the weakening of the abutments of the bridge at Akron, Ohio. The most severe washouts on the main line were between Corry, Pa., and Marion, Ohio. From Marion to Chicago there were about 15 washouts of minor importance. While the main line was closed, traffic from Jersey City moved to Buffalo over the regular route and thence to Chicago over the Lake Shore & Michigan Southern, which was not affected.

The line to Cleveland was closed by a 1,200 ft. washout at Aurora, Ohio. A trestle over this washout was expected to be completed on April 1. While this line was being repaired, and after the main line was opened, Cleveland was reached from Akron via the Baltimore & Ohio. The line from Marion to Dayton suffered heavily and is not expected to be open to traffic until today or tomorrow. From Urbana, Ohio, to Dayton the tracks were entirely under water. About 2,500 carloads of filling will be required to repair this section. Since this line was closed this road has had no access to Dayton.

Underwood & Underwood.

Flood Scene at Dayton; National Cash Register Company's Cars Used as a Bridge for Escape from the Waters.

The Erie Railroad was particularly fortunate in having a force of about 6,000 men at work on the double tracking of the main line in the immediate vicinity of the flooded district. This accounts for the promptness with which the repairs were made. On April 1 it was said at the offices of the company that as far as was known not a single car or locomotive had left the tracks. Passengers on this company's trains did not suffer very serious inconveniences, as all the longer stops were made at large towns.

NEW YORK CENTRAL LINES.

The line to Chicago via the Lake Shore & Michigan Southern was never closed and a large amount of traffic from foreign roads moved over it. The main line of the Cleveland, Cincinnati, Chicago & St. Louis was closed by the destruction of bridges and by serious washouts. Traffic will not be moved over it for several days, as heavy repairs are necessary. A break at Covington, Ind., was repaired on March 31, and since then traffic has moved from St. Louis via Paris, Ind., Danville, Ill., Indianapolis, Bellefontaine, Ohio, and Cleveland. Beginning March 30 a route to St. Louis was available via the C. C. C. &

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St. L. to Louisville, Ky., and thence over the tracks of the Louisville & Nashville. The most serious break in the main line was the destruction of a big bridge over the Wabash at Terre Haute, Ind. This bridge was expected to be repaired by April 3. The line from Indianapolis to Chicago via Lafayette and Kankakee was closed for only a short time, and during the interval trains moved via Anderson and Elkhart to Chicago. Dayton was cut off by the destruction of two spans of the bridge over the Miami river at that point. When this bridge collapsed several freight cars fell into the river. Cincinnati was cut off by its destruction and by the fall of another bridge at Shelbyville, Ind. On April 1 connection was established to Springfield via Columbus. Cairo is cut off by heavy floods south of Lawrenceville. On April 1 access was had to all other main points on the C. C. C. & St. L., except Dayton, Cincinnati and Shelbyville. A considerable number of cars and locomotives were overturned on the tracks of this company between Springfield and Cincinnati.

By Monday the situation on the Big Four had been greatly improved and passenger service was being operated between Chicago and Indianapolis, Indianapolis and Cleveland, Cleveland and Columbus, Toledo and Springfield, Mount Carmel, Ill., and North Cairo, Ill., and on several other lines on which service had been suspended last week.

Connection was established on April 1, between Lima and Dayton via the Cincinnati, Hamilton & Dayton. The Lake Erie & Western suffered only slightly, and on April 1, was open at all points except at Cicero, Ind. This break cut off the road's approach to Indianapolis over its own tracks, but it was expected that it would be repaired by April 2.

The damage done in New York state was not so serious. A bad washout at Castleton, about three miles south of Albany, made it necessary to run from New York to Albany over the Harlem division and the Boston & Albany. This break was repaired on March 30. High water in the Mohawk valley caused delays and obliged the traffic to move over circuitous routes. Since March 30 all trains between New York and Chicago have followed their regular schedules and have been subjected to only minor delays.

The eastbound Buffalo express of the New York Central, running at about 30 miles an hour, was derailed at Yosts, N. Y., on the morning of March 30, at 2:40 o'clock, and eight sleeping cars fell down the bank at the right of the roadway, two of them lodging partly in the swollen waters of the Mohawk river. The engine and first three cars passed over in safety. Only six persons were injured, and these were not very seriously. The track had been weakened by the high water, though another train had passed over it in safety only fifteen minutes prior to the accident. The cars were of steel and their bodies were little damaged.

OTHER LINES.

The Chicago, Indianapolis & Louisville was blocked by a washout on the Wabash river north of Lafayette, Ind., and by the loss of bridges at this point and at Indianapolis, and all trains, except for short distances out of Chicago, were annulled until Saturday. The Chicago & Eastern Illinois suffered most from the floods in the vicinity of Terre Haute. Service from Chicago to the south via Terre Haute and Evansville was discontinued for several days, but trains were being operated on Monday into Terre Haute via Momence and Brazil, Ind., and service was offered to Clinton, Ind., on partial schedules. A bridge across the Wabash near Vincennes was washed out.

The Wabash line from Chicago east was free from interruptions, but on the through line from St. Louis to the east the floods in the Wabash valley resulted in tracks being washed out between Logansport, Peru and Fort Wayne.

On all lines that have been opened since the flood began every effort has been exerted by the railways to hasten the passage of trains bearing supplies to the people driven from their homes, and circulars have been issued, both by the railways and by the express companies, announcing that such supplies will be carried free when directed to properly constituted relief authorities.

The floods in the lower Ohio and the Mississippi rivers now threaten great damage. At Cairo railway traffic is already completely blocked, with a prospect of a long suspension. The height of the river on Wednesday was 54.4 ft., the highest on record, and two-thirds of the population had left the city. The Illinois Central arranged to take passengers from Chicago to Memphis by way of Thebes and the Frisco road.

PRINCIPLES OF ELECTRIC RAILROADING.*

By C. L. de Muralt,
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I.

If we go over the list of American railroads that have thus far installed electricity as motive power on any part of their lines, we find that in almost every case the installation was planned and carried through by one of the large electric manufacturing companies. Very few individual engineers seem to possess today sufficient knowledge to design and execute work of this kind. Yet, the intricacies of the problem are after all not any greater than those connected with many another railroad question. It is my firm belief that the average man, who applies himself to the solution of these difficulties, will readily be able to get a thorough understanding of all the factors that enter into the problem. The same man, who now has to decide whether the traffic capacity of a certain division had better be increased by grade reduction or by the purchase of heavier locomotives, must be able to say whether or not electricity is advantageous for the operation of any of his lines.

To show how simple the matter really is, will be the object of this series of articles. We will first review some of the fundamental laws that underlie all propulsion of trains on tracks, by steam as well as by electricity. Then we will show how those laws affect the technical as well as the financial side of electrification. In other words we will endeavor to establish under what conditions electricity may be used advantageously as motive power in place of steam, and under what other conditions it will not pay to do so. Finally we will determine what are the advantages and disadvantages of the various types of electric locomotives now on the market and will try to find out what are the specific operating characteristics of each.

INTRODUCTORY.

The movement of all railroad trains is influenced by what might be termed three great natural forces, namely:

(1) Inertia, or the force of the mass, which tends to maintain the status quo and opposes any change in speed. This force tends to prevent the starting of a train from rest, and likewise also the stopping of a train from full speed.

(2) Gravity, or the force which tends to make all bodies get as near the center of the earth as possible. This force opposes the running of a train up a grade or away from the center of the earth, but it helps a train on the down grade or towards the center of the earth.

(3) Friction, or the force which opposes the motion of two bodies in contact with one another. In the case of a train, friction shows itself mainly in three forms, i. e., bearing friction, friction between wheels and rails, and friction between train and surrounding air.

To move any train we must supply an outside force of sufficient magnitude to overcome the combined influence of these three natural forces. To start the train from rest we must use up a certain amount of energy to overcome the inertia and to impart momentum to the train. As the train starts we must supply additional energy to overcome bearing, rail and wind friction. If a grade is to be taken, still more energy must be

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furnished to lift the train against the action of gravity. This latter, however, may be liberated again if the train later on runs down the same grade or a grade of similar magnitude. Finally, if we want to stop the train, we generally turn the stored up momentum into heat by the application of the brakes.

All this is perfectly plain, and the difficulty begins only when we try to get at the actual value of the various forces which have to be overcome; in other words, when we try to estimate the power which must be put into a given locomotive so that it will be able to perform a certain specific service. Even this is not so very difficult. At least it is possible to get these values with sufficient accuracy for all practical purposes. With our present knowledge of the art we may even undertake to guarantee that a certain service can be performed by the use of a certain amount of coal or a certain amount of electricity, as the case may be, after having made due allowances of course for variations in the weather and in the human element which enters into this problem due to the presence of the engineman in the cab. In fact, contracts of this kind have already been made in several instances, and the estimated figures were checked with surprising accuracy by the figures obtained in actual service.

Before taking up a detailed discussion of the effect of each of these three forces upon the movement of the train it may be well to point out that their relative importance varies with the different kinds of railroad service. For instance, in suburban service we find inertia to be by far the most important force to be taken into consideration. It is almost altogether a problem of putting sufficient energy into the train to make a quick start and bring it up to full speed within the shortest possible time. Then, soon after full speed is reached, power is shut off, there is a little period of coasting, and then the brakes are applied and the train brought to a standstill again as quickly as possible. Gravity seldom enters into the calculation to any material extent because there are seldom any serious grades to overcome. And even friction, though present of course, is insignificant in amount as compared with inertia.

In long distance service, on the other hand, we find the influence of inertia of comparatively little importance. It is true that a certain amount of energy has to be spent to get the train under way, but when it is once started, the train is kept going at a steady speed for so long a time that the amount expended to overcome friction gets to be very much greater than that expended to overcome inertia.

In mountain service, or in any other heavy grade proposition, gravity is of course the ruling force, compared with which the other two become insignificant. It is interesting to note in this connection that, whenever means are employed to regain or recuperate the energy which is liberated by the trains on the down grade, the efficiency of this kind of service may be very much improved. This is not feasible with steam operation, but with electricity it may readily be done, and any one interested in this particular aspect of the problem might investigate what has been accomplished by the Italian State Railways on that part of their system known as the Giovi line, near Genoa. By a judicious use of a particular type of electric motor well suited for returning energy to the line on down grades, the coal consumption has been reduced in this instance by from 48 to 62 per cent.

We see therefore that these natural forces are not always to be looked upon as a hindrance to the movement of the trains. Gravity may be a help or a hindrance according to circumstances. Even inertia may be useful under certain conditions. Friction, alone, will always be an opposing force. Before any serious electrification work can be undertaken, it is necessary to calculate as closely as possible the influence of these three forces upon the movement of traffic over the given division or divisions, and in the next few articles we propose going into this matter somewhat in detail in order to show how these influences may be evaluated, and how from their evaluation we may get a very close estimate of the feasibility or non-feasibility of electric traction in any particular instance.

General News.

The government has filed suit against the receivers of the Wabash to recover $3,000 in penalties for alleged violations of the hours of service law.

The Chicago, Burlington & Quincy has announced that the installation of its telephone train despatching system between St. Louis and Burlington will be completed by June 1.

The new member of the Interstate Commerce Commission is named Marble. The railroads, we think, will find that he has his heart in his work.—*Philadelphia North American.*

The Western Maryland has ordered from the Western Electric Company apparatus for a telephone line to be used for train despatching between Hagerstown, Md., and Cumberland, 80 miles.

After several months of negotiations the Queen & Crescent Route has announced an increase in pay of 8 per cent. for its telegraph operators, levermen and station agents. About 400 men will be affected.

The Chicago & Alton has issued an order to all employees, directing them to take places in the smoking car when traveling in the service of the company whenever necessary, in order not to crowd out paying passengers.

The executive committee of the Chicago Association of Commerce has adopted a resolution expressing the opinion that the enactment of the full crew bill now pending in the Illinois legislature would place upon the railways an unfair burden.

The full crew law of New Jersey is noticed below. That of New York is reported on another page. The full crew bill passed by the legislature of Oklahoma, and noticed in last week's issue, was not approved by the governor, and will not become a law.

The Cleveland, Cincinnati, Chicago & St. Louis has increased the length of track-maintenance sections on its lines in central Illinois from seven to ten miles. The forces allotted to each section will be increased, and each gang will have a gasoline motor car.

The Canadian Pacific has increased the pay of locomotive engineers on the lines east of Cartier, Ont., 10 per cent. On the lines west of Cartier and east of Fort William a small increase has been granted to enginemen on passenger trains and work trains.

Flying from Juterbog to Ploen, Germany, March 31, two officers of the German army remained in the air six hours and nine minutes, flying between these two points, a distance of 372 miles, without a stop. This is the longest distance ever traversed by two persons in an aeroplane.

The Department of Agriculture reports that in the five years preceding March, 1912, the office of public roads of the department built 215 object-lesson roads; in all about 300 miles of road 15 ft. wide, and by expert advice aided in the formulation of more than 650 model county road systems. It has also assisted 26 states in effecting equitable state-aid plans.

Representatives of the legal department of the Chicago, Burlington & Quincy, Missouri, Kansas & Texas, Atchison, Topeka & Santa Fe, and Chicago, Rock Island & Pacific, appeared before the governor of Missouri last week and urged him not to sign the bill just passed by the legislature requiring all foreign railroad corporations either to incorporate under the laws of Missouri, or to cease doing business in the state.

Among the first contributions received for the relief of the sufferers in the storm at Omaha on March 23, were $5,000 checks sent by H. U. Mudge, president of the Chicago, Rock Island & Pacific; W. A. Gardner, president of the Chicago & North Western; A. L. Mohler, president of the Union Pacific, and Darius Miller, president of the Chicago, Burlington & Quincy, on behalf of their respective companies.

New Jersey again takes her place as the banner state in the march of progress; the state in which the legislator and the labor leader most successfully combine to evolve new and valuable schemes for promoting the safety of the public. Assemblyman Arthur F. McGrath, of Jersey City, in bill No. 627, proposes

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that the state shall prohibit a railroad from testing the diligence of its engineemen and firemen in the observance of signals. This bill provides that, in cases where tests of apparatus are to be made in the operation of trains, the railroad company shall give precious notice, in writing, to the engineman! In other words, surprise checking will become a crime.

The board of arbitration appointed several months ago to decide on the application of the employees of the Chicago surface street railways for an advance in wages, has rendered a decision allowing an increase in the maximum scale for earmen of two cents an hour under a graduated scale, in accordance with the length of service, ranging from 23 cents an hour for the first three months, to 32 cents for the sixth year. The figures in the scale awarded by the board correspond exactly with the amounts offered by the companies previous to the arbitration, with the exception that 32 cents, instead of 31 cents is allowed for the sixth year.

The Baldwin Locomotive Works, Philadelphia, in carrying freight between its shops in the city and those at Eddystone, 13 miles south of the city, seems to be independent of the locomotive. With ten five-ton Saurer gasolene trucks, a great part of the articles which have to be sent from one shop to the other are taken from the storehouse at the starting point and delivered at the door at the other end, with but one loading, and usually in a good deal less than two hours. All of the ten trucks are used most of the time in making regular trips, two round trips a day. Each truck when in regular use makes about 60 miles a day, and the cost of operation is twelve dollars per twelve-hour day; or, assuming full loads on each trip, four cents per ton per mile.

The legislature of Connecticut passed an act recently requiring all railroad ticket agents to issue free tickets for the members of the legislature at any time when they might wish to attend any meeting of the senate or house of representatives, or of a committee. Governor Baldwin promptly vetoed the bill; and the lower house, in acting on the motion to repass the bill, notwithstanding the objections of the governor, was able to muster only 39 votes in its favor, compared with 154 voting nay. The governor told the legislators that in his judgment they could not require a common carrier to carry them free, any more than they could require an inn-keeper to entertain members of the legislature free. Governor Baldwin reviewed the attempts of the legislators in past years to get around the constitutional provision forbidding anything of this kind, and he showed that definite but unsuccessful action looking to the removal of the constitutional limitation had been taken in 1885, 1889, 1891, 1893, 1895, 1902, 1903, 1905 and 1907. What a persistent idea!

Full Crew Law in New Jersey.

Governor Fielder of New Jersey on April 1 signed the full crew bill of that state; and New York, New Jersey and Pennsylvania now have substantially the same law. The New Jersey law goes into effect in thirty days. The presidents of the principal railroads appeared before the governor of New Jersey, as had been done in New York, and George A. Post, president of the Railway Business Association, also appeared. President Rea of the Pennsylvania told Governor Fielder that unless there was a halt in this kind of legislation, the railroads would be driven to support government ownership of railroads. Full crew bills and grade crossing bills are hurting the credit of the railroads, so that it has become increasingly difficult to raise money for improvements.

Railway Employees to Lose Free Transportation?

A full crew bill is pending in the legislature of Colorado. The general managers of the Colorado lines at a recent conference agreed that if this bill were passed they would issue an order prohibiting the further issuance of free transportation to the families of railroad employees and to employees themselves except when traveling on the business of the company. The position taken by the general managers in interviews is that full crew legislation is promoted by the employees, that it tends to increase the operating expenses of the companies, that in order to meet these increased expenses they must make savings in other directions, and that the most feasible way to make them would be to curtail free transportation as indicated.

The action of the general managers of the Colorado lines has attracted attention and is the subject of consideration elsewhere. The president of one of the large roads entering Chicago has made the following statement:

"The action of the Colorado lines has, of course, been discussed by railway executive officers in Chicago. The full crew legislation which is being so generally passed is promoted by railway employees. Its effect is to make it necessary to employ more men and thereby to increase operating expenses, and it is deemed by railroad officers to be unnecessary and burdensome. Such laws require that an extra man be provided in the crew of a train for whose employment there is no need either for safety or good service. The net revenues of most railways are not large enough to justify increases in expenses in some directions which are not accompanied by reductions in expenses in other directions. Various means of offsetting the increases in expenses caused by full crew legislation have been considered. The elimination of the issuance of free transportation to employees seems the most feasible and satisfactory method of meeting the situation. There are 1,700,000 railway employees in the United States. There are about five people in the average family, and assuming that each employee represents a family, they represent a total of 8,500,000 people to whom free transportation is now freely given, or about 9 per cent. of the population of the country. It is given to them not only by the lines on which those who request it are employed, but for travel on railway lines throughout the United States. The total cost to the railways of this free transportation is very large and a corresponding saving could be made by withdrawing it. It is issued entirely as a favor to the employees and is seldom or never considered by them in their demands regarding wages and conditions of work. As a class railway employees are very well paid, and therefore do not need free transportation any more than any other class of people. The railway managers would withdraw free transportation from them very reluctantly and would not do so as a matter of retaliation, but merely as a matter of business necessity. However, since the organizations of employees are the principal promoters of full crew legislation it would be simple justice that the necessary economy should be effected by withdrawing free transportation from them rather than by the adoption of some means which would affect other travelers and shippers."

The Ne Plus Ultra of Safety Regulation!

According to press despatches a bill is pending in the Kansas legislature to "regulate the movement" of trains at crossings. "When two trains approach a crossing," says the bill, "both shall stop, and neither shall go ahead until the other has passed by."

An Official Hint.

There are some few agents who still sell tickets to the nearest junction point and instruct passengers to repurchase there. These men are gradually being weeded out. An agent who will not take the trouble to sell a passenger through to destination should get out of the business, as he has no future.—*L. & N. Passenger Bulletin.*

Railway Legislation.

The Keckley bill to reduce intrastate freight rates in Nebraska by 20 per cent. has been defeated in the house by a vote of 48 to 46.

The attorney general of Texas has drafted a bill to be introduced in the legislature, providing that when a foreign corporation acquires the ownership of a domestic road, the stock shall be placed in the hands of trustees of the bondholders of the domestic company, and these trustees shall operate the company entirely independent of the foreign corporation that owns it. The railroad commission is authorized to make periodical examinations of the records of the company.

A Government Scale Testing Car.

The Bureau of Standards, Department of Commerce and Labor, utilizing an appropriation of $25,000 which has been made by Congress for use in the next fiscal year, beginning July 1, will extend the scope of its investigation of scales in railroad

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yards, grain elevators and other places where interstate traffic is handled, and will have built a test car. This car will not itself be used as a weight, but will carry movable weights, which will be used for testing. It is proposed to have the car carry a number of standard weights of 10,000 lbs. each and a large number of 50-lb. weights. A truck, capable of carrying 50 tons, will be carried on the car to be used for moving the standard weights, in testing scales. The car will be equipped with a crane for lifting the truck and the heavy weights.

S. W. Stratton, director of the bureau, says that officers of railroad terminals and of elevators have shown much interest in the activities of the bureau. Several state commissions of weights and measures are also asking for the car. The bureau will probably co-operate with the Interstate Commerce Commission in the investigation of alleged irregularities in weighing, and the car can be used, of course, to secure information as to the accuracy of shippers' scales, as well as those of railways.

Absurd Valuation Theories.

Estimates of losses to the railroads, caused by the floods, are necessarily only guess-work as yet. The highest figures do not seem unreasonable when one remembers the number of bridges destroyed, the miles of track washed away, the other physical property wiped out, besides the loss caused by demoralization of train service, delays, extraordinary outlay, and the future diminution of transportation business from the ruined districts. Now, we should like to ask the physical-valuation men what place in their calculations they reserve for such unforeseeable and enormous impairments of railway property. Will they undertake the role of an earthly Providence, and tell the managers just what the average loss will be from disasters of this kind, over a period of years? Or, granting that increased capital expenditure warrants higher freight charges, would they say that the thing for the railways to do would be to impose higher rates at the very moment when the people in the afflicted territory are least able to pay them? Such questions go to the heart of the theory that you can exactly and scientifically determine railroad rates by an exact and scientific physical valuation of railway property. For in the latter there are too many variables to make the process at all a safe guide. This is vividly shown just now in the blow which the railways have received through the floods. But the same thing is shown all the time in a thousand ways, less startling, but no less conclusive against the views of the rigidly doctrinaire railway valuers.—*Evening Post*, New York.

Reminiscences of William Mahl.

When the Supreme Court decreed that the Union Pacific should relinquish control of the Southern Pacific, one of the most troublesome problems was the question as to which road should have the men who had occupied positions of joint responsibility. In the realinement there was no doubt as to the disposition of William Mahl, who worked at Harriman's right hand for the ten most active years of the financier's life. The controller of the Union Pacific-Southern Pacific system had handled the accounts of the Huntington road for more than thirty years, and he at once elected to go with Kruttschnitt and his other old associates. Mr. Mahl has been in active railroad service for more than half a century. He is a quiet-spoken, unassuming man.

"I have had great opportunities for learning," he said. "I have worked side by side with some of the greatest railroad builders in history. There was Albert Fink of the Louisville & Nashville; Col. Scott, of the Texas & Pacific; Collis P. Huntington, who I believe built more miles of road than any other American, and Edward H. Harriman. Huntington never built a line that went into a receivership. He bought into roads that had their financial troubles, but I don't believe that any one who shared his faith and stayed with him ever lost money on one of his ventures. Huntington had wonderful patience in waiting for results."

Mr. Mahl began with the Louisville & Nashville in 1860.

"We had way bills for passengers then. When the train was ready to start the conductor was handed a sheet naming the passengers intrusted to him. 'Mrs. Smith and children, Elsie and Frank, from Lexington to Midwood,' etc., and on a separate sheet 'one colored man, from Lexington to Frankfort.' The passenger cars were heated by round stoves, near which was piled cordwood. If the car was not warm enough for a traveler he threw on more wood. When a car was wrecked the fire poured out on the floor and the car went up quickly in flames. I remember the pleasurable excitement that followed the invention of a jacketed stove called Spear's Anti-Fire Heater. This used coal and the fire door locked, so that the stove could be stood on end without setting the car afire. When steam was introduced into the cars we paid $500 for apparatus that we bought after the patents expired, for $90. Most of my mementos were destroyed in the Equitable fire. I had a printed sheet saved from those days with this notice in bold type: 'Any shipment over eight tons will be charged double first-class rates.' You see, 16,000 lbs. was a car's capacity.

"The Louisville & Frankfort was started with a standard gage track. In the war this was changed to 5 ft., then back to 4 ft. 8½ in. To carry out a traffic arrangement the line was afterward changed to 5 ft. again, and then back to standard gage. We got so we could shift almost an entire line of rails simultaneously, dropping the spikes back into their old holes (!) It was comparatively easy to shorten the axles of cars and engines, but it bothered us sometimes to lengthen them.—*New York Times.*

The Pere Marquette Investigation.

Testifying before the legislative committee which is investigating the Pere Marquette at Detroit, F. W. Stevens, formerly general counsel of the road, on March 24, read into the record a statement of his views as to what should be done to improve the situation of the road. He said it will be a good thing for Michigan if the road is able, during the next ten years, to make such additions and improvements as the development of the state makes desirable; that in order for it to issue the necessary securities it is vital that investors should not be deterred by fears of a hostile attitude on the part of public authorities.

He therefore advocated a repeal of the state 2-cent fare law, which he said had cost the road $3,000,000 in five years, and the passage of a new law which will recognize the difference between passenger business in sparsely settled communities and in more populous sections; a radical change in the policy of the state as to railway regulation; and the defeat of bills now pending in the legislature which would increase the expenses of the road by $800,000 per year. He also said that the nature of the report made by the committee at the conclusion of the investigation would have an important effect on the credit of the road.

On March 25, J. L. Cramer, comptroller, was questioned at length regarding various accounts.

S. M. Felton, president of the Pere Marquette and of the Chicago Great Western, testified before the committee on March 26. He said that the combination of the Pere Marquette and the Cincinnati, Hamilton & Dayton in 1904 was unwise, and the acquisition of the Chicago, Cincinnati & Louisville a positive detriment to the Pere Marquette. As to the branches now operated he had not yet formed a conclusion as to all, but knew that some do not pay. He considered the extension of the line to Chicago a wise move. After having been appointed receiver he had spent a great deal of time familiarizing himself with the condition of the road. At that time the roadway and track were not in good condition, but they have since been improved. The condition of the rolling stock was better, and as soon as the money can be raised additional equipment will be obtained. An effort is now being made to get more work out of the motive power.

Testifying before the committee on the following day, Mr. Felton announced that among the improvements contemplated by the receivers to increase the efficiency of the Pere Marquette are: The laying of 25,000 tons of new rails; the installation of automatic block signals; the building of a new freight terminal at Grand Rapids; grade reductions west of Plymouth; the building of double track Delray to Plymouth; the provision of additional facilities at Grand Rapids and a new freight terminal at Porter, Ind. Mr. Felton would not hazard an estimate as to the cost of putting the road in condition to meet the demands of traffic, nor an opinion as to whether it would ever pay dividends. He said the gross earnings for the fiscal year ending June 30, 1913, were estimated at $18,000,000, compared with $17,160,000 in 1912. He would not make any forecast

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of the operating expenses, but said that the state of Michigan had increased taxes more than other states, and that the 2-cent fare law had had a serious effect on the company's earnings. In the period from 1903 to 1907, before the 2-cent law went into effect, the average fare paid per passenger was 75.7 cents. In the period from 1907 to 1912, after the law went into effect, the average fare per passenger was 66.7 cents. Mr. Felton said that two cents is not enough to pay for the luxuries in travel that the public wants. To illustrate further the situation of the road, he cited figures showing the average freight rate per ton mile, and the freight density for a number of roads, to show that while the average rate is about the same, the traffic density is much greater on the other roads, as follows:

Average freight rate per ton mile.	Road.	Tons moved one mile per mile of road.
6.4 mills	Pere Marquette	757,000
6.1 mills	Illinois Central	1,372,739
6.76 mills	Michigan Central	1,673,390
6.26 mills	New York Central	2,753,318
5.8 mills	Baltimore & Ohio	2,803,648

Report on Collision at Lockport, N. Y.

The Interstate Commerce Commission has issued a report by Inspector Belnap, dated March 14, giving the causes of a rear collision on the International (electric) Railway near Lockport, N. Y., January 25, about 2 a. m. One passenger and one employee were killed, the employee being the motorman of the passenger train, who is held at fault for the collision. The freight had stopped to set out some cars, and, as it was known that the passenger train, an extra, was following, had sent back a flagman. The passenger train came on at full speed, and, disregarding the red light of the flagman, ran into the rear of the standing freight, making a very bad wreck. The passenger train was an extra, which had taken a party of "Eagles" to a "smoker" at Buffalo; and the conductor and motorman being members of, or interested in the "Eagles," attended the smoker and drank some beer; at least two bottles apiece. The motorman had been on duty, off and on, since six o'clock the morning before; and although he had not worked sixteen hours altogether, within the twenty-four hour period, it is believed that he was sleeping in his cab, or at least that the lack of rest, combined with the influence of the beer, had made him oblivious to the red light of the flagman. The motorman having been killed, a chemical analysis was made of his stomach, and this revealed the presence of alcohol. Mr. Belnap says that it is bad practice for any person connected with the operation of a railroad to indulge in intoxicating liquors at any time. He also says that the rules should require the use of torpedoes by flagmen under all conditions. On this road torpedoes are required to be used only in case of fog or storm.

The Pullman-Car Porter.

Lemuel, our porter, is about 50, solid, round, smiling and black, as black can be. It was his proverbial good nature that invited intimacy, and as he blacked away at the shoes I got from him the outlines of the story of the day's work:

"I live on West Twenty-sixth street, New York City. I must be on duty at Hoboken at 6:30 p. m. My train leaves at 9 p. m., but I must have my car all ready, with half the berths made up. My run ends at 9 in the morning. After that I must clean and dust my car, change the linen, and make up about 10 berths so as to be ready at night. It is noon when I am done. Then I get my breakfast. I have the afternoon to myself. I go to bed somewhere. I must be at the car at quarter before 9 in the evening. The train leaves at 9:15. It reaches New York about 8 in the morning. Then I must clean and dust my car, change the linen, cross the river to my home on Twenty-sixth street, shave, wash off this Pullman dirt, get my breakfast and then go to bed. I make eight of these round-trips, one night out and the next night back. Then I am supposed to have one-round trip off. I do not get more than one-half these lay-offs, because so often there is no one to take my place. I have been on this run for 13 years. It is 650 miles round-trip. I get over four hours' sleep every day, besides the naps I catch on the way."

Of course those of us who travel with Lemuel and know him piece out his stipend by practical appreciation of his kindness and faithfulness. But it is the man and the corporation that loom before us whenever we think of his shiny black face. Why worry about him when he does not seem to worry about himself? But he is a man, a real gentleman. He is industrious, sober, kind. He seems to act so like all true folk that some of us who know a brother human when we meet him cannot be indifferent to his long, long days of unillumined, unaspiring grind. . . . He knows how to get along with nervous women and boorish men. But why in the name of all that is rich and reasonable in our civilization need we overwork and underpay Lemuel? Why should we scrimp his sleep to four hours in 24, with a few cat-naps thrown in?—*The Universalist Leader.*

American Sleeping Cars.

Perhaps if enough respectable English critics will consent to come over here and inspect our sleeping cars and then go back home to write of their discomforts, their shocking lack of privacy, their immodesty, and so on, we shall the sooner see that the critics are perfectly right. No one of intelligence that we have ever heard of defends the American sleeping car. And yet the sleeper trundles stuffily on, mingling the breathings of the inmates, reeching the snores of the few who are able to sleep at all, revealing all stages of deshabille that in any other circumstances would be blushed for, and causing unanimous curses. The Pullman people go on doggedly building sleepers that no other country would dream of using, and the railroads go on permitting such cars to be run in their night trains. We know of no other defiance of public sentiment to compare with this. —*Lowell Courier-Citizen.*

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 26, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. Q. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 2d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Nealy, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

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CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st Monday in month, except January, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. C. Wilson, Lehigh Valley, Easton, Pa.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 East Broadway, Winona, Minn. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—M. C. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotehford, Union Station, Peoria, Ill.; 2d Friday, Peoria.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Mmadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—Prof. Franklin Usher, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Telg. Supts.

RICHMOND RAILROAD CLUB.—F. W. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—C. H. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—G. Macomber, Toledo, Ohio; 3d Tuesday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. E. Kidd, Ramapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Associations.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—J. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly, Detroit.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosewarne, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

J. D. Brown, assistant general passenger agent of the Erie Railroad, at Cleveland, has counted up the number of students enrolled in four-year courses in the agricultural colleges of Massachusetts, New York, Pennsylvania and ten central states; and he finds that the total number enrolled last year, 6,801, was 22 per cent. greater than the number enrolled in the same colleges in the year preceding.

The number of immigrants (mainly from Europe) arriving in New York harbor during the three months ending March 31, was fifteen per cent. larger than the number arriving during the same quarter of the preceding year, the totals by months being as follows:

	1913.	1912.
January	36,892	30,877
February	50,964	39,890
March (approximate)	89,911	83,608
Total	177,767	154,375

The governor of Maine has appointed two citizens of that state to take part in the "New England railroad conference," the board to represent the six New England states, which was proposed by Governor Foss, of Massachusetts. The appointees are Mr. Emery, formerly chief justice of the state, and Colonel Osgood, of Lewistown.

Governor Felker of New Hampshire, in a special message to the legislature, which body, in connection with the agitation over the proposed Grand Trunk line and proposed measures in relation to the Boston & Maine, has been considering freight rates for a long time past, recommends that the present rates on the roads of that state be legalized for two years, and that, in the meantime, the Public Service Commission, in co-operation with the railroad companies, prepare new tariffs, to be submitted to the legislature in 1915.

The Belt Railway of Chicago announces that arrangements have been perfected for handling less than carload shipments from industries on its rails. Shipments of 10,000 lbs. or more of miscellaneous freight for any number of roads may be loaded into a car at an industry, and will be moved free of charge to a transfer station at Clearing, where they will be transferred into cars for the outbound stations of each of the various roads. Shipments from industries on connecting lines will also be received under the same conditions, and switched free from the junction point of the connecting line to Clearing.

Summary of Revenues and Expenses of Steam Roads in January.

The Bureau of Railway Economics' summary of revenues and expenses and comments thereon for January, 1913, are as follows: The railways whose returns are included in this bulletin operate 220,821 miles of line, or about 90 per cent. of the steam railway mileage of the United States. Total operating revenues for the month of January, 1913, amounted to $241,196,559. Compared with January, 1912, the total operating revenues of these railways show an increase of $37,250,850. The total operating revenues per mile of line amounted to $1,092 in January, 1913, and $933 in January, 1912, an increase of $160, or 17.1 per cent. Freight revenue per mile increased 20.1 per cent., and passenger revenue per mile 10.1 per cent.

Operating expenses amounted in January to $178,405,387. This was $18,893,789 more than for January, 1912. These operating expenses per mile of line amounted to $808 in January, 1913, and $730 in January, 1912, an increase of $78 per mile, or 10.7 per cent. All the five primary operating expense accounts showed increases per mile over 1912.

Net operating revenue amounted in January to $62,791,172. This was $18,367,061 more than for January, 1912. Net operating revenue per mile of line amounted to $284 in January, 1913, and $203 in January, 1912, an increase of $81 per mile.

Taxes for the month of January amounted to $10,116,824, or $46 per mile, an increase of 4.6 per cent. over January, 1912.

Operating income amounted in January to $238 per mile of line, and in January, 1912, to $158. This was an increase of $80, or 50.6 per cent. Operating income for each mile of line for each day in January averaged $8, and for January,

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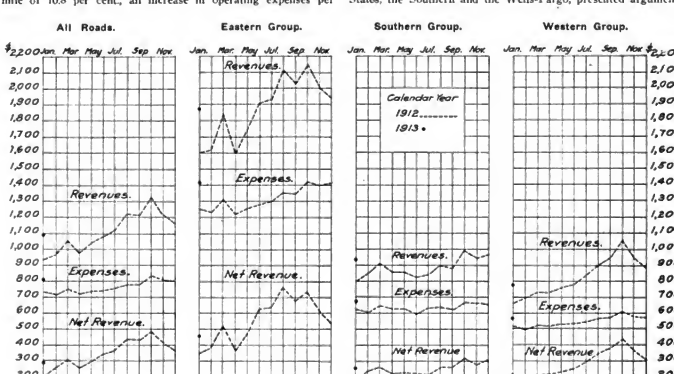
1912, $5. The operating ratio for January was 74.0 per cent., which is comparable with 69.0 per cent. in December, 1912, and 78.2 per cent. in January, 1912.

The railways of the eastern district show an increase in total operating revenues per mile of line as compared with January, 1912, of 17.1 per cent., the railways of the southern district an increase of 16.9 per cent., and the railways of the western district an increase of 17.7 per cent. Operating expenses per mile increased 13.0 per cent. on the eastern railways, 8.4 per cent. on the southern railways, and 9.6 per cent. on the western railways. For the eastern railways net operating revenue per mile increased 32.0 per cent., for the southern railways it increased 47.1 per cent., and for the western railways it increased 46.6 per cent. The increase in taxes per mile was 2.6 per cent. in the eastern district, 7.7 per cent. in the southern district, and 6.2 per cent. in the western district. Operating income per mile increased 40.2 per cent. in the east, 56.1 per cent. in the south, and 60.9 per cent. in the west.

Comparison of the returns for the seven months of the fiscal year with those of the corresponding months of the previous fiscal year reveals an increase in total operating revenues per mile of 10.8 per cent., an increase in operating expenses per



Monthly Revenues and Expenses per Mile of Line in 1912 and 1913.

mile of 9.5 per cent., and an increase in net operating revenue per mile of 13.6 per cent. This net operating revenue per mile of the eastern railways increased 11.0 per cent. as compared with the corresponding period of the previous year, that of the southern railways increased 6.0 per cent., and that of the western railways increased 18.7 per cent.

The diagram shows the variations in operating revenues, operating expenses, and net operating revenue per mile for the separate months of the calendar year 1912 and for January, 1913. The following table shows the per cent. of operating revenues consumed by each class of expenses:

PER CENT. OF TOTAL OPERATING REVENUES.

	January		Fiscal year ending		Calendar year ending	
	1913.	1912.	1912.	1911.	1912.	1911.
Maintenance of way and structures	12.3	11.6	12.7	12.9	12.8	12.7
Maintenance of equipment	17.8	18.4	15.8	15.5	16.0	15.7
Traffic expenses	2.1	2.5	2.2	2.2	2.0	2.1
Transportation expenses	39.2	43.0	35.9	35.5	35.5	35.4
General expenses	2.6	2.9	2.5	2.5	2.4	2.5
Total operating expenses	74.0	78.2	69.1	68.6	68.7	68.4

INTERSTATE COMMERCE COMMISSION.

The extensive giving of free passes to shippers, city officers, judges and others by the railroads of Colorado has been investigated by the commission, and Commissioner Harlan, who went to Colorado, says that there was an "orgy of petty graft." He says that the railroads have promised to carry out the wishes of the commission; but it is reported that criminal indictments, against both carriers and shippers have already been returned.

David E. Brown, special examiner, has laid before the Interstate Commerce Commission 147 reports of the work of himself and his assistants in the examination of the accounts of the New York, New Haven & Hartford and its controlled properties. Seventy of these reports deal with the New England Navigation Company and fifteen with Rhode Island Electric lines; eight with the Connecticut Company, and thirteen with the Consolidated Railway Company, which operates electric lines in Connecticut.

The express companies—the Adams, the American, the United States, the Southern and the Wells-Fargo, presented arguments at Washington April 1, against the proposed decreases in rates which have been proposed by the Commission. Walker D. Hines appeared for all five companies. He said that the estimates which had been made by the companies last year, had been wholly upset by the loss of business occasioned by the introduction of the parcel post. During the month of January, the business of the express companies, in packages weighing less than 11 lbs., had fallen off about 18 per cent., and in February about 27 per cent. In February the greatest loss reported was that by the Adams Express, which was 30.5 per cent., and the lowest was that reported by the United States Company, 22.8 per cent. Mr. Hines estimated that if the reduced rates proposed by the commission were applied to all of the present business of the companies, the loss in gross revenue would be $26,000,000 a year. The attorney of the New York Chamber of Commerce attacked Mr. Hines' statement as purely hypothetical, declaring that the present rates are excessive, that the proposed new rates would be reasonable, and that, under the present contracts, the express companies are making excessive allowances to the railroad companies.

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Complaint Dismissed.

Robinson Land & Lumber Company v. Mobile & Ohio. Opinion by the commission:

The commission found that an advance from approximately 4 cents to 5 cents per 100 lbs. in the rate on lumber from Chicora, Miss., to Mobile, Ala., had been justified by the defendants. (26 I. C. C., 427.)

Little Rock Chamber of Commerce v. St. Louis, Iron Mountain & Southern et al. Opinion by the commission:

In this case the complainant contended that the rates on cement from St. Louis, Mo., and from Eagle Ford and Harry's, Tex., to Little Rock, Ark., were unreasonable. From St. Louis, the rate is 17 cents per 100 lbs., and from Eagle Ford and Harry's, 19 cents. The commission found that the evidence was not conclusive. (26 I. C. C., 341.)

St. Louis Blast Furnace Company v. Louisville & Nashville et al.

A. P. DeCamp, as lessee of the St. Louis Blast Company v. Baltimore & Ohio et al. Opinion by Commissioner Meyer:

The complainant contends that the rate of $2.80 per net ton charged for the transportation of coke from points in Virginia, West Virginia and Pennsylvania to Carondelet, Mo., are unreasonable to the extent that they exceed $2.23 per net ton. Reparation is asked. The commission found that the evidence was not conclusive. (26 I. C. C., 355.)

May Brothers et al. v. Yazoo & Mississippi Valley Railroad Company et al. Opinion by Commissioner Clements:

Upon complaint that the provisions in the defendants' tariffs for the application of gross or flat rates on shipments of logs from points on their lines in Mississippi to Memphis, Tenn., and the refund of a portion thereof upon shipment of the products via the lines of either of them, result in unjust and unreasonable charges for the movement of the logs from the forests to Memphis; the commission found that the gross rates were not shown to have been unreasonable. (26 I. C. C., 323.)

Proprietary Association of America v. New York Central & Hudson River et al. Opinion by the commission:

In this complaint the complainant contends that the rates charged for the transportation, between interstate points in official classification territory, of certain printed advertising matter consisting of circulars, pamphlets, almanacs, etc., in less than car load quantities are unreasonable. These articles are rated first-class in less than carloads in official classification, and the complainant asks that they be accorded a fourth class rate. The commission found that the rates complained of were not shown to have been unreasonable. (26 I. C. C., 318.)

American Brake Shoe & Foundry Company v. Alabama Great Southern et al. Opinion by the commission:

Two shipments of brake shoes were transported from Chattanooga, Tenn., to Houston, Tex., on which charges were collected on the joint through carload rate of 30 cents per 100 lbs., minimum weight 40,000 lbs. Under contract between shipper and the Houston & Texas Central, the consignee, the former was to assume the freight charges up to New Orleans, and the benefit is claimed of the less-than-carload rate to that point of 22 cents per 100 lbs. at actual weight. The commission found that the charges had been properly assessed. (26 I. C. C., 446.)

Max O'Buren et al. v. Southern Pacific et al. Opinion by Commissioner McChord:

The complainants contend that certain rates charged by the defendants were invalid because the defendants had not posted them in the stations at the proper time. The commission found that while the posting of tariffs is required by the act and while a failure to post the same may subject the carriers to penalties, the failure to obey the law in this respect does not invalidate the tariff when it has been properly filed with the commission. The commission decided that the rates complained of were legal as the supplements containing them were published and filed with the commission as required by law. (26 I. C. C., 322.)

W. Nelson Edelsten v. Pennsylvania Railroad Company et al. Opinion by the commission:

The complainant purchased a mileage ticket entitling the bearer to 1,000 miles of transportation over the lines of the defendants. This ticket was destroyed by accident after coupons representing 200 miles' travel had been used. The following conditions were printed on the ticket: "If this ticket is lost, mislaid or stolen, it will not be replaced, nor will any refund be made on such account." The defendant refused to refund the value of the unused portion of the mileage book on account of this condition. The commission found that as this ticket was sold at a reduced rate and that the conditions printed on the ticket were not unreasonable the defendant should not be required to make any refund. (26 I. C. C., 359.)

Robertson Paper Company v. Rutland Railroad et al. Opinion by the commission:

Transcontinental rates on plain manila wrapping paper in carloads are 75 cents per 100 lbs.; on the same paper oiled or greased 90 cents; and on waxed paper $1.20. On a petition alleging unreasonableness, and undue prejudice in the rates on oiled, greased, and waxed papers and praying that the 75-cent rate be made applicable on all wrapping papers, the commission found that wrapping paper, as understood in the paper trade, is a generic name covering many grades; that oiled, greased, and waxed papers are separate and distinct commodities not only from the plain paper from which they are made, but also from each other; and that the rates applied on oiled and waxed papers were not shown to have been unreasonable. (26 I. C. C., 430.)

Railroad Commission of Montana v. Northern Pacific et al. Opinion by Commissioner Clements:

In this case the complainant contends that the rates on mining machinery in carload and less-than-carload quantities from Butte, Mont., to points in Idaho and Washington are unreasonable. No one directly connected with the Butte Machinery Company, on whose behalf the complaint was filed, was present at the hearing, and the representative of the Railroad Commission of Montana, the only witness on behalf of the complainant, had no knowledge of the character or the extent of the business of that company. The commission found that if it condemned the present rate it would be acting upon no evidence or information except a comparison of rates pointed out from tariffs on file with the commission by the Railroad Commission of Montana. The complaint was dismissed without prejudice. (21 I. C. C., 407.)

Kalmbach-Ford Company, Ltd., v. Kansas City Southern et al. Opinion by Commissioner Clements:

The complainant seeks the establishment of a differential between the rates on corn and corn products from Kansas City and common points to Shreveport, La. It was not contended that the present rate on corn is unreasonable. The complainant also alleges that it is discriminated against in favor of millers at points in Texas, Arkansas, Missouri and Lake Charles, La., who receive lower rates on corn than on corn products received from Kansas City. The commission found that as a rule a reasonable differential was approved between raw material and manufactured articles, but that wherever the carrier has waived the privilege of a slightly advanced rate for the transportation of the product and where the rate on the raw material was reasonably low, the rate adjustment should not be interfered with. (26 I. C. C., 289.)

American Insulated Wire & Cable Company v. Chicago & North Western et al. Opinion by the commission:

The defendants charge for transportation of copper wire in carloads from Dollar Bay, Mich., to Chicago, a rate of 15 cents per 100 lbs. during the months when navigation on the great lakes is open, and a rate of 22 cents per 100 lbs. during the months when such navigation is closed. The complainant contends that the higher rate is in contravention of the last clause of the fourth section of the act to regulate commerce, and is in itself unreasonable. The commission found that the maintenance of varying rates on copper wire from and to the points in question, depending on whether the great lakes are open or closed to navigation, is not in contravention of the statute, also that 22 cents per 100 lbs. is not shown by the evidence to be an unreasonable rate for the service during the months when that rate is applied. (26 I. C. C., 415.)

News-Times Publishing Company v. the Atchison, Topeka & Santa Fe et al. Opinion by the commission:

The complainant contends that the through first-class rate of $2.34 per 100 lbs charged for the transportation of supplements to its paper known as the *Sunday Magazine* of the *Rocky Mountain News*, from New York to Denver, Colo., is unreasonable.

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In official and western classification magazines are rated first-class. The complainant contends that the publication in question should be grouped with other newspaper supplements, which take the second class rate of $1.91 per 100 lbs. between the points in question. Under western classification newspaper supplements are described as "patent insides and newspaper supplements, folded (not sewed), in bundles." The commission found that the publication in question was sewed, and although it was a supplement it resembled more nearly a magazine than other supplements, such as the comic section. The commission decided, therefore, that the publication does not come within the description of supplements in a classification and is a magazine, and that the rate was properly assessed. (26 I. C. C., 395.)

Reparation Awarded.

McLaughlin Motor Car Company, Ltd., v. Grand Trunk et al. Opinion by the commission:

The commission found that the rate of 51 cents per 100 lbs. charged for the transportation of automobile chassis, k. d. in carloads from Flint, Mich., to Oshawa, Ont., was unreasonable to the extent that it exceeded 37½ cents per 100 lbs., minimum weight 15,000 lbs. As this rate has been in force for over fifteen months, no order regarding a rate for the future was issued. (26 I. C. C., 315.)

Central Commercial Company v. Atchison, Topeka & Santa Fe et al. Opinion by the commission:

The complainant attacks as unreasonable the rate charged by the defendant for the transportation of petroleum residuum, or road oil from Coffeyville, Kansas, to Hastings, Nebraska. Reparation is asked. The commission found that the present rate, which is 33.1 cents per 100 lbs., is unreasonable to the extent that it exceeds 21 cents per 100 lbs. and prescribed that rate for the future. (26 I. C. C., 373.)

Pacific Stationery & Printing Company v. Oregon-Washington Railroad & Navigation Company et al. Opinion by the commission:

The complainant contends that the double first class rate charged for the transportation of less than carload shipments of rotary mimeographs from Chicago to Portland, Ore., is unreasonable and asks for reparation. The commission found that the rate in question was unreasonable to the extent that it exceeded one and one-half times first class rate and prescribed that rate for the future. (26 I. C. C., 370.)

Diamond Crystal Salt Company v. Michigan Central et al. Opinion by the commission:

The complainant ships salt over a through route from St. Clair, Mich., to Savannah, Ga., and Jacksonville, Fla., the traffic moving by rail to Baltimore, Md., and thence via the Merchants & Miners Transportation Company by water to destination, on a through rate of 29½ cents per 100 lbs., of which 15 cents is the separately established rate of the water carrier applied to the through transportation. Upon petitions alleging the unreasonableness of the through rate and charges and asking for reparation, the commission found that the through rate on salt over the route in question was unjust and unreasonable to the extent that the separately established rate of the water carrier applied to the through transportation, 15 cents per 100 lbs., exceeds 12 cents per 100 lbs. (26 I. C. C., 434.)

Goodman Manufacturing Company v. Pennsylvania Railroad et al. Opinion by the commission:

The complainant contends that the rate charged by defendant for transportation of machinery from Ridgway, Pa., to Rentchler, Ill., was unreasonable. Reparation is asked. In absence of a joint through rate there was charged a rate of 40.4 cents per 100 lbs., the factors of which were a fifth class rate of 21 cents to Louisville, Ky., a commodity rate of 15 cents from Louisville to Belleville, Ill., a sixth class rate of 44 cents, Belleville to Rentchler. The complainant said that there were several available routes over which there were lower combinations than via the route of movement and that the shipment should have been forwarded to Belleville direct via the Louisville & Nashville over which route there was a combination rate of 29.4 cents per 100 lbs. The commission decided that the shipment was misrouted by the initial carrier and that in consequence the complainant was compelled to pay an unreasonable rate. (26 I. C. C., 423.)

Rate on Fertilizer Reduced.

Meridian Fertilizer Factory v. Texas & Pacific et al. Opinion by Commissioner McChord:

The complainant contends that the rates on fertilizer from Shreveport, La., to various destinations in Arkansas are unreasonable and unjustly discriminatory to the extent that they exceed the rates from Memphis and St. Louis to the same destinations. The complainant argued that though there was a good market for commercial fertilizer in Arkansas, the rate adjustment from Shreveport to Arkansas points was so high that the complainant was deprived of its just share of sales in that state, even at points closer to Shreveport than to the competitive market. The commission decided that reduction should be made in most of the rates on fertilizer from Shreveport to Arkansas points and that these reductions would produce a larger volume of traffic to the carriers. Reasonable rates for the future were prescribed. (26 I. C. C., 351.)

Rate on Cottonseed Not Increased.

In re advances in rates on cottonseed from points in Oklahoma to Little Rock, Ark. Opinion by Commissioner Prouty:

The suspended tariffs proposed to cancel joint rates from points on the Missouri, Oklahoma & Gulf in Oklahoma to Little Rock, Ark. The commission found that the advances in the rates which would be effected by the cancellation of these joint rates would seriously affect the shippers, and ordered the defendant to cancel the suspended tariff. (26 I. C. C., 211.)

Hamburg, Mich., Discriminated Against.

Hiram G. Beach v. Ann Arbor Railroad et al. Opinion by the commission:

The complainant alleged that Hamburg, Mich., was discriminated against because the defendant maintained a round trip week-end fare of $1.25 during the summer season from Toledo, Ohio, to Whitmore Lake and Lakeland, Mich., which are summer resorts, while denying this low fare to Hamburg, Mich., a summer resort located between Whitmore Lake and Lakeland. The commission found that this practice constituted a discrimination against Hamburg and ordered that in future the defendant desist from charging lower or more advantageous fares from Toledo to Whitmore Lake and Lakeland than to Hamburg. (26 I. C. C., 410.)

Rates on Phosphate Rock Not Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of phosphate rock in bags from points in Tennessee to Norfolk, Va., and other points. Opinion by the commission:

The proposed advanced rates upon crude ground phosphate rock in carloads transported from points in Tennessee to New England and middle eastern states were found to be unreasonable and the present rates were ordered to be maintained as maxima for two years. The carriers were ordered to cease and desist from discriminating in rates between ground phosphate rock in bulk and ground phosphate rock in bags. (26 I. C. C., 377.)

Shipment Misrouted.

Pole Stock Lumber Company v. Gulf & Ship Island et al. Opinion by the commission:

The complainant forwarded a number of carloads of lumber from points in Mississippi and Louisiana to South Chicago, Ill., and directed routing via Louisville, Ky. A combination rate of 30 cents was applied. At the same time defendants, with the exception of the New Orleans & Northeastern, were parties to a tariff naming a joint rate of 24 cents from points of origin to destination which reserved to the carriers the right to route all shipments of lumber and articles taking the same rates, but the tariff did not specify any particular routes. Adhering to the principle announced in *Kettler Lumber Co. v. G. & S. I. R. R. Co.*, 21 I. C. C., 14, the commission decided that in the absence of routing directions in the tariff the joint rate of 24 cents was applicable to such shipments as moved over the lines of defendants concurring in said joint rate; that as to such shipments participated in by the New Orleans & Northeastern it was the duty of the initial carrier, a party to the joint rate of 24 cents, to-

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so route the shipments as to secure to them the joint rate, and that not having done so the shipments were misrouted. Reparation was awarded. (26 I. C. C., 451.)

Hard Wood Lumber Rates Reduced.

Blue Grass Lumber Company et al. v. Louisville & Nashville et al.

Robinson Lumber Veneer & Box Company et al. v. Louisville & Nashville et al.

S. C. Major v. Louisville & Nashville et al. Opinion by the commission:

As these three cases involve attacks on the rates on hard wood lumber from points on the Louisville & Nashville in Alabama, south of the Tennessee river, to eastern seaboard territory and interior eastern points, they were consolidated and disposed of in one report. The commission found that the rates in question were unreasonable to the extent that they exceeded the rates on yellow pine between the same points by more than 2 cents per hundred pounds and prescribed those rates for the future. (26 I. C. C., 438.)

Through Rates on Shipments Reconsigned.

New Kentucky Coal Company v. Louisville & Nashville et al. Opinion by the commission:

The complainant shipped coke in carloads via defendants' lines from certain Virginia points to Chicago, and thence, upon reconsignment, to various points beyond. Transportation charges were collected on basis of the rates to and from Chicago. Through rates were in force at the time, which were lower than the combinations on Chicago. The complainant claims that the through rates should have been applied. The commission found that as to the shipments that moved to Chicago via the Louisville & Nashville and Chicago, Indianapolis & Louisville lines the through rates were applicable and should have been charged. Reparation was awarded. Under the tariffs of the Louisville & Nashville and the Cleveland, Cincinnati, Chicago & St. Louis, reconsignment at Chicago on the basis of the through rates was not authorized, and reparation on these shipments was denied. (26 I. C. C., 417.)

STATE COMMISSIONS.

It was announced informally at a meeting of the Louisiana State Railroad Commission, in New Orleans, last week, that the commission would notify all railroads in the state on which more than one train a day is run, to install block signals. The Southern Pacific and the New Orleans & Northeastern already have considerable installations of automatic block signals.

The Iowa board of railroad commissioners will hold a general rate and classification hearing at Des Moines on May 14, and a special hearing on the subject of demurrage rules on May 13. The questions to be considered are, proposed changes in the Iowa rules, to agree with the interstate rules now in effect, and a proposed increase in the demurrage charge from $1 to $3.

The railroad commission of Colorado has handed down a decision ordering reductions ranging as high as 28½ per cent. in the rates on coal from the northern Colorado fields to Denver on the Colorado & Southern, the Chicago, Burlington & Quincy, and the Union Pacific. Commissioner Kendall issued a dissenting opinion in which he says that while she believes the rates are now too high, the reduction ordered is excessive.

COURT NEWS.

The Southern Illinois Coal & Coke Company has filed suit against the Illinois Central for damages amounting to $597,270 because of losses said to have been sustained by the company through failure of the road to provide it with enough cars from August, 1909, to date.

In the Federal court at Minneapolis, April 1, the Minneapolis, St. Paul & Sault Ste. Marie and the Russell-Miller Milling Company pleaded guilty to giving and receiving illegal rebates, and were fined $5,000 each. The offenses were committed in connection with shipments of grain stopped at Minneapolis for milling.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1913.

Name of road.	Average mileage operated during period.	Operating revenues: Freight.	Passengers.	Total, inc. misc.	Operating expenses: Maintenance—Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Georgia, Southern & Florida	395	$112,561	$76,714	$224,799	$43,728	$38,213	$6,514	$94,512	$8,362	$176,393	$48,404	.....	$10,749	$37,644	$11,066
Louisville & Nashville	1,160	1,000,896	312,000	1,403,396	180,998	146,780	19,930	544,412	21,128	913,248	490,148	.....	111,413	378,735	98,795
Minneapolis & St. Louis	1,586	639,093	137,980	832,749	107,275	105,389	18,399	333,805	20,307	585,675	247,074	$—62	32,103	209,272	271,075
New Orleans, Mobile & Chicago	5471	158,315	25,894	198,594	27,904	24,696	4,937	93,795	10,154	170,606	27,988	—106	7,490	20,392	—31,696
Ohio Riv. & Land Co.	1013	73,596	23,299	103,800	8,609	6,091	572	22,416	4,383	42,023	60,866	2,404	6,596	56,462	6,498
St. Louis Southwestern	9063	593,065	127,125	761,465	105,219	97,365	30,655	339,781	30,172	423,692	337,773	—599	26,796	310,468	12,388
Ulster & Delaware	129	39,539	13,856	56,631	18,464	13,536	907	30,962	3,080	36,954	—303	165	3,300	—3,438	6,272
Georgia, Southern & Florida	395	$286,796	$197,152	$1,491,573	$190,362	$386,884	$54,234	$598,869	$65,494	$1,185,843	$305,930	.....	$80,974	$224,956	—$61,459
Louisville & Nashville	1,160	2,611,107	1,000,896	4,001,396	1,403,396	1,403,396	1,403,396	1,403,396	1,403,396	1,403,396	1,403,396	.....	1,403,396	1,403,396	1,403,396
Minneapolis & St. Louis	1,586	4,482,202	1,139,126	5,975,797	780,117	741,326	123,538	2,269,186	146,796	4,061,213	1,947,584	—752	218,066	1,699,266	835,215
New Orleans, Mobile & Chicago	5471	1,174,722	216,697	1,479,369	234,387	149,417	24,940	529,268	57,269	993,801	485,568	—463	32,427	452,678	62,982
Ohio Riv. & Land Co.	1013	484,712	158,946	687,915	63,844	42,551	4,127	145,644	23,084	279,196	396,946	21,011	43,516	377,741	47,653
St. Louis Southwestern	9063	3,938,915	953,137	5,163,180	679,232	728,142	209,367	1,724,078	182,217	2,905,536	2,257,644	1,969	171,233	2,087,342	145,459
Ulster & Delaware	129	402,292	159,810	692,434	94,146	90,556	9,301	283,458	18,907	495,256	201,666	501	23,100	179,062	—10,141

Average mileage operated during previous period 1 1904; 1905; 1913. — Indicates Deficits, Losses and Decreases.

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Railway Officers.

Executive, Financial and Legal Officers.

Lewis Lukes has been appointed assistant to the president of the Canadian Northern, with headquarters at Toronto, Ont.

Joseph W. Jamison has been appointed general attorney of the Missouri, Kansas & Texas for the state of Missouri, with headquarters at St. Louis, Mo., succeeding Lee W. Hagerman, resigned.

The jurisdiction of the officials of the Illinois Central has been extended over the Chicago, Memphis & Gulf. M. A. Chambers, auditor of disbursements of the latter road, has been appointed auditor and freight claim agent, with headquarters at Dyersburg, Tenn.

H. A. Scandrett, who has been interstate commerce attorney of the Harriman Lines at Chicago, has been appointed interstate commerce attorney of the Union Pacific, Oregon Short Line and Oregon-Washington Railroad & Navigation Company, with headquarters at Omaha, Neb., effective April 1.

The following appointments have been announced on the Chicago, Milwaukee & St. Paul: W. F. Dudley has been made auditor of traffic; G. J. Bunting and J. Welch are assistant general auditors of material accounts; W. T. Carroll, assistant freight auditor; August Jacobs, assistant ticket auditor; J. A. Mulhall, assistant auditor of expenditures; J. S. Butler, assistant auditor of material accounts, and John Williams, assistant car accountant.

Edward Beecher Pierce, whose appointment as auditor of the Missouri, Kansas & Texas has already been announced in these columns, was born July 3, 1873, at Leavenworth, Kan. He was graduated from the Leavenworth (Kan.) high school and began railway work in February, 1894, in the accounting department of the Kansas City, Fort Scott & Memphis. From July, 1900, to June, 1904, he was in the accounting department of the St. Louis & San Francisco at St. Louis, Mo., and on July 1 of the latter year was made auditor and freight claim agent of the north Texas lines of the Frisco, including the Ft. Worth & Rio Grande and the St. Louis, San Francisco & Texas, with office at Ft. Worth, Tex. He resigned on March 17 to become auditor of the Missouri, Kansas & Texas, with headquarters at St. Louis, as above noted.

Benjamin Akerly Dousman, whose appointment as general auditor of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has already been announced, was born March 21, 1859, at Milwaukee, Wis. He was educated in the public and high schools of Milwaukee, and began railway service April 19, 1879, with the Chicago, Milwaukee & St. Paul as junior clerk in the car accountant's office. A year later, in May, 1880, he went to the auditing department in charge of freight accounts, and in November of that year he was transferred to general accounts. On July 6, 1908, Mr. Dousman became assistant general auditor, which office he filled for two years, when he was made assistant auditor, July 1, 1910. He held the latter position until he was promoted to that of general auditor on March 15 of this year. Mr. Dousman's entire railway service of 34 years has been with the Chicago, Milwaukee & St. Paul. Mr. Dousman has jurisdiction also over the Bellingham & Northern, the Tacoma Eastern and the Gallatin Valley.

B. A. Dousman.

Operating Officers.

E. Dowling, trainmaster of the Atchison, Topeka & Santa Fe at Las Vegas, N. M., has been appointed assistant division superintendent at Dodge City, Kan.

J. R. Pickering, acting superintendent of car service of the Rock Island Lines, has been appointed superintendent of car service, with headquarters at Chicago; effective April 1.

William E. Morris, formerly assistant general manager of the Chicago & North Western, has been appointed general manager of the Denver Northwestern & Pacific, with headquarters at Denver, Colo.

W. B. Denham, general manager of the Georgia & Florida, with office at Augusta, Ga., having resigned, all officers heretofore reporting to the general manager will in future report to B. W. Duer, vice-president, in charge of operation, with headquarters at Augusta.

F. R. Blunt, formerly superintendent of the Smithville district of the Missouri, Kansas & Texas, has been appointed general manager of the Pallcios, San Antonio & Peeos Valley, which is under construction in southern and western Texas. The headquarters of the company are at Yoakum, Tex.

William Mosby has been appointed superintendent of transportation of the St. Louis Southwestern Railway Lines, with headquarters at Tyler, Tex., succeeding F. J. Hawn, who has been appointed superintendent of the Ft. Worth division of the St. Louis Southwestern of Texas, with office at Mt. Pleasant, Tex., in place of E. Richards, who has been made superintendent of the St. Louis Southwestern, with headquarters at Pine Bluff, Ark., succeeding E. A. Peck, deceased.

Alfred H. Egan, superintendent of the Kentucky division of the Illinois Central, has been appointed general superintendent of the Yazoo & Mississippi Valley, with headquarters at Memphis, Tenn., succeeding George W. Berry, who has been appointed terminal superintendent of the Illinois Central, with headquarters at Chicago, with jurisdiction between South Water street and Matteson and between Twelfth street and Parkway, in place of James H. Brinkerhoff, resigned. Lewis W. Baldwin, engineer of maintenance of way, succeeds Mr. Egan as superintendent of the Kentucky division, with headquarters at Louisville, Ky.

Traffic Officers.

C. A. Rouse has been appointed general agent of the Erie Despatch, with headquarters at Indianapolis, Ind.

W. C. Elmer, chief clerk in the ticket offices of the Canadian Pacific at Chatham, Ont., has been appointed traveling passenger agent, with headquarters at Toronto, succeeding J. J. Brignall, resigned.

C. Hanson, division freight agent of the Texas & Pacific and the International & Great Northern at Ft. Worth, Tex., has been appointed joint live stock agent, with headquarters at Ft. Worth, to succeed D. C. Smith, resigned. George L. Moore, commercial agent at Oklahoma City, Okla., succeeds Mr. Hanson, and M. C. Bailey, traveling freight agent at Dallas, Tex., takes the place of Mr. Moore.

Garnett King, assistant general freight and passenger agent of the El Paso & Southwestern System, and the Morenci Southern, at El Paso, Tex., has been appointed general agent of these companies, with headquarters at St. Louis, Mo., succeeding J. L. Hazzard, resigned to accept service with another company, and the position of assistant general freight and passenger agent at El Paso, has been discontinued.

E. G. Spencer, commercial agent of the Kansas City Southern at Beaumont, Tex., has been appointed general agent of the freight department at Beaumont, Tex., in place of J. L. Boyd, resigned to engage in other business. J. C. Walker, traveling freight agent, with headquarters at Shreveport, La., succeeds Mr. Spencer. S. A. Martin, traveling freight agent of the St. Louis Southwestern at Shreveport, succeeds Mr. Walker.

Engineering and Rolling Stock Officers.

John E. Gardner has been appointed electrical engineer of the Chicago, Burlington & Quincy, with headquarters at Chicago.

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D. C. Ross has resigned as master car builder of the Michigan Central, effective April 1, and will reside at his summer home at Algonac, Mich.

W. F. Steffens has been appointed assistant chief engineer of the Chesapeake & Ohio and the Chesapeake & Ohio of Indiana, with office at Richmond, Va.

W. J. McLean, master mechanic of the Duluth, Winnipeg & Pacific at West Duluth, Minn., has been appointed master mechanic of the Kettle Valley Railway, with headquarters at Penticton, B. C.

H. M. Taylor, director of construction of the National Railways of Mexico, with headquarters at Mexico City, Mex., has resigned and his former position has been abolished. All officers and employees who have hitherto reported to Mr. Taylor will in future report to G. P. DeWolf, chief engineer of construction.

Daniel J. Brumley, engineer of construction of the Illinois Central and the Yazoo & Mississippi Valley, has been appointed engineer of maintenance of way of those roads, with headquarters at Chicago, to succeed Lewis W. Baldwin, transferred. Fred L. Thompson, engineer of bridges and buildings, succeeds Mr. Brumley, with headquarters at Chicago, and Maro Johnson, assistant engineer of bridges, takes Mr. Thompson's place, with office at Chicago.

Maro Johnson, who has been appointed engineer of bridges and buildings of the Illinois Central and the Yazoo & Mississippi Valley, with headquarters at Chicago, was born at Iowa City, Iowa, in 1877, and graduated from the engineering department of the University of Iowa in 1898. The same year he entered the service of the Illinois Central as masonry inspector, and subsequently held various positions on that road until 1905, when he went to the Indianapolis Southern, a subsidiary of the Illinois Central, as resident engineer. Two years later he returned to the service of the Illinois Central as resident engineer on the track elevation work at Grand Crossing, Ill. In September, 1912, he was promoted to assistant engineer of bridges, and now becomes engineer of bridges and buildings of the same road as above noted.

M. Johnson.

OBITUARY.

Peter S. Archibald, who was chief engineer of the Intercolonial Railway from March, 1878, to 1898, died on March 16, at his home in Moncton, N. B. He was born on March 18, 1848, at Truro, N. S., and began railway work in July, 1867, in the engineering department of the Intercolonial Railway, and held various positions in that department until his promotion to chief engineer. He resigned from that position in 1898, to become a consulting engineer.

Caspar Buhrer, formerly roadmaster of the Lake Shore & Michigan Southern at Sandusky, Ohio, and later superintendent of the tie and timber-treating plant of that road near Toledo, died at his home in the latter city on March 23, aged 58 years. Mr. Buhrer was connected with the Lake Shore some 35 years and had been roadmaster about 30 years. He retired about two years ago owing to ill health. Mr. Buhrer was the inventor of the Carnegie steel tie and one or two reinforced concrete ties.

J. W. Petheram, formerly from October, 1893, to the latter part of 1909, chief engineer of the Missouri, Kansas & Texas Railway of Texas, died on March 26 at his home in Dallas, Tex., aged 70 years. Mr. Petheram was born in Largo, Scotland, and was educated at Madras College at St. Andrews, Scotland. He entered railway service in June, 1873, as resident engineer of the Credit Valley Railway of Canada, and from February, 1875, to August, 1879, was assistant engineer of the same road. From April, 1881, to January, 1884, he was successively chief engineer of the Georgian Bay & Wellington and assistant engineer of the Chicago & West Michigan, and was then until January, 1888, chief engineer of the latter road. Subsequently to October, 1893, he was general roadmaster of the Missouri, Kansas & Texas of Texas, and was made chief engineer on the latter date, which position he held for about 16 years, when he sustained a stroke of paralysis, from which he never fully recovered.

James McCrea, who, up to the beginning of the present year, was president of the Pennsylvania Railroad, died at his home in Haverford, Pa., near Philadelphia, on the night of March 28, at the age of 65. He had been in failing health for several weeks. An account of Mr. McCrea's life, with a portrait, was given in the *Railway Age Gazette* on November 22 last, when he resigned his position as president. Mr. McCrea was born in Philadelphia, May 1, 1848, and was educated at the Pennsylvania Polytechnic College. He began his railway service as rodman and assistant engineer on one of the minor lines of the Pennsylvania system, and his whole active life was passed in the service of that company. He served on the western lines of the company 25 years. Mr. McCrea leaves a wife, two sons and a daughter. One of the sons, James A. McCrea, is general manager of the Long Island Railroad, at New York City. The funeral was held on Monday of this week at St. Mary's Protestant Episcopal Church, Ardmore, Pa., a large number of railroad officers and financiers from Philadelphia, New York and other cities being present. All traffic on the Philadelphia Division of the road was suspended for three minutes at the time of the burial.

George T. Nicholson, vice-president in charge of traffic of the Atchison, Topeka & Santa Fe System, with headquarters at Chicago, died in Los Angeles, Cal., on March 30, following an operation. Mr. Nicholson was born July 1, 1856, at Belvidere, N. C. He was educated at the Kansas State University and began railway work in 1882 as clerk in the general passenger and ticket office of the Atchison, Topeka & Santa Fe. He was successively rate clerk, chief rate clerk, chief clerk, assistant general passenger and ticket agent and general passenger agent to February 1, 1897, when he left the Santa Fe to become general passenger agent of the St. Louis & San Francisco. He returned to the Santa Fe in May, 1898, as passenger traffic manager of the entire system, and in October, 1905, he was elected vice-president in charge of traffic. Funeral services are to be held at Lawrence, Kan., on Friday. The Santa Fe ran a special train Thursday night to accommodate railway men who wished to attend.

G. T. Nicholson.

PARLOR CAR MAIDS IN PRUSSIA.—The Prussian minister of public works has had occasion to chide the house maids (or car maids) who are expected to keep everything spick and spandy in the cars which correspond to our drawing-room cars. They have not shown proper zeal in attending to their duties, he says. They must maintain extreme cleanliness in all parts of the car; see that fresh drinking and washing water, and clean towels and soap are provided before the supply is exhausted, and not remove them before the car reaches its final destination, as they have done too often. Conductors are made responsible for the proper service of these women, who are especially to see that the car is perfectly neat when transferred from a Prussian to a connecting railway.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE NEW YORK CENTRAL LINES are in the market for 180 locomotives.

THE LEHIGH VALLEY is considering the purchase of 25 mikado locomotives.

THE ATLANTIC COAST LINE has ordered 11 Pacific type locomotives and 9 switching locomotives from the Baldwin Locomotive Works.

THE HAVANA CENTRAL has ordered 8 consolidation locomotives from the American Locomotive Company. The dimensions of the cylinders will be 20 in. x 26 in.; the diameter of the driving wheels will be 50 in., and the total weight in working order will be 154,000 lbs.

CAR BUILDING.

THE ST. LOUIS & SAN FRANCISCO is in the market for 1,000 box cars, and 1,000 gondola cars. This company will also soon order some stock cars.

THE BALTIMORE & OHIO has ordered 1,500 all-steel, 50-ton hopper cars. This order was divided equally between the Pressed Steel Car Company, the American Car & Foundry Company and the Standard Steel Car Company. This company has also an option on 1,000 additional hopper cars.

THE ATLANTIC COAST LINE has ordered 12 all-steel, passenger coaches, 4 all-steel, combination passenger and baggage cars and 4 all-steel, combination mail and express cars from the Pullman Company, and 2 steel underframe passenger coaches, 2 steel underframe, combination passenger and baggage cars and 3 steel underframe, combination mail and express cars from the American Car & Foundry Company.

IRON AND STEEL.

THE SEABOARD AIR LINE is in the market for 10,000 tons of rails.

THE BALTIMORE & OHIO is in the market for 5,000 tons of rails.

GENERAL CONDITIONS IN STEEL.—According to the *Wall Street Journal* the losses sustained by the steel plants in the Sharon, New Castle and Youngstown districts from the recent floods will not be as great as at first estimated. Heads of the different departments are optimistic and say that with a few exceptions the plants will be operated within a few days. In Sharon the North Works of the Carnegie Steel Company will be running the first of next week. The greatest loss sustained by the Carnegie Steel Company was at its coking plant in Farrel. It is feared that the entire plant will have to be rebuilt. Officers of the company estimate that the loss will be close to $200,000. The blast furnaces are in good shape and the other mills were not extensively damaged. The shutting down of a number of plants and the poor transportation service will have its effect on the April shipments of the Steel Corporation, but it is not believed that the resulting decrease will exceed 200,000 tons if adequate freight service is speedily restored. Orders have been small recently, but prices continue to remain firm.

RAILWAYS AND COLLIERIES IN INDIA.—The Bengal Chamber of Commerce has addressed the government of India deprecating the acquisition of colliery land by railway companies. The chamber argues that railways have no right to embark on undertakings which can be more satisfactorily and efficiently managed by private companies. Five years ago the chamber raised this question but the government of India was not impressed by the argument and declared that it was its established policy to permit railways to own and operate collieries. A short time ago the railways had to choose between operating their own mines or increasing their freight charges, on account of the sharp advances in coal prices.

Supply Trade News.

The Roberts & Schaefer Company, Chicago, has received a contract from the Western Maryland to build a large Holmen coaling station at Williams, W. Va.

Henry Jungerman, formerly in the motive power and inspection department of the Harriman Lines, has been made railway representative of Tate-Jones & Company, Inc., Pittsburgh, Pa.

Charles A. Lindstrom, chief engineer of the Pressed Steel Car Company, Pittsburgh, Pa., has been made assistant to the president, with headquarters in Pittsburgh; B. D. Lockwood, assistant chief engineer of the same company, has been made chief engineer; J. F. Streib, mechanical engineer of the company, has been made assistant chief engineer, and Felix Koch has been made mechanical engineer.

The Duff Manufacturing Company, Pittsburgh, Pa., has moved into its new plant and general office building on Preble avenue, Pittsburgh. The old works on Marion avenue have been dismantled. The new factory building has about 68,000 sq. ft. of floor space, and is located on a tract of ground approximately five acres. It has track connections with the Pennsylvania Railroad and the Baltimore & Ohio. This company is also planning to erect a new plant in the Chicago district, and one at either Windsor or Hamilton, Ont. Both of these plants are expected to be in operation in the fall of 1913.

The Federal Signal Company, New York and Troy, N. Y., last week bought the property of the American Railway Signal Company of Cleveland, Ohio, together with all the company's assets, and stock on hand. It also will carry out the unfinished contracts for construction. The principal contract on which the American company was engaged was for the installation of automatic block signals on 150 miles of single track, of the New York, Chicago & St. Louis in the state of Indiana. There are a number of smaller contracts on other roads. H. M. Abernethy, general manager of the American company will join the Federal company, with office in Cleveland.

H. F. Ball, special consulting engineer, with office in New York, and formerly vice-president of the American Locomotive Company, New York, has been made president of the Economy Devices Corporation, 30 Church street, New York, which has recently been formed. This company has taken over the business of the Radial Buffer Company, which company has been dissolved. Among the devices which will be marketed by the new company is the Radial engine and tender buffer. Mr. Ball entered the service of the Pennsylvania Railroad as an apprentice at Altoona, Pa., in 1884. Four years later he entered the drafting room at Altoona, and in 1890 was appointed chief draftsman of the car department of the Lake Shore & Michigan Southern. Two years later he was made general foreman of the car shops at Cleveland, Ohio, and in 1894 he was appointed general car inspector. In 1899 he was made mechanical engineer of the same road, and was promoted to superintendent of motive power, in February, 1902. In 1906 he left the Lake Shore to become vice-president of the American Locomotive Automobile Company; a few months later his jurisdiction was extended over the American Locomotive Company as vice-president in charge of engineering. In December, 1912, he left the American Locomotive Company to open an office as special consulting engineer. Mr. Ball was

H. F. Ball.

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president of the Central Railway Club in 1900, and of the American Railway Master Mechanics' Association in 1905-6.

President R. P. Lamont, of the American Steel Foundries, has submitted the annual report to the stockholders for the tenth fiscal period of the company for the calendar year ended December 31, 1912. The gross sales for the year were $14,319,571.58, and the gross earnings from operations of plants and other income after deducting manufacturing expenses (which includes $1,160,536.32 for repairs and maintenance), also selling, administration, head and district office and other expenses, were $1,588,766.14. The net income of $777,756.17 applicable to surplus shown on the balance sheet is the remainder after deducting all interest and $322,506.90 for depreciation of fixed properties, also $184,173.91 appropriated for the sinking fund. In comparing the earnings for 1912 with the preceding fiscal period, which showed a loss of $259,030.92, it should be borne in mind that such period covered a term of 17 months, only the first few of which showed any profit. If the sales for 1912 be compared with the calendar year 1911, the change is far more pronounced as that 12 months' operations showed a loss of $514,401.82. As shown by the balance sheet $188,249.74 was charged to capital account during the year for new construction, additions, machinery equipment, etc., and in addition a further sum of $135,624.56 was spent for replacements, minor additions, and improvements, and charged to the depreciation reserve. During the year equipment for the production of car couplers has been installed at East St. Louis, and at the Hammond plant a new building for the production of axle beams has been added. President Lamont says that the pronounced business depression of 1911 continued well into the following year, but about midsummer a noticeable improvement in the volume of orders became apparent. The improvement, however, was not reflected in the company's earnings until two or three months later, hence the year's showing is largely the result of the operations for the last six months of the year. At the present time the volume of orders in hand is, with one exception, the largest in the history of the company.

TRADE PUBLICATIONS.

CHICAGO & NORTH WESTERN.—The passenger department has issued an illustrated booklet describing the special features of its new Overland Limited train that was put in service between Chicago and San Francisco on April 1.

DENVER & RIO GRANDE.—The passenger department has issued a special folder in German describing the city of Denver, and enumerating its principal points of interest in recognition of the Bundesturnfest, to be held in Denver in June.

BRIDGES.—The Strauss Bascule Bridge Company, Chicago, has issued an interesting booklet devoted to the Strauss direct lift bridge, an application of the counterbalancing mechanism of the Strauss bascule to the vertical lift bridge. The booklet contains a general description of the principles of this type of bridge, and is illustrated with drawings of various types that have been installed.

PAINT.—The Sherwin-Williams Company has published an attractive pamphlet containing a story entitled "Making Over Maybridge," which relates the experiences of a young city man who returns to his boyhood town after ten years and over the opposition of some of the more conservative old residents organizes a club to "brighten up" the town, by cleaning up refuse, painting old buildings, and otherwise making the town attractive.

LOCOMOTIVE BOILERS.—The Wm. H. Wood Loco. Fire Box and Tube Plate Company, Media, Pa., has published a folder entitled, Improvements in Locomotive Boilers Versus Regular Standard Boilers with Flexible Stays. In this folder are enumerated a number of results from tests which show the great efficiency of Wood boilers compared with boilers having flexible stays.

THIRD CLASS SLEEPING CARS IN NORWAY.—Norway follows the example of Sweden in ordering some third-class sleeping cars. They have three berths to a section, each 24 in. wide, and there are 12 sections to a car. These cars will weigh 76,000 lbs., and will cost $8,800 each.

Railway Construction.

ARTESIAN BELT.—An officer of this company, which operates a line from Macdona, Tex., to Christine, 43 miles, writes regarding the report that an extension is to be built from Christine, that contracts were recently let and grading work is now under way on an extension southeast, 17 miles. The work involves handling 15,000 cu. yds. to the mile. Maximum grades will be 1 per cent., and maximum curvature 1 deg. The company expects to develop a traffic in oil, coal, cotton and garden truck. (March 28, p. 779.)

ATCHISON, TOPEKA & SANTA FE.—According to press reports plans are being made for double tracking work through a mountainous section from Victorville, Cal., south to Summit, 19 miles.

BOSTON ELEVATED.—A contract for the construction of section B, of the Dorchester tunnel, at Boston, Mass., has been given to the Hugh Nawn Contracting Company, Roxbury, at $351,048. The contract covers about 500 lineal feet of a street railway passenger tunnel to be operated by the Boston Elevated.

BUFFALO, ROCHESTER & PITTSBURGH.—An officer writes that a contract has been given to the Miller Construction Company, Lock Haven, Pa., for grading and masonry work on a five-mile branch at Luceme, Pa.; and a contract has been given to Lane Brothers Company, Altavista, Va., for grading and masonry work on twelve miles of second track and grade revision between Rochester, N. Y., and Scottsville. (March 28, p. 779.)

CANADIAN PACIFIC.—An officer tells us that a contract for grading the Kootenay Central has been let to Foley Bros., Welch & Stewart, on the section from a point 60 miles south of Golden, B. C., to Shookumchuk, about 65 miles. (March 28, p. 779.)

CHAMBERSBURG & SHIPPENSBURG.—Application has been made for a charter in Pennsylvania, by this company with a capital of $250,000 and headquarters at Chambersburg, Pa. The plans call for building from Red Bridge Park, Chambersburg, north and east through Greene and Southampton townships, Franklin county, following in a general direction the line of the Harrisburg, Carlisle & Chambersburg turnpike to the western line of Shippensburg, nine miles. Thad. M. Mahon, president; W. H. Fisher, W. Alexander, H. B. McNulty, J. G. Schaff and J. F. Shank are directors.

CHICAGO, BURLINGTON & QUINCY.—This company has authorized the construction of second track from McCartney, Wis., to Bagley, 23 miles; Prairie du Chien to Charme, 7 miles; De Soto to Victory, 6 miles, and Fountain City to Alma, 14 miles, at an estimated cost of about $3,800,000. Third track will also be built from Downers Grove, Ill., to Aurora, 11 miles, at an estimated cost of $500,000.

Grading work for second track, parallel with present alinement between Pisgah, Ill., and Virden, 23 miles, is now under way. The grading is being done by J. E. Finncane.

GULF, TEXAS & WESTERN.—This company has made two reconnaissance surveys, it is said, for the proposed extension west from Seymour, Tex. One of the surveys extends northwest from Seymour to Floydada, about 150 miles, where connection could be made with the branch of the Santa Fe that runs to Plainview. The other survey was made from Seymour to Crosbyton, about 125 miles. At Crosbyton the line would connect with the Crosbyton-Southplains, which runs to Lubbock. The G., T. & W. recently finished work on the section from Jacksboro south to Salesville, 24 miles. (February 28, p. 411.)

KOOTENAY CENTRAL.—See Canadian Pacific.

MONROE, LOUISIANA & GULF.—Incorporated in Louisiana with $1,000,000 capital to construct or purchase a line from Monroe southwest to Winnfield, with New Orleans connection. Financial arrangements have been made. J. M. Parker, New Orleans, is president; T. J. Sheldon, is vice-president, and Perry Sandel, is secretary and treasurer.

OREGON SHORT LINE.—An officer writes that the company expects to begin construction work some time during the next few months on the extension of the Twin Falls branch south from a point in Idaho to a connection with the Central Pacific in Nevada. (March 21, p. 692.)

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PLATEAU VALLEY.—According to press reports financial arrangements have been made to build a line between Grand Junction, Colo., and Collbran, 48 miles. The company plans to use the tracks of the Denver & Rio Grande from Grand Junction to Palisades, from which place a new line is to be built east through the canyon of Plateau creek via Mesa, Molina and Plateau City to Collbran. Preliminary surveys have been made. It will cost about $1,000,000 to build the line. Jacob Yeckel, president, and A. J. Halter, vice-president, Denver. (January 31, p. 231.)

SUBURBAN RAILWAY.—A bill has been passed by the legislature of New Brunswick authorizing this company to build suburban lines from St. John, N. B., as follows: To Loch Lomond, 10 miles; to Rothesay, 9 miles; to Millidgeville, 3 miles, and to Westfield, 14 miles. The bill provides that the company must spend $50,000 in construction the first year, the same amount the second year, and $100,000 the third year, besides making provision for hydro-electric power.

TEXAS ROADS.—Plans are being made to build from Whiteflat, Tex., south to a connection with the Quanah, Acme & Pacific. This project is being financed by ranchmen and land owners along the route of the proposed line. It will be built and operated as an independent line, and it is planned to ultimately extend it north to Memphis, and south to Spur, in all about 100 miles.

RAILWAY STRUCTURES.

ASHLAND, WIS.—It is announced that the Chicago & North Western will build another ore dock east of its present docks. The new dock will be of steel and concrete, and will cost about $1,000,000.

BUTTE, MONT.—Work is to be started soon on the erection of a new passenger station.

CARLTON, MINN.—The Northern Pacific has announced its intention of constructing a large terminal at this point, to be used as a storage and makeup yard to relieve the congestion at Duluth. A similar terminal will be constructed at White Bear, Minn., to relieve the pressure of the Twin Cities.

DEMOPOLIS, ALA.—The Southern Railway is asking for bids for building a new freight station at Demopolis, to take the place of the old structure recently burned. The new building will be of brick construction with fireproof roof 40 ft. x 153 ft. There will also be an open platform 48 ft. x 60 ft., and the improvements will include loading platforms, paved teamways, and the necessary track changes.

DICKERSON RUN, PA.—The Pittsburgh & Lake Erie has given a contract, it is said, for building a roundhouse, a shop structure, a storeroom and a power house at Dickerson Run.

DU BOIS, PA.—The Buffalo, Rochester & Pittsburgh will make improvements to the shops at Du Bois, it is said, to include an extension to the erecting shop, 250 ft. x 137 ft.; an addition to the power house, an extension to the boiler making shop, 150 ft x 300 ft.; a pattern shop will be built 64 ft. x 70 ft., two stories high, and another building 35 ft. x 70 ft. will be put up. The company it is said, has also under consideration plans for the construction of a steel car plant, which calls for a structure 192 ft. x 400 ft., equipped with eight tracks.

FAUNSDALE, ALA.—Bids are wanted by the Southern Railway for building a combined freight and passenger station at Faunsdale, to take the place of the old station destroyed by fire. The new building will be of frame construction with tile roof.

PEMBINA, N. D.—The Canadian Northern will enlarge its shops and increase its yard capacity.

RIVERSIDE, PA.—The Buffalo, Rochester & Pittsburgh has given a contract to the American Bridge Company, New York, for a double track bridge, to be built over the Allegheny river at Riverside.

WEST TOLEDO, OHIO.—The Lake Shore & Michigan Southern will build two roundhouses and a power plant at its Air Line Junction yards.

WHITE BEAR, MINN.—See Carlton, Minn.

Railway Financial News

ATCHISON, TOPEKA & SANTA FE.—Under the law which has been passed by the Texas legislature, the Gulf, Colorado & Santa Fe, a subsidiary of the Atchison, Topeka & Santa Fe, is to operate the Gulf & Interstate, the Texas & Gulf, the Concho, San Saba & Llano Valley and the Sweetwater-Coleman division of the Pecos & Northern Texas.

BOSTON & ALBANY.—The Massachusetts Railroad Commission has been asked to authorize the issue of $3,627,000 5 per cent. bonds of October 1, 1913-1963. The proceeds of the sale of these bonds is to be used to refund a like amount of 4 per cent. bonds due October 1, 1913.

CALIFORNIA, SHASTA & EASTERN.—The Railway Commission of California has authorized this company to issue $568,000 bonds and $349,500 stock. The securities are to be sold at not less than 80. The original application was for an issue of $797,000 bonds and $1,075,600 stock.

CORNWALL & LEBANON.—The Pennsylvania Railroad has bought nearly all of the $800,000 stock of this company, of which previously $542,500 was owned by the Pennsylvania Steel Company, and most of the remainder by the Lackawanna Steel Company.

GALVESTON, HOUSTON & HENDERSON.—The issue of $2,000,000 new first mortgage 5 per cent. bonds, which was proposed, and which has been previously mentioned in these columns, has been postponed, owing to the company's inability to adjust the necessary formalities with the Texas railroad commission, holders of the $2,000,000 first mortgage 5 per cent. bonds, which were due April 1, and who were offered the privilege of exchanging their bonds for new bonds, received cash on April 1.

HOUSTON & BRAZOS VALLEY.—See Missouri, Kansas & Texas.

MISSOURI, KANSAS & TEXAS.—This company has bought an interest in the Houston & Brazos Valley. Included in the purchase is trackage rights over the International & Great Northern between Anchor, Tex., and Houston. This gives the M. K. & T. an additional outlet on the Gulf of Mexico at the terminus of the Houston & Brazos Valley at Freeport.

RUTLAND.—The New York Public Service Commission, Second district, has authorized the company to issue $210,000 equipment trust certificates, to be sold at 94½. The proceeds of the sale is to pay for six freight locomotives, one switching locomotive, one combination mail and baggage car, two baggage cars, three smoking cars, two first class coaches and one kitchen coach.

RAILWAY CONSTRUCTION IN AUSTRALIA.—Good progress is being made with the new railway lines under construction. The line from Bairnsdale to Orbost, 60 miles, will open up a large area of productive country, which hitherto has been handicapped by the absence of transit facilities. About 800 men are employed on the work and bridges, culverts and earthworks have been laid down for a distance of 40 miles from Bairnsdale. The section to Bruthen, 20 miles from the head of the existing line, will be first opened to traffic. A temporary bridge has been constructed over the Mitchel river and another of a more permanent character spans the Nicholson river.

BRANCH LINE FOR INDIA.—The branch line which is under construction from Bhairab-Bazaar to Tangu, which is a continuation of the Akhaura-Bhairab branch of the Assam-Bengal Railway, continues to make good progress, and it is expected that the line will be opened to traffic in April, 1914. About 85 per cent. of the earthwork has been completed and about 80 per cent. of the major bridges. The rails are also laid over a part of this branch. There have been labor difficulties on the line owing to the coolies finding work on railway construction nearer home and partly to the heavy rains in the recruiting districts which facilitated cultivation and reduced the annual emigration. It is intended to cross the Meghna river by means of a car ferry. This branch line joins the Dacca branch of the Eastern Bengal State Railway at Tong and there will then be through communication between Chittagong and the rich districts of Dacca and Mymensingh.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

E. A. SIMMONS, *President.*
L. B. SHERMAN, *Vice-President.* HENRY LEE, *Sec'y & Treas.*
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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each.

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,100 copies were printed; that of these 8,100 copies, 8,046 were mailed to regular paid subscribers and 166 were provided for counter and news companies' sales; that the total copies printed this year to date were 129,800—an average of 8,634 copies a week.

VOLUME 54. APRIL 11, 1913. NUMBER 15.

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A UNIQUE meeting took place in New York under the auspices of the American Society of Mechanical Engineers on Tuesday evening. The subject of Steel Passenger Car Design was treated in its most important phases by thirteen engineers, each of whom may be regarded as an expert on the particular part of the subject which he spoke on. The papers were short and, in almost all cases, to the point. It is unfortunate that more time could not have been given to the open discussion, and yet it is doubtful if so much valuable information could have been brought out at one meeting in any other way. The large meeting room was crowded to the very end of the session, which was adjourned at a late hour. The remarkable and widespread interest which has attended the two railway sessions of this society indicates remarkable possibilities for the discussion of mechanical department problems on broad engineering lines, and may well be studied by the managements of our railway clubs and mechanical department associations, several of which are getting anything but efficient results because of a lack of intelligent and active interest on the part of those in charge.

IN Texas the train crew bill was defeated by the opposition of the farmers. In Oklahoma the governor vetoed it, on the ground that it was wrong in principle and would tend to increase railway expenses and rates. We publish elsewhere Governor Cruce's veto message. The Chicago Association of Commerce, perceiving that the tendency of such legislation is to make rates higher, has adopted a resolution opposing it in Illinois. It is very surprising that the commercial travelers and shippers, who in the past have been so active in promoting legislation concerning passenger and freight rates, have been so slow to manifest opposition to measures which without increasing safety increase operating expenses and which thereby tend to keep rates up or to justify advances in them. Every full crew bill passed is an argument for higher passenger and freight rates. Legislatures and commissions in regulating rates can hardly ignore increases in operating expenses forced on the railways by law; and even if they do ignore them, the courts will not. If the traffic representatives of large industrial concerns and commercial organizations were as much alive to the interests they represent, as they have been at some other times, they would be as actively opposing most of the legislation that is being promoted by the lobbyists of the railway brotherhoods, as they were in opposing the general advances in freight rates over two years ago. They would likewise be active in agitating for legislation to so amend the Erdman Act as to secure reasonable settlements of controversies between the railways and their employees regarding wages and conditions of work, for every settlement of one of these controversies that increases wages tends to make more imperative the need for increases in railway rates.

MASTER car builders and mechanical department officers who have been confronted with the problem of efficient maintenance of freight cars have been at their wits' end to devise some unit of comparison which would closely gage the expenditures for maintenance with the duty performed by the cars. The number of these cars is so large that it is impossible to keep a close check on the cost of maintaining individual ones, particularly since a large proportion of them are interchanged generally and may be off the home lines for a considerable part of the time. The cost per car per year is the unit ordinarily used, but, as indicated in the article by Mr. Fritts on another page, it is of little value as a basis for comparison, and the same may be said of the cost per car per mile. Mr. Fritts has given this problem a great deal of attention during the past few years and proposes a unit which takes into consideration the average mileage per car, the average capacity per car, and the average tons per train; a diagram is presented showing the trend of this duty line as compared with that for the cost of repairs per mile run during the last few years on the Lackawanna. The unit proposed seems to be a most reasonable one, and is undoubtedly superior to the basis of comparison which is ordinarily used, particularly if the methods by which these figures are derived in the auditor's office do not vary from time to time.

A TRAIN crew bill is pending in the legislature of Colorado. The general managers of the Colorado lines have announced that if it becomes a law, on the day it goes into effect the issuance of free transportation to the families of railway employees and to railway employees themselves, except when traveling on the business of the companies, will be stopped. Railway managers elsewhere are considering the desirability of following the example of the general managers of the Colorado lines. Such action will be met with the charge that it is "retaliatory." Train crew legislation is being promoted by the brotherhoods of railway employees. While ostensibly in the in-

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terest of public safety, it is really intended to increase the number of men that railways must employ. The free transportation issued to employees and their families is sometimes mentioned in the schedules fixing wages and conditions of work. Usually, however, it is not provided for in contracts, and is simply a favor extended by the company to the employee. The activity of certain classes of employees in promoting full crew legislation is a selfish effort to further their own supposed interests at the cost of the companies and the public. Why should the roads and the public be the only ones adversely affected by it? Why should the roads continue to be generous to those who directly or indirectly are responsible for legislation intended and adopted to injure them? If they can save by reducing the free transportation of employees part of the expense caused by train crew and other legislation promoted by employees, why shouldn't they do so? Not all classes of employees are concerned in securing such legislation, however. Clerks, station agents, section foremen, etc., have had little, if anything, to do with it. Furthermore, they are not as well paid in proportion as the members of the various brotherhoods. If action is to be taken reducing free transportation it would seem to be only just that it should be discriminating, and should not affect those who are in no way chargeable with the legislation in question.

WE publish elsewhere an article by H. Bortin, an experienced valuation engineer, advocating early concerted action by the Interstate Commerce Commission, the railways and others interested, for the purpose of laying a broad and deep foundation for the valuation of railways which Congress has required the commission to make. As Mr. Bortin points out, there is no general agreement among even those who have devoted the most study to valuation and had the most experience in making valuations, regarding the exact meaning of some of the most familiar terms used in discussions of the general subject. There is equal lack of harmony of views regarding the methods that should be employed. The usual practice in making valuations has been for the public utility corporations to work up a vast amount of data and furnish it to the commission or other body having the work in charge, and for this body to then check over and revise the data and make such additional investigation as it considered necessary. Doubtless the same course will be followed in making the general valuation of the railways. Certainly, however, the Interstate Commerce Commission should not issue any instructions to the railways regarding their part of the work until an understanding has been reached regarding the interpretation of the various terms that the commission must use in issuing its instructions and the methods to be followed in carrying them out. Preliminary to a conference, or conferences, between the representatives of the railways and the members or representatives of the commission it would seem that the railways themselves should get together through appropriate officers and harmonize their own views and attitude. They have lost much in the past and caused themselves and the commission a great deal of unnecessary trouble by failure to act harmoniously and present a united front. The valuation of railways will be one of the most important pieces of work, if not the most important, ever done in connection with the regulation of railways in this country, and the plans for making it cannot be worked out too carefully and thoroughly. The scheme outlined by Mr. Bortin may not be the best that could be suggested, but it has the undoubted merit of being, as far as it goes, the best that has been suggested.

THE tempest in New England has died down, and the railway atmosphere there may almost be said to be natural. The temperature cannot yet be called normal, for the New Haven road, with its enormous outside burden of the Boston & Maine and other non-paying or poor-paying properties, still has a hard and complicated problem, straining all its resources. If every city were friendly, Mr. Mellen would still face a thousand perplexities. But the agitators appear to be exhausted, at least temporarily. The directors of the Boston Chamber of Commerce have made a report in which they say that the state of Massachusetts ought not to buy the Boston & Maine, nor require the New Haven to give up its control of it. They see that the weaknesses of the Boston & Maine were not caused by the New Haven management, and in their declaration to that effect, they silence one of the agitators' tom-toms. They call for a "strong" state railroad commission, and would like to have more Massachusetts men on the New Haven's board of directors; and in general present a sane, business-like report. How so conservative a body as the Boston Chamber of Commerce could ever have allowed itself to be used as the tool of irresponsible agitators is something of a mystery. Now, even Mr. Brandeis is quiet. Possibly the reduction in the market price of the railways' stocks, which has now been accomplished, is all that he wants. The New England newspapers also are sane. Those with yellow tendencies have little to say, and the substantial journals, all the time knowing that the proper way to deal with Mr. Mellen, whatever his faults, was through rational discussion, have now found the courage to say so. The city of Boston wants numerous railway improvements and the Chamber of Commerce asks for them, but these are not specified definitely, and the project for aiding new steamship lines, so as to increase the export and import trade of the port, is the principal thing mentioned. The problem of providing railway improvements in a big city, and doing it on a safe basis, financially, is always a difficult one, and the vagueness of the Boston report gives evidence of this fact. The men who framed it realize the magnitude of the task. The city and the railroad are now ready to begin their negotiations where they ought to have begun a year ago.

PROVIDENCE, the other storm center, has had its problem reduced, as compared with Boston's, to the acme of simplicity. The Grand Trunk, after spending two and a half millions on its Providence branch, offers to give away the property outright. If the state of Rhode Island or the city of Providence will take the unfinished railroad and complete the job the Grand Trunk will not only make this big contribution, but will pay 5 per cent. on whatever money the Rhode Islanders may put into the enterprise. In the language of the street, "money talks"; and in this case it talks in very simple terms. Moreover, the answer which it calls for can be (and ought to be) expressed with equal force and simplicity. As an opportunity to translate the talk of stump speeches and irresponsible legislative and newspaper discussions into actual business enterprise, this offer of the Grand Trunk is a notable event. It is claimed that the road is backing out of an agreement dishonorably; that the officers of the company promised to build a railroad to Providence. As to whether this agreement was in writing or what were its precise terms nothing is published. No evidence is produced to show that there was even a moral agreement, nor do we know with whom the agreement was made. That the officers of the Grand Trunk honestly intended to build the road is clear enough from work that has already been done. They would not have spent two and a half millions just to scare the New Haven. Whatever may be the fact as to honor or dishonor, it is difficult to see any better way out than that which is offered. It appears that the Grand Trunk has been forbidden by the Dominion government to involve itself in big investments outside of Canada; and that no money can be raised for the Providence extension without the Grand Trunk's endorsement, because of doubts as to the profitableness of the proposed line. If it be said that the Grand Trunk directors ought to go into their own pockets for the six millions to complete the road, they will reply that Mr. Hays, now dead, went into this enterprise without their authority. We hold no brief for these directors, and know nothing of their thoughts or intentions beyond what is published; but in the present aspect of the case Mr. Chamberlin's offer to operate the road, and pay 5 per cent. on its cost, would seem to be a proposition which the people of Providence ought to regard as

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thoroughly business-like. At any rate, as we have said, there will now be a fair opportunity for all citizens to get a very lucid lesson on the general question of the relations of the state to the railroads.

THE SUBSTITUTION OF THE SALE OF LEGISLATION FOR VOTES FOR ITS SALE FOR CASH.

THE enactment of laws in various states, especially to further the supposed interests of railway employees and with the effect of increasing railway operating expenses suggests some not very pleasant reflections on certain contemporary tendencies in politics and government in the United States.

The present is being exalted by many writers and speakers as a period of reform in public affairs. One of the reasons assigned is that the corrupting influence of capital over politics and legislation is being reduced or abolished. There are indications that in the minds of many reform consists in substituting the corrupt and corrupting influence of their own class over government for the corrupt and corrupting influence of other classes. It is true as to railway corporations specifically that in many states and in the nation they formerly used free transportation, and in some cases even cash, to control the action of political conventions, law-makers and even governors. On occasions this was done to secure legislation unduly advantageous to the railways; at other times to prevent legislation unjustly prejudicial to them. The immorality and criminality of these practices have been universally recognized and denounced. In consequence of the aversion to them of honest corporation officials, of the public sentiment that has been manifested, and of legislation which has been passed they have been almost abolished. It is now even against the law for a corporation to contribute to a national campaign fund. Today almost the only means used by railways to influence public regulation of their affairs is the most open presentation of facts and arguments to the public, to regulating commissions, to law-making bodies and to public executive officials.

Capital has much money, but relatively few votes. Labor organizations have relatively little money, but many votes. While the illegitimate use of money to influence legislation has greatly decreased, the illegitimate use of votes to get it is rapidly increasing. Citizens are given the suffrage in order that they may protect and further their legitimate interests; and the *legitimate* interests of every citizen coincide with those of the public. Therefore, no man or class of men has any moral right to use his vote or its votes to promote ends that are contrary to public ends. Men are elected to legislatures and to other public offices solely to serve public purposes. They have a right to solicit and secure votes by promising to carry out, and by carrying out, policies intended and adapted to promote the interests of the public. They have no right to solicit and secure votes by any other means or for any other purpose whatsoever.

Now, the members of the railway labor brotherhoods through their legislative representatives are seeking legislation such as that to increase the size of train crews in the pretended interest of safety, but for the real purpose of increasing the number of men that railways must employ. There is not a single well-authenticated case on record of a fatal accident caused by the want of enough men in a train crew. Governor Sulzer of New York, in a statement defending his action in signing the full crew bill in that state, said "the truth is that nearly all the accidents of recent years might be prevented by the employment of more men." If Governor Sulzer, in making that statement, did not say what he knew to be false, he is the most ignorant man regarding the facts about American railway accidents who ever undertook to discuss them. No assertion on the subject more utterly incorrect and misleading ever emanated from any source; and it is incomprehensible how the governor of a great state, having any sense of his public duty or responsibility, could have given it currency, supported by the weight of his name and official title. The only accident specifically referred to by him —that in which, as he says, 41 persons were killed—was due to neglect of an engineman who had on the engine with him a monitor, presumably competent, in the person of his fireman. How would the third brakeman called for by the new law have tended to prevent the engineman's error? The fact is that the full crew legislation not only does not increase the safety of transportation, but interferes with making it more safe. It has been estimated by the special Committee on the Relations of Railway Operation to Legislation that a federal full crew law would increase railway operating expenses $12,000,000 a year. That amount is 5 per cent. on an investment of $240,000,000. It has been estimated by the same authority that for $260,000,000 all the railways could be equipped with the block system. Now, the universal installation of block systems would materially increase safety, while full crew legislation does not increase it in the slightest degree. In other words, the full crew legislation, by requiring an addition to operating expenses which does not increase safety does tend strongly to interfere with the installation of the block system which would increase safety. The only effect of full crew legislation is needlessly to increase the operating expenses of the railways. This causes economic waste, the ultimate effect of which is to injure the public, because all of the operating expenses of the railways must be paid from revenues derived from freight and passenger rates. Mr. Sulzer's utterance accentuates the change that has taken place in the executive mansion of New York state since Charles E. Hughes was governor; and the fact that the governor of Oklahoma vetoed the full crew bill in that state illustrates one improvement that has taken place in affairs in Oklahoma since Charles N. Haskell was governor.

The means by which the railway employees are securing such legislation is by indicating that the law-makers who vote for their bills and the governors who sign them will benefit by being given their votes, while those who refuse to do so will suffer correspondingly. In other words, they are bribing the law-makers and the governors with votes in the same way, for the same purpose and with the same effect, as corporations have in other years bribed law-makers and governors with cash. The law-makers who are voting for these bills and the governors who are signing them, if they are acting with a scintilla of intelligence, know that they are contrary to the public interest. To all appearances they are being passed and signed because those who pass and sign them believe that while they are designed and adapted to confer special privileges on a class at the expense of the public, they will secure votes for those who pass and sign them. In other words, railway employees are consciously bribing public officials with their votes, and public officials are consciously letting themselves be bribed by them into passing and signing legislation which sacrifices the interests of the many for the supposed benefit of the few.

Neither morally nor in the results to the public does the huckstering of legislation in exchange for votes differ essentially from its purchase and sale for cash. Capital in the one case and labor in the other uses the currency of which it commands the largest supply. That is the only difference. Public men in each case sell the same commodity, namely, the public welfare. The two kinds of transactions equally involve moral turpitude, are equally shameful, equally contrary to the duties of citizens of a democratic state, equally disregard every dictate of honor and duty by which public officials should be governed. That this is not generally recognized simply shows that there is need for a much greater public awakening on moral and political questions than has yet occurred. That the men who in public life are loudest in denouncing improper activities on the part of corporations are also those who are the most forward to rush into the market and to sell the interests of the public for votes for themselves simply shows that the political hypocrite, demagogue and dispenser of buncombe are still with us.

The immorality and wrong to the public of the sale of special privileges to capital for cash has become clearly and generally recognized. When will the immorality and wrong to the public of the sale of special privileges to certain classes for votes become as clearly and generally recognized?

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NEW YORK'S FREIGHT TERMINAL PROBLEM.

THERE has never been a far-sighted co-operative plan for handling New York's local freight traffic on Manhattan and for properly developing its harbor. The old hand-to-mouth policy of handling local traffic on the west side waterfront of Manhattan has been pursued until it has reached its limit of development, but the volume of traffic is ever increasing. The serious congestion, delays and excessive terminal expenses entailed by this system make expansion imperative. To continue to develop along the old lines the railroads would require more space on the west side waterfront. This is not available and cannot be created. Moreover, the greater part of the space now occupied by the railroads on the waterfront is urgently needed for the expansion of shipping facilities. This waterfront space is the just inheritance of the steamship companies and the welfare of the city demands that they be permitted to make full use of it. As the railroads can never hope to handle the future growth of traffic with their present facilities, and as expansion on the waterfront is out of the question, only one course is left—to go elsewhere.

Confronted with this situation the roads terminating on the New Jersey shore of the North river have continued to hold back, vainly contending that the steamship companies should be forced away from the waterfront for their benefit. They have made no attempt to solve the problem along new lines and have individually considered and condemned each plan that has been devised for them. Some of the proposed solutions are outlined on another page. Perhaps a successful solution of the problem has not yet been presented, but the thing most to be deplored is that the criticism of the Jersey roads has been solely destructive. The limited amount of desirable space and the enormous expenditures involved make co-operation necessary to secure maximum efficiency and minimum expenses. Obviously a satisfactory solution of this problem can never be reached without the assistance of the railroads, but thus far the Jersey railroads have flatly refused to co-operate because of the rivalry and jealousy which exist between them.

The city stands ready to lend its valuable assistance to the successful completion of any project which shall meet with general approval. Funds for the initial costs of the improvements can be raised at a lower rate of interest by the city than by the railroads, and if these improvements were built and owned by the city the rental charges would only have to meet the interest charges, maintenance and amortization. No profit would be necessary. The city would be willing to do this because the bonds would be self-supporting and therefore excluded from the debt limit, there would be no public burden and the city would reap enormous benefits indirectly.

Apparently the New Jersey roads lose sight of the fact that the New York Central is their common rival, that its position today is decidedly more advantageous than theirs, and that it has plans under way to still further increase this advantage. If the plan, which has been drawn up by the Board of Estimate's committee on terminal improvements, is approved, the New York Central will cover its tracks on the west side of Manhattan above Seventy-second street, will build a subway south from Sixtieth street connecting with all its terminals, and will remove its present surface tracks south of Sixtieth street. The chief advantages of this plan to the city are negative. The city will have a little more park space along the upper west side, a little less smoke and the dangers of the surface tracks will be eliminated. The New York Central will have a much better connection with its terminals, but the great problem of a co-operative terminal policy, the only thing which will materially benefit New York both commercially and industrially, is left entirely to the future. The New York Central is strengthening its position. What are the Jersey roads going to do? Their common rivalry should be a bond between them, for if a co-operative policy were adopted and carried out the New Jersey roads, by reducing their terminal expenses, would be enabled to compete more successfully with the Central, they would secure a larger proportion of New York's traffic and would benefit both individually and collectively.

The undertaking would be momentous and the roads feel that they will not venture on any plan until it can be definitely proved to them that it will reduce costs, facilitate transportation and preserve approximately the same balance of power between them. Until now no committee, properly equipped to draw up a plan to meet all these requirements, has studied the question. A successful plan would involve engineering, operation and the interests of both New Jersey and New York City. Therefore, if a committee were formed, composed of one engineering and one operating officer of each of the roads interested, together with representatives of both New York City and the state of New Jersey, it should not be long before a plan was devised which would be satisfactory to all. Until some such committee is formed there is but little chance of any general policy being agreed upon. In the meantime the situation will become even more aggravated than at present. The present terminal expenses are needlessly high, and therefore involve waste. This waste should be eliminated.

The needed improvements include the evacuation of the west side waterfront by the railroads to permit the expansion of shipping facilities; the establishment of joint terminals and warehouses connected with all railroads and all docks; the diffusion of these terminals to prevent the congestion of drayage; the installation of mechanical devices for handling package freight quickly and cheaply; the partial elimination of railroad traffic from the surface of the harbor to permit more freedom for marine traffic; and above all a reduction in terminal expenses. If it is impossible to devise a plan which will meet all these requirements then the plan which would meet most should be adopted; but until the problem has been properly grappled with there is no means of knowing what can and what cannot be done.

NEW BOOKS.

Locomotive Dictionary. 1912 (Third) Edition. Compiled and edited for the American Railway Master Mechanics' Association by Roy V. Wright, managing editor of the *Railway Age Gazette* and editor of the *American Engineer*, assisted by Porter L. Swift. Illustrated. 901 pages. 9 in. x 12 in. Published by the Simmons-Boardman Publishing Company, New York, and distributed by the McGraw-Hill Book Company, 239 West 39th street, New York. Price, leather bound, $6; cloth bound, $4.

The progress made in the design of locomotives, both steam and electric, during the past three years is well illustrated by the contents of this edition of the Locomotive Dictionary when compared with the 1909 edition. It has been necessary to go beyond a mere revision of the previous edition, and so far as the illustrated section is concerned, it is practically a new book. The definition section also has been thoroughly revised and considerably expanded. While the Mallet, Mikado and Pacific type locomotives have been given special attention, the lighter types are by no means overlooked. This is especially true in connection with the switching and Atlantic type locomotives. In connection with each locomotive elevation a complete list of dimensions, weights and ratios is given, an improvement which, no doubt, will be much appreciated. It is evident that considerable study has been given to the selection of the typical parts and details that are presented and only approved designs that have been successful in service are illustrated. Cross references between the general and detail drawings are included wherever possible. Among the new sections that have been added are one on mechanical stokers and one on locomotive tool equipment; the sections on oil burning locomotives, electric locomotives, air brakes, and frames and frame bracing have been materially enlarged. The illustrations showing the Master Mechanics' Association standards have been entirely redrawn, making them more legible and greatly improving their appearance. The section on machine tools occupies 60 pages and gives photographic reproductions of practically all kinds of metal working machinery used in the repair of locomotives.

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Letters to the Editor.

GOOD POINTS IN ENGLISH PASSENGER TRAIN SERVICE.

NEW YORK, March 15, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

During my recent visit to England several practices of the railroads struck me as of possible interest to your readers. The English method of handling commutation is particularly noticeable. They sell what are known as contracts, good for any period desired from one month to a year and for any number of rides. A person simply purchases a contract covering any two stations and rides as often as he pleases. There is no delay to have a piece cut off of the ticket or the necessity of hiring extra men to punch useless holes in tickets, as is done in this country. The contracts are pieces of light cardboard about 3 in. x 4 in., and show the names of the two stations and the date of expiration in large type, so that they may be read at a glance.

The habit of punching holes in tickets in this country is not only to a large extent useless, but is often annoying. The writer vividly recalls missing a train to Philadelphia in order to get a useless hole punched in a ticket. I entered the ferry office in the last few seconds before the boat left, purchased a ticket without delay, waved it at the man with the punch and rushed for the boat, only to be stopped by the man at the gate in response to a yell from the ticket puncher. The man with the punch had seen me purchase my ticket and saw it in my hand as I passed through the chute, but would not permit me to catch my train because he had not succeeded in punching a useless hole. Another incident, amusing instead of annoying, occurred on the New Haven, where a conductor wanted to argue as to my destination because he had punched the ticket so full of holes that the station had disappeared.

So much for the holes. Probably a more important subject is that of train schedules. English trains are on time. As an English railroad is liable for damages in cases of delay, it becomes necessary to have trains on time, and they are. Everyone seems filled with the idea of time and the necessity for keeping trains on time, not only while running but in the departure from stations. It is of this latter feature that particular notice should be taken, as we are entirely too much given to carelessness in this respect, trusting to our giant locomotives to make up the lost time. Our locomotives do make up this loss over and over again, but at a tremendous expense for fuel and repairs.

Only a few days ago I saw one of our fastest trains lose three minutes at a station simply because the passengers were all in a bunch at the far end of the platform from where the train stopped. At another station the ushers had lined the passengers up at the proper places ready to board the train, with the result that not only was no time lost, but one minute of the loss at the other station was made up. Why not extend this idea?

Of course, one could not help noticing the English platforms on a level with the floors of the cars and hoping that the platforms, in at least the more thickly populated sections of this country, would soon be raised.

We are reported to kill on the average fourteen trespassers on the railroads every day throughout the year, and a great hue and cry has recently been made about the matter. Of course, our laws covering trespassing on the railroads are very lax, but the railroads could help by making trespassing difficult. One can hardly manage to walk on an English railroad track without putting himself to great inconvenience.

Those of us who have stood in the vestibule of a dining car waiting what seemed an endless time for a chance to eat, have fervently prayed for a change. The English method is to "book" a passenger for the first or second service, then call him when the meal is ready. This scheme is made easy for the reason that the meals are served in courses to all at the same time just as though it was a large family party. A further advantage is the very considerable reduction in the number of waiters required. Americans would probably not stand for such a procedure at home, but a great improvement over existing conditions could undoubtedly be made. Only last week I found a Michigan Central dining car conductor who made out a regular schedule and notified passengers when they could eat. When I found the diner full and the conductor advised me that he would call me in thirty-five minutes, if I would let him know where I was sitting, I demurred on the ground that someone who stood in the vestibule would get my place. However, he informed me that he ran his car according to schedule and allowed no standing in line. It was certainly far pleasanter to sit down comfortably and read until called, and in my opinion this conductor's method might well be extended.

There are of course many points in which we excel, but my idea in writing this letter is to simply call attention to a few items which may be of interest rather than to make a general comparison.

C. J. MORRISON,
Chief Engineer, Froggatt, Morrison & Co.

THE STATION AGENT'S UNIVERSITY.

TEXAS CITY, TEX., April 3, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In your issue of March 28, page 743, there appears an article on "Suitable Studies for Station Agents."

While I have never served a railroad company in this capacity, my railroad experience and an intimate knowledge of the efforts and sacrifices which a small measure of success has cost many of my acquaintances in this line of employment, prompts me to take issue with the writer on some of his views expressed.

While there is but one "royal road to success," there are diversified methods of traveling over that road—depending upon the circumstances of the individual whose ambition spurs him on to something better. Some men who have attained success are really and sincerely of the opinion that experience was their only teacher, yet, if they themselves realized the facts they would be compelled to admit that as a result of one's interest in a particular line one will be impelled to a painstaking study of every article which deals with the subject in which he is interested.

There is no question but that a publication such as the *Railway Age Gazette* is indispensable to a broad view of the various phases of railroading of the present day. The writer is a subscriber for and an ardent advocate of this publication, and acknowledges himself indebted to the publisher and authors of the many valuable articles, which have recently been published, for information which could probably not have been obtained elsewhere. Yet, to the young man who has carefully planned his future course, but who has not been afforded the opportunity of the technical or professional training which he craves through the medium of experience or of a college course, many of the correspondent schools of today afford advantages for advanced study valuable to employee and employer as well.

When one learns to "live on twenty-four hours a day," the time spent in study and mental discipline is an advantage rather than a handicap to his working hours. From practical experience (and for the benefit of others, who, like myself, must acquire their training in the "university of hard knocks") I can state that the subject of law, the various literary branches of a university course, traffic matters, both rail and water borne, and many other important branches, can be successfully taught by correspondence, and that through a study of these courses one can successfully increase his own earning capacity and qualify himself for better service to his employer.

I am submitting this communication solely with the view to offering the encouragement—which I, myself, would have often welcomed—to those who are grasping the only means at hand for attaining to a greater measure of success.

HARVEY A. THOMAS,
Secretary and Local Attorney, Texas City Terminal Company.

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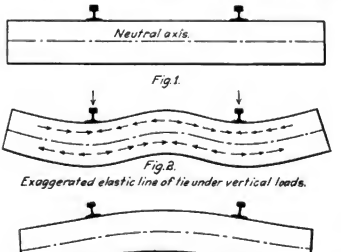
THE DESIGN OF CONCRETE OR REINFORCED CROSS-TIES.

CHICAGO, March 10, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I notice in the papers that a representative in Congress introduced a joint resolution on February 4 directing the Interstate Commerce Commission to investigate and report upon the use and necessity of a certain specified combination railroad tie. An appropriation of $25,000 goes with this resolution, to provide for the expense of an investigation of this particular tie and other kinds now in track. The investigators are also to consider the question of accidents due to defective track and roadbed and are to have six months to prepare their report.

The first thing that strikes one on reading this item of news is that the Interstate Commerce Commission is being invited to investigate itself. The commission has recently made a report,



after some five years' consideration of these matters, which deals with the subjects mentioned above. (See report of the Block Signal and Train Control Board, *Railway Age Gazette* of February 14, 1913, page 293.) This report covers most of the objections to concrete ties. One point is omitted, however, viz., that the fastenings must provide for different widths of rail bases to allow for relaying.

The joint resolution seems to imply dissatisfaction with this report. Is it because the investigating committee failed to perceive the many exceedingly fine (perhaps invisible) points of some particular make? The *Congressional Record* might consider the propriety of fixing space rates for advertising, and perhaps our bulkiest publication of innocuous fiction might be made to pay. We could then have the pleasure of seeing alongside of speeches that were never delivered, appliances that were never used. Why does our so-called representative feel so much interest in a matter of this sort? Could it possibly be because it is "agin" the railroads?

The impression seems to have gone forth that the railroads are not giving any attention to these matters and know nothing about them. On the contrary, every chief engineer's office in the country is flooded with sundry schemes by which some individual hopes to repeal the laws of mechanics. A little elementary knowledge of mechanics would help most of these inventors. In time, undoubtedly a good compound tie may be invented by some one and its qualifications must be in the line set forth by the board cited above.

I would suggest to those going into the question that they demonstrate what happens when the compound tie is loaded. These demonstrations can be made mathematically. As a starter, the following will indicate the method. Figure 1 shows a homogeneous tie without a load. Figure 2 shows the exaggerated form of the elastic curve assumed by the tie when placed on a uniformly elastic bearing or ballast. This supposes that the tie is of sufficient length. Figure 3 shows the form assumed when the tie is too short. As will be noticed, the tie is subjected to shearing stresses under the base of the rail. In addition to this, the outer fiber of the top of the tie is in tension (Fig. 2) at the middle and in compression under the base of the rail. The bottom of the tie is in tension under the rail and in compression in the middle. This explains why so many ties are faulty; the materials of which they are composed are not calculated to resist certain kinds of stresses. The wooden cross-tie with considerably less powers of resistance still answers the purpose on account of its approximately uniform elasticity. If these manufacturers and inventors of cross-ties will come forward with a rational explanation and demonstration showing why certain materials have been placed at certain points and other kinds at others, they will always receive attention. It may surprise them, no doubt, to find that statute law, even when its constitutionality has been passed upon by the Supreme Court, will not repeal or abrogate the smallest law of mechanics.

PAUL M. LA BACH.
Assistant Engineer, Chicago, Rock Island & Pacific.

PUNISHMENT FOR INTOXICATION.

WASHINGTON, D. C., March 7, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

"SULZER SIGNS HIS FIRST LAW."—These were the headlines that attracted my attention in a recent New York paper, and I was further interested in finding that the law which gave the governor so much satisfaction in signing was one for the punishment of drunken chauffeurs. The governor remarked, "I don't think we ought to countenance drunken chauffeurs." He is right; but what about train employees?

Some years ago I suggested to the railroad commissioners in a southern state that they advocate the enactment of a law making intoxication on the part of train employees, or any employee engaged in the operation of trains, a felony; make drinking on duty a crime.

The states and the federal government are forever passing laws and penalizing corporations for violations of law, but such laws seldom provide a penalty or punishment for the real violator. We are trying to safeguard the public by the introduction of mechanical devices; why not also safeguard the people with a few laws applying to the human agency?

EX-RAILROADER.

[A man in charge of an engine or a train should not be intoxicated or drink on duty; that is generally agreed on; but many railroad officers are now disposed to go further than that; to require total abstinence at all times. It is very difficult, however, to enforce so rigid a rule. Our correspondent is in a sense less radical than railroad managers. He would find it very difficult to enforce his rule; less rigid as a rule, but ostensibly more severe in the proposed punishment. Courts and juries cannot be induced to impose severe punishments except where there is a well defined and serious offense; and cases of drunkenness often are not susceptible of clear definition or satisfactory proof—while yet they are serious enough to afford all necessary moral justification for dismissing and perhaps for punishing the culprit. The brotherhoods, which boast of their influence over legislation, are not very likely to promote a law of the kind proposed; and bills affecting "labor" which are not promoted by the labor unions rarely, if ever, become laws.—EDITOR.]

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STEEL PASSENGER CAR DESIGN.

A Symposium of Papers Prepared by Experts for Presentation Before the New York Meeting of the Am. Soc. Mech. Engrs.

So successful was the railway session of the December meeting of the American Society of Mechanical Engineers that the committee in charge, of which E. B. Katte, of the New York Central, is chairman, immediately took steps, in co-operation with the New York meeting's committee of the society, to plan for another railway meeting to be held in New York. This session, held Tuesday night of this week, was more than ordinarily successful, in spite of the fact that the program was of great length. It consisted of thirteen short papers, each prepared by an expert on the particular phase of the subject assigned to him. Abstracts of these papers follow:

INTRODUCTION TO GENERAL DISCUSSION.

By H. H. Vaughan,
Assistant to the Vice President, Canadian Pacific.

The advent of the steel passenger car has brought with it many new problems and an opportunity for more diverse opinions than any other change that has taken place in car equipment. The construction of the wooden passenger car developed along fairly uniform lines. The varieties of framing were few and the differences unimportant, while the introduction of steel platforms, wide and narrow vestibules, reinforced end and sill construction and similar improvements occurred gradually, and with practically similar designs on all roads. The change from wood to steel in freight car construction resulted in the abandonment of designs that had almost become standardized and the introduction of many new types, but in this case the principal problem, other than that of obtaining satisfactory designs, has been the extent to which it was advisable to use composite or all-steel construction.

In the case of the passenger car, the types to be employed will probably not be changed by the substitution of steel for wood. The increase in capacity that has taken place in freight equipment cannot be duplicated in passenger cars, and there appears to be no tendency at present toward any increase in length or carrying capacity. The questions that now confront us relate rather to the design and construction of cars of the present type and of the materials that may be advantageously employed in place of the wood which has been used for so long. They are complicated by the necessity of providing for greater safety for the passengers than was secured in the wooden car, with an equal degree of comfort, and the difficulty of anticipating the behavior of this new equipment in the case of accident. Certain difficulties, such as the best systems for heating, lighting and ventilation, are common to both steel and wood construction, and improvements in these matters pertain to general progress rather than the use of steel construction.

The following list, while probably incomplete, outlines in a brief way the important variations that must be considered in deciding on the preferable construction of steel passenger equipment:

Framing	Steel underframe	
	All-steel frame	Center girder
		Side girder
Outside finish	Plained	
	Sheathed	
Roof construction	Clear-story	
	Circular	
Inside finish	Steel	
	Wood	
End construction	Design and strength	
Floor	Design and material	
Insulation	Material	

No doubt questions of equal importance have been omitted, and in many cases those mentioned require careful consideration with regard to degree, as for instance, the strength of the framing or the thickness of the insulation. The list illustrates, however, the diversity of possible solutions of the preferable steel passenger car.

The steel underframe does not appear to be a satisfactory or permanent development. There is but little saving either in weight or cost over the all-steel construction, and it is difficult to see how the same strength in case of accident can be obtained. Experience will show whether the wood superstructure can be secured in such a way as to prevent working as the car gets old, but as it cannot be arranged to carry any weight this appears questionable. It can hardly be regarded except as an intermediate step between all-wood and all-steel construction.

In all-steel construction the side-girder car presents advantages, but, as in freight construction, both types will probably persist. The side-girder construction utilizes the greater strength on the side framing without superfluous weight, and it is possible that greater framing strength may prove necessary. With equal strength of side framing the side-girder car may be made lighter than the center-girder type, and the weight of steel passenger cars is one of the most serious problems to be faced by any railroad not having a level line. American passenger equipment was already excessively heavy per passenger carried with wood construction, and the use of steel has increased this weight from 10 to 20 per cent., which is a most serious matter. Apparently side-girder cars, as so far constructed, have a decided advantage over the center-girder type in their light weight and greater strength in case of accident tending to crush in the side of the car. This will probably lead to the use of this type on roads on which weight is of importance.

In spite of the many advantages of the sheathed car in case of construction and maintenance, it appears that the cost and weight of the additional metal will prevent its extensive use. This question is chiefly one of appearance and convenience, and is of minor importance.

The circular roof has been extensively introduced on steel passenger cars on account of its lightness and simplicity of construction. It has the objection that deck sash ventilation cannot be employed. The Pullman Company while using the clear-story roof have, however, discontinued the use of deck sash ventilation, so that evidently in their opinion this objection is not important. The deck sash is, however, of value in a standing car, and when properly screened is certainly advisable in hot weather, especially when the road is dusty. The Canadian Pacific has compromised on this question and is using a roof of approximately circular form with deck sash. The strength and simplicity of the circular roof are retained with the ventilating qualities of the clear-story type.

The preferable material for inside finish is a matter for future decision. With the ample protection afforded by a steel car against accident, there does not appear to be any objection to wood inside finish on the ground of safety. It is more ornamental than steel and a better insulator. Probably on no question in passenger car design is opinion so divided amongst both railroads and car builders. There is today very little difference in cost, and it certainly appears probable that in the future the tendency will be to adopt steel interior finish, if not entirely, at any rate to a great extent.

The construction of the ends of the cars has received considerable attention, and the strength now usually employed is enormously greater than anything attempted in wood construction.

The floor construction in steel cars is entirely different from that in wooden cars, and is usually of metal covered with a flexible cement. In constructing a sample car for the Canadian

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Pacific the writer used in addition an underfloor covered with insulating material, and covered the cement with ½ in. of cork. This car was also exceptionally well insulated at the sides, 2 in. of cork being used next the outside plating. Tests during the past winter have shown that this car is actually warmer than the ordinary wooden car, the same amount of heating surface being used in both types. The floor was tested by taking the temperature of water standing on it in cans, there being no practical difference between the results in the wood and steel cars. The question of insulation is an important one, both in hot and cold weather, and while other insulation might no doubt be equally effective, it is interesting to be able to advise that with proper insulation there is no question of the steel car being satisfactory.

PAINTING OF STEEL PASSENGER CARS.

By C. D. Young,
Engineer of Tests, Pennsylvania Railroad.

A fundamental reason for painting any surface of a passenger car is to protect it from the damaging effects of the air which is more or less loaded with gases and moisture.

The all important point in the painting of iron or steel surfaces is first to have the surfaces thoroughly cleaned and entirely rid of scale and rust, as this is as important as the painting itself. To accomplish this, sand-blasting, where possible, was resorted to, supplemented by the use of wire brushes and emery cloth in the more obscure places and the more uneven surfaces. The sand-blasting, however, was confined largely to the outside surfaces and the latter practices to the inside portion of the car.

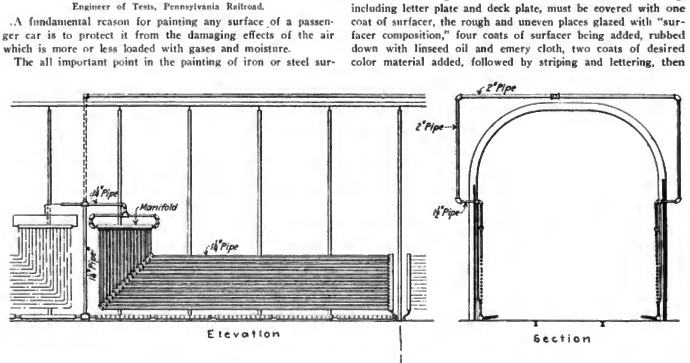
The schedule for painting steel passenger car trucks, underframes and superstructures is as follows:

Trucks. Before assembling all surfaces on truck parts throughout, including all concealed surfaces, but not including wheels and axles, must be covered with one coat of suitable primer. After assembling, all surfaces exposed to view after the body of the car has been placed on trucks, except wheels, must be covered with two coats of truck enamel.

Underframes. During the process of construction all parts of the underframe, including concealed surfaces and surfaces where metal bears on metal, must be covered with two coats of good metal preservative of a non-inflammable nature. All accessible surfaces must be covered with a third coat of metal preservative.

Superstructures. Before assembling all parts made of iron or steel, including the roof, must be covered with one coat of primer. A second coat of primer, properly thinned with turpentine or similar material, must be applied to all surfaces, including those which are concealed when the car is completed. Wherever possible, this second coat must be put on after the sheets are in place.

After assembling, the outside of the side and end sheeting, including letter plate and deck plate, must be covered with one coat of surfacer, the rough and uneven places glazed with "surfacer composition," four coats of surfacer being added, rubbed down with linseed oil and emery cloth, two coats of desired color material added, followed by striping and lettering, then finished with three coats of finishing varnish. The outside of the roof must be finished with one coat of heavy protective paint, followed by one coat of a mixture composed by volume of three parts of mixed ground color and one part of the protective coating used. The top surface and edges of the headlining should be painted with two coats of some preservative, or color paint.



Steam Piping in Oven for Baking Paint on Steel Cars.

The interior of cars should receive very careful attention in order to produce the desired finish. To illustrate fully the various steps and time taken to complete the painting, the following is given as outlining the progress of the work. This is attained with the use of surfacers, colors and varnishes con-

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taining a relatively large amount of artificial driers and varnish gums, in order to obtain the artistic finish desired for the interior.

Headlining.

1st day.—Apply one coat and stipple after application.
2d day.—Stand for drying.
3d day.—Apply one coat and stipple after application.
4th day.—Stand for drying.
5th day.—Apply one coat and stipple after application.

Sides Above Window Sills and Ends.

1st day.—Apply one coat or primer.
2d day.—Stand for drying.
3d day.—Apply one coat surfacer.
4th day.—Necessary puttying and glazing.
5th day.—Apply as many coats surfacer as are necessary to make a level surface.
6th day.—Same as 5th day.
7th day.—Rub down with emery cloth and linseed oil.
8th day.—Apply one coat of ground color.
9th day.—Apply one coat of ground color.
10th day.—Apply one coat of ground color.
11th day.—Apply one coat and stipple after application.
12th day.—Apply one coat rubbing varnish.
13th day.—Stand for drying.
14th day.—Apply one coat rubbing varnish.
15th day.—Stand for drying.
16th day.—Apply one coat rubbing varnish.
17th day.—Stand for drying.
18th day.—Rub with oil and pulverized pumice stone.

Sides Below Windows.

1st day.—Apply one coat or priming.
2d day.—Stand for drying.
3d day.—Apply one coat surfacer.
4th day.—Necessary puttying and glazing.
5th day.—Same as 6th day.
6th day.—Apply as many coats surfacer as are necessary to make a level surface.
7th day.—Rub down with emery cloth and linseed oil.
8th day.—Stand, awaiting bringing up other work.
9th day.—Stand, awaiting bringing up other work.
10th day.—Apply one coat bronze green.
11th day.—Apply one coat bronze green.
12th day.—Apply one coat of rubbing varnish.
13th day.—Stand for drying.
14th day.—Apply one coat of rubbing varnish.
15th day.—Stand for drying.
16th day.—Apply one coat of rubbing varnish.
17th day.—Stand for drying.
18th day.—Rub with oil and pulverized pumice stone.

RESULTS OF AIR DRYING PAINTS ON STEEL.

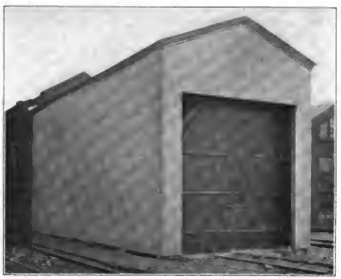
The artificial driers and gums used in hastening the time of drying and hardening of the various coats and permitting the necessary rubbing continue this action so that the paints and varnish increase in hardness and brittleness, rendering them susceptible to cracking and chipping, and the process of disintegration is aggravated by excessive expansion and contraction of the steel surfaces as compared with wood. The linear expansion of steel being more than twice that of wood would seem to indicate the use of more elastic coatings than formerly used for wooden cars.

This fact has been borne out in the service of the paint in a great many cases in an investigation which recently came under my observation. It was noticed that when some of the equipment had been in service about four months, the interiors of the cars showed varnish cracks and checks. As time went on more cars gave evidence of this deterioration, the final outcome being that an investigation was made to see how serious the condition was. Some 400 cars were carefully examined, special attention being paid to choose cars built by various manufacturers, where different makes of surfacers and varnishes were employed. An endeavor was also made to determine whether the cracking of the painted surfaces was confined to the varnish coats or the surfacer coats, or both. In order to classify the various conditions found, four readings of percentages were arbitrarily taken, the condition of a new car being taken at 100 per cent.:

Per cent.	Condition of Varnish and Surface.
90 to 80	Good, no checking
80 to 70	Fair, slight checking
70 to 60	Medium, considerable checking
60 to 50	Poor, checked from outside varnish coat to metal

Sample cars were selected to illustrate these various classes, and photographs were taken of the different defective surfaces so as clearly to indicate to the eye what the different percentages meant.

The result of this examination showed that the exteriors including the sides, ends and vestibules, were in fair condition There were a few exceptions to this, but they amounted to less than 6 per cent. of the total having serious varnish and surface cracks. Interiors were found generally to be in a poor condition. About 80 per cent. of the equipment examined had the



Exterior of Oven Used for Baking Paint on Steel Cars.

varnish checked through to the surfacer. Some of these conditions developed after four to eight months' service, indicating either that an entirely new system of painting would be necessary to overcome these troubles, or that a more elastic paint would have to be used for interior finishing under the present existing practice of painting steel.

To obtain some data indicating what should be done to meet the conditions, preliminary experiments were made by painting a number of panels and baking them in a heated oven. Repeated experiments along this line indicated that artificial driers could almost, if not entirely, be eliminated in the paint formulae

Steel Car in Oven.

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and that more elastic materials could be used without the aid of artificial oxidizing agents. It was also observed that the elastic varnish used on the exterior of the cars could, under this system, be used to advantage on the interior, and by the aid of the heat of the oven they could be dried to the desired hardness, permitting the rubbing with oil and pumice to get the "flat finish." The outcome of the experiments indicated that it would be desirable to extend the experimental panels to a full size car and, therefore, a proper baking oven was planned that would accommodate one of the largest existing steel passenger cars for the purpose of baking each coat as applied to the exterior and interior surfaces.

This oven, as designed and built by the Pennsylvania Railroad at its Altoona shops, is 90 ft. 3 in. long, 13 ft. wide and 15 ft. high. The framework of the structure is made up of 3-in. I-beams for the sides, spaced 5 ft. centers. The roof framing is made of the same sections and curved to conform closely to the contour of the car roof. Each end of the oven has two large doors which may be readily opened and closed. The oven is lined on the inside with ¼-in. steel plate, and on the outside with galvanized iron of 0.022 in. gage. The 3-in. space is filled with magnesia lagging, thus effecting the needed insulation. The doors are insulated in a similar manner. Along the walls of the interior of the oven are placed 16 rows of 1½-in. steam pipes, and along the floor, close to the walls, are arranged manifold castings with small lengths of pipe tapped into them at right angles. By this means over 2,000 sq. ft. of heating surface is provided. A steam pressure of approximately 100 lbs. to the square inch is used, thus making it possible to get an oven temperature of over 250 deg. Fahr. Rectangular openings, made adjustable, are provided on the sides near the floor line, allowing the necessary admission of air for circulation. Four 8-in. Globe ventilators are spaced at equal distances in the roof and are provided with dampers to regulate the size of the opening. By this means of ventilation, fresh air, which is required for the proper drying of paint, is obtained, as well as providing for the egress of the volatile matter present. Automatic ventilation and steam regulation have not, at the present time, been applied, but these have been considered advisable, if the result of the experiment seems to warrant a more extended application of the practice. A track is placed on the floor of the oven and connected at each end of the oven with other tracks leading into the regular paint shop where the different coats of paint are applied to the car before each baking operation.

BAKING PAINT ON STEEL.

The method of painting a car in this oven is briefly as follows: First, a priming coat is given the exterior and interior of car, which is then moved into the oven and baked for three hours. The temperature at the start is about 160 deg., but rapidly rises at about 1 deg. per min. until a temperature of 250 deg. is reached, requiring about 1½ to 2 hours. The oven is held at this temperature until the lapse of 3 hours, when the car is withdrawn and allowed to cool sufficiently to work upon, after which the surfaces are glazed and depressions and uneven places puttied. The car then receives its first coat of surfacer, is returned to the oven for 3 hours, baked and removed for additional coats which vary from two to three in number as the needs of the case require.

TABLE 1.—TIME SCHEDULE FOR PAINTING EXTERIOR AND INTERIOR OF STEEL PASSENGER CARS.

Period of Work.	Outside. Body.	Roof.	Trucks.	Inside. Body Above Window Sills.	Head-lining.	Body Below Window Sills.
1	1st prime	1st prime	.....	1st prime	1st prime	1st prime
2	Glaze	.....	.....	Glaze	Glaze	Glaze
3	1st surface	.....	.....	Rub-ground	Rub	Rub
4	2d surface	2d prime	.....	.....	.....	.....
5	3d surface	.....	.....	.....	.....	.....
6	Rub	.....	.....	.....	.....	.....
7	1st tuscan	3d prime	.....	2d ground	1st green	1st green
8	2d tuscan	.....	.....	Stipple	.....	.....
9	Stripe and letter	.....	.....	.....	.....	.....
10	1st varnish	.....	Truck	1st varnish	.....	2d green
11	2d varnish	.....	Color	2d varnish	.....	.....
12	3d varnish	.....	.....	3d varnish	.....	1st varnish
13	.....	.....	.....	Rub	2d green	.....
				air dry		

After the last coat of surfacer has been applied and baked, the outside surface of the body of the car is rubbed down with emery and oil to produce a flat and smooth surface. The various color coats used, such as tuscan red on the outside, pale green, bronze, and bronze green on the inside, are then put on. Two coats of each color are required to get standard shades. Each coat of color is likewise baked.

The car then receives the required lettering, striping, etc., after which the outside and inside surfaces get three coats of a high grade finishing varnish, especially adapted for the baking process. Each coat of varnish is baked at a temperature from 120 deg. Fahr. at the start to 150 deg. Fahr., which is maintained until the expiration of 3 hours. The interior surfaces of the car are then rubbed with pumice and oil, giving the "flat finish" effect desired, thus completing the painting of the car. To illustrate better the schedule of operation followed, or the timing of the various coats, both for the outside and inside, to secure the most economical conditions, Table 1 is given.

All of the work done by the baking process of painting may be accomplished in six to eight days, thus effecting a saving in time of about ten days as compared with the standard or present air drying system. Further, the paints and varnishes have been worked up so that they are especially adapted for this baking process, having greater elasticity. Exact formulae for the various mixtures are well defined, so that uniformity in material is expected, thus giving greater durability, better appearance and longer life for the paint work.

The checks and cracking previously found will be considerably lessened, if not almost removed. By oven painting the work is done under more uniform conditions, which at the present time are so hard to control. It enables the surfaces of the car to be heated uniformly and dried thoroughly, thus removing any objectionable moisture before the first priming coat is applied, which is a very desirable feature of the new method.

A considerable saving will be effected by the shorter time that cars will be held out of service when undergoing repairs and repainting in the shops. It is expected that dirt, soot, etc., will not adhere or imbed themselves so readily and that the general appearance of the car will be improved.

This oven was placed in service the early part of this year and the results of the complete car at this time seem to justify the experiment. They seem to indicate that the results obtained from a small panel can be duplicated in the full size passenger equipment car and that, if this is the case, this method of painting can be used to advantage not only for the painting of steel passenger equipment cars, but for the painting of any other full size steel structure of a similar character where protection and finish are desired.

Results and indications at this time seem to justify our expectations that the new process of baking will give, over the present air drying system: (*a*) Longer life of material applied. (*b*) A general appearance as good or better. (*c*) Less cost of material at no increase in the labor charge. (*d*) A considerable saving of time for shopping cars, which results in a saving of shop space. (*e*) Complete sanitation for old cars. These advantages are offset by the initial cost of installation and operating cost of the oven.

TRUCKS FOR PASSENGER CARS.

By JOHN A. PILCHER,
Mechanical Engineer, Norfolk & Western.

Six-wheel trucks. The six-wheel, all-metal truck has the following advantages which make for its selection over other types: It is non-inflammable. It provides a strong material to resist the heavy loads, and occupies only a limited space. It provides a durable material. It reduces the axle loads, and the unit load on the bearings, lessening the liability to hot boxes, reducing the pressure on the brake shoes, lessening the tendency to heat the wheels and shoes, adding to the life of the brake shoes, and reducing the frequency between renewals and adjustments. It spreads the heavier loads over a greater area of

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structure, and brings more points of contact with the rail, reducing the influence of track irregularities on the riding of the car, and in cases of very heavy cars, where the unit pressure between wheel and rail might approximate the elastic limit, reduces the tendency to shell the wheel and roll out the rail, adding to the life of both.

It has been estimated that for a passenger car making 50,000 miles a year, the cost for hauling the car is 5 cents per lb. per year. If the six-wheel trucks weigh 14,000 lbs. per car more than the four-wheel trucks necessary to carry the same car, it means the hauling of 14,000 lbs. additional at a cost of $700 per year, which brings up a question for vital consideration. While the wheels, brasses, and brake shoes, and other such removable parts may individually have a longer life, there are also more of them in service during the period. Careful comparison would have to be made to determine which has the advantage at this point.

Four-wheel trucks. The four-wheel, all-metal truck is also available in connection with steel cars, and has the advantage of reduced first cost, reduced weight, smaller number of parts to maintain, and if the car is sufficiently light for the unit stress between the rail and wheel to be kept down to a point well below the elastic limit of the material, they should be given serious consideration. The only drawback under these conditions is the possibility of its reduced riding qualities. Its decided advantage in reducing the weight of the train should help to make it a favorite because of the corresponding reduction in the cost of transportation.

Cast-steel vs. riveted wrought-steel frames. The cast-steel one-piece frame has become a great favorite even in the face of the high unit cost of these castings. The adaptability of the castings to the various changes of form and section necessary on account of the limited available space has no doubt had much influence. The attractiveness of the one-piece structure, eliminating all joints, and furnishing a frame ready set up, is another strong argument in its favor. The manufacturers having control of this cast-steel truck frame have evidently been successful in reducing to a minimum the concealed flaws often met with in steel castings. This, no doubt, has added largely to its popularity.

While the absence of riveted joints and the consequent doubling of material at the joints helps to keep down the weight, the fact that the working fiber stress of cast steel is low, and the sections at many points have to be made larger than is necessary on account of foundry limitations, the weight of the frame as a whole is great. This added to the large unit cost for special steel castings makes the user pay well for the advantages gained.

The riveted wrought-steel frame seems to have been held back in its development by the success of its rival in cast steel. Many users have shown conservatism in making use of the good thing already considered acceptable, hesitating to try out the different construction with the hope of lower first cost, with less weight, and equally good service. Wrought steel at a very moderate unit cost has the advantage of a very reliable material which can be worked to a relatively high fiber stress. The cost of fabrication, when the work is done in any large quantity, when added to the cost of material, will still leave a large margin in its favor. Is it possible that the lack of a specially interested advocate has prevented its virtue from becoming prominent, and delayed the experience needed to prove, in actual service, its worth? We find that practically all of the prominent car builders have already worked up designs for wrought-steel trucks, and are ready to construct them if the purchaser so desires, but they do not seem inclined to push them, as they evidently offer no special inducement to their own advantage.

Experience of several years of careful comparison of the cost of maintenance will be needed to say whether the one-piece cast-steel frame, or the riveted wrought-steel frame truck would be the most advantageous, when both the first cost and weight could be considered along with the cost of maintenance.

Wheels. For passenger service, the wheels have been practically narrowed down to steel tired wheels and wrought-steel wheels. The steel tired wheels have been of many forms of centers and fastenings; the latest recommended practice of the Master Car Builders' Association is that the tire be shrunk on and bolted. The recent development of the solid wrought-steel wheel has made available for passenger car service a wheel equally as safe and durable as the steel tired wheel at a very much reduced cost.

Axles. For passenger service we would recommend the use of from 60 to 75 per cent. of the loads used in freight service on M. C. B. axles, based on the light weight of the car, and limiting the load to about 90 per cent. of that in freight service, considering the weight of both car and lading. The lighter rating is, of course, to be taken for cars such as baggage and express, since the increased weight on account of lading would be heavier, while the higher rating could be taken for coaches and similar cars where the increase of the lading would be light.

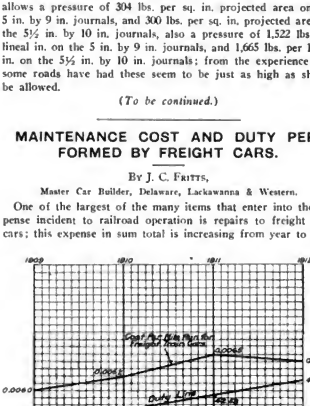
The Postoffice Department has limited the maximum load per wheel for postal cars to 15,000 lbs. when using 5 in. by 9 in. journals, and to 18,000 lbs. when using 5 in. by 10 in. journals, making a further limitation based upon 18,000 lbs. as the maximum brake load for any one cast-iron brake shoe under emergency conditions of brake application. This limitation of wheel loads, after deducting the weights of the wheels and axles, allows a pressure of 304 lbs. per sq. in. projected area on the 5 in. by 9 in. journals, and 300 lbs. per sq. in. projected area on the 5½ in. by 10 in. journals, also a pressure of 1,522 lbs. per lineal in. on the 5 in. by 9 in. journals, and 1,665 lbs. per lineal in. on the 5½ in. by 10 in. journals; from the experience that some roads have had these seem to be just as high as should be allowed.

(To be continued.)

MAINTENANCE COST AND DUTY PERFORMED BY FREIGHT CARS.

By J. C. FRITTS,
Master Car Builder, Delaware, Lackawanna & Western.

One of the largest of the many items that enter into the expense incident to railroad operation is repairs to freight train cars; this expense in sum total is increasing from year to year.



Showing Comparative Trend of Maintenance Cost and Duty Performed by Freight Cars on the Delaware, Lackawanna & Western.

It has been claimed that it has increased in a proportion far in excess of the work performed by such cars, the work referred to being considered only from a standpoint of tons carried per car. This, it would seem, is not correct, although it is obviously of interest to know whether the duty performed by freight car

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equipment is increasing in the same proportion as the expense incident to the maintenance.

It is the practice of railroad statisticians to prepare figures comparing the cost of maintaining freight car equipment from year to year either on a unit basis or on a per-car-mile basis, and it is questionable in either instance if it can be determined from such figures whether the duty performed warrants the increased cost. The unit basis of comparison is of little value. A railroad may spend an average of $50 per car for maintenance of freight train cars one year, and the following year spend $60 per car; still the equipment may be performing service that would warrant the increased cost. The cost-per-mile basis is misleading, inasmuch as no distinction is made as to the capacity of cars in service or of the main tonnage.

There are many features that influence the expense incident to car maintenance, and when comparative figures are prepared for the information of those interested, it would seem desirable to show more than the mere cost per unit per annum or per car mile, and that in addition to such figures the duty performed should be given, so that reasons for the increased costs would be apparent.

A 25-ton car will be much less expensive to maintain than a 50-ton car, and roads that make a practice of handling short trains should maintain their equipment cheaper than those where long and heavily laden trains are the rule. Therefore, information relating to the duty performed should be as comprehensive as is consistent with existing conditions.

It is realized that if all conditions that enter into the operation of freight train cars were considered in preparing comparative figures, the result would be so complicated that it would be difficult to understand, but it is believed that the three principal items that enter into the matter of duty performed by car equipment should be considered, i. e., car mileage, car capacity, and average tons per train.

The diagram indicates the cost per mile per car for maintenance for the calendar years 1909 to 1912, and also the duty performed by the equipment during the same period, on the Delaware, Lackawanna & Western. The formula used in obtaining the figures shown by the "Duty Line" is as follows: Average mileage per car multiplied by the average capacity per car multiplied by the average train tons divided by 4,000,000. (The figure 4,000,000 has no significance; it is merely used to reduce the result to a figure more easily handled.) The result shows that, while the cost per car mile for repairs has increased 6.6 per cent., the duty performed by the car equipment has increased in the same period 19.9 per cent.

AUTOMATIC STOPS AND AUDIBLE SIGNALS.

The New York, New Haven & Hartford, which a few weeks ago announced that two automatic stops were to be tried on the lines of that company, advises that the two devices referred to are those made by the Union Switch & Signal Company, Swissvale, Pa., and by the International Signal Company, New York. In connection with this announcement it will be of interest to review the general situation, as regards progress in the matter of automatic stops. The following notes summarize the principal news items which have appeared since the issue of the *Railway Age Gazette* of September 20 last, when a list was given of the roads on which experiments were being made. In the present account, we are including the audible distant signal of the Federal Signal Company, as this device is designed to perform substantially the same function as that fulfilled by the automatic train stop.

The account published in September, page 506, contains the names of ten roads on which automatic stops are in regular use. These ten are the Boston Elevated; the Erie; the Great Western of England; the Hudson & Manhattan; the Interborough, of New York; the Long Island; the Pennsylvania; the Philadelphia Elevated; the San Francisco, Oakland & San Jose; and the Washington Water Power Company. The Erie must now be taken out of the list of roads on which automatic stops are in regular operation, as the overhead stops which were in use on that road for several years have been taken out of service. On the portion of line where this apparatus was used, automatic block signals have lately been installed; and it was not deemed advisable, in this location, to rebuild the automatic stop apparatus so as to make it operative in connection with the automatic signals. In connection with the Great Western of England, it should be noted that the number of automatic stops is small; but the number of cab signals in use is considerable.

The Maryland & Pennsylvania is to be added to the list of roads on which automatic train stops are in regular use. The Jones system, made by the Jones Safety Train Control System Company of Baltimore, is now in regular service on that road from Baltimore, through the yards and for several miles northward, and is reported as giving satisfactory service. Nine locomotives are equipped.

The Jones apparatus has been in experimental use for over a year. It is worked by means of an intermittent contact rail. The contact rail is fixed on the sleepers outside of the running rails of the track, and is engaged by shoes depending from the tender truck, one shoe being used for the stopping apparatus, and another for the cab signal. Besides the contact rails fixed at points where the brakes are to be applied, there are separate contact rails for the caution shoe and the stop shoe, the caution rails being placed a sufficient distance in the rear to warn the engineman that he is approaching a stop rail, and giving him an opportunity to apply the brakes before he reaches the stop rail, if the block ahead is occupied. There is also an additional caution rail immediately in the rear of the stop rail, and if the engine is brought to rest with the contact shoe touching this rail, a proceed signal will be given as soon as the track ahead is clear. This prevents the operation of the automatic stop except in cases of emergency.

The cab signal consists of a dial and a miniature semaphore; and there are two electric lights, of different colors, to indicate proceed and stop. The plan provides for a bell to sound whenever a caution rail is passed.

The stop rails and shoes can be so arranged, that if a train is running below a certain speed it can pass the stop rail without operating the automatic valve. This has been installed on this road on only one engine, for demonstrating purposes.

The electric features of the apparatus are arranged on a "closed circuit" plan, so that any interruption of the electric current will operate to give a stop signal and "stop." The arrangement of the circuits on the engine is such that when the block is clear, a current from the track is picked up, through the contact rail, located at the entrance to a block or elsewhere, and substituted for the battery current in the engine circuits, thus maintaining the cab signal and air-brake valve mechanisms in their normal running positions. If the track current is short circuited, as when the block ahead is occupied, the cab signal or the brake valve, as the case may be, is operated by the lifting of the shoe on the contact rail.

The September list referred to above included nine roads on which experiments had been made or were being made, two of these being roads which also appear in the list given in the preceding paragraph. These nine roads are the Canadian Pacific; the Chicago, Burlington & Quincy; the Chicago & Eastern Illinois; the Detroit River Tunnel; the Interborough Rapid Transit Company; the New York Central & Hudson River; the Pennsylvania; the Pennsylvania Lines west of Pittsburgh; and the Staten Island Rapid Transit Company.

On the Chicago & Eastern Illinois, the Miller automatic stop apparatus is nearly ready for use, and will probably be operated experimentally within two weeks or less. The work has been delayed by the floods.

The experiments on the Niagara Falls branch of the New York Central have been finished.

Of roads on which something new has been done since Sep-

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tember there are ten. These are the Chicago Great Western; the Cincinnati, New Orleans & Texas Pacific; the Delaware & Hudson; the Delaware, Lackawanna & Western; the Denver, Northwestern & Pacific; the Erie; the Huntingdon & Broad Top Mountain; the Indianapolis & Cincinnati Traction Company; the Maryland & Pennsylvania (see above); and the New York, New Haven & Hartford. It will be seen that the total number of roads represented in these three lists is 26.

Chicago Great Western.—The experimental use of the Gollos automatic stop on this road was reported in the *Railway Age Gazette*, November 1, page 849.

C. N. O. & T. P.—The Buell automatic stop is in experimental use on this road.

Delaware & Hudson.—An audible signal, made by the Federal Signal Company, is being installed near Troy, N. Y. It is the outcome of the proposal made by Mr. Cade last autumn, and noticed in the *Railway Age Gazette* of September 27, pages 562 and 569. It is an audible distant fixed signal designed to give an alarm loud enough to command the attention not only of the firemen (in case the engineman is incapacitated) but also the conductor and all other persons on the train. In a box located at and connected with the distant semaphore (or, in the case of three-position signals, with the caution indication) there is a magazine of 104 very loud torpedoes. These are fixed within the box in a movable frame in such a way that the frame, when released, as the signal goes to the caution position, will fall by gravity; and in falling it will actuate successively four hammers, at intervals of a half second, each hammer exploding a torpedo. Thus the magazine, it will be seen, contains a supply for twenty-six operations. As the engine enters on the track circuit which begins at this signal it de-energizes a track relay; and the dropping of the relay armature is arranged to so affect the magazine that it will fall. But it is the duty of the engineman to prevent this operation, by another operation, carried out by means of a short electrical conductor and a third rail, fixed at the side of the running rail of the track. The engineman, by depressing a movable member on the engine, and thereby making electrical connection between this short rail and the running rail, prevents the audible signal from going into operation. The lever by which the engineman performs this cutting-out operation is so arranged that he cannot move it until he has first shut off steam (or applied the brakes, or both, as may be deemed desirable). Being alive and attentive to the visual signals, he will habitually cut out the audible signal, and it should never be called into operation. In other words, if the apparatus is maintained properly and the engineman never fails, the signal will never sound. With such an arrangement, regular tests will be made to give assurance that the apparatus is in working order. Additional details of this scheme are described or suggested in the article referred to above, but these have not yet been sufficiently developed to be further described at the present time.

Delaware, Lackawanna & Western.—On this road an experimental installation of the International automatic stop is being made. This was briefly described in the *Railway Age Gazette* of December 27, page 1273. The fixed or stationary ramp used in this system is about 20 ft. long and its upper surface is about 5 in. higher than the top of the track rail; it is placed from 12 in. to 18 in. outside the track. In the case of an engine moving in the direction opposite to the current of traffic, the plunger is not lifted by the ramp. The other roadside member, the one which is controlled by the condition of the track ahead, consists of a horizontal arm, supported on a post about 19 in. above the rail. The post is set 3 ft. 7 in. outside the track. The arm moves around in a horizontal plane. Mr. Webb proposes to arrange the air valve so that, when opened, it cannot be again closed by the engineman until he stops his train and descends to the ground. He also proposes another arrangement in which the engineman may close the valve, provided the speed of his train has been reduced to a pre-determined rate, and, also, a third scheme, so arranged that the engineman may close the valve at once; that is to say, he will be allowed at all times to use his own judgment in the regulation of speed, after the air valve has been opened by the stopping apparatus, the opening having given him an audible warning.

The Federal Signal Company's audible signal will also be tried on the Lackawanna.

An automatic stop recently brought out by the Union Switch & Signal Company is to be tried on this road. It is a mechanical trip apparatus, and will be arranged to operate under limitations regulated by the speed of the train. If, for example, a train passes a distant signal at an excessive speed, it will be stopped at a certain point beyond; while, if the speed at the distant signal is within the prescribed limit, the stopping apparatus will not go into effect. The engineman, therefore, finds the same condition that is found by the motorman on the trains in the Interborough subway, where speed-control apparatus is applied to a succession of signals, with automatic stops, located at very short intervals, approaching the stations on the lines where the express trains have to be run less than two minutes apart, and so must "close up" at the stations. As long as he obeys the speed limit rule, he finds clear signals ahead of him, if the section ahead is clear; but if he exceeds this limit he is stopped, because he reaches the next stopping point before the automatic stop has been made inoperative by the time-limit apparatus.

Denver, Northwestern & Pacific.—An apparatus made by B. F. Wooding has been used on this road for several months. Its peculiar characteristic is the contact rail, lying alongside the running rail. It is a comparatively thin blade, placed vertically. It is covered by another rail lying alongside and pressed against it by springs. This second rail, in section, is in the shape of an inverted L, pivoted at its lower edge so as to turn on an axis parallel to its length. The short member of the L protects the fixed rail from ice and snow. The member carried on the locomotive passes between these two rails, pushing the cover-rail to one side, and thus makes electrical contact with both the fixed rail and the cover, throughout their length. The contact rail is not straight, but for a part of its length bends away from the track; and by means of this change of direction, which gives a slight sidewise movement to the member depending from the engine a mechanical as well as an electrical effect is produced on the engine.

Erie.—Preparations are being made for an experimental installation of the induction apparatus of H. D. Patterson of New York. Mr. Patterson puts the primary of a transformer on the engine and the secondary is fixed on the roadbed. There is nothing movable on the ground.

Huntingdon & Broad Top Mountain.—The experiments of the Safety Block Signal Company on this road were described in the *Railway Age Gazette*, January 31, page 216.

Indianapolis & Cincinnati Traction.—The despatcher's manual block system, with cab signals, made by the Northey-Simmen Company is in use on this road, and in connection with it there is an experimental installation of automatic stops. (Five other electric roads have contracted for the Simmen cab-signal and despatching system.) An account of the Simmen apparatus, with some illustrations, was given in our issue of September 20, last, page 516.

New York, New Haven & Hartford.—The apparatus of the International Signal Company and of the Union Switch & Signal Company, noted above, are both to be tried on this road.

Pennsylvania Lines West of Pittsburgh.—The Gray-Thurber apparatus, installed on this road some time ago, has been changed in some of its details and will be tested within the next few weeks. The automatic stop of the Union Switch & Signal Company is to be tried also on this road.

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NATIONAL VALUATION CONVENTION URGED.

Concerted Action Should Be Taken to Make Appraisal of Railways Economical, Intelligent and Just.

By H. Bortin.

On March 1 the United States Senate passed a federal valuation act which had been passed by the House, and which was signed by the President the same day, and thus became a law. Compliance with this act will involve an expenditure of about $5,000,000 by the Interstate Commerce Commission, and at least three times as much, or about $15,000,000, by the railroads of the country, during the next three to five years, depending on the degree of thoroughness and accuracy with which the work of valuation shall be done.

The above estimates, although based on the cost of similar work done by state railway commissions and railways, are, nevertheless, susceptible of considerable increase or decrease, depending on considerations to be treated below. To be more specific, it may be said that instead of this work costing $5,000,000 and $15,000,000, it might be made to cost either $3,000,000 and $9,000,000, or $6,000,000 and $18,000,000, according to the amount of preliminary study and investigation given to the subject, and the efficiency and experience of the organizations formed to do the work, as well as on the adaptability of the organizations to this kind of work.

The ultimate expense to the government will consist largely of the cost of checking the railroads' figures and re-arranging and re-compiling them for statistical and other purposes, while the ultimate expense to the railroads will consist of many different items, chief among them those for doing field work; making up new maps and profiles; making blue prints of maps and profiles, both for use in the valuation and to be returned to the Interstate Commerce Commission; making computations from data taken in the field, and classifying and compiling them; abstracting information from existing records and compiling it uniformly with that obtained from the field notes; and, finally, checking and summarizing all of the details involved in the above.

The ultimate expense of the foregoing, both to the government and to the railroads, will depend in a large measure on the extent to which existing information is utilized; in the case of the railroads, on the extent to which they utilize the information contained in their records, and in the case of the government on the extent to which it utilizes the information furnished by the railroads.

In an undertaking of this magnitude, which is as yet in a developmental stage, there always exist at least three equal possibilities as to ultimate cost, these being as follows:

(1) A fairly low cost which indicates, and is the result of, thorough preliminary study and investigation, and of an efficient and experienced organization.

(2) A rather high cost which produces quite a marked effect upon all those who have to bear the expense, and which is the direct result of insufficient preliminary study and investigation, and of inefficient and inexperienced organization.

(3) A somewhat moderate cost, that is, a cost which would reflect conditions such as mentioned under each of the above categories; such a cost, for example, as mentioned in the first paragraph of these remarks.

Now, it rests entirely with those who are responsible for the authorization of these expenditures as to which of the above marks the ultimate cost will reach.

The valuations that have been made in a few states have cost the railway commissions making them anywhere from $10 to $20 per mile, and the railroads furnishing such valuations to the commissions, two to four times that much, according to the degree of thoroughness with which they have been made, and the amount of field work that has been done. When it is remembered that all these valuations were merely reproduction valuations, and therefore involved only a small portion of the work that will be necessary in order to comply with the provisions of the federal valuation act, it will readily be seen that the cost to the railroads might very easily run up to an average of $75 per mile or more, and the cost to the government to $25 per mile.

Comparatively few railroads in this country have made valuations, and but a very small part of those that have done so, have had any kind of an organization exclusively engaged upon such work. Therefore, there are only a handful of railroad men in this country who have had any experience in this kind of work and who have kept in close touch with the literature of the subject. Furthermore, they have been so widely scattered that there has been no uniformity in their understanding and interpretation of many of the important elements and factors entering into a valuation.

It is, therefore, of great importance to all the railroads of the country that a definite program be planned and laid out before each road starts out an organization upon this work.

At a recent convention of the National Association of Railway Commissioners, a report was read in which the opinions of the engineers and experts of the various commissions who had made valuations regarding the various elements entering into valuation of public utilities were set out in detail, and it was very manifest that there was a wide difference of opinion regarding most of the important elements. The same condition is true as to the engineers of the various railroads. They differ just as widely regarding certain questions of valuation. It is needless to say that such differences exist as between representatives of the railroads and the experts of the railroad commissions. This clearly shows the urgent need for extensive study and investigation of the different phases of this subject by a national, representative and competent organization.

While it is only intended, in this article, to call the attention of the railroads and the Interstate Commerce Commission in a general way, to the urgent need of the creation of a national valuation committee, or commission, or association composed of men experienced in valuation matters as well as in matters involving a knowledge of economics and of transportation, it might nevertheless be well to point out specifically a few of the many important problems that must be solved in making a valuation. And it might be said right here, that unless most of these problems are solved beforehand—and they are easily susceptible of solution by such a national valuation organization as is here to be recommended—they will be solved individually by the hundreds of railroads making valuations and at an enormous expense; and the final results will differ so widely and radically that when they ultimately come up for adjudication by the Interstate Commerce Commission or by the courts, a large number of them will have to be entirely revised and altered, which will add tremendously to the ultimate cost. Nor is this a mere theoretical statement. On the contrary, it is based on experience which is bound to be repeated unless it is properly guarded against.

Among the most important needs is a uniform definition and interpretation of the following terms, together with the specific enumeration of the elements embraced by each:

Cost of reproduction, new.
Cost of reproduction less depreciation.
Present value.
Original cost.
Actual cost.

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Original cost plus additions and betterments.
Commercial valuation.
Intangible items.
Non-physical items.
Physical items.
Adaptation, solidification and seasoning.
Going value.
Development cost.
Deficit below a fair return.
Interest during construction.
Engineering.
Contingencies.
Franchise value.
Working capital.
Unearned increment.

In addition to the need for a more or less uniform interpretation of the above terms—where such is possible—it is equally important that questions such as the following be considered and discussed and agreed upon if possible, among these being:

(1) What are to be the basic theories and assumptions that must inevitably be made in undertaking a "reproduction cost" valuation? For example, should it be assumed that in reproducing a road, a partly completed portion will be turned over to operation, or should it be assumed that nothing would be turned over to operation until the entire road is reproduced?

(2) What is to be the dividing line, if there is one, between physical, and intangible or non-physical, items?

(3) How is "depreciation" to be considered in a valuation?

(4) What should be the "program of construction" for "reproduction valuation" purposes, and to what extent is it to be followed in determining sources of material, labor, and freight charges?

(5) How should the construction period during which there will be no revenues from operation be determined for purposes of ascertaining interest and other charges dependent upon the period of construction?

(6) How should apportionment be made of each kind and class of property between the several states and the several sections within the states, as well as between the several accounts embracing such property?

(7) What unit prices should be used? The average for the preceding year or five years or what?

(8) What methods should be used in valuing right-of-way, station and terminal grounds and real estate?

(9) How should government-granted lands and vacated streets and alleys owned or used by the railroads be treated?

There are many more equally important questions which the limitations of this article do not permit mentioning. There is, however, one subject that cannot be properly omitted, and that is the question of forms for field data, for office compilation and for final return to the Interstate Commerce Commission. This matter is of even more urgent and immediate importance.

When it is considered that the above represent only a few of the points that require discussion and interpretation in a "reproduction cost" valuation, and when it is remembered that the "original cost," stock and bond value, and all the other factors called for in the national valuation act will require even more of study, investigation, discussion and interpretation, it will readily be seen how extremely important and urgent is the need for a national valuation organization.

In view of the foregoing the following suggestions concerning an adequate organization, are offered:

First, that each railroad system engaged in working up the information required by the national valuation act appoint two committees, one to be an "advisory committee," and the other a "working committee," the advisory committee to be made up somewhat as follows:

(1) The chief engineer or his principal assistant.
(2) The general counsel or one of his principal associates.
(3) The auditor or one of his principal assistants
(4) The superintendent of motive power and machinery or his principal assistant.
(5) A responsible representative of the executive's or comptroller's office.
(6) The valuation engineer, who should be secretary of the committee.

The working committee to be made up somewhat as follows:

(1) The valuation engineer (above mentioned) chairman.
(2) An assistant in charge of accounting and historical features.
(3) An assistant in charge of engineering department features.
(4) An assistant in charge of stock and bond and securities features.
(5) An assistant in charge of "reproduction" cost valuations "to date" and the working up of all other features in a uniform manner.

The great advantage of an organization of this kind lies in the fact that it would insure thorough and authoritative results and would prevent considerable duplication of interdepartmental work involving great expense.

Second, that a national valuation convention be assembled at a very early date, to be constituted somewhat as follows:

(1) One valuation engineer from each railroad system in the country.
(2) The valuation committee of the American Society of Civil Engineers.
(3) A valuation committee of the American Railway Association.
(4) A valuation committee from the American Railway Engineering Association.
(5) A valuation committee from the National Association of Railway Commissioners.
(6) A valuation committee from the Interstate Commerce Commission.
(7) Those private consulting engineers of the country who have been engaged in the valuation of public utilities.

Third, that a committee of seven, to be made up of one member from each of the seven classes of representatives above described, be given the authority to name temporary officers for the convention and to act as a nominating committee during the course of the entire convention.

Fourth, that everyone attending this convention as an accredited representative come prepared to bring up and discuss in concrete form, all questions that have come up in the course of their valuation experience, particularly with reference to desirable methods and organization for the purposes of this national valuation.

Fifth, that committees be appointed or elected for both the purposes of expediting the work of the convention and for continuing the work for which the convention was assembled; these committees to have their meetings stenographically reported and the minutes issued as bulletins not later than one week after each meeting of each committee is held.

Sixth, that at this convention a permanent organization or association be formed and officers elected. This association to convene again in six months, and annually thereafter.

As previously stated, the limitations of this article do not permit of going into many important details, and therefore it has been the aim and purpose merely to point out in a general way a few of the more important and immediate needs of both the railroads and the Interstate Commerce Commission towards working up a satisfactory program for the economical and efficient prosecution of the federal valuation; and it is hoped that these remarks and the resulting discussion and comment will crystallize into some definite and well thought out action.

The above remarks are written with a full realization that the suggestions contained therein will meet with some opposition from many railroad officials, engineers, experts and others, mostly on the ground that they seem rather novel, which to many people is synonymous with the word impracticable. At the same time it is quite certain that there will be as many more

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who, because of their more intimate knowledge of the subject, will agree that there is an immediate need for some concerted action somewhat along the above lines. Of this the writer feels convinced, and the conviction is founded on intimate knowledge and experience gained during three years in which he has been constantly in charge of making valuations, explaining them to railroad commissions, taking an active part at valuation conferences, and keeping in touch with the work done by others through the literature on the subject.

Whether the above suggestions meet with favor or with opposition is of relatively small importance. The main object of this article, as stated before, is to bring this phase of the subject before all those who are vitally interested; and it is hoped that it will bring forth discussion which will ultimately tend towards economy and efficiency.

ARBITRATION OF THE FIREMEN'S WAGE CONTROVERSY.

In the arbitration proceedings at the Waldorf-Astoria Hotel, New York, on Thursday last, W. S. Carter, president of the firemen's brotherhood, began his summing up of the case. He said that those eastern railroads which have not yet put the ten-hour day into effect should be made to do so, if for no other reason than that of uniformity.

Referring to the railroads' statement that the granting of the men's demands would standardize the rates of wages for all the firemen on the roads involved, regardless of the roads' ability to pay the increased rates or the efficiency of the individual men, Mr. Carter said: "We do not ask the same rate of wages for all firemen on these 54 roads. Our demands are based on a scale divided into twelve groups asking for a separate minimum rate for each of the classes of service set forth. The groups are so arranged that the men on the larger engines, having a greater productive efficiency, shall be paid a higher minimum rate than the men on the smaller and less productive engines. Thus it cannot be said that we are asking the same rate for the fireman whose labor is not as productive of revenue as his brother fireman whose efficiency and productive ability is much greater. The scale of wages set forth in the demand is classified according to the weight of the locomotive on drivers which we are emphatically of the belief represents in the most practical and fairest way the productive power to the roads."

Referring to the plea of the railroads that they were financially unable to grant the demands, Mr. Carter said: "I don't know of any other class of employers but the eastern railroad managers who would ask their men to work for less because their balance in the bank was decreasing. The poor or small road generally uses a smaller size engine, and the rate which we ask this commission to award us is based on the size of the engine."

The western roads, he claimed, have always been more liberal in their treatment of labor in wage controversies than the eastern roads. "Nobody has said, up to the present time," Mr. Carter continued, "that our demands are excessive, and we think we have been more than fair in asking for rates slightly less than those that are being paid on the western roads. There has been much criticism directed at the Erdman act method of arbitration by the roads on the ground that it generally resulted in a compromise being effected. Gentlemen of the commission, we do not ask for a compromise in this case; we do not want you to split the difference. If we are entitled to all that we ask for give it to us. I trust to the wisdom and justice of this commission."

In concluding the case for the railroads, on Saturday last, Elisha Lee, chairman of the conference committee of managers, said: "Since these arbitration proceedings started, the situation of the railways has undergone great changes. The most startling of these has been through the floods of the Middle West. The entire railway system of Ohio and Indiana was practically put out of business for five days. On the Pennsylvania Lines West of Pittsburgh an aggregate of a mile and a half of steel bridge work was washed away, and we understand the New York Central and Baltimore & Ohio will each have to pay out more than $3,000,000 in repairs to property alone. To repair and replace the railways affected by this disaster will practically wipe out the surplus earnings of many railroads. In other cases dividends will be threatened. The reason is, of course, that all such damage must be retrieved out of current earnings and cannot be charged to capital. There was never a more striking nor more unexpected object lesson of the absolute necessity for a railway company to earn a surplus adequate to protect its credit and enable it to take care of expensive emergencies.

"Since this board was constituted the state of New Jersey has passed a law providing that the cost of all grade crossing removals shall be borne by the railroads alone. To carry the law out fully would cost one company alone $60,000,000—so it has been publicly stated. A few days ago the state of New York passed an extra crew law—and we understand it was supported by our firemen friends—which is expected to cost the railroads of that state some $2,000,000 per year. New Jersey followed suit with a similar law expected to cost about $500,000 per year.

"It has been urged that railway labor should be more highly paid and that to make this possible freight rates should be raised. Without urging the question as to whether the rising costs of materials, wages, and even capital itself, do not justify increasing rates, we can, nevertheless, urge that even this remedy would be no panacea for this circle of increasing railway wages. The move would go on all the stronger. When the public, through commissions, through mandatory legislation or through arbitration under the law, assesses additional payments to be made out of railway revenues, that same public in effect levies an additional tax upon itself—unseen and intangible for the moment, perhaps, but inevitable in its effect. This public little realizes how agencies acting presumably in its behalf are piling up the burdens on the railroads. That public dimly imagines that it is the capitalists of Wall street who are being injured.

"But it is not so. The railway managers of the country are fighting the battle of the public—that public which is entitled to have efficient transportation facilities at reasonable rates. It is entitled to enjoy rates based upon real capital invested. It should pay rates which will yield proper wages to railway labor and a sufficient return upon the capital necessary to provide proper facilities. But this is the fundamental question this board has to answer—it is, indeed, the fundamental problem which the public itself must solve:

"Shall we, in our desire to escape the rocks of both Scylla and Charybdis, steer far away from the possible payment of undue returns upon railway capital that we may be wrecked through arbitrary additions to railway expenses both by legislation as well as by such movements as this, designed, as we believe, to give a class of men more than their proper share of the funds available for the payment of wages?"

The terms of the award will be made known by April 23.

ROME TO NAPLES RAILWAY.—Works are now in progress on different points of the new line from Rome to Naples through Pozzuoli, which it was decided to construct after the government took over the private railway companies in 1905, in order to do away with the present detour through Frosinome, and ensure better communication between the two Italian cities. The total length will be 133 miles, against 155 miles by the existing route, and the total expenditure involved is estimated at $26,600,000, apart from the $1,600,000 which will be required for improving and transforming the central station which is located at Naples.

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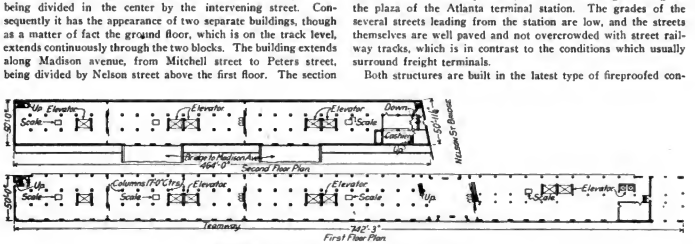
SOUTHERN RAILWAY FREIGHT STATION AND OFFICE BUILDING AT ATLANTA, GA.

The Southern Railway has completed an inbound freight station and office building at Atlanta, Ga., which is of the most modern construction. The building extends for two city blocks, being divided in the center by the intervening street. Consequently it has the appearance of two separate buildings, though as a matter of fact the ground floor, which is on the track level, extends continuously through the two blocks. The building extends along Madison avenue, from Mitchell street to Peters street, being divided by Nelson street above the first floor. The section

livery of freight, ample facilities for the reception of freight for shipment being provided by the company's three outbound freight stations, one located just west of the new building and running its entire length, and the others at convenient points for shippers in different parts of the city. The new station is located in the center of the city, close to the financial and the wholesale and retail business districts, and within easy reach of the main lines of electric railway traffic, the office building fronting on the plaza of the Atlanta terminal station. The grades of the several streets leading from the station are low, and the streets themselves are well paved and not overcrowded with street railway tracks, which is in contrast to the conditions which usually surround freight terminals.

Both structures are built in the latest type of fireproofed con-

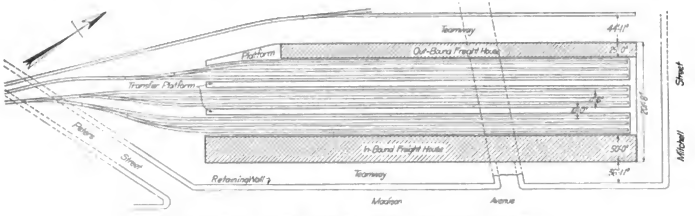


Floor Plans of New Freight Station at Atlanta, Ga.

between Mitchell and Nelson streets is six stories high, and that between Nelson and Peters streets three stories. For convenience the six floor section will be referred to as the office building, and the three floor section as the freight building. Construction work was started on March 21, 1911, and was carried on continuously, the freight building being ready for occupancy on September 1, 1912, and the office building, December 1, 1912. Both sections of the building have been so constructed as to permit the placing of additional floors in the future.

The office building houses the various departments located in Atlanta, including the assistant to president, the assistant freight traffic manager, the general freight agent, the assistant general

struction. The freight building is of reinforced concrete throughout—footings, columns, walls, floors and roof. The office building has a reinforced concrete frame, including footings, columns and floors, the space between the exterior columns and around them being filled with pressed brick. All partitions between rooms are built either of concrete, brick or hollow terra cotta tile. In the freight rooms of the freight building there are brick fire walls at intervals of about 150 ft., the few openings in which are automatically closed in case of fire by rolling doors covered with sheet steel, so as to confine any fire which may break out entirely to one compartment. The many doorways in each freight room required for the rapid receipt and delivery of



Plan of Southern Freight Houses and Track Connections at Atlanta.

freight agents, the assistant general passenger agent, the coal freight agent, the live stock agent, the superintendent, and other traffic and operating officers who have been located in different office buildings. The four upper floors furnish space for these offices, while the two lower floors, that on the track level, and that on the street level are used as part of the inbound freight station. The freight building is given over to freight station purposes, with the exception of portions of the second and third floors, which are used for the offices of the local freight agent and the stationery department.

This inbound freight station is used exclusively for the de-

freight are closed by rolling steel shutters, and the transoms above the doors have steel bar frames and are glazed with wire glass. In both buildings all windows which may be exposed to fire in neighboring structures, such as on the track side and on the Nelson street face have steel frames and sash, and are glazed with polished wire glass. The stair halls in the freight building are entirely disclosed by concrete walls, the stairs are of concrete, the doorways have steel frames and the doors are covered with sheet steel. All freight elevator shafts have steel encased sliding doors. All freight rooms have standard fire plugs connected to the fire mains so that although no part of the structure itself

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can burn, every precaution has been taken to restrict any fire which may start in the merchandise stored in the buildings to the room in which it started.

The freight building extends from Nelson street viaduct south towards Peters street viaduct for a distance of 464 ft. It has a width of 50 ft., and is three stories high, the total height above the driveway level being about 47 ft. The lowest or first floor is the one on which all freight will be removed from the cars and transferred to drays on the opposite side of the building. On this side a granite paved driveway having a minimum width of 36 ft. extends from Garnet street on the south, under Nelson and Mitchell streets and the Atlanta terminal station to Madison avenue near Hunter street on the north, which will permit the handling of a vast amount of traffic without undue congestion. Freight may also be carried by any one of the five elevators in the building, each having a capacity of 8,000 lbs., to the second floor where two bridges span the low level teamway just described, and enable vehicles to drive up to the building direct from Madison avenue. Each of these bridges has a width of 65 ft. between curbs, and is paved with creosoted wood blocks on a waterproofed concrete floor.

The entire lower floor of the freight building, and about two-thirds of the second floor are to be used for freight rooms, the total area being slightly over 39,000 sq. ft. The local agent's office will occupy the Nelson street end of the second and third floors, an area of 12,600 sq. ft. The stationer will occupy about half of the third floor, and about a quarter of the second floor, an area of about 18,000 sq. ft. The part of the building which is to be used for offices is finished in oak, and has all the equipment found in modern office buildings of the highest class.

The office building is situated between Mitchell and Nelson streets, having a length of 237 ft., a width of 50 ft., and a total height above the teamway paving of a little over 91 ft. The lower or track level floor, and about three-fourths of the second floor are to be used as freight rooms, the remainder of the building being devoted to office use. The floor area for freight purposes is about 19,100 sq. ft., and that for office purposes about 49,000 sq. ft. The equipment of the freight rooms is similar to that in the freight rooms of the freight building, except that there are but two freight elevators in this building. On the second floor there are two bridges spanning the low level teamway and affording a direct connection with Madison avenue, each having a clear width between curbs of 31 ft., or approximately one-half the width of those of the freight building.

The offices on the second to the sixth floors inclusive are reached either by concrete stairs encased in white Georgia marble, or by two passenger elevators. There are 74 rooms on these five floors, the smallest having an area of 63 sq. ft., and the largest 6,570 sq. ft. The offices are finished in oak, with hardwood floors, and most of the rooms are furnished with telephone, bell and fan outlets, there being the usual general equipment of water plugs and hose for fire protection, mail chutes, dumb-waiters and tariff carriers.

These buildings are lighted by electricity, which is also used for operating the elevators, and are heated by steam, both being supplied by the power plant of the Atlanta terminal station just across Mitchell street from the office building. A power plant to serve these buildings was designed and arrangements were being made to construct it at the Peters street end of the freight building, but it was later considered advisable to postpone the

Mitchell Street End of Office Building.

work for the present, and obtain the light and heat from the Atlanta terminal company, which now serves the outbound freight house and the transfer sheds of the Madison avenue station.

The reinforced concrete of both buildings was designed according to the recommendations of the Joint Committee on Plain and Reinforced Concrete, which are more conservative than the standards used in many examples of this type of construction. The design and construction of these buildings were handled under the supervision of B. Herman, chief engineer of maintenance of way and structures. H. W. Hesselbach was the architect, and H. N. Rodenbaugh, the engineer in charge. R. M. Walker & Co., of Atlanta, were the contractors.

New Inbound Freight Station with Old Outbound Station in Foreground.

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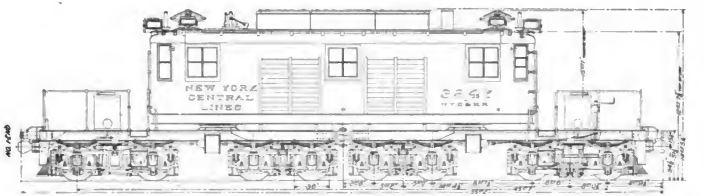
ARTICULATED ELECTRIC LOCOMOTIVES FOR THE NEW YORK CENTRAL.

After a series of tests on the Harlem division of the New York Central, an eight-motor articulated, 600-volt direct current electric locomotive has been placed in service on the electrified section at New York and an order placed with the General Electric Company for nine others of the same design.

The locomotives in service up to this time on the New York Central's electric zone weigh approximately 230,000 lbs. Those of the new design are considerably lighter, weighing 200,000 lbs., but the entire weight is carried on the drivers while in the older type the weight on drivers was only 140,000 lbs. The new locomotives are designed with a view to continuous high speed, and it is claimed they will exert sufficient tractive effort to haul a train weighing 1,000 tons at 60 miles per hour. In regular service they can develop 1,400 h. p. continuously and as high as 5,000 h. p. for short periods.

The original New York Central electric locomotives had a two-wheel guiding truck at either end, with 28,000 lbs. on the axle. There were four pairs of driving wheels, each carrying the armature of a direct current, bipolar, gearless motor. To improve the riding qualities, a four-wheel guiding truck was substituted in a more recent design. A further development in a subsequent type was to increase the distance between the guiding trucks and the rigid wheel base. The riding qualities were improved, but at a loss in the mechanical efficiency of the locomotive; for about 80,000 lbs. were added to the weight on the trucks for the sole purpose of guiding the locomotive. The latest step has been the addition of motors to the guiding trucks so that the entire weight is available for adhesion. A still greater separation of the fixed wheel base and the guiding trucks lengthened the machine so as to necessitate constructing the running gear in two sections, with a spring-connected, articulated joint between the frames. The cab is supported on the two parts of the frame on center pins. Each section is equipped with one rigid and one swivel four-wheel truck. The rigid truck is built up of heavy steel castings, the side frames being of a truss pattern. The end frames and center cross frames are steel castings securely bolted to the side frames and supporting the



Side Elevation of the New York Central's Latest Type of Electric Locomotive.

magnet poles. The magnetic circuit of each truck consists of the armatures mounted on the axles, the magnet poles carried on the end frames, the side frames and an additional magnet bar forming a path in parallel with the side frames. The weight is carried on semi-elliptic and coil springs resting on the journal boxes.

The main frame of the locomotive is a box girder built up of 10-in. channels with ½-in. top and bottom cover plates. It is 36 in. wide and 22 ft. long and is bolted to the top member of

Electric Locomotive with Articulated Frame Connection and Eight Motors.

the rigid truck, extending forward over the center plate of the leading truck and backward to the hinge which connects the two halves of the frame. The main frames carry in their top plates the center pins which support the weight of the cab. These center pins are hollow and serve as air passages, the box girder acting as a distributing reservoir for the air delivered from the blower in the cab to cool the motors. The construction of the swivel or leading truck is similar to that of the rigid truck, except that it is connected by a center pin to the main frame.

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While the locomotive has a total wheel base of 45 ft. 7 in., the greatest rigid wheel base is 6 ft. 6 in.

The cab is 35 ft. long and 10 ft. wide and is divided into three sections, consisting of a motorman's compartment at either end and a central section containing the air compressors, blowers, contactors and rheostats, grouped so that they are conveniently accessible for inspection and repair. There is a platform on either end of the locomotive, from which access to the cab is obtained through doors. The field poles of the eight bipolar motors are carried on the truck frames, which form the magnetic circuit. There are four independent magnetic circuits in the locomotive corresponding to the four trucks. The magnetic flux path on each truck passes in series through the fields and armature of one motor, through the center transom and the fields and armature of the second motor to the end frame, and then returns to the starting point through the two side frames and a reinforcing magnet bar lying parallel with the frames. The motor is practically enclosed, and the field coils are waterproofed and armored. Each field coil is wound in a brass shell, the windings being in two decks of flat ribbon copper laid side by side. The outside turn is covered with insulation and an armor of sheet steel is clamped over it, filling the space between the sides of the shell in such a way as to protect the windings from water or mechanical injury. End shields are provided for each motor, which render it dust-tight and as nearly water-tight as is possible in a motor equipped with outlets for forced ventilation.

Each motor at its one hour rating has a capacity of 325 amperes on 600 volts, or a continuous rating of 260 amperes on 600 volts under forced ventilation. For the complete equipment of eight motors, this corresponds to a capacity of 13,500 lbs. tractive effort at 54 miles an hour for the one hour rating, and 10,000 lbs. tractive effort at 60 miles an hour continuously. The motors are electrically connected in parallel permanently, in pairs, and the pairs may be connected in three combinations, series, series-parallel and parallel. They are insulated for 1,200 volts, so that if at any future time it should be desired to operate the locomotive on that voltage, the pairs of motors can be changed from parallel to series connections and the same speeds and control combinations obtained as on 600 volts.

The control equipment is the Sprague-General Electric Type M. The external regulating resistance, divided into four parts, is directly connected, each part to a pair of motors permanently grouped in parallel. The pairs of motors with their respective resistances are connected in series on the first point of the controller. The resistance is varied through eight points and finally short-circuited on the ninth or running point. The pairs are then operated similarly in series-parallel with all resistance cut out on the seventeenth point. Finally all of the pairs are connected in parallel with the twenty-fourth step a running point. This provides a control with nine steps series, eight steps series-parallel and seven steps parallel. The transition between series and series-parallel is effected without opening the motor-circuit, and there is no appreciable reduction in tractive effort during the change. The smooth transition between points, both rheostatic and transitional, permits motor operation close to the slipping point of the wheels. The locomotive weight on the drivers is so proportioned that the motors operate safely up to the slipping point, which serves as a limit to prevent overloading the motors. The transition between all four pairs of motors in series to series-parallel is accomplished by short-circuiting two of the pairs of motors during the instant of transfer. The transition between series-parallel and parallel is effected by means of the standard bridge method. The motor cutout switches are connected so that any pair of motors may be cut out of circuit. The locomotive will operate when a pair of motors is cut out with two groupings of the motors, the first with two pairs of motors in series and the second with three pairs of motors in parallel.

For protection against short circuits all the main fuse boxes are of the copper ribbon type, fitted with hinged covers to facilitate fuse renewals. The box is provided with a magnetic blowout, which is energized by the current passing through the fuse. The main fuse boxes are located as near as possible to the overhead trolley and to the third rail shoes in order to protect the wiring circuits near the source of supply. Each pair of motors is locally protected by a fuse box. The main switch is provided with a blowout so that heavy currents may be opened without damage. An ammeter is located at each engineer's position and records the current in the circuit of one pair of motors. The main motor rheostats are formed of cast-iron grids mounted in a frame and insulated in mica. The rheostat boxes are assembled in the monitor deck of the locomotive.

Current is collected by eight underrunning third-rail shoes, or by two overhead trolleys when on gaps in the third rail. The trolleys are of the pantograph type and are pneumatically operated from either end of the cab by a foot-operated valve. The trolley is held in a raised position only while the valve is held open by the engineer's foot.

The blower set for ventilating the driving motors is located

End View of the New York Central's Electric Locomotive.

in the central compartment of the cab and has a capacity of 24,000 cu. ft. of air per minute; it is driven by a series wound motor of the railway type. The air compressor is two-stage, motor driven with a piston displacement of 100 cu. ft. of air per minute when pumping against a tank pressure of 135 lbs. per square inch. The compressed air, in passing from the low pressure to the high pressure cylinder, is conducted through radiating pipes under the platform of the cab. This reduces the temperature and allows condensation of moisture before entering the high pressure cylinder. From the high pressure cylinder it is delivered into a series of four air reservoirs, each 16 in. x 90 in. These are located under the floor of the cab and are connected in series, to afford further opportunity for radiation and condensation. Leach type L double pneumatic sanders are provided and the bell is fitted with the Sampson automatic ringer. All wiring is drawn through conduits and is carefully protected from mechanical injury.

The principal data and dimensions are as follows:

Length inside of knuckles	55 ft. 2 in.
Length over cab	33 ft.
Height over cab	12 ft. 8 in.
Height with trolley down	14 ft. 6 in.
Height with trolley running	15 ft. 1 in.
Width over all	10 ft.
Total wheel base	45 ft. 7 in.
Rigid wheel base	5 ft. and 6 ft. 6 in.
Total weight	200,000 lbs.
Weight per axle	25,000 lbs.
Dead weight per axle	6,395 lbs.

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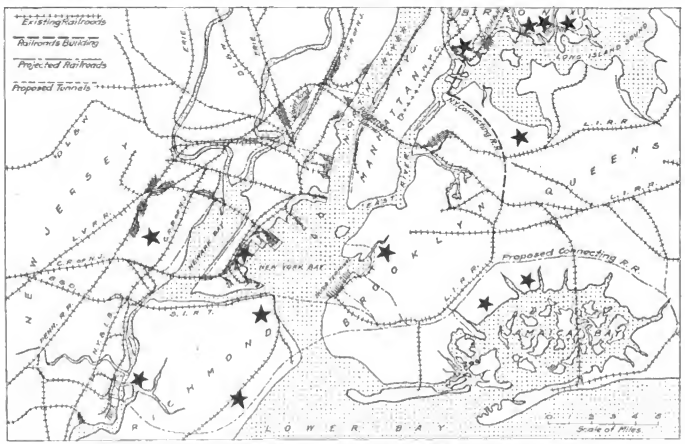
NEW YORK'S FREIGHT TERMINAL PROBLEM.

Necessity for a New Policy, Peculiar Difficulties Encountered and Some of the More Interesting Solutions Offered.

New York has done less to develop its port along modern lines than any other important shipping center in the world and is far behind many naturally inferior ports as regards adequate terminal facilities and cheap and quick means of transportation. The present congestion of traffic and the recognized impossibility of relieving it by the old methods have induced the city and the manufacturers to start a strong movement to bring about the necessary improvements. The difficulty is greatly aggravated by the separation of the port into four parts, viz., the New Jersey section, the Manhattan and Bronx section, the Long Island section and the Staten Island section. Freight communication between these four sections is now only possible by car floats and lighters, and it will not be until they are connected by freight tunnels that the disadvantages of this separation will be entirely overcome.

The situation has been studied and various plans, more or less practicable, have been submitted. The most comprehensive of these was devised by Calvin Tomkins, until recently commissioner of docks for New York City. It provides for the construction by the city of joint railroad freight terminals and warehouses along the east side of the marginal way on the west side of Manhattan, connected by spurs with a proposed four-track elevated railroad which would run along the marginal way to a connection with the New York Central's tracks at Sixtieth street. Tunnels under the North river are also proposed which would connect the mainland with the elevated railroad at some point near Forty-second street. A joint classification yard of large capacity connected with all the New Jersey roads would be built near the entrance to the tunnel on the Jersey side. Until the tunnels were built the cars would be carried by car floats to docks above Twenty-third street, where they would be transferred to the terminals by means of the elevated road, which would be reached by ramps. The plan also includes the construction of tunnels under the Narrows, connecting the borough of Brooklyn with Staten Island, also other terminal developments similar to the Bush terminals at points indicated on the accompanying map by stars.

This plan, if carried out, would give all factories and warehouses in Greater New York direct track connection with all railroads and steamship piers. In its entirety it is on an enormous scale, but it should be remembered that it was not formulated with the idea of showing what was needed in the immediate future, but rather to show the reasonable limit to which the advantages of the port could be developed. The purpose of the plan, therefore, is to indicate along what lines improvements should be made to secure the maximum efficiency for both the present and the future.



Proposed Connecting Railroads and Terminal Development Sites for Greater New York.

The advantages and possibilities of terminal development are just beginning to be appreciated. Terminal charges are absorbed in freight rates, and where the terminal facilities are inadequate and the methods antiquated and costly, the terminal charges constitute a large percentage of the freight rates, particularly on short hauls. Railroads have consistently reduced grades, eliminated curves and increased the efficiency of their motive power and rolling stock to reduce their operating costs, but comparatively little has been done to improve the practices at terminals, a field which offers innumerable opportunities for economy. Aside from establishing direct track connections between all warehouses, factories and transportation lines there is the field of handling freight by means of mechanical devices, which has

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been so successfully developed abroad and almost utterly neglected in this country. Adequate terminal facilities constitute a most important factor today in attracting manufacturers to a community. It is of great importance, therefore, if a community is to preserve its manufacturing industries, or to attract others to it, that the costs and delays incident to the handling of traffic at its terminals be reduced to a minimum.

The commercial and industrial supremacy of New York is fundamentally due to its unrivaled harbor and its situation at the end of the only level route from the Mississippi valley to the Atlantic seaboard. The result of these advantages is that as a combined shipping and railroad center it has no equal. Owing to the lack of efficiency of the car float and lighterage systems the disadvantages of its insular position have not been overcome. Under the present arrangement cars are brought from New Jersey to the New York piers in the morning, where they are moored and left until evening to be unloaded and reloaded. The freight from the cars is carried to the piers by hand trucks and piled on narrow platforms. Drays call at the piers to remove or deposit the freight; the space for drays is insufficient and congestion results. Where two car floats are placed end on end the hand truck run is 600 ft. The car floats are pulled out late in the afternoon to catch the evening trains and any freight received after that time must wait over until the next day. The railroads are obliged to hold uncalled for freight 48 hours, and this temporary storage increases congestion. The process is slow and expensive. On a conservative estimate the terminal expenses on traffic from New Jersey amount to about $1.35 a ton.

The problem on the island of Manhattan is not only the most difficult but also the most important. Of all the railroads which reach New York only one, the New York Central, carries freight to its terminals in the city over its own tracks. A very large portion of the west shore of Manhattan is occupied by the terminals and docks of the railroads, which terminate on the New Jersey shore of the North river. This condition has existed for a number of years, and was satisfactory until the growth of railroad and marine traffic necessitated more extensive terminal and dockage space on the water front than was available. This situation made a change of plan imperative. The water front space is the only logical place for the piers of the larger vessels, partly because it is the most convenient for passengers, and partly because the deepest marginal channel runs along the shore. If the steamships were forced away from this locality other channels would have to be deepened at an enormous expenditure and the present deep channel would be wasted because it is not needed for railroad traffic. It is also highly desirable that railroad and shipping terminals be built as near together as possible. To accomplish this Mr. Tomkins suggested that the railroad terminals should be built along the east side of the marginal street. If this idea were carried out the space on the waterfront required by the railroads would be greatly reduced and the sites of their present terminals could be used by the steamship companies. Space on the east side of West street is much cheaper than on the water front, and the increased terminal facilities would permit the roads to handle their freight more economically and with greater despatch.

The terminal buildings would each doubtless occupy a block and the dray approaches and passageways at grade, together with the platforms, would include the entire ground floor; in other words these buildings would be arcaded, standing on columns, and would greatly increase the street surface. The second floor would be on the same level as the elevated railroad and would be used to load and unload freight cars. The third, fourth and fifth floors would be devoted to storage warehouses, and it is planned to use the upper floors for factory purposes. It is believed that the manufacture of many light articles could be attracted from the center of the city to the factories over the terminals on account of the more sanitary conditions and the improved transportation facilities. If this could be accomplished the rentals would serve to reduce the overhead charges. Elevated car yards would be provided adjacent to the terminals for car storage. The joint terminals would be built and owned by the city and rented to the roads. Individual terminals could also be built by the roads at their own expense.

The four-track elevated railroad would extend from Washington market to a connection with the tracks of the New York Central at the yard of that road at Sixtieth street. It would have spur connections with all the railroad terminals and warehouses, and would be used jointly by all the railroads. It would not be connected with the steamship piers, but instead a system of telpherage over the elevated road is advocated to connect the piers with the warehouses on the other side of the street. When this road shall have been built the surface tracks of the New York Central on Tenth and Eleventh avenues and West street, which have proved so dangerous, may be removed. If four tracks are not sufficient to handle the traffic additional trackage up to at least ten tracks may be provided. Mr. Tomkins believes that to keep West street under complete municipal control, and at all times subject to the city's terminal policy, the city should build and own the elevated structure, contracting with the railroad companies through a joint terminal company, organized by the city, in the ownership and control of which the roads should be permitted to participate on terms of equality. Interest and maintenance charges would be recouped by the city from reasonable rental or service charges. In order to encourage commerce the city should not look for more than the return of interest, maintenance and amortization upon its investment. In this way the improvements would pay for themselves, the bonds would be exempted from the debt limit of the city and there would be no public burden. Public ownership is favored because the money can be secured at a lower interest rate, and also because private ownership involves profits over and above interest and amortization charges.

The car floats would have to dock north of Twenty-third street, so that the cars could be transferred to the terminals in that vicinity at grade. Surface tracks would not be permitted on the marginal street south of Twenty-third street, as they would interfere with street uses. Cars destined for the downtown terminals would be sent via the elevated road, which would be reached by means of ramps near the car float docks.

Tunnels under the North river are proposed to eliminate the long carfloat journeys and to establish direct track connection between all the New Jersey roads and all the terminals on Manhattan. Until the passenger tunnels had demonstrated their practicability, freight tunnels were never seriously considered. It was proposed to connect Manhattan with the mainland by a bridge. The relative merits of the two plans are now under consideration, but no definite conclusion has yet been reached. This track connection is now highly desirable and will before long be of paramount importance if the growing traffic of the city is to be handled quickly, and if the advantage of certain roads over others is to be obviated.

The plan includes the construction of a joint classification yard with a capacity of at least 6,000 cars near the entrance to the tunnels on the Jersey side which would be connected with all the Jersey roads by a belt railroad as shown in the map. The tunnels would most probably be built from a point on Manhattan near Forty-second street to the nearest point on the opposite shore. Two single track tunnels would be built first, one tunnel for each direction; and more could be added as needed. Whether the cost of operation of such tunnels would be low enough to warrant their construction has not yet been determined. As New York City could not build them alone the co-operation of the state of New Jersey would have to be secured. Mr. Tomkins believes that the tunnels should be built and owned publicly, because of the large initial cost, and that they should be used jointly by the roads on payment of rental charges as in the case of the elevated road. It is proposed to ultimately extend the tunnels under the city and under the East river to a connection with the New York Con-

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necting Railroad now under construction. When this road, which is being built by the New York, New Haven & Hartford and the Pennsylvania Railroad jointly, is completed, freight from New England will be carried direct to the Bush terminals at South Brooklyn, from which other roads are easily accessible. This will be a big improvement over the present arrangement which involves a long carfloat journey up the East river. It will be the first and easiest step in the connection of the different sections of the port.

New York is both a commercial and an industrial center. It is commercial in that it establishes a connection between different transportation systems, and it is industrial in that a large amount of its traffic either originates or terminates in the community. It is in this latter capacity that most of the development should be made for the industrial function of the city is of far greater importance than is the commercial function. For this reason the classification yards for through and local freight should be separated, and preference should be given to the latter. No freight that is not destined for New York proper should ever enter the island of Manhattan. Terminals and yards for that class of traffic should be built in the outlying districts where land is cheap and where the cars would not impede the movement of local traffic. The manufacture of heavy articles should be attracted away from Manhattan and for this purpose sites have been selected for proposed terminal developments on the waterfront of the various boroughs of the city. These developments would be similar to the Bush terminals at South Brooklyn, and would afford docks of large capacity, warehouses, cheap land, and adequate railroad connections. The stars on the map indicate the sites of the proposed developments.

Mr. Tomkins' plan is vigorously opposed by the Jersey railroads. They contend that the longer carfloat journey and the additional haul to the downtown terminals over the elevated road would increase rather than decrease their expenses. The economy of freight tunnels has not yet been proved and the railroads are skeptical. Thus far their attitude toward the joint operation of facilities has been entirely hostile. The New York Central now sends a considerable amount of its freight from its uptown yards to its downtown terminals by water, on account of the inconvenience and expense incident to the operation of its surface tracks. This road is therefore subjected in a measure to the same handicaps as are the New Jersey roads, and they assert that if the proposed improvements were effected the New York Central would derive the greatest benefit and that its position would be materially strengthened in relation to them. They also argue that as some of the steamship lines form connections with the southern roads in direct competition with them, this competition would be stimulated to their detriment if those lines were permitted to expand on the waterfront. This is not a very serious objection, however, and could easily be outweighed if the other features included in the plan could be made attractive.

D. C. Willoughby has recently come forward with a plan for the terminal development of the west side of Manhattan, which is apparently very similar to the one just outlined. Instead of an elevated road along the river street, Mr. Willoughby proposes to build a four-track subway, connected with terminals and warehouses on the east side of the street, and with the mainland by tunnels under the North river. Under this plan the improvements would be built and operated by a private company, one-quarter of the profits going to the city and the balance to the company.

The Board of Estimate's committee on terminal improvements has drawn up a plan for the elimination of the New York Central's surface tracks and for the expansion of that road's terminals on Manhattan. This plan is now being considered by the Board of Estimate. It provides for the covering of the Central's tracks above Seventy-second street, the construction of extensive yards between Seventy-second street and Sixtieth street and a subway below Sixtieth street connecting with the several terminals of that road. At the hearing on April 8 this plan met with strong opposition on the grounds that the benefits derived by the New York Central would tend to create a monopoly; also that though the city would have more park space along the upper west side, it would be spoiled by being bisected by the structure covering the railroad tracks. It was urged that the problem below Sixtieth street should not be treated until it was decided what should be done for the New Jersey roads so that a plan could be adopted which would benefit all alike. As the covering of the Central's tracks would interfere with the city's plan for extensive parks along the upper west side it was suggested that the tracks in that vicinity should be sunk so that the park space would not be divided.

W. J. Wilgus, a consulting engineer, and formerly chief engineer of the New York Central, has originated a plan, described in the *Railway Age Gazette* of October 16, 1908, page 1150, which involves radical departures from anything hitherto attempted. Under this plan it is proposed to transfer freight in New Jersey from the large freight cars to small standard gage cars of sufficient capacity to carry the largest pieces of package freight, each equipped with an electric motor. These small cars would then be brought to Manhattan, by tunnel or carfloats, where they would connect with tunnels along the marginal way. About 30 joint terminals would be built, some along the east side of the marginal way and others at the chief distributing points in the heart of the city. The interior terminals would be reached by branch tunnels under the sidewalks connected with the main tunnels along the marginal way. These tunnels would be connected with the New York Central and also with the New York, New Haven & Hartford. This plan would overcome the disadvantage of bringing the large cars to Manhattan terminals, where there would be insufficient yard space to handle them properly. The small cars could negotiate sharp turns, and the feature of individual motors would make them easy to handle. The plan would also eliminate long drayage hauls and the wide diffusion of terminals would reduce congestion in the streets.

Cyrus Miller, president of the borough of the Bronx, has devised a plan for the industrial development of the Bronx, which is worthy of mention. That borough has increased rapidly in population, but is sadly lacking in manufacturing industries. President Miller's plan includes an industrial railroad which would skirt the southern and eastern shores of the Bronx, connecting the New York Central with the various branches of the New York, New Haven & Hartford, including the New York Connecting Railroad. This road would connect with a proposed terminal development at the mouth of the Bronx river on the eastern shore of the borough. Warehouses could be built along the line and factories could be reached by spurs. This road should also be publicly owned, so that its advantages could be availed of on equal terms by all. The water at the mouth of the Bronx river is deep enough to enable large vessels to dock, and docks at that point could be reached via the Long Island sound, thus enabling the ships to avoid the difficulties of New York harbor. When the New York Connecting Railroad shall have been completed the Bronx will have excellent connection with all the railroads reaching New York. This section would be highly desirable for manufacturing purposes if these improvements were completed, because land is cheap and there is a very large skilled labor population in the immediate vicinity from which to draw. Adequate railroad and shipping connections would also be available. At present the majority of the working population of that district spends a considerable amount of time and money in transportation to and from places of business, which in many cases are in lower Manhattan. For this reason work in factories almost at their door should prove highly attractive.

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SOUTHERN PACIFIC BRIDGE AT SACRAMENTO.

Double Track, Double Deck Structure with Highway on Upper Level—Believed to Be Heaviest Swing Span Ever Built.

The Southern Pacific has recently completed a bridge across the Sacramento river at Sacramento, Cal., which contains what is believed to be the heaviest swing span in existence. Since about 1864, there has been a bridge across the river at Sacramento, and since 1870 it has been used jointly as a highway and railway bridge, the railway and highway using the same floor until 1895. At that time the bridge which has just been abandoned, was built and the grades separated, the railway using the lower floor of the Howe truss spans and the highway a floor placed on the top chords. This bridge was single track and bottled up the entrance to the large yard at Sacramento, the end of the bridge being only about 400 ft. from the depot. This bridge and the earlier ones were of timber construction on pile piers, the piles being driven about 50 ft. into the river bottom, bringing up on the gravel and boulders that form the bed of the stream below the scour line. In considering the renewal of this bridge, it was decided that every effort should be made to build a permanent structure on which the maintenance would be low, so a traffic agreement was made with the counties of Sacramento and Yolo, and work began in June, 1910.

The watershed of the Sacramento is about 27,000 square miles, and the average rainfall is about 30 in., ranging from 18 to 20 in. in the valley to over 100 in. in the mountains. Praetically all of the precipitation occurs during a few months in the winter and early spring, so the discharge of the river varies from a minimum of about 5,500 cu. ft. per sec. to a maximum of about 600,000 cu. ft. per sec. The bed of the river is composed of sand to a depth of about 40 ft., under which is a layer of boulders and gravel to a depth of 26 ft., with finer gravel and streaks of clay beneath. Hardpan is found at about 120 ft.

The piers were put in by pneumatic process and were carried down to a 15 ft. penetration into the boulders and gravel. The pivot pier is 42 ft. in diameter, built on an octagon-shaped caisson 54 ft. in diameter, and is 84 ft. high. It contains 5,550 cu. yds. of conerete. The caissons for the other piers were 24 ft. x 60 ft., the piers being 9 ft. 10 in., 10 ft. 7 in. and 11 ft. 1½ in. wide at the top and 37 ft. 10 in. long. The abutments were built back of the slope of the levees on pile foundations, with cut-off below low water.

The location of pier 1 was in water about 2 ft. deep and a small clamshell dredge was employed to throw up an island large enough to support the caisson during construction. The caissons for piers 2 and 4 were built on platforms supported on piles driven around the sites of the piers and were lowered into the water by long screws, the water being 8 ft. deep. There was about 7 ft. of water at the site of the pivot pier, and as the caisson was so large, an island was thrown up to support this caisson also, as it was not considered advisable to lower it into the water with the screws. No difficulty was experienced in sinking the caissons, and this part of the work was completed in the low water season from June to December.

Sacramento River Bridge from the Sacramento End.

The superstructure consists of two 167 ft. double track, double deck, riveted spans; one 394 ft. 10 in. double track, double deck, swing span and one 109 ft. 8 in. double track, double deck span with inclined steel highway approaches at each end on 5 per cent. grades. The swing span is entirely center bearing, and weighs a little over 6,300,000 lbs., the steel weighing 4,820,000 lbs.

The lower floor is designed to carry the Harriman Lines common standard loading on two tracks and the upper floor is designed to carry the highway traffic of 100 lbs. per sq. ft., with a concentrated load of a road roller or traction engine weighing 35,000 lbs. on four wheels of 5 ft. gage, with axles 6 ft. apart. The highway is 18 ft. wide, with a 5 ft. sidewalk on each side. The sidewalk curbs are 8 in. high, with the corners protected by 3 in. x 3 in. angles anchored to the curb by curved, swedged anchor bolts.

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Sacramento River Bridge of the Southern Pacific.

The floor slab and sidewalks are reinforced with triangular mesh wire reinforcement, and the stringers and floorbeams on all parts of the bridge directly over the railway tracks are encased in concrete, except on their bottom flanges. The wearing surface on the inclined approaches is composed of creosoted blocks cut from close-grained red fir and treated by the full cell process.

The concrete slab was finished to a true surface ½ in. low. When set, a layer of dry sand and cement in equal proportions was spread over the slab and struck off with a straight-edge to the proper height to receive the blocks which were then laid on an angle of 67½ deg. with the curb and brought to surface by tamping on a 2 in. plank about 8 ft. long. The surface was then flooded with water and kept wet for several days. An expansion joint 1 in. wide was left at each curb and all joints were filled with hot refined asphaltum. The wearing surface on the level part of the bridge is a 2 in. layer of asphalt bitumen.

The center bearing is a phosphor-bronze disc, 52 in. in diameter and 6 in. thick, placed between the two nickel-steel bearing plates 5½ in. thick. The lower center is of cast steel 9 ft. in diameter and 2 ft. 2¾ in. high, and the upper center is 5 ft. 9 in. in diameter and 1 ft. 8 in. high. The lower center casting rests on a grillage 12 ft. 6 in. square and 4 ft. 4 in. high, built into the pier, the top of the grillage being 3 ft. 8 in. below the top of the pier. This was necessary on account of the limited distance from the top of the pier to the base of rail, which was only 8 ft. 4¾ in. The grillage is built of 24 in. 120 lb. I-beams with 1 in. plates on the top and bottom, one set of I-beams being at right angles to the other, with the spaces between the beams filled with grout.

The top center casting supports three cross girders, which carry the span. These cross girders are 5 ft. 10 in. deep back to back of angles, 38 ft. 2 in. long, with webs 8⅝ in. thick, composed of five 1 in., two 1⅛ in. and two ⅝ in. plates stitch riveted together with 1¼ in. rivets. There are five coverplates 15/16 in. x 27 in. The cross girders are spaced 2 ft. 4 in. center to center and weigh about 105,000 lbs. each. The lower chords butt against these cross girders, diaphragms between them making a continuation of the chord.

The center post rests on top of the cross girders and the inner end posts connect to gusset plates at the foot of the center post. The upper chord bars are 2⅛ in. x 16 in., with a 16 in. pin, there being six bars in each set.

The span was erected with a regular straddle-leg traveler on the permanent draw-rest or protection.

The calculated dead load swing deflection at the ends was 5⅛ in., and as the end wedge uplift is 15/16 in., the eyebars were shortened to take up 4 3/16 in. The span was connected up and riveted with the ends 4 7/16 in. high, and when swung with the entire dead load, it deflected to 4⅞ in., or ¼ in. less than the calculated amount.

The ends of the span are raised and locked by a wedge at each corner having a taper of 1 in. in 5 in., the stroke being about 20 in. The center of the span is steadied, but not lifted, by a wedge on each side under the ends of the cross girders having a taper of 1 in. in 10 in., with a stroke of 12 in., and the track rails are raised 8 in., at their ends, by the same machinery.

An automatic latch at each end of the span assists in centering the bridge. These latches are withdrawn by power, when the wedges are drawn and the rails lifted, but are disconnected from the other machinery as soon as the span swings a foot or so, and are then ready to drop automatically when the bridge is closed again. The latches are counterbalanced and adjusted so they will not drop, if the span is moving too fast when closing.

The span will open in either direction and the ends are reversible. The span balances very closely, this balance being maintained by 12 balance wheels which travel on a circular track just inside of the rack. Four wheels in equalizing carriages on each side of the span and two fixed wheels under the first floorbeam on each side of the center keep the ends of the span from

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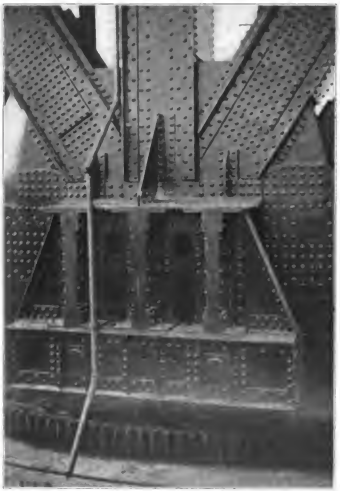
tilting too much. A clearance of ¼ in. is allowed under each wheel, so they carry no weight except the slight amount required to overcome any lack of balance due to wind, etc.

The machinery is operated and the span lighted with 550 volt direct current, which is taken to the top of the pivot pier through a submarine cable, which also contains two wires for a telephone. The terminals are connected to two circular rings made of 50 lb. steel rail which are supported on concrete blocks on the pier, the insulation being a treated wood block 6 in. thick. Street railway contact shoes are fastened to the bridge and slide on the power rails.

The electric current is purchased from the Pacific Gas & Electric Company who have several sources of power, all of which are not likely to be interrupted at the same time. A storage battery of 160 cells has been provided for use in case of power trouble,



Details of Center Showing Heavy Cross Girders.

of sufficient voltage and capacity to swing the bridge four or five times at slow speed.

The swinging motors are two series wound, weather-proof motors of 75 h. p., mounted on the lower chords, one on each side of the bridge near the center. Each motor is geared through a separate train of gears to two rack pinions, which mesh in a rack with a pitch diameter of 38 ft. 2⅛ in. The motors and gearing develop a rack pressure of about 300,000 lbs. The center wedges are operated by a 10 h. p motor and the end wedges by 40 h. p. motors, one at each end of the bridge. All motors have solenoid brakes capable of holding against the full power of the motor. The brakes on the motors operating the wedges are released when the current is applied to the motor and are automatically applied when the current is shut off. The brakes on the swing motors are shunt brakes and are released on the first point of controller, without applying power to the motor. They are held in release after the current is shut off the motor so the bridge can drift as much as is desired.

The controller is of the series parallel type and has the necessary resistance for controlling the operation of both swinging motors. Switches in the base will cut out either motor. The three wedge motors are operated by controllers geared together so as to be operated by one handle. The operator's house is

Upper or Highway Deck.

situated directly over the highway deck at the center of the bridge and from it all movements are controlled. Overload circuit breakers and the necessary fuses are provided, as also are a voltmeter and an ammeter.

An air compressor of 16 cu. ft. per minute capacity supplies air for the signal system and for the whistle which is used to signal boats. This compressor is electrically operated and automatically controlled.

The highway gates are operated by 2 h. p. motors connected

Lower Railway Deck.

with worm gearing to the gate posts. Double-throw switches in the operator's house open and close the gates. These gates are about 14 ft. long. When open they form part of the handrail of the adjacent fixed spans, and when closed swing across the sidewalk and highway away from the swing span. This allows them to be opened toward the swing span and away from any

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teams or pedestrians that may stand close to the gates, waiting for them to open.

Electro-pneumatic signals and derails are provided for both tracks at each end of the bridge, the wires being coupled and uncoupled by a connection on the shaft which raises and lowers the rails. The ends of the fixed and lift rails are locked to each other by wedges, one on each side of the fixed rail, which slide on a base-plate with beveled guides. The travel of the wedges is 6½ in., and they are operated by air cylinders electrically controlled. When the wedges are pulled back the lift rails are free, and when pushed forward they engage about 6 in. of the end of the lift rails, making a positive lock. The beveled guides clamp the wedges tightly to the rails. The outer wedge is a little higher than the track rail for a few inches at its center, forming an easer rail to carry the wheels over the gap between the fixed and lift rails.

The bridge is unlocked in about 20 seconds and swung 90 deg. in about 1½ minutes, the entire operation seldom taking more than five minutes. It is opened on an average of about 12 times per day.

The highway deck is lighted by 225 incandescent lamps of 16 c. p. placed in 3-light clusters on lamp posts about 40 ft. apart along each handrail. These lamps are wired in circuits so one, two or three may be lighted at a time.

The American Bridge Company furnished the steel superstructure, the total weight of which is 4,500 tons. The pneumatic foundation work was put in by the Missouri Valley Bridge & Iron Company, the other foundation work, erection, installation of machinery, etc., being done by the Southern Pacific forces.

The structure was designed under the direction of John D. Isaacs, consulting engineer for the Southern Pacific. The foundation, concrete floors, electrical and signal systems, etc., were designed by and the work in the field was performed under the direction of J. Q. Barlow, assistant chief engineer, G. W. Rear, general bridge inspector, being directly in charge.

GOVERNOR CRUCE'S MESSAGE VETOING OKLAHOMA TRAIN CREW BILL.

The legislature of Oklahoma recently passed a full crew bill which Governor Cruce vetoed. The governor's veto message was as follows:

"I have studied this bill from every angle and the more I have studied it, the more I have become convinced that it should not receive my approval. In the enactment of this bill, it is only the railway companies and their employees that have been considered. The thousands of people in this state who travel upon the railroads and ship their products and merchandise over same have not entered into the discussion. This fact, however, must remain after all has been said, for that every dollar of expense placed upon railway corporations in Oklahoma will ultimately be paid by those who patronize the railroads. The cost of putting this bill into operation is estimated by the corporation commission at something like $250,000, while the cost is estimated by the railroad companies at more than $400 000. But whether it be $100,000 or $500,000, that amount in the end will be paid by those who use the railroads. Another thing I have learned to believe is that those who have made a lifetime study of railroad operations are better judges of the proper method of operating them than I am, and I believe that this is equally true when applied to a majority of the members of any legislative body. The trouble in Oklahoma is and has ever been that in dealing with public service corporations we have assumed to know more about how properly to operate them than those who have given the matter careful study. Public service corporations need to be regulated and need to be controlled. Oklahoma has undertaken to do this by the creation of a corporation commission and has clothed that commission with unusual authority in dealing with such matters. That commission, after having studied this question, is better able to place suitable regulations upon the railroads than is the governor or the legislature.

"The practical effect of this bill would be to give employment to a number of railroad men without increasing the efficiency of the service, and would be supplying positions for three men to do the work that can be done by two. It is in entire harmony with the principle that has prevailed in this state of creating an army of officials to do the work that ought to be done by half that number of men. This legislature has set itself to the task of reducing the number of officials drawing salaries from the state, and a Herculean task it is proving. It is certainly inconsistent while trying to curtail the number of useless public officials, to increase the number of appointed employees, who in the end must draw their subsistence from the same source that is now drawn upon by these useless public employees."

THE OTIS INCLINED FREIGHT ELEVATOR.

The three inclined elevators for moving truckloads of freight up an inclined gang plank (from a steamer) which were installed at the Union wharf of the Metropolitan Steamship Company at Boston about three years ago, have not only been the means of a large saving in the cost of handling the cargoes of the vessels using that wharf, but, according to Albert Smith, general agent of the company, there has been a saving of 20 per cent. in the time required to unload the ships. From 1,000 to 1,500 tons of freight is unloaded over the inclines daily, a quantity which previously required the labor of 150 men, which number has been materially reduced. The cost for electric power per month is $30. The machines are only used

Inclined Elevator at Mystic Dock, Boston & Maine Railroad, Boston.

during the periods when the inclines, owing to the position of the ship, are decidedly up-hill, and not when the gangway is level. Mr. Smith estimates that when in operation the three machines carry 125 tons of freight an hour, during a period of five hours each day. The current, at 20 cents an hour, makes the cost of power 1 cent for every six tons of freight moved.

The inclined elevator is simple in construction and operation, and the photographic view illustrates its operation clearly. It may be installed on any shipping platform or gangway, or in any warehouse or freight station to connect one floor with another. The machine consists essentially of an endless chain, of special construction, kept in motion by an electric motor. It is provided on its lower side with malleable iron shoes, which slide in a lubricated steel channel, supported on a wooden

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bolster bolted to the incline. The upper surface of the chain is provided with projecting teeth or lugs. These lugs engage the axle of the truck as it is drawn on the incline, and the truck and its load are hauled or, rather, pushed, up by the endless chain. The truck wheels roll on the floor of the incline and, of course, support and carry the load. At the upper end of the incline the chain turns about the driving sprocket and the lugs are disengaged from the axle of the truck, the wheels of the truck at this time being on the horizontal floor. The machine works successfully with either two-wheel or four-wheel trucks. With a two-wheel truck the man goes with the truck, and in practice, he leans back upon the truck handles and is, in effect, pushed up the incline with his load. With four-wheel trucks, it is not necessary to have a man accompany the truck, and with these, capable of carrying much heavier loads, certain installations make use of electric trucks carrying loads of 4,000 lbs. and over.

The motor operating the machine is located on the upper floor at the side of the incline. The main shaft, carrying the driving sprocket which operates the hauling chain, is provided at its outer end with a steel spur gear, journaled so that the gear projects a considerable distance above the floor line. Meshing

Inclined Elevator at the Dock of the Merchants & Miners' Steamship Company, Savannah.

with this gear is a steel pinion mounted on a countershaft, which is journaled on a special bed plate supporting the motor. This countershaft carries a spur gear which meshes with a pinion mounted on the motor shaft. The motor is wound, when so desired, to produce two speeds, one of which gives a speed of travel in the hauling chain of 125 ft. per minute, and the other a speed of 250 ft. per minute. The motor is also provided with a suitable friction brake. When desired, a reversing switch is provided which enables the inclined elevator to be run backwards, for the purpose of carrying loads down the incline. All these operations are under perfect control of the attendant.

The consumption of electric current is relatively small, the friction in the machine being reduced to a minimum. When the elevator is running without its load, the power required to keep it in motion is approximately 2 h. p. When carrying, say, five loaded trucks, which amount in the aggregate to 2,500 lbs., up an incline 50 ft. long, at an angle of 25 deg., the trucks moving at a speed of 250 ft. per minute, the machine is carrying 12,500 lbs. of freight a minute, or 375 tons an hour. To do this, requires a consumption of electric power of about 10 h. p. Assuming a cost of 5 cents per h. p. per hour, for the electric current, the total cost to elevate 375 tons is 50 cents. These figures are the result of tests made under actual working conditions. Where it is necessary to meet a variation in the height of vessels due to the rise and fall of the tide, the "inclined drop" is furnished with hinges so that it may be raised or lowered.

The platform type of elevator is a moving incline formed of hard maple treads to which are fastened small leather covered cleats. At the right and the left, that is, at each end of the treads, are projecting lugs which engage steel projections bolted to the bottom of the trucks. With this type, if trucks are not used, packages of merchandise can be laid on the moving platform and carried up or down.

The capacity of a machine of any type varies, of course, according to the speed at which it is driven, the type of truck employed, and the speed at which the truckmen move their trucks. Ordinary hand trucks can be carried about 10 ft. apart. At a speed of 250 ft. per minute, the machine is capable of transporting 1,500 hand trucks an hour. Fully 25 per cent. of the number of truckmen required under old-fashioned methods, can be dispensed with; and the remaining stevedores can individually perform the work of several men working under oldtime methods.

Because of the rapid movement of the inclined elevator and the ease in ascending the incline, the truckman ascends at a trot. With the platform type the attendant rides up with the load if he so desires. When the top is reached he must not slacken, because of the line of trucks behind him. This has a tendency to speed up all the workers and keep them moving at a dog trot, on the levels as well as on the incline. In some instances where the rise and ebb of the tide is very pronounced, the dock elevator has performed its work at a grade of approximately 45 per cent.

Sets of these machines have been installed at the Pequonnock dock, Bridgeport, Conn., owned by the New York, New Haven & Hartford; at Mystic wharf, Boston, of the Boston & Maine; at the Savannah docks of the Merchants & Miners Transportation Company; the dock of the Old Dominion Line, New York, and at other places. The photographic view is typical of all these installations. This inclined elevator is manufactured by the Otis Elevator Company, of New York.

South Manchuria Railway Estimates.—The estimates for the next fiscal year for the South Manchuria Railway have been curtailed by about $1,000,000, some of the new enterprises having been abandoned and some of the new works originally planned to come in the present fiscal year having been put off to the coming year. This leaves approximately $7,000,000 as the estimates for the ensuing fiscal year which will be invested principally in the following undertakings: Improvement of the main line and the Mukden-Antung line; construction of passenger and freight cars; prosecution of Dairen harbor works; widening of entrance to the Kawasaki dock; establishment of an agricultural experiment station at Kungchuling; construction of transfer arrangements between steamer and wharf at Antung; construction of new warehouses at Newchwang, etc.

New Line for Spain.—The Spanish government has approved a project, now well under way, for constructing a 35-mile railway from Huelva to Ayamonte, in the Seville district. As Ayamonte is a frontier town, whence ferries cross the river to Portuguese territory, the projected railway will facilitate access to Portugal and is hoped to shorten to some 18 hours the journey from Seville to Lisbon, via Huelva. It is also supposed that most of the traffic between Portugal and Andalusia will pass over the new line, in addition to many of the tourists who land or embark at Lisbon. The new railway, the complete construction of which is expected to take not more than 20 months, will have nine stations, including the termini. Its estimated cost of construction is about $770,700. The line will run over low, level, marshy land. The road is to be of the 3 ft. 3 in. gage. The projectors of this railway are the Sociedad Espanola de Ferrocarriles Secundarios, with offices in Madrid.

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General News.

President B. L. Winchell, of the Frisco lines, traveled 55,394 miles in 1912, and 59,173 miles in 1911. During 1912 he attended seventy-five meetings, which included banquets and conferences.

A bill has been introduced in the Illinois legislature providing that the maximum fare to be charged by any railway for continuous trips within the limits of a municipality shall be five cents.

The conference committee of the railroads, representing the 54 eastern lines, has agreed to confer about wages with committees of conductors and trainmen in New York City on April 22. The conductors and trainmen presented their demands about three months ago. The increases which they want are said to average 15 per cent.

The lower house of the Pennsylvania legislature has passed a bill providing for the establishment of a commission of three citizens to fix the minimum wages to be paid to all women and children who work in industrial establishments in the state; and there are provisions relating to railroad employees, one of which is that every flagman must have had 18 months' experience on trains.

The workmen's compensation bills which were considered by the legislature of Oklahoma at its recent session were all rejected. Faults pointed out by the governor, in the compensation law which is in force in the state of Washington, appear to have made the legislators cautious. The legislature of Indiana also has adjourned without passing any compensation law; and in Missouri the subject has been postponed until the next session of the legislature.

In connection with the reorganization of the operating and maintenance staff of the Dominion government railways, a change has been also made in the system of accounting on the Intercolonial. The system in use on the Canadian Pacific has been adopted, and the accounting will be done by divisions. An accounting staff is being organized at each of the four superintendents' offices, and these offices will report to Moncton, where the accounts for the system will be assembled.

It is announced this week that strikes of track laborers on the Pennsylvania Railroad have been broken, some of the strikers returning to work, and a large number of new men having been employed. Small local strikes in the track department have been reported at Trenton, Philadelphia, Altoona and other places on the main line. The principal trouble appears to have been the influence exerted over the laborers by leaders in strikes at industries near the railroad, which were managed by the "Industrial Workers of the World."

The legislature of Arkansas, which adopted a full crew law some years ago, has this year taken further action for the benefit and protection of the brakemen. At least the brakemen's monthly magazine says that the law is for their "benefit and protection." By an act which goes into effect on May 1, there must be three brakemen in each switching crew at all places where cars are switched, pushed or transferred across public crossings within a city; but the law applies in cities of the first and second classes only, and does not apply to roads less than 100 miles long. The full crew law applying to freight trains has a clause exempting railroads less than fifty miles long, and the penalty, $100 to $500 for each train unlawfully run, does not apply during strikes of men in train service. The full crew law of Arkansas as it applies to passenger trains requires in each crew, a porter and a flagman or a brakeman; but it does not apply to trains of less than three cars.

A "safety-first" rally of employees of the Ann Arbor Railroad was held at Owosso, Mich., last Saturday evening, April 5. The principal speaker was R. C. Richards, general claim agent of the Chicago & North Western, the originator of the safety-first movement. Following the lecture the railroad company gave a dance for the employees and their wives and sweethearts. There were between 900 and 1,000 people at the meeting, of whom at least half were actual employees. Mr. Richards spoke for two hours. He had with him a large number of stereopticon views, vividly illustrating his arguments. Several general officers from Toledo and all of the local officers were present. The train and enginemen, track and shopmen, and station forces of the road have taken a keen interest in the Safety First movement, and an organization of the employees, patterned after the one on the Chicago & Northwestern, was begun about a month ago.

The state of Arkansas is now the most progressive in the union, at least in one respect. The promoters of the anti-tipping propaganda have actually got the legislature to "come across" with a law, and the law is now in effect—except where the customer and the servant conspire to evade it. The act is No. 98, and it makes it a crime to solicit or receive any "gift, compensation, honorarium, or gratuity, commonly known as a tip." A railway or sleeping car company which permits tipping will be guilty of a misdemeanor. It is reported that some dining-car waiters and sleeping-car porters have asked their bosses to transfer them to runs outside of Arkansas. We have no confirmation of this report, though these men have done some audible growling. In other places, however, there is a marked absence of complaint, and it looks as though a large part of those travelers who have been in the habit of giving tips may be waiting for the state to begin some prosecutions before changing their practice.

New York Terminus of the Lehigh Valley.

Beginning May 1 the Lehigh Valley will run its passenger trains to and from Jersey City over the tracks of the Central Railroad of New Jersey, and will use the terminal station of that company, the contract for the use of the Pennsylvania terminal expiring at the end of April. Ferries from the Central of New Jersey station run to Twenty-third street and to Liberty street, New York City. The Lehigh Valley will use its own tracks to a point within about two miles of the Jersey City terminus. Passengers to and from Newark will use the new station of the road in that city, at Elizabeth and Meeker avenues. This station is conveniently reached by street-car lines from Broad and Market streets.

"Make the Railroads Aid Ohio."

The head-line artist has a multitude of sins to answer for. The heading of this paragraph, sent to us by a correspondent, who cut it from the *Kansas City Times*, is an example. Often the head-line editor seeks novelty with such exclusive enthusiasm that he forgets both the facts and the perspective. We hardly expect to reform him; but we sympathize with our correspondent, who says:

This would seem to indicate that the railroads had refused to assist the people of the stricken communities and were withholding offers of aid until compelled to act by state authorities; or that the railways had been temporarily appropriated by the state on account of their (the railways') refusal to lend assistance. The railways are by far the heaviest individual losers in many such disasters; but they are in most instances the first to offer such assistance as is within their power to grant; free transportation for supplies, physicians, etc., and usually substantial monetary contributions. If the people had even a vague idea of the aid extended annually by the railways to charitable causes, they would be amazed. Think of the prompt action of the railways in tendering service and money at the time of the San Francisco fire and of the very recent Omaha tornado.

A Directory of Commercial Organizations.

In response to a senate resolution passed December last, the Department of Commerce has submitted to the senate a list of the commercial organizations in the United States. This record, with a list of agricultural organizations, will be printed for distribution, provision being made for 1,500 copies for the use of the senate. The list of commercial organizations was prepared by the Bureau of Foreign and Domestic Commerce, which for nearly two years has been collecting for use in its own work detailed information regarding such organizations, their functions, membership, income, etc. The information in the files of the bureau at the time the resolution was adopted was supplemented by such additional facts as it was possible to obtain before Feb-

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ruary 15, the date on which the list was to be submitted to the senate, and this list when published will record about 3,500 national, interstate, state, and local organizations.

In the compilation of its information the bureau has utilized various symbols to indicate the field of service and the activities of the various organizations. These symbols have been used in the list submitted to the senate, so that when published it will furnish in a concise manner a complete record of the organizations, their functions, membership, and other details. The information thus compiled constitutes a directory of commercial organizations of the country such as has never before been prepared and it should prove of practical value to business men.

New Railways by Fiat.

The Texas Welfare Commission says that the hour has come when in the name and behalf of Texas and for her prosperity and further progress radical changes for the better must be brought about in the railroad situation. "New lines must be constructed; old lines must be improved; additional yards, terminals, sidings and depots must be constructed. Safety signal devices should be installed; second track should be built; grades should be revised; wooden bridges should be superseded by steel and masonry; heavier rails should be laid." But where is the money to come from? Texas has led the procession in the matter of regulating the railways. Let us now see what success it is going to meet with in securing capital for the railway extensions which "must be built."—*Railway Record.*

The New York Dock Railway.

Subject to the approval of a contract yet to be made, the New York State Public Service Commission for the First district has authorized the New York Dock Railway to issue $500,000 in capital stock, $450,000 preferred, and $50,000 common. The New York Dock Railway was organized by New York Dock Company interests for the purpose of operating a short railroad, which crosses certain streets in Brooklyn, and therefore had to have a franchise from the city. The proceeds of the sale of the new stock will be devoted to the following purposes:

Property to be acquired from the New York Dock Company	$383,100
New barges and lighters	32,300
New railroad construction	22,000
Corporate stock deposited with the city	5,031
Payment to the city for local franchise	5,000
Organization expenses	3,918
Legal expenses	26,905
Working capital	20,746
Total	$500,000

A contract for the transfer of the tracks and property to the New York Dock Railway is at present the subject of public hearings.

New Railroad Laws in Texas.

The legislature of Texas at its recent session passed the following bills affecting railroads:

An act making it a misdemeanor for station agents to fail to bulletin properly the arrival and departure time of passenger trains.

An act authorizing the Missouri, Kansas & Texas to take over and operate several of its subsidiary lines.

An act authorizing the Houston & Texas Central to purchase and operate the Hearne & Brazos Valley.

An act authorizing the Texas & New Orleans to take over and operate the Burr's Ferry, Brownde1 & Chester.

An act authorizing the St. Louis Southwestern to take over the Stevensville North & South Texas.

An act authorizing the Gulf, Colorado & Santa Fe to take over and operate its Pecos Valley lines.

An act authorizing the El Paso Southwestern to take over and operate the El Paso & Northeastern.

An act requiring railroads to equip all side tracks with derailing devices.

An act providing that no railroad shall build lines within 4,000 feet of the shore line of Aransas Harbor.

An act extending the time for two years in which railroads may complete extensions of their lines, as provided in their respective charters.

A resolution directing the attorney general to investigate the St. Louis Southwestern Railroad's alleged violation of its charter provisions in not building an extension of its Eastern Texas line from Lufkin to Crockett.

Report on Collision at Ford's, La.

The railroad commissioners of Louisiana, reporting on a butting collision, which occurred on the Vicksburg, Shreveport & Pacific near Ford's, February 21st where west bound passenger train No. 5 encroached on the time of east bound passenger train No. 2, say that too much discretion is allowed to employees in the operation of trains. Trains should be operated under positive orders. In other words, "the block system is deemed by the commission to be the safest system of operating trains." It is true, say the commissioners, that the superintendent, in his testimony, intimated that the failure of the employees to obey the rules in this case had shaken his confidence, so that he feared they would not obey the signals of a block system. But, says the report, "this does not appeal to the commission as being logical. There seems to be no dispute on the general proposition that it is safer to operate trains by keeping them a specific distance apart, rather than a specific time apart."

The Grand Trunk in Southern New England.

President E. J. Chamberlin, of the Grand Trunk, last week sent a letter to the governor of Rhode Island offering to give to the state the Southern New England Railroad, the unfinished line between Palmer, Mass., and Providence, R. I., begun by the Grand Trunk, as it now stands; on condition that the state complete the road and agree to one of two ways of operating it. The alternative methods of operation proposed are described as follows:

"First—If the state desires to operate the railroad, we will grant running rights on reasonable terms over the New London Northern from Palmer to Brattleboro, Vt., so as to make the line sufficiently long to constitute an operating division; and we will also make a traffic agreement between the Central Vermont and the state-owned railroad for a division of through rates on a mileage basis with a reasonable additional allowance for terminal charges; or, second,

"The Central Vermont will lease the state-owned railroad for a rental equivalent to 5 per cent. interest on the actual cost to the state of completing the whole line."

The statement adds that the line cannot be completed by the company unless the state becomes the second guarantor of the necessary bonds (as heretofore proposed by Mr. Chamberlin); and that if the state is unwilling to accept the road as a gift and complete it, the contractors will remove their apparatus, and the line will be definitely abandoned about the middle of the present month.

Mr. Chamberlin says that the sum of two and a half million dollars has already been expended on the line and that its completion will require several millions more than was originally estimated.

The services of the Grand Trunk engineers are tendered to the state, which would receive also all plans, surveys and other data used by the company. If the state does not wish to accept the offer, it is asked to consider the earlier request to guarantee the company's bonds.

The Flood Damage.

Accurate accounts of the damage done by the floods of March 25-29, in Ohio, Indiana and adjacent states are still lacking, the work of restoration being the greatest emergency-burden ever experienced by the principal roads in central territory. President Willard of the Baltimore & Ohio has estimated that that company's losses will amount to 2½ to 3 millions of dollars, and the loss of traffic for the last week of March and the first week of April will aggregate two millions. The property loss of all railroads in the territory damaged by the floods of the 25th-27th he estimated at from $18,000,000 to $20,000,000. He said that it would be impossible for the company to make many of the improvements which had been planned. At Zanesville the B. & O. lost a car shop worth about $300,000 and a bridge worth $250,000. The road lost 12 bridges in the flood and had several miles of track completely washed away. Trains were run through from Washington to Chicago, April 4, over its own lines, although it was necessary to detour trains over divisions not or-

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dinarily used for this traffic. At Zanesville and on the Ohio River division it took many days to make even temporary repairs. At Hamilton and Dayton the railroad yards were ruined.

The Chesapeake & Ohio was able to run trains east of Huntington, W. Va., by the 4th, but west of there it took until the 6th to restore the tracks to Cincinnati. West of Cincinnati the damage was extensive and the line was not opened till the 9th.

The Pennsylvania lines in Ohio suffered severely. An officer said that the steel bridges lost would aggregate in length about 8,000 ft. A second rain in central Ohio on the 4th caused some washouts, and the Pennsylvania, after using its own line for a short time was obliged again to use the Erie between Akron to Mansfield. A second series of washouts occurred also on the Cleveland, Akron & Columbus. The Pennsylvania's bridges, which were wrecked beyond repair, numbered 14, six of which were large ones. The Cleveland & Pittsburgh was opened through on April 2.

The Toledo, St. Louis & Western was opened throughout its length April 1.

The Wabash seems to have suffered less than the other roads in Indiana, and freight was accepted April 2.

The Largest Ship in the World.

The new steamship "Vaterland" of the Hamburg American Steamship Company was launched at Hamburg April 3, the greatest mass of steel ever put into the water. The vessel's launching weight was 31,000 tons, and her gross tonnage will be over 50,000 tons. She will be 950 ft. long, and 100 ft. wide; and her height, from keel to masthead, will be 250 ft.

This vessel will be 5,000 tons larger than the "Imperator," her sister ship, which has lately been finished, and which will cross the Atlantic next month. The "Vaterland" will not be ready for service until 1914.

All of the three new monster ships of the Hamburg American line will have double steel hulls, the inner "skin" being carried high above the water line. In the "Vaterland" 1,500,000 rivets were used, weighing 1,500 tons. The steel plates were riveted together, and the walls completed, before the port holes were cut. These holes were made by the use of the acetylene torch. These vessels will have search-lights of 80,000 candle power, and the lights will be placed high enough to throw their rays thirty miles out to sea. The "Vaterland" will have 84 life boats, two of which will be equipped with high power motors, capable of towing other boats. These motor boats will have wireless telegraph apparatus, with which messages can be sent 200 miles.

Pere Marquette Investigation.

Newman Erb, chairman of the board of the Pere Marquette, testified before the legislative committee which is investigating the affairs of the road, at Lansing, Mich., on March 28. Among the reasons for the deficit which threw the road into bankruptcy, he mentioned wage increases, bad weather, and disruption of traffic caused by undertaking too many improvements at one time. President Cotter tried to do too much at once in 1911, he said, tearing up too many lines at once and interfering with traffic. He also criticised the men who managed the road during the eight years between his first connection with it, and his second connection as receiver, saying that they "sat like bumps on a log" and made no effort to develop the property. He considered the road to be worth $70,000,000, the amount of its present funded debt, as a future prospect, and expressed the belief that it was not necessary for the stockholders to lose a single cent. With $20,000,000 the road could be made a paying institution in two years under present conditions, and with half that sum in four years. He also cited the gradual reduction in rates from an average of 7.03 mills per ton mile in 1902, to 5.75 mills in 1911, while expenses have been going up at the rate of $1,000,000 a year for wages, $500,000 for materials, and on an average of $280,000 for taxes. If the 1902 conditions had prevailed in 1911, he said, the net earnings would have been increased by $6,000,000. Some of the branch lines are unproductive, and will be for years. The road must be put in condition to handle cheaply long-haul tonnage. If the state imposes no further burdens the Pere Marquette will emerge from its difficulties.

Eugene Zimmerman testified before the commission on April 2. He declared that the Cooley appraisal of $28,000,000 as a replacement value of the road was entirely too low, as was the second appraisal of $34,000,000, and he thought it was worth nearer $70,000,000, but would make no definite estimate without a thorough investigation. He said that Michigan, through its laws affecting railroads, was confiscating them, and that he would not invest a dollar in a Michigan road. Asked if he did not think the people would be willing to give the roads higher rates if the roads demonstrated the necessity, he replied, "No, I don't; lots of the people are not honest." He did not think the state could operate the road successfully, because there would be too much politics in the management and that it would ruin the state. In his opinion the road could be operated at 75 per cent. of its gross earnings, and the latter could be increased from $17,000,000 to $20,000,000. Mr. Zimmerman also, under cross-examination, furnished the committee with a large amount of detailed information regarding the financial affairs of the road and the various sales of its stock.

Pennsylvania Pensions.

The Pennsylvania Railroad has now paid pensions 13 years, and a total of 7,152 men have received payments, through the funds, of $8,368,786, all out of the earnings of the various companies in the System. Of this amount $6,319,902 has been paid on the lines east of Pittsburgh, and $2,048,884 west of Pittsburgh. At the present time there are 3,807 men on the pension rolls. On December 31 last, there were 296 pensioners on the lines east of Pittsburgh more than 90 years of age. The names, occupations, and divisions where last employed of those over ninety years of age were as follows:

Name.	Occupation.	Division.
Micheal Eckerline	Laborer	Altoona shops.
James Kaylor	Blacksmith	Altoona shops.
Elias Griffith	Watchman	Altoona shops.
James L. Shields	Foreman mason	Conemaugh.
David L. Graeff	Machinist	Philadelphia.
Thomas C. Payne	Laborer	Trenton.
Charles Lupton	Car builder	Philadelphia Terminal.
James Gray	Agent	Elmira.
Chas. A. Jefferies, Sr.	Signal repairman	Philadelphia.

The pension amounts to one per cent. of the average salary or wage for the ten years previous to retirement, multiplied by the number of years the man has been in the employ of the company. Employees retire without any obligation whatever to the Pennsylvania Railroad, and many of them engage in outside occupations. This pension plan, inaugurated by Mr. Cassatt in 1899 with much doubt as to its eventual success, is now declared by the officers of the company to have proved to be of immense benefit to a large number of men, and to have contributed enormously to the contentment of the men in the service of the road.

Suit for Southern Pacific Lands.

Julius Kruttschnitt, chairman of the executive committee of the board of directors of the Southern Pacific, testifying at New York City this week in the suit of the government charging fraud in the acquisition of lands by the Southern Pacific in Kern county, Cal., denied the truth of the statement, published last year, on the authority of the attorney general, that officers of the Southern Pacific had known that lands on which the companies sought patent, contained oil. The land in question aggregates 6,800 acres and it has been charged that it is worth $15,000,000. Mr. Kruttschnitt denied emphatically that there had been any fraud or deception in obtaining the patents.

Asked if he considered $15,000,000 a fair value of the lands now he said:

"I don't consider the lands of any value. Were it not for the imputation of fraud in this suit I would favor selling the lands for 15 cents an acre to any person who might be foolish enough to buy the property."

He contended that the lands in 1904 were poor grazing or agricultural lands, as stated in the patent claim.

He admitted that some time previous to the patent of these lands he had been in charge of the oil development work of the Southern Pacific, but he declared he had no information as to the land other than that contained in the official papers and map used in the patent proceedings. He denied the claim made by the government that the Southern Pacific had a thorough examination of the land made before the patent was secured. He said the Kern Trading & Oil Company was a fuel oil development and oil purchasing department of the Southern Pa-

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cific. There was no secrecy in connection with its formation.

"We did not consider it oil land in 1903-4," he said, "but some years later 'wildcat' promoters entered this territory, and through their operations the impression was created that the land was generally oil producing. Those fellows had to give up in despair and abandon the fields."

W. N. Mills, special assistant attorney-general, turned to Mr. Kruttschnitt and said:

"Don't you know that there are three valuable gushers now in operation on these lands, producing 1,000 barrels of oil daily?"

"That is news to me," replied Mr. Kruttschnitt. "I am glad to hear it, for if that is so the land has some value."

Railway Club of Pittsburgh.

At the next meeting of the Railway Club of Pittsburgh, to be held April 25, Walter V. Turner, chief engineer, and P. H. Donovan, mechanical engineer of the Westinghouse Air Brake Company, Pittsburgh, Pa., will read a paper on The Effect of Changed Operating Conditions and Modern Rolling Stock on the Brake and What Is Being Done to Make This Money Saving or Money Losing Apparatus as Efficient as Heretofore.

American Society of Engineer Draftsmen.

At the next meeting of the American Society of Engineer Draftsmen, to be held in the Engineering Societies' building, New York, April 17, D. B. Heilman, Mem. Soc. E. D. (Philadelphia & Reading), will read a paper entitled, Teaching Legible Sketching for Shop Plans to the Operating Engineer and Machinist. This lecture will be illustrated by a projectograph.

Railway Signal Association.

The next meeting of the Railway Signal Association will be held at Hotel Astor, New York City, on Wednesday and Thursday, June 11 and 12, the dates having been changed from the tenth and eleventh by a recent decision of the Board of Direction.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W. Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMAN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 26, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andrucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Nealy, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—N. S. Brown, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—F. E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Congress, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick Building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilner, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION OF THE U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, 683 Atlantic Ave., Boston, Mass., 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, Old Ab. St. Ry. Bldg., Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotehford, Union Station, Peoria, Ill.; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. R. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—S. Hartwell, Cedar Rapids, Iowa. Next meeting, August 12-13, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 20-23, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with Am. Ry. Eng. Assoc. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Telg. Supts.

RICHMOND RAILROAD CLUB.—F. D. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—W. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—W. Nicholson, Spicer Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—H. Nold, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Luncheons 3d Tuesday in October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 2042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, 1, S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

The meeting of the Western Classification Committee, which is expected to last for several weeks, was begun at St. Louis on April 1.

F. R. Stevens, agriculturist of the Lehigh Valley, who goes around among the farmers responding to their requests for information, says that he has already traveled in his automobile 20,000 miles on these errands.

The Canadian Pacific has restored the uniform rate of one dollar a day, demurrage, on freight cars, the rates of two dollars and three dollars which have been in force since the scarcity of cars last autumn being now discontinued.

The Grand Trunk reports 3,000 passengers leaving Montreal in the last two weeks in March in eleven special trains, for Ontario and points in Western Canada, all these passengers having come from Europe by way of Portland, St. John to Halifax.

The Southwestern Passenger Association, Western Passenger Association, Southeastern Passenger Association, and Central Passenger Association have authorized a special rate of two cents a mile to St. Louis for the Fourth Annual Peace Congress to be held on May 1, 2 and 3.

"Trade and Traffic" is the name of a new monthly publication, the first number of which has just been issued at Tampa, Fla., by L. T. & B. E. Calkins. A sub-title reads "Finance and Real Estate." The editor has at least two of the essential qualifications; he knows how to write and he is familiar with railway freight traffic.

At Williamsburg, Ky., the Adams Express Company has been fined in court $1,475 on nineteen charges of delivering liquor in territory where its sale is forbidden, the action of the express company being alleged to be contrary to the provisions of the federal law recently passed by Congress, regulating the interstate movement of liquors.

Somebody has figured out that the freight carried through the Soo canal in 1912, 72½ million tons, troubled the waters there about every 15 minutes. The number of cargoes, 20,000, means large ships, 3,625 tons on the average. At that it involves 85 ships a day for the season of 236 days. In 100-ton boats, such as used to be common, it would mean 725,000 vessels a year, 3,060 a year through the season, 180 an hour at the height of trade, or one every 20 seconds. By caravan, five camels to the ton, this would require 364½ million camels a year, or a million a day, or with the restricted season nearly 1.5 million a day. At the busiest there would be 91,125 camels an hour.

The Pennsylvania State Railroad Commission has before it complaints from two teamsters in Philadelphia, who claim that they are discriminated against at the freight houses of the Pennsylvania Railroad and the Philadelphia & Reading, in Philadelphia. One of the two complainants has proceeded against the Pennsylvania, and the other against the Reading; and the Philadelphia Team Owners' Association is aiding the prosecution on behalf of both. It is claimed that freight coming to the freight houses in the cars is piled up indiscriminately and is often so covered by other goods that the teamsters have to waste much time in getting what they want. They demand that the employees of the railroad shall truck the freight to the wagon door. The complaint charges that packages for the large stores which do their own trucking are sorted and placed near the doors where the teamsters can get them easily. It is claimed that tailboard delivery—that is, delivery of the freight close to the point where the wagon backs up—is in vogue in Chicago, Cleveland, Buffalo, Rochester, St. Louis and Minneapolis.

Chicago Street Traffic.

A subcommittee of the Chicago Association of Commerce has submitted to the association a report on the teaming, transfer, express and storage interests of Chicago, in which it is stated that more than 250,000 tons of freight are hauled through the streets of Chicago daily, making a total approaching 100,000,000 tons a year. This represents an annual business of more than $60,000,000, and an investment in excess of $85,000,000. According to the report more than 10,000,000 tons of coal are trucked through Chicago streets annually. Structural steel, brick, sand, ice, general merchandise, produce, packinghouse products and milk, are among the other commodities that are large factors in the total. The number of vehicles registered with the city authorities in 1912 was 80,000, an increase of 11 per cent. The increase in capacity was still greater. Of these vehicles more than 50,000 are horsedrawn wagons and trucks, and 2,790 are automobile trucks. The number of motor trucks carrying less than one ton increased from 922 in 1911, to 1,554 in 1912, while the number carrying over one ton increased from 656 to 1,018.

INTERSTATE COMMERCE COMMISSION.

Fred W. Sweney, of Chicago, has been appointed chief examiner of accounts for the Interstate Commerce Commission, to succeed Charles A. Lutz, who recently resigned to become comptroller of the United States Express Company. Mr. Sweney has been an employee of the commission several years.

The commission has suspended from March 31 until July 29, certain items in a supplement to Agent W. H. Hosmer's tariff, which contain increased rates for the transportation of linseed oil cake and meal and flaxseed screenings from Minneapolis, Minn., and other points to gulf ports.

The commission has suspended from March 31 until September 30, a supplement to the tariff of the Minneapolis & St. Louis, which contains increased rates applicable to the transportation of grain, grain products and seeds from Aberdeen and other stations in South Dakota to Duluth, Minn.

The commission has suspended from March 27 until July 25, an item naming increased rates on flour, in carloads, from points in Kansas and other western states to California terminals, published in supplements to certain tariffs. The present rate from Atchison to San Francisco is 65 cents per 100 lbs., and the proposed rate is 75 cents. An increase of 10 cents per 100 lbs. is also proposed from various other points.

The commission has suspended certain schedules contained in supplements to Agent R. H. Countiss' tariff, which would advance rates on lumber and shingles from Pacific coast points, including San Francisco, to certain points in Colorado, Wyoming and Texas. For example, it was proposed to cancel the present through rate of 50 cents per 100 lbs. on lumber moving from San Francisco to Dalhart, Tex. The combination of local rates applicable would be 30 cents to Los Angeles plus 50 cents from that point to Dalhart, making an advance of 30 cents per 100 lbs. Like advances would result between other points.

Complaint Dismissed.

James J. McLoughlin v. Texas & Pacific et al. Opinion by the commission:

The complainant contends that the rate charged for the transportation of hay from Endora, Ark., to New Orleans, La., was unreasonable. Reparation was asked. The commission found that the evidence was not conclusive. (26 I. C. C., 307.)

Alfred Struck Company v. Louisville & Nashville et al. Opinion by the commission:

The commission found that the charges on shipments of doors and window frames, set up, from Louisville, Ky., to Galveston and Houston, Tex., Chattanooga and Memphis, Tenn., and Atlanta, Ga., were not unreasonable. (26 I. C. C., 469.)

Memphis Bureau v. Louisville & Nashville et al. Opinion by Commissioner McChord:

The complainant contended that the rate of $1.10 per ton on coal from western Kentucky and Alabama mines was unreasonable to the extent that it exceeded $1.00 per ton. The commission found that the evidence was not conclusive. (26 I. C. C., 402.)

Board of Trade of Cheraw, S. C., et al. v. Seaboard Air Line et al. Opinion by the commission:

The complainant attacks the class and commodity rates from all directions to Cheraw, S. C., alleging that they are unreasonable and prejudicial as compared with the rates to Wadesboro

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and Monroe, N. C. The commission found that the evidence was not conclusive. (26 I. C. C., 364.)

Stewart & Clark Manufacturing Company v. Atchison, Topeka & Santa Fe et al. Opinion by the commission:

The complainant contends that the rating of double first class on speedometers in western classification was unreasonable. Reparation is asked on shipments in less than carloads from Chicago to San Francisco and Los Angeles, Cal. The commission found that the evidence was not conclusive. (26 I. C. C., 361.)

Wholesale Produce Dealers Association of Brooklyn, N. Y., v. Long Island Railroad. Opinion by the commission:

The complaint attacking the defendant's track-storage charges exacted at certain delivery tracks in Brooklyn, N. Y., was dismissed, the evidence showing that members of complainant association use defendant's cars for warehouse purposes. The charges themselves were not found to have been unreasonable. (26 I. C. C., 413.)

Cal Hirsch & Sons Iron & Rail Company v. Washington, Baltimore & Annapolis Electric et al. Opinion by the commission:

The complainant contends that the rate of 77½ cents per 100 lbs. for the transportation of less-than-carload shipments of school desks and other articles from Annapolis, Md., to East St. Louis, Ill., are unreasonable. The commission decided that the evidence was not conclusive. (26 I. C. C., 480.)

Exson Granite Company et al. v. Southern Railway Company et al. Opinion by the commission:

Between June 24 and July 2, 1909, complainants shipped 43 carloads of granite paving blocks from Granite Quarry, N. C., to Chicago, upon which the defendants charged a joint rate of $3.30 per net ton. The intention of the carriers was to reduce this rate to $3.10 per ton, effective June 24, but the reduction was not accomplished until July 3. Upon a petition alleging that the rate of $3.30 per ton from Granite Quarry to Chicago was unreasonable, the commission decided that the mere agreement of the parties with respect to a rate, or the mere subsequent reduction of a rate, is not sufficient ground for a finding of unreasonableness. (26 I. C. C., 449.)

Reparation Awarded.

The Board of Railroad Commissioners of the state of Montana, in behalf of Frank W. Campbell, v. Northern Pacific et al. Opinion by the commission:

The commission decided that the charges of 65½ cents per 100 lbs. on a carload of emigrant movables from Edmunds, N. Dak., to Shawmut, Mont., were unreasonable, to the extent that they exceeded 51 cents per 100 lbs., and prescribed that rate for the future. (26 I. C. C., 482.)

Capital Electric Company v. Baltimore & Ohio Chicago Terminal. Opinion by the commission:

The commission decided that the rate of 95 cents per 100 lbs. charged by defendants for transportation of a carload of enameled-iron conduit pipe from Harvey, Ill., to Salt Lake City, Utah, was unreasonable to the extent that it exceeded 75 cents per 100 lbs., and prescribed that rate for the future. (26 I. C. C., 472.)

Rates on Hoops Reduced.

Disher Hoop & Lumber Company v. St. Louis & San Francisco et al. Opinion by the commission:

The commission decided that the rate of 6½ cents per 100 lbs. on coiled elm hoops from Chaffee, Mo., to Thebes, Ill., was unreasonable to the extent that it exceeds 4 cents per 100 lbs., and prescribed that rate for the future. Reparation was awarded. (26 I. C. C., 488.)

Minimum Weight Reduced.

Josiah Partridge & Sons Company et al v. Pennsylvania Railroad et al. Opinion by the commission:

The commission decided that the maintenance of minimum carload weight of 10,000 lbs on chairs, n. o. s., set up, from Lewisburg, Pa., to Jersey City, N. J., was unjustly discriminatory against complainants and unduly preferential to shippers from other points from which the same commodity is transported under a minimum carload weight of 8,000 lbs., and prescribed that minimum for the future. (26 I. C. C., 484.)

Reconsigning Charges Reduced.

C. C. Justice Company v. Pennsylvania Railroad. Opinion by the commission:

The commission decided that the charge of $5 per car for reconsigning carloads of green tomatoes at Altoona, Pa., was unreasonable to the extent that it exceeded $2 per car, and prescribed that charge for the future. Reparation was awarded. (26 I. C. C., 478.)

Hardware Rates Reduced.

McGregor-Noe Hardware Company v. St. Louis & San Francisco. Opinion by the commission:

The commission decided that the rates for the transportation of less-than-carload shipments of band and boiler iron, corrugated iron, horse and mule shoes, wire, woven-wire fencing, nails and spikes from Springfield, Mo., to certain local points in Missouri and Arkansas were unreasonable to the extent that they exceeded commodity rates formerly in effect, and prescribed those rates for the future. (26 I. C. C., 466.)

Switching Charges Not Increased.

In re switching charges at Sheffield, Minn. Opinion by Commissioner Prouty:

The commission decided that the proposed advance from $3 per car to $5 for switching grain and grain products by Chicago Great Western between the interchange track of the Chicago, Rock Island & Pacific and the mill of protestant at Sheffield, Minn., was not justified, and that a charge of not exceeding $3 might properly be made for the switching of the loaded car and $1.50 for the movement of the empty car. (26 I. C. C., 475.)

Passenger Fares Increased.

In re Fares from Suburban Points on the Washington-Virginia Railway to Washington, D. C. Opinion by Commissioner Prouty:

The suspended tariff increases the passenger fares from stations on the line of the Washington Virginia Railway in Virginia, Petty to Green Valley, inclusive, to points in Washington, D. C., from 10 cents to 15 cents. The commission found that the suspended tariff contained prices for family and commutation tickets which would enable passengers to travel at a lower rate than is possible under the rates now in effect, and that the results of the suspended tariff would probably be to cheapen rather than enhance the cost of transportation. The order of suspension was vacated. (26 I. C. C., 398.)

Joint Rates Established.

Texas Cement Plaster Company v. St. Louis & San Francisco et al. Opinion by the commission:

The complainant alleges that the failure of the Kansas City, Mexico & Orient, and the St. Louis & San Francisco to establish joint through rates on cement plaster from Plasterco, Tex., to destinations on the line of the St. Louis & San Francisco results in unjust discrimination against its product. The commission decided that the defendant should be required to establish joint rates from said point of origin to points on the line of the St. Louis & San Francisco not exceeding those contemporaneously maintained from Acme, Tex., to the same destinations. (26 I. C. C., 508.)

Colorado Passes.

In re issuance and use of passes, franks and free passenger service. Opinion by Commissioner Harlan:

The commission found that with the single exception of the Chicago, Burlington & Quincy, the railroads in Colorado until last November were violating the law respecting the issuance of free passes. Annual system passes were freely issued to persons who had only a nominal connection with the railroads and trip passes for the families of such persons were also furnished. Free state passes were readily granted to prominent interstate shippers, but the occasional shippers rarely received

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such favors. Public officials, particularly those who favored the railroads, also obtained passes without difficulty. The commission held that an intrastate pass unlawfully given to an interstate shipper was a step toward the purchase of his traffic. The proper rules restricting the use of the passes were printed on the back of the passes, but the commission decides that as these instruments by which the purposes of the law might be defeated had been voluntarily distributed by the carriers, it was the duty of the carriers to protect its facilities and services against the improper and unlawful use of the passes by proper policing. The railroads had been eager to abolish these practices, but each was afraid to start the movement on account of the loss of traffic which was sure to follow. The Burlington alone broke away; and it did this at a loss, which would have been much greater if its lines had been differently located. The investigation of the commission enabled the carriers to stop these practices without requiring any particular carrier to assume the burden with its shippers of initiating the movement. The carriers readily agreed to conform their practices in the future to the rulings of the commission, and since the investigation was commenced they have taken steps with that end in view. Other reports on this investigation will be issued when it has been determined just how far prosecutions must follow the disclosures. (26 I. C. C., 491.)

Demurrage Charges Properly Assessed.

Leo P. Harlow, trustee, v. Washington Southern. Opinion by the commission.

The complainant contends that the demurrage charges paid upon certain shipments of cottonseed oil consigned to the Cotton Oil Company at Relee, Va., were excessive. Reparation is asked. The complainant is trustee in bankruptcy for the Columbia Cotton Oil & Provision Corporation. This corporation has private tracks at Relee capable of holding about 35 cars, and asked the defendant to store the cars consigned to it on these private tracks in order to avoid demurrage charges. The shipments in question were on order-notify bills of lading. An order-notify shipment is a notification to the carrier that title to the consignment is retained by the consignor until delivery of the bill of lading properly endorsed. Ordinarily the order-notify bill of lading is forwarded to the bank with a sight draft attached for the value of the shipment, and the person notified at destination can only obtain possession of the bill of lading by payment of the draft. The carrier cannot without incurring liability deliver such shipments until the bill of lading is properly surrendered. The delivering carrier did not surrender possession of these cars until the bills of lading for them were surrendered. Neither did it store the cars as requested, for such action might have resulted in the carrier becoming liable to the consignor, and moreover, such delivery would not have stopped the accrual of demurrage charges under the tariff. The commission decided that the delay in presenting the bills of lading was the fault of the bankrupt corporation, and that the demurrage charges were properly assessed. The complaint was dismissed. (26 I. C. C., 511.)

Investigation of Fiber Packing Boxes.

Examiner Boyle of the Interstate Commerce Commission, began a hearing at Chicago on April 4, in the case of R. W. Pridham Company, of Los Angeles, vs. the Southern Pacific, et al., involving the reasonableness of the eastbound commodity rates out of California which are higher for commodities packed in fiber board boxes than for the same articles packed in wooden boxes. Although the complainant rested his case at the hearing in Los Angeles several months ago, the associations representing the fiber box manufacturers, the wooden box manufacturers, and the users of fiber board containers have filed interventions in the case, and Examiner Boyle stated that it has now assumed practically the attitude of a general investigation by the commission of the entire subject of substitutes for wooden boxes.

Luther M. Walter, the attorney representing the fiber box manufacturers, stated that, except in the rates from California, no discrimination is made between fiber board and wooden boxes. The first witness was J. B. Fellows, president of the Illinois-Michigan Fiber Box Company, who testified at length regarding the history of the development of the fiber package as a freight container, which he was the first to manufacture without wooden edges. His company is now making between 4,000,000 and 5,000,000 boxes a year, and receives no complaints against the fiber box for transportation purposes from its customers. It is decidedly to the interest of the manufacturer, he said, that the box shall be satisfactory, and therefore the product is tested during manufacture every half hour, and no effort is made to market the boxes for the transportation of bulk freight, or for commodities or conditions for which it is unsuited. For the articles customarily shipped in such boxes he considered that fiber made as satisfactory a container as wood, and he promised to submit a list of such commodities.

Several shippers who have used large numbers of fiber boxes strongly defended them as against wooden boxes, except under certain conditions, such as those which must be met by ocean freight that often has to be rehandled several times, and declared the fiber box superior to wood for many kinds of shipments. Photographs taken in warehouses showing the condition of fiber boxes and wooden boxes under various circumstances were introduced in evidence.

STATE COMMISSIONS.

The railroad and warehouse commission of Missouri has rescinded its order dated March 19, refusing to approve Western Classification No. 51 and declaring that Western Classification No. 50 would remain in effect. The reason given is that under the operation of the new law the commission will cease to exist on April 15, and within that short period it will not have time to make such investigation as the importance of the questions involved will require. It is concluded that the matter of the approval or disapproval of Classification No. 51 should be taken up by the new public service commission.

The railroad commission of Louisiana has issued a circular, No. 419, announcing its intention to order the introduction of the block system on all railroads in the state, except those less than 25 miles long, and except those which run only one train a day each way. The circular says that the three important roads in the state which already have block signals are operating their trains under the system "with splendid results." All roads are called upon to send to the commission, before April 30, a statement of what accidents have occurred on their lines during the past five years; a list of telegraph offices with the distances between them, and showing also stations which have no telegraph; also the number of regular trains run each way daily.

The Public Service Commission of Maryland in a case against the Northern Central, decides that a local passenger train, carrying intrastate passengers, may not rightfully be sidetracked to allow an express train, behind time, carrying interstate passengers, to run ahead of it. It was contended by the railroad company that the commission had no right to issue an order that might interfere with the running of its through trains engaged in interstate traffic. The commission took the ground that the schedule for the local train belongs to it when it is running on that time, and not to a belated express train, and, in brief, that the rights of the passenger traveling wholly within the state are equal to those of the passenger from without the state, and that the railroad's time table in this respect is its contract with the passenger.

The Public Service Commission of Missouri.

The law of Missouri abolishing the Railroad and Warehouse Commission, and establishing a Public Service Commission with extensive powers, goes into effect April 15. This law, which was Senate bill No. 1, fills 149 pages, and the powers granted to the new commission embrace apparently everything of a radical nature which is to be found in the laws of New York and the other states which have adopted new statutes concerning transportation and other public utilities during the past few years. Street railroads, gas companies, electric light, water, and express companies, telephone and telegraph companies are dealt with at great length. The term of each of the five commissioners will be six years. They must have been citizens for five years and must be 25 years old. The governor in making appointments designates the chairman. The governor also appoints a general counsel for a term of six years, but the commission appoints its own secretary. The commissioners during their terms are to reside at Jefferson City. Their salaries will be $5,500 each;

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that of the general counsel $4,500; and that of the secretary $3,600. The commissioners and their employees are forbidden even to suggest the appointment of any person to a place under any corporation subject to the supervision of the commission. Among the detailed powers granted to the commission is a clause authorizing it to order the construction of side tracks to industries. It may prescribe the time in which express packages are to be received and when delivered, and the limits of delivery territory. The commission may order railroads to provide a suitable car to be used in testing track scales, the expense to be apportioned, by the commission, among the different railroads. The commissioners and their employees may ride on trains and engines by paying fare, and on reasonable notice may have the use of an inspection locomotive, or a special locomotive and an inspection car, once a year. In adjusting rates for passengers or freight, the commission is to "have regard among other things to a reasonable average return on the value of the property used in public service and to the necessity of making reservation out of income for surplus and contingencies." The commission may order the restoration of reduced fare passenger tickets which have been discontinued within five years past. Connecting railroads may be ordered to form through lines, and if necessary the commission may order the construction of a connecting track. The commission may suspend new tariffs, but not for more than 120 days.

No road shall hereafter be constructed across a railroad track, nor a railroad across a public highway, nor a railroad across another railroad, without the permission of the commission; and the commission has the right to refuse consent. The commission may ascertain the value of the property of every railroad, street railroad and common carrier, and may make revaluations from time to time. The commission may order the installation, maintenance and operation of appropriate safety devices, including interlocking and block signals, and to establish uniform or other standards of equipment.

About half of the pages of the law are taken up with provisions relating to gas, electric light and telegraph companies.

The Railroad and Warehouse Commission having been abolished, a new law has been passed, House bill No. 516, creating the office of warehouse commissioner and regulating the inspection and weighing of grain.

COURT NEWS.

In the superior court at Bridgeport, Conn., on Tuesday of this week, Judge Greene began the trial of officers of the New Haven road charged with criminal negligence in connection with the derailment at Westport, October 3, last; Messrs. H. J. Horn, B. R. Pollock, C. N. Woodward and L. J. Carnall.

The attorney general of Missouri has announced that quo warranto proceedings will be filed in the state supreme court to oust the St. Louis & San Francisco from control of the Kansas City, Clinton & Springfield, a line running from Kansas City to Springfield, on the ground that it is a parallel and competing line.

The Supreme Court of the United States, in the case of McGinnis, a locomotive engineer, killed while running the engine of a train of the Gulf, Colorado & Santa Fe, holds that married daughters of railroad employees may not enjoy benefits under the federal employers' liability law in case of the negligent killing of the father. Justice Lurton, for the court, reversed a verdict of $15,000 awarded the widow and children. The decision holds that the employers' liability law grants benefits only to those who are shown to have suffered loss.

The supreme court of the United States, this week, in the case of the Mine Hill & Schuylkill Haven railroad decided that where the property of a corporation is leased to another, and the owning company has no income except the rental, it is not doing business, in the contemplation of the federal corporation tax law, and therefore is not liable to pay the corporation tax. A dissenting opinion was rendered by Justice Pitney, in which Justices Day, Hughes and Lamar concurred. Justice Pitney holds that in investing their receipts, the directors of the owning company "do business."

In the county court at Greenville, Ky., last week, forty suits were entered against the Illinois Central seeking damages for the failure of the road to furnish cars to coal operators in Muhlenberg county. The plaintiffs are workmen in the mines and their suits are based on the charge that the company, in failing to perform a public duty, failed in its duty to them, the miners, as members of "the public." The attorney for the plaintiffs says that 1,800 suits will be filed. All of the suits thus far filed are for small amounts, the basis of each claim being that the plaintiff has been deprived of work because of the absence of cars.

The Supreme Court of the United States has reversed the Federal Court in Alaska which annulled five of the six counts of an indictment against the Pacific & Arctic Railway & Navigation Company and others charged with violating the anti-trust law and interstate commerce law, in regard to Alaska transportation facilities. All the counts charged in varying form that the railroad from Skagway to the headwaters of the Yukon had entered into a conspiracy with steamship lines to destroy the competition of independent steamship lines, such as the Humboldt Steamship Company, by charging the independent lines higher rates and refusing to make joint rates with the independents. The Alaska court held that before it could have jurisdiction over the case the alleged discrimination should be passed upon by the Interstate Commerce Commission; but this view is now rejected and the case goes back for trial.

The commerce court has denied the petition of the Atchison, Topeka & Santa Fe asking the court to set aside the order of the Interstate Commerce Commission reducing from $30 to $7.50, the company's charge per car for refrigerating oranges and lemons, where such fruits are pre-cooled and pre-iced by the shipper. The carriers denied that shippers had any right to ice cars, as in so doing they took out of the hands of the carrier a part of the transportation service, the law having declared that refrigeration or icing is an element of transportation. The court finds that the railroads get greater revenue per car, and per ton of load, when the shippers pre-cool and pre-ice the fruit. Transportation is more economical where the fruit is pre-iced, as then the boxes can be packed more closely together in the car. The roads, however, evidently want the privilege of furnishing the ice themselves, though it appears that the commission would probably rule that any such service, performed by the carrier, must be done at cost or a very small advance on cost. The court justifies the commission in holding that the shipper has a right to pre-cool the fruit and pre-ice it, at least until the railroads offer a substitute which would be fairly equivalent in cost and efficiency.

Anthracite Coal Case.

The Supreme Court of the United States in the anthracite coal case, recently decided, has directed that its decree be amended so as to give the district court power to decide whether four certain "65 per cent. contracts" should be excepted from the decision which held that such contracts were void. The Supreme Court held that the contracts whereby the railroad coal companies bought the output of independent operators at 65 per cent. of the price of coal at tidewater, suppressed competition and violated the Sherman anti-trust law.

The Delaware, Lackawanna & Western Railroad, the Hillside Coal and Iron Company, the New York, Susquehanna & Western Coal Company and the Pennsylvania Coal Company maintained that their contracts did not suppress competition.

Justice Lurton, explaining that the court had been asked to exempt five contracts from the effect of the decision, said: "We find there is inadequate evidence before us to pass upon four of these contracts. Therefore we modify the decree so as to allow the District Court to take evidence and pass upon the point. The attorney-general is willing to have the decree amended so as to exempt the contract between the Pennsylvania Coal Company and the Elk Hill Coal and Iron Company. We amend the decree so as to exempt this contract."

SUBWAY FOR GENOA, ITALY.—Genoa is confined to a comparatively narrow territory, between the mountains and the sea, and can only grow at the two ends. Two engineers, E. Ravà and S. Cattaneo, have planned a subway and elevated railway to serve it, from a suburb on the west to one on the east, a distance of a little over 6 miles, about three-fourths of which will be underground. The cost is estimated at $5,000,000.

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Railway Officers.

Executive, Financial and Legal Officers.

W. H. Emerson has been appointed acting freight claim agent of the Chicago & Eastern Illinois, with headquarters at Chicago.

C. B. Ferry, assistant secretary of the Chicago, Milwaukee & St. Paul, at New York, has been elected vice-president, with headquarters at New York. Mr. Ferry will also continue to act as assistant secretary.

E. H. McHenry, vice-president in charge of the engineering department of the New York, New Haven & Hartford, with headquarters at New Haven, Conn., has resigned, effective May 1.

The following appointments are announced on the Chicago, Milwaukee & St. Paul: G. J. Bunting and J. Welch, assistant general auditors; R. N. Dudley, ticket auditor, and W. M. Harvey, auditor of material accounts; all with headquarters at Chicago.

Carl Remington, assistant to chairman of the Chesapeake & Ohio and the Hocking Valley, at New York, has been appointed secretary of those roads, succeeding James Steuart MacKie, who remains as treasurer of both roads, with headquarters at New York. Mr. Remington has been appointed secretary also of the Missouri, Kansas & Texas.

C. N. Whitehead, secretary and treasurer of the Missouri, Kansas & Texas, at New York, has been appointed assistant to president, with headquarters at St. Louis, Mo. Carl Remington has been appointed secretary, with headquarters at New York, and Frank Johnson, local treasurer at St. Louis, has been appointed treasurer, with headquarters at St. Louis, succeeding Mr. Whitehead, effective April 16.

J. W. Taylor, who recently was appointed assistant to the president of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, as has already been announced in these columns,

J. W. Taylor.

has been with the St. Paul road since a boy. He started as a messenger in the office of the car department at Milwaukee, Wis., in 1888. He subsequently filled several positions in the mechanical department until 1904. He then was promoted to general storekeeper, and five years later, in 1909, he was made a division superintendent. The following year, in 1910, Mr. Taylor became assistant to the comptroller, which position he held until March 15 of this year, when he received the appointment of assistant to President Earling, with office at Chicago, as noted above, succeeding E. D. Sewall, who has been elected vice-president.

Angus Daniel McDonald, deputy comptroller of the Southern Pacific Company at New York, has been appointed vice-president and comptroller, with headquarters at New York, succeeding William Mahl, retired under the pension rules of the company. Mr. McDonald was born on April 14, 1878, at Oakland, Cal., and was educated at various schools and at the University of Notre Dame. He began railway work January 8, 1901, with the Galveston, Harrisburg & San Antonio, and from September, 1904, to November, 1907, was chief clerk in the accounting department of the Southern Pacific Company at San Francisco, Cal. From December, 1907, to November, 1908, he was auditor of the Los Angeles Pacific Company, and then for one year was auditor of the Pacific Electric Railway Company, at Los Angeles. In January, 1910, he was appointed auditor of the Southern Pacific Company, at San Francisco, and three years later was made deputy comptroller at New York, which position he held at the time of his appointment as vice-president and comptroller of the same company, with headquarters at New York, as above noted.

William P. Newton, whose appointment as general auditor of the St. Louis & San Francisco, with headquarters at St. Louis, has already been announced, was born October 4, 1854, at Portersville, Pa. He was educated in private schools and began railway work in May, 1875, with the Leavenworth, Lawrence & Galveston, now a part of the Santa Fe, and the Kansas City, Ft. Scott & Gulf, now a part of the Frisco. From May, 1877, to May, 1879, he was auditor, secretary and treasurer of the Joplin Railroad, now a part of the Frisco, at Girard, Kan., and from the latter date to March, 1881, was traveling auditor for the St. Louis & San Francisco. He was then chief clerk and general bookkeeper until September, 1900, when he was appointed assistant general auditor, which position he held until his recent promotion to general auditor, as above noted.

William Mahl, vice-president and comptroller of the Southern Pacific Company at New York, voluntarily retired on April 7, under the pension rules of the company, after 53 years' continuous railroad service, 31 of which were in the service of the Southern Pacific Company. Mr. Mahl was born in Carlsruhe, Baden, December 19, 1843, and came to America with his parents in 1852. In 1860 he was entered as an apprentice in the shops of the Louisville & Nashville. In four years he became successively a machinist, a draftsman and chief clerk in the mechanical department. From 1864 to 1872 he was auditor and purchasing agent of the Louisville, Cincinnati & Lexington. For a few years he served under Colonel Thomas A. Scott as auditor, purchasing agent and financial agent of the Texas & Pacific. Soon after the panic of 1873 he returned to the Louisville, Cincinnati & Lexington, becoming its general superintendent. In February, 1882, Mr. Huntington called him to New York, where he served successively as general agent, comptroller and assistant to the president of the Chesapeake & Ohio and the Southern Pacific and the various collateral railways, steamship lines and other large interests of Mr. Huntington. After Mr. Huntington's death Mr. Harriman continued and extended Mr. Mahl's functions so as to cover the entire Union Pacific and Southern Pacific systems. He was vice-president and comptroller of both systems from October, 1909, until the Union Pacific and the Southern Pacific were separated under an order of the Supreme Court; and on February 6, 1913, resigned from the Union Pacific.

W. Mahl.

Operating Officers.

M. J. Kelley has been appointed superintendent of the Chicago, West Pullman & Southern, in charge of operating, maintenance of way and of equipment, with headquarters at Chicago.

Arthur B. Shafer, acting superintendent of the New York, Susquehanna & Western, at Jersey City, N. J., has been appointed assistant superintendent of the New York, Susquehanna & Western and the Wilkesbarre & Eastern.

R. H. Tuttle, superintendent of the Arizona division of the Atchison, Topeka & Santa Fe Coast Lines at Needles, Cal., has been appointed superintendent of the Albuquerque division, succeeding E. J. Gibson, resigned to go to another company, and J. A. Christie, trainmaster at Fresno, succeeds Mr. Tuttle.

J. H. Brinkerhoff, heretofore terminal superintendent of the Illinois Central at Chicago, has been appointed general superintendent of the Belt Railway of Chicago. The position of general

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manager on the Belt Railway has been abolished, and J. M. Warner, who has been general manager of both the Belt Railway and the Chicago & Western Indiana, will be general manager of the Chicago & Western Indiana. R. W. Stevens, who has been superintendent of the Belt Railway, has been appointed superintendent of the Chicago & Western Indiana, all with headquarters at Chicago.

Charles E. Brower, who has been appointed superintendent of the Atlanta, Birmingham & Atlantic, with headquarters at Fitzgerald, Ga., as has been announced in these columns, was born on August 20, 1873, at Franklinville, N. C. He received a college education, and began railway work in October, 1893, with the Cape Fear & Yadkin Valley, and for six years was in the service of that company, first as a telegraph operator and later as train despatcher. He was out of railway work during the two following years, and then entered the service of the Southern Railway. On July 17, 1902, he was appointed despatcher on the Atlanta, Birmingham & Atlantic, and on March 15, 1906, was promoted to trainmaster, which position he held until his appointment on March 1, as superintendent of the Brunswick division of the same road.

C. E. Brower.

E. Richards, whose appointment as superintendent of the St. Louis Southwestern, with headquarters at Pine Bluff, Ark., has already been announced in these columns, began railway work in 1881 as a telegrapher for the Chicago & Alton. Subsequently he was similarly employed on the Wabash and the Mexican National until 1884, when he went to the St. Louis Southwestern, and remained with that road until 1898, serving successively as telegraph operator, train despatcher, chief train despatcher and trainmaster. From 1899 to 1901 he was general manager of the Louisiana & Arkansas, and during the latter year was a train despatcher for the Chicago & North Western at Boone, Iowa, and chief train despatcher for the Choctaw, Oklahoma & Gulf at McAlester, Okla. Mr. Richards returned to the St. Louis Southwestern of Texas in 1902 as chief train despatcher at Mount Pleasant, Tex., leaving to go with the Louisiana Railway & Navigation Company as trainmaster at Shreveport, La., in 1905. He again became connected with the St. Louis Southwestern in 1907 as assistant superintendent at Pine Bluff, Ark., and was transferred to the Ft. Worth division as superintendent in October, 1912, which position he held until his recent appointment as superintendent at Pine Bluff, as above noted.

E. Richards.

F. J. Easley, assistant general manager of the first district of the Chicago, Rock Island & Pacific, with headquarters at Des Moines, Iowa, has been appointed assistant general manager of the third district, with office at El Reno, Okla., succeeding T. H. Beacom, who takes the place of Mr. Easley. A. T. Abbott, superintendent of the Iowa division, with office at Des Moines, has been transferred to the superintendency of the Des Moines Valley division, with headquarters at Des Moines, succeeding C. L. Brown, assigned to other duties. E. J. Gibson, superintendent of the Atchison, Topeka & Santa Fe at Winslow, Ariz., succeeds Mr. Abbott at Des Moines.

H. J. Curry, trainmaster on the Boston division of the Boston & Albany, at Beacon Park, Allston, Mass., has been appointed superintendent of the Albany division, including the main line and all branches between Springfield, Mass., and Albany, N. Y., with headquarters at Springfield. S. H. Clark, superintendent of the Albany division at Springfield has been appointed assistant superintendent of both the Boston and the Albany divisions, with headquarters at Springfield, and he will have special charge of the examination department, with jurisdiction over both divisions from Boston to Albany. Sheridan Bisbee, road foreman of engines, has been appointed trainmaster at Beacon Park, succeeding Mr. Curry.

Traffic Officers.

John S. Talbot has resigned as general western agent of the Western Maryland at Chicago.

George A. Blair has resigned as general traffic manager of the Chicago & Alton, to become assistant freight traffic manager of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago.

In addition to his duties as mail traffic manager of the Southern Pacific, H. P. Thrall has been appointed inspector of transportation service in its relation to the public, with headquarters at San Francisco.

C. J. Jones, formerly traffic manager of the Copper River & Northwestern and the Alaska Steamship Company, has been appointed general freight agent of the Southern Pacific, with headquarters at San Francisco, Cal.

E. M. Linzee has been appointed milk agent of the Chicago & Alton, with temporary headquarters at Springfield, Ill. As soon as the new station building is completed Mr. Linzee will have his headquarters at Bloomington, Ill.

W. E. Prendergast, assistant general freight agent of the Chicago, Milwaukee & St. Paul, has been appointed general freight agent, with headquarters at Chicago, succeeding H. E. Pierpont, recently promoted to freight traffic manager.

D. W. Agnew, soliciting freight agent of the Georgia Southern & Florida, at Cincinnati, Ohio, has been appointed commercial agent, with office at Valdosta, Ga., succeeding T. J. Cumming, resigned, and C. T. Dabney succeeds Mr. Agnew.

Robert Ralston, soliciting freight agent of the Cincinnati, New Orleans & Texas Pacific, at Cincinnati, Ohio, has been appointed traveling freight agent, with headquarters at Cincinnati, succeeding Harry Langmead, resigned, and George W. Frank succeeds Mr. Ralston.

W. A. Barrows, division freight agent of the Boston & Albany, at Worcester, Mass., has been appointed assistant general freight agent. William Callanan succeeds Mr. Barrows, and J. J. Woodis has been appointed eastbound agent, with office at Boston, Mass.

M. E. Schnell, city passenger agent of the Chicago Great Western at Waterloo, Ia., has been appointed district passenger agent at Des Moines, Ia., succeeding D. E. Peterson, who has been appointed city passenger and ticket agent at that point in place of H. O. Post, resigned to engage in other business.

J. B. Keefe, assistant general freight agent of the Delaware, Lackawanna & Western, at New York, has been appointed industrial commissioner, with headquarters at New York. C. H. Drinkwater, contracting freight agent at Chicago, has been appointed commercial agent, with headquarters at Minneapolis, Minn., succeeding E. H. Eden, deceased, and K. E. Long succeeds Mr. Drinkwater.

E. B. Coolidge, general freight agent of the Wheeling & Lake Erie, has been appointed general coal and ore agent, with headquarters at Cleveland, Ohio, succeeding H. J. Booth, who has

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been granted leave of absence. On his return Mr. Booth will take up special duties. R. F. Kelly, general passenger agent, has been made general freight agent also. T. J. McRoberts, chief clerk to the general passenger agent, has been appointed assistant general passenger agent, with office at Cleveland.

Engineering and Rolling Stock Officers.

C. F. W. Felt, who, on April 1, became chief engineer of the Atchison, Topeka & Santa Fe system, with headquarters at Chicago, as already announced, was born April 29, 1864, at Salem, Mass. He was graduated from the Massachusetts Agricultural College in 1886, and began railway work in September of that year with the Atchison, Topeka & Santa Fe Railway. From September, 1886, to October, 1887, he was rodman and later until February, 1888, was bridge engineer. He was then for three months with the Denver & Rio Grande as levelman; from August, 1888, to April, 1889, instrument man for the Arizona & Southeastern, and from the latter date to February, 1890, transitman on the Topolobampo line in Mexico. In April, 1890, Mr. Felt was made resident engineer of the Northern division of the Gulf, Colorado & Santa Fe at Cleburne, Tex., and in July, 1892, he went to the Rio Grande & Southern as office engineer, returning to the Gulf, Colorado & Santa Fe in February, 1893, as division engineer. Three months later he was transferred to Galveston, Tex., as resident engineer, and in September, 1896, he was promoted to chief engineer of the Gulf lines of the Santa Fe at Galveston, which position he held for thirteen years, being advanced to chief engineer of the Eastern and Western lines, with office at Topeka, Kan., in November, 1909. He now becomes chief engineer of the entire system, as above noted.

C. F. W. Felt.

C. A. Seley has resigned as mechanical engineer of the Rock Island Lines, effective May 1, to engage in a manufacturing business, the details of which will be announced later. This closes a career of 25 years of active railroad service. Mr. Seley was born December 26, 1856, at Wapella, Ill., and began railway work in 1879 as a draftsman for the St. Paul, Minneapolis & Manitoba. From 1881 to December, 1886, he was engaged in other work of a mechanical engineering nature, and then until January, 1888, was chief draftsman for the St. Paul & Duluth. The following four years he was with the Great Northern, and in May, 1892, he entered the railway supply business, returning to active railway service in March, 1895, as chief draftsman for the Chicago Great Western. He left the latter road in April, 1899, to become mechanical engineer of the Norfolk & Western, which position he held until May, 1902, when he was appointed mechanical engineer of the Rock Island Lines, with headquarters at Chicago. Mr. Seley has been an active member of various railway associations in committee work, and has served as a member of the executive committee of both the Master Car Builders' and Master Mechanics' Associations for many years. For three years prior to January 1 last he was a member of the sub-committee of mechanical officers of the Special Committee on Relations of Railway Operation to Legislation, which conducted the negotiations between the railways and the Interstate Commerce Commission and the postoffice department on safety appliances, boiler inspection rules and steel postal car specifications. He acted as chairman of this sub-committee most of the time. Mr. Seley was president of the Western Railway Club in 1907 and 1908, and has been chairman of various committees. He is also author of many papers on railway electrification and on car, locomotive and boiler design. His varied experience has built up for him a very large acquaintanceship with railway mechanical officers and railway supply men throughout the country.

C. A. Seley.

A. D. Case has been appointed engineer of structures of the Boston & Albany, with office at Boston, Mass., succeeding W. F. Steffens, resigned.

G. M. Rice, assistant engineer of the Chicago, Milwaukee & St. Paul, Puget Sound lines, has been appointed division engineer at Spokane, Wash., succeeding A. G. Holt, who was recently promoted to assistant chief engineer.

Samuel Lenzner, general foreman in the car department of the Michigan Central, has been appointed master car builder, with headquarters at West Detroit, Mich., succeeding D. C. Ross, and John Otto succeeds Mr. Lenzner.

J. W. Small, formerly assistant general manager (mechanical) of the Sunset-Central lines of the Southern Pacific, has been appointed superintendent of motive power of the Seaboard Air Line, with office at Portsmouth, Va., succeeding A. J. Poole, resigned.

OBITUARY.

John R. McCord, formerly traveling passenger agent of the Cincinnati, Hamilton & Dayton, died on April 2, at Washington, D. C., at the age of 59.

Richard R. Metheany, secretary and auditor of the Grand Rapids & Indiana, died suddenly at Grand Rapids, Mich., on April 7, aged 58 years. Mr. Metheany was born at Lima, Ohio, February 4, 1855, and had been in railway service since 1870, when he began as clerk in the auditor's office of the Grand Rapids & Indiana. From 1877 to October 1, 1895, he was chief clerk in the same office, and on the latter date was made secretary and auditor.

Charles E. Pugh, formerly first vice-president of the Pennsylvania Railroad, from which position he retired on March 1, 1911, under the pension rules of the company, died on March 8, at Old Point Comfort, Va. He was born at Unionville, Pa., on February 25, 1841, and entered the service of the Pennsylvania as agent at Newport, in October, 1859. He served as passenger conductor and train despatcher, and in 1870, was made general agent at Philadelphia. In April, 1879, he was appointed general superintendent of the Pennsylvania Railroad division; and in October, 1882, was made general manager. In March, 1893, he was elected third vice-president; and in February, 1897, second vice-president. This position he held for 12 years, being at the head of the operating department of the road, including motive power. He became first vice-president on March 24, 1909, in charge of the purchasing insurance, real estate and pension departments. He was also first vice-president of the Northern Central, the Philadelphia, Baltimore & Washington and the West Jersey & Seashore; and a director of the Long Island Railroad, and of many other companies in the Pennsylvania system. Mr. Pugh's character may be briefly epitomized by the following extract from a resolution of the directors, published in the *Railway Age Gazette*, when he retired from service: Endowed by nature with a happy combination of firmness of character and a most gentle and lovable disposition, he has ever been held in high esteem as well by the army of employees over whom he exercised authority as by his official associates; and the conspicuous loyalty of his subordinate officers is attributable as much to their personal affection for him as to the esprit de corps which is the stronghold of the Pennsylvania Railroad organization.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE GEORGIA RAILROAD is in the market for 6 locomotives.

THE WABASH has asked authority of the courts to purchase 30 locomotives.

THE LEHIGH VALLEY has ordered 25 locomotives from the Baldwin Locomotive Works.

THE GRAND TRUNK has ordered 25 mikado locomotives from the Baldwin Locomotive Works.

THE NORTHWESTERN OF BRAZIL has ordered 4 mogul locomotives from the Baldwin Locomotive Works.

THE PITTSBURGH & SHAWMUT has ordered 5 mikado locomotives from the Baldwin Locomotive Works.

THE BOSTON & MAINE locomotive inquiry comprises 20 switching locomotives and 40 Pacific type locomotives.

THE NEW YORK CENTRAL & HUDSON RIVER is having 43 consolidation locomotives converted into mikado locomotives by the American Locomotive Company.

THE LAKE SHORE & MICHIGAN SOUTHERN is having 14 consolidation locomotives converted into mikado locomotives by the American Locomotive Company.

THE NEW YORK, CHICAGO & ST. LOUIS has ordered 8 ten-wheel freight locomotives, 6 switching locomotives, 6 consolidation locomotives, and 3 ten-wheel passenger locomotives from the American Locomotive Company.

THE BOYNE CITY, GAYLORD & ALPENA has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 18 in. by 24 in., the diameter of the driving wheels will be 50 in. and the total weight in working order will be 106,000 lbs.

THE HAVANA CENTRAL, Cuba, has ordered 4 Pacific type locomotives from the American Locomotive Company. The dimensions of the cylinders will be 20 in. by 26 in., the diameter of driving wheels will be 62 in. and the total weight in working order will be 173,000 lbs. These locomotives will be equipped with superheaters.

CAR BUILDING.

THE HARRIMAN LINES will soon place an order for 201 passenger cars.

THE CHICAGO, MILWAUKEE & ST. PAUL is building 300 ore cars at its shops at Milwaukee, Wis.

THE BOSTON & MAINE freight car inquiry comprises 1,500 gondola cars and 4,500 box cars.

THE CHICAGO & WESTERN INDIANA has ordered 300 ballast cars from the Haskell & Barker Car Co.

THE CHICAGO, PEORIA & ST. LOUIS has ordered 200 box cars from the American Car & Foundry Company.

THE BOSTON ELEVATED has ordered 30 passenger cars from the Pressed Steel Car Company and 25 passenger cars from the American Car & Foundry Company.

THE WABASH has asked authority of the courts to purchase 200 hopper cars, 750 automobile cars, 20 passenger cars, 1,000 steel underframes for box cars, and 1,000 steel underframes for stock cars.

THE NORFOLK SOUTHERN has ordered 300 box cars and 6 caboose cars from the Mt. Vernon Car & Manufacturing Company and 100 flat cars from the American Car & Foundry Company.

SIGNALING.

The Canadian Pacific has installed automatic block signals—Hall, three-position, upper quadrant—on its line between St. John, N. B., and Vanceboro, Me., 50 miles.

Supply Trade News.

The Watson-Stillman Company, New York, has moved its Chicago office from the Rookery to the McCormick building.

The Pittsburgh, Forge & Iron Company, Pittsburgh, Pa., has moved its Chicago office from the McCormick building to the Railway Exchange.

E. O. Hopkins, of Chicago, general manager of the Indiana Tie Company, and formerly receiver of the Peoria, Decatur & Evansville, died in Chicago on April 3.

A. Otto Hiester, manager of the Buffalo office of the United States Light & Heating Company, and previously with the National Battery Company, has joined the sales force of the Edison Storage Battery Company, Orange, N. J.

A. E. Rosenthal has resigned his position as western representative of the Lima Locomotive Corporation, Lima, Ohio, and the Chicago office of that concern has been temporarily discontinued. Mr. Rosenthal retains his position as president of the National Railway Equipment Company, Chicago.

J. F. Duntley, father of W. O. Duntley, president of the Chicago Pneumatic Tool Company, and of J. W. Duntley, president of the Duntley Pneumatic Sweeper Company, died on April 5 at his residence in Detroit, Mich. He was at one time vice-president of the Chicago Pneumatic Tool Company, and was actively interested in the affairs of the company up to the time of his death. He was 71 years old.

TRADE PUBLICATIONS.

PNEUMATIC TOOLS.—The Chicago Pneumatic Tool Company has issued bulletins Nos. 137, 138 and 139, describing various types of the Chicago Giant rock drill and appurtenances.

COALING STATIONS.—The Roberts & Schaefer Company, Chicago, published a very attractive booklet illustrating and briefly describing its reinforced, concrete, Holmen, locomotive, coaling stations.

MOTOR CARS.—The Buda Company, Chicago, has issued catalog No. 184, illustrating and describing the specifications of its various types of motor cars for railroad inspection, section and maintenance service.

CRANES.—The Industrial Works, Bay City, Mich., has published bulletin No. 209, illustrating and describing its wrecking locomotive, construction and freight cranes, also its transfer tables and pile drivers.

UNIONS.—The Jefferson Union Company, Lexington, Mass., has published a brief illustrated folder outlining the career of Simon Bolivar, who liberated South America from Spanish control, and concisely describing the success with which Jefferson Unions have met.

CULVERTS.—The California Corrugated Culvert Company, Los Angeles, Cal., has published a handsome catalog illustrating many installations of its corrugated culverts, and pointing out their advantages. A table showing the capacity of corrugated iron culverts is included.

CAR HEATING.—The Gold Car Heating & Lighting Company, New York, has published an illustrated book of instructions relating to the installation of steam heat and hot water circulation systems for passenger trains, for use by passenger trainmen, engineers, car inspectors, etc.

GAGES.—The Ashcroft Manufacturing Company, Boston, Mass., has published a 128-page illustrated booklet on its steam pressure and vacuum gages, Edson recording gages, Tabor engine indicators, engineering specialties and pipe tools. This booklet includes prices and a convenient index.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—The passenger department of this company has devoted two illustrated folders to interesting accounts of the events which took place along its lines during the Civil War. These folders are intended for those who expect to attend the United Confederate Veterans' Reunion, to be held at Chattanooga, Tenn., May 27-29.

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Railway Construction.

CANADIAN NORTHERN.—The Alberta legislature has been asked to authorize the Canadian Northern Western to construct railway lines as follows: From Taber northeasterly to Consort; from Medicine Hat northwesterly to the Canadian Northern Saskatoon-Calgary line; from the Canadian Northern Saskatoon-Calgary line northerly to the Canadian Northern main line in range 6 or range 9, west 4th meridian; from the Canadian Northern Saskatoon-Calgary line northeasterly to the eastern boundary of the province; from Cardston westerly to the western boundary of the province, and from Metting Creek on the Canadian Northern Vegreville-Calgary line to Wetaskiwin, and thence westerly via Pigeon Lake to the Canadian Northern Strathcona-Pincher Creek line. These lines are in addition to those authorized in the company's charter, which include a line from Edmonton or Strathcona to the western boundary of the province, near the Pine or Peace River Pass, and from a point on the line between Edmonton and Calgary to Rocky Mountain House, thence to the Brazeau and Macleod rivers, and continuing to a junction with the Canadian Northern main line west of Edmonton. M. H. MacLeod, Winnipeg, Man., is general manager and chief engineer.

CANADIAN NORTHERN WESTERN.—See Canadian Northern.

CANADIAN PACIFIC.—On the eastern lines, 14.2 miles of main line, between St. John, N. B., and McAdam, are being relaid with 85-lb. rail, replacing 80-lb. sections, and on 126 miles of branch lines, 72-lb., 73-lb., and 80-lb. rails are being laid, replacing 48-lb., 56-lb., 60-lb. and 62-lb. rails.

According to press reports bids are wanted April 15 for the construction of a diversion of the main line from mile 69 Mountain division, which is one mile west of Six Mile Creek, B. C., to mile 92, two miles west of Cambie. The work includes piercing a long tunnel. The new line is to have easier grades and the summit will be 533 ft. lower than the existing line. In addition, the distance will be shortened three miles; the curvature reduced by 2,356 degrees, and 4½ miles of snow sheds and 2,260 ft. of steel bridges will be eliminated.

CAPE GIRARDEAU NORTHERN.—This road has been extended from Coffman, Mo., west to Farmington, 14 miles.

CHESAPEAKE & OHIO.—This company has let a contract for the construction of a 22-mile line down Beaver Creek into Lloyd and Pike counties, Kentucky, through a rich coal and timber section.

CHICAGO, MILWAUKEE & ST. PAUL.—This company has awarded contracts for the grading for second track between Elberon, Ia., and Tama, 16 miles, and also between Dunbar and Capron, to the Walsh Construction Company, Davenport, Iowa. This work involves the handling of about 625,000 yd. of earth. All grading for second track between Green Island, Ia., and Manilla is now under contract.

EDMONTON, STONY PLAIN & WABAMUN (Electric).—This company has been granted a charter in Canada to build from Edmonton, Alta., west to Stony Plain, thence to Lake Wabamun, about 45 miles. E. S. McQuaid, president, Edmonton A. Boileau, Edmonton, is interested. (March 14, p. 529.)

FLORIDA ROADS.—We are informed that surveys are being made for a line from Charlotte Harbor, Fla., northwest via Murdock to Venice, about 15 miles. There will be one important trestle on the line. W. J. Bowling, St. Louis, Mo., is back of the project.

GLENGARRY & STORMONT.—The Canadian parliament has been asked to incorporate this company to build railway lines from the Canadian Pacific at St. Polycarp Junction, Que., southwesterly through Lancaster township, Ont., and Charlottenburg township, and Cornwall township to Cornwall, Pringle, Thompson and Burgess, Ottawa, are acting for the applicants.

GRANTS PASS-CRESCENT CITY.—Organized in Oregon with $5,000,000 capital to build from Grants Pass on the Southern Pacific, in Josephine county, Ore., southwest to Crescent City in Del Norte county, Cal., about 100 miles. The incorporators include J. F. Reddy, Medford. W. W. Harmon and L. C. Gilkey, Grants Pass.

HUDSON RIVER CONNECTING.—See New York Central & Hudson River.

MIDLAND VALLEY.—Financial arrangements have been made, it is said, to build an extension from Wichita, Kan., northwest towards Denver, Colo.

NASHVILLE, SHILOH & CORINTH.—Plans are being made, it is said, to build a line to connect Nashville, Tenn., with Corinth, Miss. The route from Nashville will be through the counties of Davidson, Williamson, Hickman, Lewis, Perry, Wayne and Hardin in Tennessee and Alcorn county in Mississippi, about 150 miles. J. H. Carpenter, J. W. Ross, J. B. Walker and G. A. Hazzard are interested.

NATIONAL RAILWAYS OF MEXICO.—The Durango-Muleros line of the Durango division has been extended from Muleros, Mex., southeast to Mena, 26 miles.

NEW YORK CENTRAL & HUDSON RIVER.—Under the name of the Hudson River Connecting a line is to be built from a point on the New York Central & Hudson River at Stuyvesant, N. Y., thence over a bridge crossing the Hudson river to a connection with the West Shore at Feura Bush. A two-mile branch is to be built from Feura Bush south to another connection with the West Shore, and a second branch is to be built from Stuyvesant to a connection with the Boston & Albany. There will be one bridge in addition to the one to be built over the Hudson river. Stuyvesant is 18 miles south of Albany, and the proposed connection will form an outside route for the heavy movement of freight which now goes through Albany.

PACIFIC GREAT EASTERN.—This company, which is building from Vancouver, B. C., north to the Grand Trunk Pacific at Fort George, about 350 miles, has plans under consideration, it is said, for eventually extending the line from Fort George through undeveloped portions of northern British Columbia and the Yukon, also through Alaska. (December 20, p. 1235.)

SAN ANTONIO, UVALDE & GULF.—This company has opened for business the Pleasanton-Campbellton subdivision from Pleasanton, Tex., south to Campbellton, 20.6 miles.

SOUTH CAROLINA WESTERN.—An officer writes that work is about finished on a branch from Lydia, S. C., southeast to Timmonsville, about 15 miles. No plans have been made or are contemplated for an extension from Timmonsville south to Olanta.

TWIN MOUNTAIN & POTOMAC.—This road has been extended from Burlington, W. Va., to Twin Mountain. (September 6, p. 454.)

RAILWAY STRUCTURES.

CHICAGO, ILL.—The Baltimore & Ohio has given a contract to James Stewart & Co., New York and Chicago, for the construction of a large grain elevator in the Calumet river district, South Chicago, to have a capacity of 875,000 bushels.

MARQUETTE, MICH.—The Duluth, South Shore & Atlantic has announced that it will build a 15-stall roundhouse and a 75 ft. turntable.

O'BRIEN, QUE.—Bids are wanted by P. E. Ryan, secretary of the Commissioners of the Transcontinental Railway at Ottawa, Ont., on April 30, for building a 12-stall engine house without machine shop at O'Brien. W. J. Press, mechanical engineer, Ottawa, Ont.

SPOKANE, WASH.—The Spokane, Portland & Seattle has announced plans for the expenditure of $200,000 for roundhouses, car shops and storage tracks.

SWEETWATER, TEX.—It is reported that the Kansas City, Mexico & Orient will build a new passenger station.

WINNIPEG, MAN.—Contracts have been let for bridge construction on the Grand Trunk Pacific from mile 1,094 to mile 1,486 west of Winnipeg at a cost of $2,000,000, as follows: McLellan Creek crossing, 249 ft.; Little Shuswap crossing, 129 ft.; Raa Shuswap crossing, 1,032 ft.; Cottonwood Creek crossing, 129 ft.; Fifty Mile river crossing, 129 ft.; Goat river crossing, 308 ft.; Dome Creek crossing, 129 ft.; Second Fraser river crossing, 689 ft.; Third Fraser river crossing, 968 ft.; Willow river crossing, 459 ft.; Fourth Fraser river crossing, 1,227 ft.; Upper Nechaco river crossing, 642 ft.; Bulkley river crossing, mile 1,481, 254 ft., and Bulkley river crossing, mile 1,486, 364 ft.

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Railway Financial News

ALGOMA CENTRAL TERMINALS, LTD.—This company offered in London $2,636,500 first mortgage 5 per cent. 50 year bonds. This makes $5,136,500 bonds of this issue outstanding. The proceeds will be used for the completion of terminal facilities at Sault Ste. Marie and other points.

BOSTON & MAINE.—This company has applied to the Massachusetts railroad commission for authority to consolidate with the Hampden Railroad under an agreement entered into between the two companies on March 14.

BROOKLYN RAPID TRANSIT.—Application has been made to the New York Public Service Commission, First district, for authority to purchase, through its subsidiary, the Coney Island & Gravesend $2,583,100 of the outstanding $2,983,900 stock of the Coney Island & Brooklyn, and also to acquire the remainder of the stock in future. The Coney Island & Gravesend also applied for permission to make a mortgage to secure $3,000,000 bonds to purchase this stock.

CAMBRIA & CLEARFIELD.—See Pennsylvania Railroad.

CHICAGO, MILWAUKEE & ST. PAUL.—Holders of the $2,155,000 Milwaukee & Northern first mortgage extended 4½ per cent. bonds, due June 1, 1913, and the $4,003,000 Milwaukee & Northern consolidated mortgage 6 per cent. bonds, due June 1, 1913, are notified that the mortgages securing these bonds will be extended to June 1, 1934, at 4½ per cent. The liens of the mortgages will continue unimpaired, the payment of principal and interest having been assumed by the Chicago, Milwaukee & St. Paul.

This company has sold $30,000,000 general mortgage 4½ per cent bonds to Kuhn, Loeb & Company, and the National City Bank, both of New York. Previous issues under St. Paul's general mortgage have borne interest at the rate of 3½ per cent. and 4 per cent. The bonds are due 1989.

CONEY ISLAND & BROOKLYN.—See Brooklyn Rapid Transit.

CONEY ISLAND & GRAVESEND.—See Brooklyn Rapid Transit.

DENVER NORTHWESTERN & PACIFIC.—The foreclosure sale of this company has been set for April 18.

LARAMIE, HAHN'S PEAK & PACIFIC.—The junior security holders' committee of Boston has provided a plan for the reorganization of this company without foreclosure. This plan provides for the organization of a new company in Wyoming with $2,000,000, 6 per cent. non-cumulative preferred stock and $3,000,000 common stock. Holders of the present $1,000,000 unsecured notes and $430,000 unsecured claims are called upon for a 10 per cent. assessment and will get 110 per cent. in new preferred stock. The preferred and common stockholders are assessed 4 per cent.; the preferred holders getting 54 per cent. in new preferred stock and 50 per cent. in new common stock; and the common stockholders, 4 per cent. in preferred and 20 per cent. in common. Bonds of the old company comprising $240,000 first mortgage 6 per cent. bonds, $1,536,000 first refunding 6 per cent. bonds, $480,000 collateral trust 7 per cent. notes and $500,000 general mortgage 5 per cent. bonds will be left undisturbed. The assessments total $507,000, which is sufficient to take care of the interest charges up to April, 1915, the end of the period which the committee regards as sufficient to demonstrate the working of its plan. It is understood that this plan is acceptable to the senior security holders' committee.

LONG ISLAND RAILROAD.—The New York Public Service Commission, Second district, has approved of the merger by this company of the Oyster Bay Extension Railroad. The latter runs from Locust Valley to Oyster Bay, about 5 miles, and is operated by the Long Island.

LOUISVILLE & NASHVILLE.—Kissel, Kinnicutt & Company and Harris, Forbes & Company, both of New York, will shortly offer the unsold portion of a block of $4,500,000 Atlanta, Knoxville & Cincinnati division 4 per cent. bonds, dated April, 1905-May 1, 1955.

MOBILE & OHIO.—Holders of the general mortgage bonds will vote on April 23, on the question of authorizing the purchase of the St. Louis & Cairo, now leased, and the making of a mortgage thereon to secure $3,000,000 Mobile & Ohio-St. Louis division 5 per cent. bonds, dated August 1, 1913-December 1, 1927.

NEW YORK, NEW HAVEN & HARTFORD.—See New York, Westchester & Boston.

NEW YORK, WESTCHESTER & BOSTON.—The New York Public Service Commission, Second district, has authorized this company to issue $6,044,000 first mortgage bonds. Of this issue $1,200,000 bonds are to be sold at not less than par, and the balance at not less than 92. The proceeds of this sale will be used for right of way, stations and construction purposes; also for paying off outstanding notes held by the New York, New Haven & Hartford.

T. DeWitt Cuyler and George F. Baker have been elected directors of this company, succeeding Lewis Cass Ledyard and G. M. Miller, resigned.

OYSTER BAY EXTENSION RAILROAD.—See Long Island Railroad.

PENNSYLVANIA RAILROAD.—The $165,000 Bells Gap Railroad 6 per cent. bonds due April 1 were paid on and after maturity. The Philadelphia Stock Exchange, on March 25, struck from the regular list $745,000 Cambria & Clearfield first mortgage 5 per cent. bonds due 1941, which have been canceled and destroyed.

The directors of this company have authorized an issue of approximately $45,400,000 common stock. The proceeds will be used to take up $10,222,500 of 3½ per cent. convertible bonds which matured November 1, 1912, and $9,735,000 of collateral trust 4½ per cent. bonds due June 1, 1913. The remainder of about $25,000,000 will be used for equipment and ordinary improvements.

PERE MARQUETTE.—The collateral securing the $8,000,000 five year, 6 per cent. collateral notes, dated March 1, 1911, was bid in by the committee representing $7,944,000 of these notes. The cash distribution which is being made out of the proceeds of this sale applies only to the remaining $56,000 notes, their share being $799.40 on each $1,000 of face value.

ST. LOUIS & CAIRO.—See Mobile & Ohio.

SOUTHERN PACIFIC.—See Union Pacific.

UNION PACIFIC.—Attorney General McReynolds, on April 9, disapproved the new plan for the dissolution of the Union Pacific-Southern Pacific merger recently submitted to him by Robert S. Lovett, chairman of the Union Pacific board. The Union Pacific, nevertheless, will submit the plan to the United States court at St. Louis. The plan proposes that the Union Pacific place its $126,000,000 Southern Pacific stock in the hands of a trustee for a limited time, receiving beneficiary certificates for it. The stock would be disfranchised. Stockholders of the Union Pacific would be permitted to buy a thousand shares each.

WABASH.—The receivers have filed in the federal courts application for permission to expend $7,489,500 for improvements, including $3,525,000 for motive power and rolling stock, $1,101,000 for new 100 lb. rails, and $2,054,500 for track elevation and double tracking.

YOUNGSTOWN & OHIO.—This company, on March 31, paid a quarterly dividend of three-quarters of 1 per cent. on the $1,000,000 5 per cent. preferred stock as compared with 1¾ per cent. quarterly in 1912, making 4½ per cent. during that year.

RATES ON OIL IN RUSSIA.—In 1910 the rates for carrying petroleum from the oil fields on the Caspian Sea around Baku to the Black Sea port Batum were reduced nearly one-third, from 27 cents to 18½ cents per 100 lbs., avowedly for the purpose of enabling the Russian oil to compete with the Standard Oil Company in the markets of western Europe. Now the Russian ministry of transportation affirms that it has not had this effect; that Russian exports have diminished, while the carriers have suffered serious losses from the reduced rates. Moreover, the ministry is of the opinion that an increase in exports is not desirable, as it tends to increase the cost to Russian consumers; and it favors the restoration of the old export rates. It is reported that the Austrian government takes a similar view of the petroleum production of Galicia, which has become very important of late years, and that it purposes to raise the export rates.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	7.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 10,300 copies were printed; that of these 10,300 copies, 8,755 were mailed to regular paid subscribers and 180 were provided for counter and news companies' sales; that the total copies printed this year to date were 139,800—an average of 8,738 copies a week.

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GENERAL NEWS SECTION 909

*Illustrated.

THE Pennsylvania Railroad has in the neighborhood of 3,000 all-steel passenger equipment cars in service—more than any other railroad. The observations of W. F. Kiesel, Jr., assistant mechanical engineer of that road, on the problems of steel passenger car design, which were expressed before the recent New York meeting of the American Society of Mechanical Engineers, and are reproduced on another page, are of more than ordinary interest. The most troublesome questions to be solved are whether the steel cars should be fitted with wood or metal lining, the problem of insulation, and the design and construction of the car to afford the greatest safety to the passengers when accidents occur. While wood interior finish has some advantages the use of metal is to be preferred, as pointed out by Mr. Kiesel and also by Mr. Koch, who read a paper on "Steel Interior Finish." Mr. Vaughan in his paper, which was reproduced in our issue of April 11, also suggested that the tendency in the future would probably be to adopt steel interior finish to a very great extent, and possibly entirely. The steel finish must, of course, be insulated to prevent radiation, and there is still more or less question as to the material to be used for this purpose and its method of application. Steel passenger cars have given a good account of themselves in wrecks, and the most important problem in this connection is the prevention of telescoping. Suggestions as to this were made in two of the papers which are presented in abstract in this issue—one on the "Use of Cast Steel," and the other on "Special Ends for Steel Passenger Cars."

AFTER having been the object of universal anathema all his life the "baggage-smasher" at last has found a friend who understands some of his difficulties. The Interstate Commerce Commission has rendered a decision sustaining with slight modifications the rules adopted by the carriers nearly two years ago, placing restrictions on the use of large-sized trunks and sample cases of the "wardrobe" and other freak types used mainly by traveling salesmen. The commission's order, which probably will be embodied in new tariffs to go into effect June 1, holds that the carriers may reasonably make an extra charge for the transportation of baggage exceeding 45 in. in length and may stipulate that baggage exceeding 72 in. in any dimension will not be accepted for checking; but it reduces the amount of the charge proposed from a rate equal to that for 10 lbs. of excess weight for each inch of excessive length to a rate equal to that for 5 lbs. An unusually vigorous campaign against the new uniform baggage rules adopted by the various railroad passenger associations in 1911 was waged by the commercial interests, including not only the trunk manufacturers, but nearly all houses employing large numbers of traveling salesmen. A great deal of newspaper publicity was inspired for the purpose of making the general public think it was going to be deprived of one of its privileges. The railways were willing to compromise but were insistent as to the necessity of checking the tendency toward large and freak-shaped trunks. The rules which the commission now holds reasonable represent more nearly those on which the railways were willing to compromise, but which the commercial interests would not accept, than those originally proposed, but the justice of the purpose of the rules has been fully upheld. The opinion is by Chairman Clark, who was himself in the train service long enough to understand some of the conditions under which baggage is handled. He not only shows that the personal baggage of the average traveler will be scarcely affected, but that "the questions presented in this case relate not to matters of revenue, but primarily to the physical limitations of the facilities of the carriers for the transportation of baggage, and to the conditions under which men engaged in this branch of the service must work."

IN the settlement of the recent controversy between the New England Telephone & Telegraph Company and its operators, at Boston, the company secured the adoption of an important

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principle—that of the deferred payment of wages. The demands which had been made by the operators called for increases in pay, which, it is said, averaged one dollar a week, or, say, $50 a year. The agreement, as published, provides for the establishment of what are called anniversary payments. An operator will receive $25 at the end of her second year of service; $50 at the end of the third year, and of each year thereafter, until the end of the ninth, and then $100 at the end of the tenth, and of each succeeding year. The operators demanded the abolition of the split trick; the company agrees that this shall not be compulsory on any operator after she has served eighteen months. Under the agreement, there will be a permanent "adjustment committee," consisting of three operators and three representatives of the company. Holding back a part of an operator's pay until the end of the year will be a real novelty, well worth the attention of everybody interested in the relation of employer and employee. Probably those women are quite unsophisticated, from the labor leader's point of view; but in agreeing to this new idea they are doing a good thing for themselves, we have little doubt. It is a popular theory that a workman should have all of his pay when he earns it. He very naturally wants it. The labor leader advises his constituents to do nothing to put themselves in the power of the employer. He is jealous of the railway relief associations, and this jealousy has even shown itself in arguments against pensions, paid wholly out of the employer's treasury. But in spite of this theory the lesson of real experience is that every rational experiment in thrift proves highly beneficial to all concerned. Leaving a part of one's pay in the hands of the employer for a year is a practical and useful lesson in thrift. If it binds one to the employer in an unreasonable degree, the unreasonableness can be modified and adjusted. If the employer is at all overbearing or grasping there is little danger, in these days of socialistic state regulation by the state of everything done by a public service corporation, but that his injustice will be quickly punished or corrected. One of the best ways to increase the pay of railway employees, when an increase is justified, or is necessary, would be to put the increase, or a part of it, in the shape of an annual premium. If a manager doubts the wisdom of this, he can begin cautiously, with small amounts. In the railroad world experiments with premiums have been few and comparatively small, but the principle is a sound one. The fact that this idea has been neglected is no discredit to the principle.

GIVING employees of long standing the most favorable hours is another feature of the Boston agreement which should be of interest to railroad men. This clause, translated into terms of the trainmaster's business, would mean that the older freight trainmen, and as many of them as possible, should have regular runs, with approximately uniform starting hours, and that the smallest possible number of men should be required to run "first in, first out," never knowing for two days in advance when or where to prepare for the rest-periods. We are well aware that this will seem impracticable, and perhaps even absurd, to every one who looks upon the present freight train practice as right because it is universal; but, nevertheless, there is a principle in the matter of which we shall do well, now and then, to remind ourselves. And the principle which we have chiefly in mind is not that of favoring the older men at the expense of the younger, but rather the fundamental principle of nature that the normal man should have regular habits. In discussing questions of safety we theorize a good deal about the dangers of overwork and the importance of requiring trainmen to keep themselves always in good physical and mental condition; but, in actual practice, the life of the freight trainman is made as irregular as possible. It could not be worse in that respect. It is true that the conductor and brakemen can rest a good deal while on duty, and the fireman can keep awake because his arms and legs have to be kept in motion, but with the engineman the conditions are quite different. Irregular hours are not the greatest evil in the world, and if work time is short enough and rest time long enough adverse conditions can be coped with, after a fashion. But it is well to bear in mind that adverse conditions do really exist and that, if the issue should be raised, the railway manager would be held responsible for them.

THE TRAIN CREW BILL AND RAILWAY ACCIDENTS IN ILLINOIS.

A TRAIN crew bill is pending in the Illinois legislature, and there, as elsewhere, such legislation is being advocated on the ground of safety. The annual report of the Illinois Railroad Commission for the year ending June 30, 1912, comes out opportunely to show how ignorant or dishonest are those who advocate such legislation on any such ground. The commission on page 13 thus refers to the principal cause of railway accidents in Illinois as well as elsewhere: "Of the persons killed during the year *about 75 per cent.* were trespassing at the time of the accident, and of those injured *about 52 per cent.* were also trespassers . . . Responsibility for these casualties is chargeable to the parties injured and to the failure of law-making bodies to provide suitable laws for the punishment of those who use the property of hazardous industries as a public highway. Until some authority is exerted in this direction these casualties will continue."

While special classes, to promote their own supposed selfish interests, and peanut politicians, to get votes, promote various other kinds of measures to impose restrictions and burdens on railroads, the only persons who advocate legislation to stop trespassing are those who know the most about the causes of accidents, namely, the officers of the railroads and the railroad commission. Very little consideration can be expected to be given to trespassing by the law-makers. *Whose votes are to be gained by stopping a mere 75 per cent. of all the fatal accidents on the railways of Illinois?* It may be said that full crew legislation would at least tend to prevent some of the accidents due to other causes. We give below a table stating the causes to which the Illinois commission attributes all the fatalities on railways in that state in the fiscal year 1912:

FATALITIES ON ILLINOIS RAILWAYS IN YEAR ENDING JUNE 30, 1912.

Cause of Accident	Employees.	Passengers.	Other Persons.	Total.
Train Accidents—				
Collisions	17	6	3	26
Derailments	18	..	1	19
Parting of trains	1	..	..	1
Locomotives or cars breaking down	4	..	..	4
Coupling and uncoupling	20	..	..	20
Falling from trains, locomotives or cars	37	2	32	71
Jumping on or off trains, locomotives or cars	18	4	42	64
Struck by trains, locomotives or cars,	167	..	..	..
At highway crossings	..	..	108	..
At stations	..	6	116	..
At other points along track	..	1	220	..
Total struck by trains, locomotives or cars				..
Struck by overhead obstructions	4	..	..	618
Other causes	16	2	27	4
				45
				872
Industrial Accidents—				
Handling of traffic	3	..	..	3
Handling tools, machinery, etc.	7	..	..	7
Handling supplies, etc.	3	..	..	3
Other causes	12	..	3	15
				28
Grand total				900

Under the head "Other Persons" are included trespassers, and others not either passengers or employees. A vast majority of these "other persons" were trespassers. The man doesn't live who can point out any particular class of railway accidents here mentioned which would be reduced in the slightest degree by the addition of one man, or ten men, to the crew of every freight and passenger train.

It is notable that while the Illinois commission recommends various means of reducing accidents it makes no mention of the desirability of increasing the number of any class of railway em-

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ployees. Why not brush aside the hypocritical pretense that train crew legislation is in the interest of safety, and baldly admit that its sole purpose is to increase the number of men that railways must employ? As safety legislation it hasn't a leg to stand on. As a means of ameliorating the condition of working people, something might be said for it, provided the legislation were made broad enough to increase the number of men that all classes of business men or concerns should be required to hire. There are few or no classes of laboring people who don't think they are required to do too much work. If the legislation is intended to promote purely social ends let us be consistent and require not only the number of men that railways must employ, but the number that farmers, merchants, manufacturers, miners, fishermen, housewives and newspaper publishers must employ to be increased.

If requiring the railways to employ unnecessary men is in the interest of progress and will bring the millennium nearer, how much more in the interest of progress, how much more adapted to hasten the millennium would be legislation requiring all classes of employers to increase the number of their employees by, let us say, 50 or 100 per cent.

THE REAL DANGER TO REGULATION BY COMMISSION.

As long as the public tried to control railways and other public utilities merely by inflexible laws interpreted and applied solely by the courts public regulation and its results were not satisfactory. It was long thought that the only alternative to such unsatisfactory control of public utilities was government ownership. Reasoning and experience have convinced many that both unsatisfactory public control and public ownership can be avoided by leaving public utilities under private ownership and management, while having their management and operation thoroughly supervised in the interests of the public by small bodies of experts in practically continuous session. The principal danger to the success of regulation by commission has been felt to be, both by its advocates and critics, that the managements of the concerns regulated would so resist and circumvent the commissions that their efforts to protect the interests of the public would be nullified. But the managements of most public utilities have in recent years been manifesting a disposition to bow to what they have deemed the inevitable. They no longer oppose and resist regulation by commission itself, but merely the minority of requirements and orders which they regard as very unreasonable and unfair.

Experience is showing that the real danger to regulation by commission is the attitude and course of governors, law-making bodies and the public. As has been indicated, the theory on which regulation by commission is predicated is that commissions will be composed of experts, who will be in practically continuous session, and who will, therefore, be best able to solve fairly and salutarily the problems arising out of the relations between public service corporations and the public. In order that opportunity shall be afforded for this theory to be fully tried it is necessary that regulatory laws shall be drafted in broad and general terms and that the duty of enforcing and administering them in detail shall be delegated to the commissions. This enables the commission to consider the circumstances of each case and to adapt its requirements and orders to them. Every law passed, whether by a legislature or Congress, that prescribes in detail the rates that railways or other utilities may charge, or the way they shall be operated, limits the field within which the commission may fruitfully make investigations and exercise its supposedly sound and expert judgment.

Such interference with regulation by commission is constantly going on and seems to be increasing. The people in some states, as in Oregon and Arizona, have fixed classifications and rates by referendum, although these states have commissions created and maintained expressly to deal with such matters and supposed to be competent to do so. The legislatures in many cases have passed laws to fix rates, and in many more recent instances have passed laws prescribing the number of men that the railways must employ, the hours they must work, etc., although in the states where these things have been done there were commissions which, if the theory of regulation by commission is correct, were most fit to deal with the questions involved. The state of New York has two public service commissions composed of five men each who are paid an annual salary of $15,000 a year, a total of $150,000 a year. When a train crew bill was pending in the legislature, and when it was later in the hands of the governor, the railways urged that the question be left to one of these commissions. But the bill was passed and signed. If governors and legislatures are more competent to settle such matters than commissions, it is clearly a waste of public money to maintain the commissions.

One of the necessary effects of interference with the work of the commissions by the public, the law-making bodies, the governors and—if he should interfere—by the president, is to make the concerns regulated lose respect for the commissions. They can hardly be expected to have much respect for them when the public and public officials show disrespect for them. A second effect is to make the commissions lose respect for themselves and to reduce their sense of responsibility, necessary consequences of which must be to make self-respecting and able men unwilling to serve on them, thereby deteriorating their personnel, and to make those who do accept membership perform their duties less conscientiously and thoroughly. A third effect is one already mentioned, namely, the restriction of the field for the exercise of the commission's judgment. Finally, the legislation resulting from such interference is almost certain to be either invalid, or vicious, or both. It imposes requirements and burdens regardless of differences of conditions; and therefore while it may be just as applied to some conditions, it is almost sure to be unjust as applied to most conditions. The purpose of such interferences with regulation by commission almost invariably is to impose some requirement or burden on the concerns regulated which does not commend itself to the intelligence and judgment of the commission. The modern regulating commission is seldom or never unduly favorable in its attitude toward the corporations under its control. When, therefore, it refuses to adopt any form of regulation that may be demanded it usually has very strong reason for believing that to do so would be contrary to justice and to the interests of the public; and if the motive of the promoters of regulation that commissions do not favor be investigated it will very often be found to be a desire to secure some form of special privilege for their own class at the expense of the public.

The function of the regulating commission is, in the interests of the public welfare, to stand between public utility corporations and all other classes, and insist on such relations being established and maintained between them as will best promote the interests of the whole public. The public itself is undermining the commissions, and preparing the way for the failure of regulation by commission, when it lets legislators and governors huckster legislation affecting public utility corporations in exchange for the votes of certain interested classes instead of insisting on the commissions being left free to perform their difficult, onerous and important duties without unnecessary interference.

DELAWARE & HUDSON.

In the annual report of the Delaware & Hudson for the calendar year 1912 President Loree comments on some figures taken from the reports to the Interstate Commerce Commission for all railroads in the United States for the years 1907 and 1911. These figures indicate that the total investment in railroad property devoted to public use was in 1911 $2,044,400,000 in excess of the investment in 1907, and that there was available for interest and dividends approximately $9,000,000 less in 1911 than in 1907. These figures are only available down to June 30, 1911. The Delaware & Hudson's own figures for the calendar year 1912 bear out to quite a remarkable degree the

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point that Mr. Loree makes in regard to figures for all of the roads.

In 1912 the railroad department of the Delaware & Hudson earned $22,480,000, or $1,058,000 more than in 1911, but the net operating revenue in 1912 was $8,413,000, or $250,000 less than in 1911 and during 1912 the company spent for additions and betterments $2,927,000, while during that year the amount of stock outstanding remained the same, and at the end of 1912 there was $58,171,000 bonds outstanding, which is less by $204,000 than the amount outstanding at the end of 1911. At the beginning of the year there was $597,000 carried as a special deposit to pay the cost of authorized additions and betterments, which amount was expended during the year, and in addition considerable advances were made to subsidiary and other companies as shown by an increase in bills and accounts receivable of from $2,790,000 at the end of 1911 to $4,118,000 at the end of 1912. Loans payable at the end of 1911 amounted to $900,000, and at the end of 1912 to $3,500,000. Therefore while gross has increased net has decreased, and while investment in property has increased less return has been earned even on the investment at the beginning of the year. The Delaware & Hudson has far better credit, and its earning power in relation to its capitalization is far greater than the great majority of American railroads. Nevertheless investment conditions were such that the company preferred to borrow short time money rather than try to finance its improvements.

The D. & H. operates 878 miles of road, of which 328 miles has second track. Next to the Delaware, Lackawanna & Western it carries a greater proportion of anthracite coal than any other road. Of the total tonnage of revenue freight carried in 1912, 62.83 per cent. was furnished by products of mines, and of this tonnage amounting in 1912 to 12,138,000 tons, 8,010,000 tons was anthracite coal. The Delaware & Hudson is a road having a very heavy freight density, especially when the comparatively small amount of second track is taken into consideration. In 1912 the ton miles of revenue freight carried per mile of road averaged 3,222,000. Like the Delaware, Lackawanna & Western, the Delaware & Hudson gets a good ton mile rate, the average in 1912 being 6.6 mills, comparing the average in 1911 of 6.8 mills.

The passenger business on the Delaware & Hudson does not furnish a very large proportion of total revenue and a very considerable part of it is made up of commutation business. Total receipts from passenger traffic in 1912 amounted to $3,077,000, which is an increase of only about $57,000 over 1911. The revenue from commutation ticket sales alone amounted to $1,194,000 in 1912, which is about $39,000 more than in 1911.

As already mentioned, the total operating revenue increased last year over the year before by a little over $1,000,000, the increase in revenue from coal freight traffic being $499,000, and from merchandise freight traffic $423,000. The total revenue in 1912 from coal freight traffic was $10,346,000, and for merchandise freight traffic $8,477,000. The increase in revenue from freight was due entirely to a longer average haul. In 1912 the total tonnage of all revenue freight amounted to 19,319,000 tons as against 19,888,000 tons in 1911. The average revenue per ton per mile was slightly less, while the average distance each ton was carried was 146 miles, or over 15 miles greater than in 1911. The principal changes in the classes of various commodities carried were a decrease of 1,286,000 in the tonnage of anthracite coal, and an increase of 399,600 in the tonnage of the bituminous coal; an increase of 152,000 in the tonnage of miscellaneous commodities, an increase of 149,000 in the tonnage of lumber, and an increase of 38,000 in the tonnage of merchandise.

The increase in operating expenses from $12,758,000 in 1911 to $14,067,000 in 1912 was due largely to an increase of from $1,489,000 in 1911 to $1,940,000 in 1912 for maintenance of way, and from $7,414,000 for transportation expenses in 1911 to $7,979,000 in 1912. The increase of maintenance of way expenses is due in part to the very severe weather in January and February, 1912, and also in part to charges for maintenance due to a rather extensive program of replacement and strengthening of bridges, trestles and culverts. While, of course, only the replacement value of a wooden bridge, whose place is taken by a permanent structure, is charged to maintenance, and the additional cost to additions and betterments, the replacement of wooden structures by permanent structures adds materially to maintenance costs during the years in which such work is being done. Such a program of betterment, however, should in the long run tend to reduce maintenance charges. As Mr. Loree points out, the increase in transportation expenses resulted largely from the increase in business (ton mileage) handled, although increased cost of fuel also contributed toward added transportation expenses. This increase in transportation expenses was despite an increase of 35 tons in the average revenue train load, the train load in 1912 being 502 tons. The heavier train load was obtained in part through a slightly greater number of loaded cars per train, but principally through better car loading. The average tons per loaded car in 1912 was 25.72, an increase over 1911 of 1.41.

Although the net operating revenues of the railroad department were less in 1912 than in 1911, the profits from the coal mining department offset this decrease—the gross income from the coal department amounting to $1,024,000 in 1912, as compared with $284,000 in 1911—so that the company had a net income of $5,506,000 in 1912 as compared with $5,238,000 in 1911. The regular dividend of 9 per cent. calling for $3,825,000 was declared payable quarterly in 1913.

The following table shows the principal figures for operation in 1912 as compared with 1911:

	1912.	1911.
Average mileage operated	877	877
Coal freight revenue	$10,346,095	$9,847,194
Merchandise freight revenue	8,476,851	8,053,788
Passenger revenue	3,076,507	3,019,230
Total operating revenue	22,380,103	21,421,817
Maint. of way and structures	1,940,352	1,488,237
Maint. of equipment	3,230,742	3,060,739
Traffic expenses	250,254	250,185
Transportation expenses	7,979,041	7,414,071
General expenses	626,869	544,307
Total operating expenses	14,066,779	12,758,139
Taxes	690,944	562,410
Operating income	7,812,380	8,101,268
Railroad operating income	9,081,799	9,476,245
Net railroad income	4,411,863	4,690,578
Gross coal department income	1,033,868	284,219
Net income	5,506,067	5,237,681
Dividends	3,825,270	3,825,270
Surplus	1,680,819	1,412,411

NEW BOOKS.

Book of Standards. National Tube Company, Pittsburgh, Pa. 559 pages, 4 in. x 6½ in. Price, $2.

This book is strictly a pipe handbook, is printed on thin paper so that it is not quite ⅝ in. thick, and is a handy size for pocket use. Several pages are devoted to a descriptive article covering the main process of manufacturing both welded and seamless tubes. There are a number of pages which give weights, dimensions, threads per inch, test pressures, sections of joints, specifications, etc., of the various kinds of pipes and tubings. Several pages describe, illustrate and contain tables in regard to lap-weld and seamless tubes, upset and expanded, wrought pipe bends, butted and strapped joints, etc. Considerable prominence is given to strength of tubes and cylinders under internal fluid pressure and collapsing pressures. Considerable attention is devoted to the mechanical properties of solid and tubular beams, of usual and unusual shapes. Chapters are included giving information in regard to water, gas, steam and air. It has not been the intention to go very deeply into these various subjects, only in so-far as they concern tubular products. There is a large collection of tables, such as fifth roots and fifth power, decimals of a foot for each 1/64 of an inch, etc. Several pages are devoted to area and weight factors for tubes and pipes. A table showing properties of tubes and round bars is given with an explanatory article. The Metric system is included with conversion methods for most of the more commonly used measures, including temperatures. A glossary of terms used in the pipe and fittings trade will also be found

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Letters to the Editor.

PROPER BASIS OF STATION AGENTS' PAY.

RAPID CITY, South Dakota, April 3, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The editorial in your issue of March 28, relative to the salaries of station agents, is very good, particularly wherein you say that "an efficient agent should have his pay slightly increased every few years."

Having been in the station service for one company for a number of years, I can appreciate very much your statement on this subject. We all admit that the station agent is one of the poorest paid employees, if not the very poorest, in the railroad business. We seldom hear of an agent getting an increase in salary except when it is forced by other organized employees (the telegraph operators). Through the efforts of this organization telegraph operators have from time to time been given an increase and the agents sometimes fall into a slight advance in their salaries, made, perhaps, that the agent's salary may not become smaller than that of an operator in the same office. I have found that very few agents were ever given an increase in pay simply on account of their merits. No matter how popular a man he may have become in the town or city in which he is located, or the amount of business that he may be able to control on account of his personality and acquaintance with his people, we seem to think that the only way in which we can take care of this fellow is to transfer him to some better station. It seems to me that this is all wrong and that it would be a better business principle to increase from time to time the salary of every first class, efficient agent, and keep him where we feel he will do the most good. What does a small increase in salary matter to a railroad company, or any other enterprise, when given to the man who has the stuff in him to get out and grab the business from the other fellow. Of course, I do not believe that a station should pay the same salary to a new man just taking hold, when it has been made vacant by one who has been tried and tested, but when you get hold of the right sort of an agent, try and keep him, if possible, by making it an object for him to stay. I think that when this policy is adopted we shall find the standard of the station agent will be much higher, and better results will accrue to the company.

Regarding the fixing of the number of helpers for a station, you say that "the superintendent must know very much more about the work, at some of his stations, than superintendents usually know." How true this is; and how few superintendents are really familiar with the detail working of a local agency. The percentage of agents who have worked up to a position as superintendent is so small you can hardly see it. It seems to be an established rule that we can make good superintendents out of almost any material except that coming from the station service, and when we find one who has come up from this department there is something extraordinary in the history of his advancement. Now, we all know that, when word is sent along the line to reduce expenses, about the first cut that is made is in the helpers at the stations. How many of the poor under-paid agents have their help cut down to a point where it means that there is absolutely no time for them to be out of their office looking after prospective business; and yet the getting of one shipment might pay the monthly salaries of several helpers.

When we get hold of the right kind of an agent, and the majority in the larger stations are of this sort, the superintendent should keep "hands off" to a great extent, in the hiring and discharging of his help; and when it comes to reducing expenses superintendents should rely more upon the judgment of the local agent, as to whether or not he can reduce his force without materially hurting his business. From my experience I have found that the trouble with the average superintendent is that he is too narrow. That is, he seems to feel that there is really but one department to a railroad and that his—the operating department; that it matters very little how much or how little business his division does if he can simply show a reduction in operating expenses over some other division. It has always seemed to me that the traffic department should also take more of a hand in these matters than it usually does; for I am free to confess that when it comes to the question of looking after the business interests of a railroad the traffic department has little to say. If the operating department thinks that half of a present force can do the work at a strongly competitive station down goes the force, regardless of the amount of business and revenue lost by so doing.

D. H. CRARY,
General Manager, Rapid City, Black Hills & Western R. R.

AIR BRAKE HOSE.

PASSAIC, N. J., March 18, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

At the International Rubber Conference, held in New York in 1912, considerable effort was expended in getting from the chemists and testing engineers of the railroads a thorough presentation of the subject of air brake hose. The success which resulted from this effort may be best judged by those who attended the sessions of the conference.

Several points were, however, brought out, and as these have not appeared elsewhere in print, it may be well to state them here. It was stated that the price of air brake hose was between 35 and 45 cents a foot. One railroad had offered to pay 45 or 50 cents a foot provided the hose lasted proportionately longer. One railroad observed that rubber manufacturers wanted to "land the bid" at any price, and after that the quality was adjusted to fit the price. One manufacturer observed that railroad purchasing agents wanted the "cheapest" hose and that therefore the quality was no object. One railroad observed that the rubber goods manufacturers frequently tried to deliver air brake hose which had been previously rejected because of defects. One chemist stated that there never was any good reason for the rubber manufacturers fighting the "1903 Specifications" except that they desired to manufacture a cheaper grade of hose.

The rubber goods manufacturers' chemists, who posed as experts for the Master Car Builders' Association, have little or no knowledge of the conditions under which air brake hose and steam hose are used. One manufacturer said that if superior air hose were made, he could not find a market for it.

What I wish to show is this: The eight statements quoted above cannot all be totally correct. They are obviously conflicting and it remains for either vendor or purchaser of the material to settle down and arbitrate the matter in a way which will be a credit to both sides. The importance of air brake hose in car equipment is far too great to admit of a trivial discussion of the subject, and our serious minded rubber goods manufacturers should hasten to produce for the railways a material which will give the best service consistent with the price which the railway officers are willing to pay. Two railways, at least, are today obtaining comparative satisfaction by means of carefully drawn specifications, and it might be well for the other larger transportation companies to go at this problem with some of the vim which they have expended on other large difficulties. The tests for bursting, stretching, friction, and (for steam hose) steaming, have put into the hands of the motive power superintendent considerable valuable information, which need only be sorted out and criticised in order to become of immediate use for the prepatation of adequate specifications.

Truly the problem of air hose and steam hose presents great possibilities to our railway departments for purchasing and testing, and publication of results obtained will go a long way toward improving the quality of these materials.

FREDERIC DANNERTH,
Consulting Chemist.

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MORAL CHARACTER IN THE ADMINISTRATION OF DISCIPLINE.

Chicago, April 11, 1913.

To the Editor of the Railway Age Gazette:

I note an editorial in your issue of April 4—commenting on R. T. Scholes' letter dated February 17, appearing in the same issue. Mr. Scholes is probably not aware that Mr. Kruttschnitt adopted on the Harriman lines a test of employees in advance of "Publicity for Accidents." He fully appreciated that it was as necessary to train the officials as the other employees, if the desired results were to be obtained.

There is in vogue on the Harriman lines and the Illinois Central "surprise" or "efficiency tests," a certain number of which are required to be made by the division officials each month, including the superintendent, and occasionally the general superintendent or general manager. These tests are clearly outlined to cover every phase of train operating conditions, which have to do with safety of trains and the prevention of accidents. The results of these tests reach those highest in authority, not only in regular reports, but in graphic charts showing the comparative efficiency of each division.

In addition to this an expert operating official on the staff of the highest operating official is employed as an inspector of transportation and authorized to make additional tests on any division of the road at any time. He is constantly employed in this capacity, which gives assurance to the management that not only the subordinates, but the officials themselves are complying with the rules and compelling compliance therewith.

The employees do not take kindly to the "surprise tests," but can find no reasonable objection, except that in some cases it is alleged the tests are made hazardous to the engineer by confronting him with a condition which, if real, would mean an accident; for instance, changing the switch lights to show red at a facing point switch on a curve. Confronted suddenly with the seriousness of such a situation, he might be impelled to jump off the locomotive, in the application of the first law of nature—self-preservation. It is entirely unnecessary and unwise to include such conditions in the "efficiency tests." The instructions of the Illinois Central on this subject read in part as follows:

> In no instance must tests be made where there is the slightest risk of creating a hazardous situation, or where undue alarm will be given those concerned, such as turning light on facing point switch, nor should they be made under circumstances which will cause unwarranted delay to the trains, nor subject them to the possibility of break-in-two in starting or severe application of brakes in stopping; for instance, on heavy grades. The location selected should be one where the danger signal can be observed a sufficient distance ahead to make absolutely unnecessary an emergency application of air.
>
> If indecision on part of the crew is causing too much delay, or after proper observance of rule has been rendered, to avoid as much delay as possible, the individual making test should notify the conductor that it is a test and that he may proceed with the train.
>
> Conditions should not be created which are unfair to those being tested.
>
> The test reported must be the result of conditions pre-arranged by the individual making same, and not from purely observations on their part of the performance of train and enginemen under circumstances which are otherwise created.
>
> Proper entry will be made on personal record card for failure to comply with the rules involved in these tests; the severity of such entry depending on the merits of each case.

It seems to me that the much discussed influence of the organizations in resisting discipline, or a disposition on the part of operating officials to "wink at chronic disobedience of exactly the same kind," can very easily be overcome by the use of "efficiency tests" and "publicity for accidents."

There does perhaps exist incompetency on the part of operating officials and a lack of "moral character in the administration of discipline"—not, however, to any greater extent than in other lines of business, or, if you please, in the army. If the discipline of the latter was as loosely administered and depended on the caprice of the individual who applied it, there would be utter demoralization.

I had occasion some few years ago to be thrown in the company of a general officer, who commanded a department of the United States army. In arranging matters in connection with some army maneuvers I had occasion to ride with him over the road when he observed railroad methods. I was struck with the remark he made one day: "You ought to have fine discipline on the railroad, for the reason that you can get rid of a man who is objectionable. This we can not do in the army. With the officer or private there is a certain *modus operandi* which prevents the elimination of those who do not flagrantly violate the rules of the war department."

There are very few exceptions to the general rule that railroad officials are selected by reason of their experience and capacity for increased responsibility. I will venture the assertion, without fear of successful contradiction, that the moral character and habits of the American railroad officer will rank as high as those of any other country or of the army of this or any other country.

To put forth the difficulty of administering discipline as being the resistance of labor organizations is simply an excuse for those who, for certain reasons, are unable to maintain their discipline. There is no question but what it requires considerable backbone rigidly to enforce the rules. The business conditions of a large part of the state of Georgia were recently thrown into confusion and much time and money was expended by those not connected with the railroad in an attempt to maintain discipline. The final analysis of the case by Governor Brown was to the effect that if a similar experience confronted him again he would use the entire power of the state to support the officials in maintaining discipline.

I think this is the sentiment throughout the country. The difficulty, however, seems to be that for one reason or another unreasonable concessions are made, or the superintendents are not backed up in the application of their discipline, which naturally encourages those who are employed to look after the interests of their constituents—the chairmen of the general grievance committees—to push in further than they know they have a right to go. This is human—"if you give an inch he will take an ell." If, however, properly and justly restrained, there is no difficulty in controlling this situation.

To operate the railroads without rules for the conduct of officials is naturally a difficult matter. The rules of war are very old—the rules of railroading comparatively new. The duties of officials on most roads are at present unwritten laws. As we grow in the refinement of the service, there must be developed certain well defined and standard lines of action. The nearest to those that should obtain among those heretofore evolved are embraced in what follows from Mr. Kruttschnitt's ideas as to the "surprise tests" and "publicity for accidents," both of which tend to impress upon, not only the employee, but also the operating official, his responsibilities.

In the daily application of "surprise tests" there is little hope for the official who is lacking in "moral character in the administration of discipline" to evade his responsibilities. The percentage of efficiency of his division, the individual cases of violations of rules and all of the circumstances connected therewith in the report made of each test, indicate clearly to the managing officer whether the rules are being observed or not.

Notwithstanding all such precautions there will occasionally occur accidents which are deplorable and uncalled for. These can be, in nearly every case, traced to the human equation, the negligence of duty unexpected and hard to account for, the dereliction of duty on part of the men who have perhaps been in service for many years with perfect records. These cases will undoubtedly continue as long as railroads are operated—whether we have automatic signals, interlocking or automatic control. It is human fallibility and is not manifest in railroad work alone. It is the cause of death and injury to people in every walk of life, and seems to have been a chronic trouble of the human family since Mother Eve ate the forbidden apple. It will probably become right again with the millennium.

W. L. Park,
Vice President, Illinois Central.

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FREIGHT RATES BY WATER AND BY RAIL

A Comparison in Which, for the First Time, There Is Available Adequate Data in Regard to Water Rates.

By J. L. Payne,
Comptroller of Statistics of Canada.

Although Canada and the United States have spent hundreds of millions for the development and maintenance of their inland waterways, and these waterways are the mediums for an annually increasing volume of commerce, up to the end of 1912 neither country was in possession of authentic data on which a fair comparison of freight rates by water and by rail could be made. It is all the more astounding that this should be the case in view of the fact that carriers by water have been operating on this continent for two or three centuries. The steamboat antedates the locomotive. The only excuse that could be advanced for this neglect is wholly inadequate, namely, that the inland marine interests of the two countries have never been organized on a reporting basis. If one should quite naturally ask why railways have been compelled to disclose in minute detail all their business operations, while steamboat owners have not been required to make any report at all, I am afraid it would be impossible to give a satisfactory answer.

If today anyone should, quite properly, ask the amount of capital invested in the carrying trade of the Great Lakes—to say nothing about other inland waters—the volume of freight transported annually, the earnings and operating expenses, the number and aggregate tonnage of vessels engaged in this vast service, the number of employees and their yearly remuneration, or for other items of pertinent information, I do not know from what source the answers could be got. They are not available at either Washington or Ottawa. Just why, as has been said, no one can tell. It cannot be assumed there are considerable, much less insurmountable, difficulties in the way. The Interstate Commerce Commission took the matter up three or four years ago, and prepared tentative schedules and classifications; but further steps have apparently been deferred. At all events, statistics based thereon are not at this moment to be had. The officers in charge of the American canal at Sault Ste. Marie have published from time to time figures in relation to the value of freight moved on the Great Lakes, the transportation charges, the ton mileage, and so on; but these figures have been mere approximations, based on other than direct returns of facts. They have no significance under such circumstances.

In this situation the Canadian Department of Railways and Canals decided to make an effort to at least ascertain the freight rates charged by carriers using the waterways under government control, and the task was assigned to me as a part of my regular official duties. An exceedingly limited schedule of questions was prescribed for the year 1912. The operators of steamboats were asked to indicate on each ship's report, delivered at the first canal office reached on a voyage, the rate of freight charged on cargo. As the starting point and destination were also recorded, the ton mileage could be readily figured out, and from all the data thus gathered during the year it would be a simple matter to calculate the average rate per ton per mile. That was the end aimed at. In any case where a vessel owner felt that it would be unsafe to confide such information to the statistical officer at the canal office, it was provided that he might send to Ottawa a periodical statement of his operations—say weekly or monthly. All carriers were also notified that at the end of the season of navigation, and not later than January 15, 1913, they were required to send to the department a report showing: (1) Aggregate tonnage of freight for the year; (2) ton miles of loaded vessels, and (3) gross earnings on freight. Thus one set of figures could be checked against the other.

It was not deemed expedient to ask for more than this at the outset. In the absence of special legislation on the subject, it was felt that any attempt at comprehensive or analytical statistics might lead to delay and resistance. The matter had to be approached in such a way as to win the cheerful co-operation of carriers by water; for it was known that the latter had long realized, for their own purposes, the need of reliable statistics in relation to the waterborne traffic of the Great Lakes. They were quite as much in the dark as was everybody else. Let it be said at once that the methods adopted were successful. The response of ship owners, having regard to all the circumstances, was prompt and candid. If absolutely complete returns were not received, that was wholly due to the short time allowance rather than to reluctance. An immense mass of data was sent in through the daily ships' reports, the periodical statements, and the annual return. All this was tabulated, and has yielded specific information of the greatest value in its bearing on the transportation problems of this continent. It has, at all events, the merit of being original and timely.

In order that the full significance of the information to which allusion has just been made may be appreciated, it will be necessary to have clearly in view the volume and character of the commerce of the international inland waterways of North America—for this matter is of just as much concern to the United States as it is to Canada. The following tabular statement, showing the total tonnage of freight through the American and Canadian canals at Sault Ste. Marie, at five year periods, will be illuminating:

	Tons.		Tons.
1887	5,494,649	1902	35,961,146
1892	11,214,333	1907	58,217,214
1897	18,982,755	1912	72,494,470

It will be seen that there has been an increase of 1,219 per cent. within 25 years; and yet these figures do not include the entire freight business of the Great Lakes. The trade of Lake Michigan, for example, embracing large shipments of grain from Chicago, does not pass through any of the canals, and is therefore not brought into the record. To a very large extent the tonnage just indicated might be regarded as representing the through waterborne business between the head of Lake Superior and eastern ports; and this through business has certain more or less fixed characteristics. The eastbound, or down, traffic is much larger than the westbound, and this fact has an important bearing on the rate of freight per ton per mile. Vessels are ready to carry cargo upbound at an exceedingly low rate rather than travel empty. In 1911—the last year for which full details in that regard are before me—a little over 68 per cent. of all the freight tonnage was eastbound. So far as the Canadian canal at Sault Ste. Marie was concerned, the down cargo represented 83 per cent. of the total—and the Canadian canal, it may be observed, handles 20 per cent. more business than does the American.

It must not be supposed, however, that these percentages in any respect have reference to the nationality of the traffic itself. As a matter of fact, only 10.3 per cent. of all the freight tonnage which passed through the Canadian canal at Sault Ste. Marie in 1912 belonged to Canada. It is not known what was the division at the American canal. A record is not kept of the facts in that relation. Just why, is not known. In 1908 the Department of Railways and Canals began to make a separation of American and Canadian business through all the canals of Canada, and following has been the result:

	Canadian. Tons.	American. Tons.	Total. Tons.
1908	5,012,147	12,490,673	17,502,820
1909	7,378,057	26,342,691	33,720,748
1910	7,883,614	33,106,994	41,990,608
1911	7,792,907	30,237,446	38,030,353
1912	9,376,529	38,210,716	47,587,245

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This situation is almost wholly confined to Sault Ste. Marie, where, as has been said, American freight tonnage passing through the Canadian canal in 1912 made up 89.7 per cent. of the total. At the Welland Canal, Canada had 54 per cent. of the aggregate. The St. Lawrence canals, with a gross business of 3,477,188 tons, showed 67 per cent. attaching to Canada. For all the canals of Canada, however, it is a significant fact that more than four-fifths of the gross traffic is distinctly and wholly American.

Coming now to the consideration of the freight rate by water for 1912, it will be convenient—in fact necessary in a large sense—to separate American and Canadian traffic, although the facts will be given with regard to both. It must first be explained, however, that the 9,376,529 tons of Canadian freight indicating in a preceding paragraph was not the net tonnage. That figure represents the aggregate of all the canals and for that reason there is repetition. For example, a cargo from Fort William to Montreal is recorded first at Sault Ste. Marie, then at the Welland, and lastly at the St. Lawrence canals. The actual net tonnage was 6,942,278. Leaving out a salt water canal in Nova Scotia, and a small canal in Manitoba, these figures are reduced to 6,771,920, to which the inquiry of 1912 had reference. Complete returns were received with respect to 6,292,661 tons, or 93 per cent. of the total. It is confidently asserted that the result would not have been materially affected if the remaining seven per cent. had been reported. The ton miles for this volume of business amounted to 3,286,187,160, and the gross earnings to $6,378,893.43. Using these factors, it will be seen that the average receipts per ton per mile were 0.194 cent. The average earnings per ton were 91.04 cents.

The net American business through the canals of Canada in 1912 amounted to 36,840,812 tons, and returns were received covering 26,030,661. Details with regard to several millions of additional tons were sent in too late to be incorporated in the official report. The number of ton miles was 21,799,392,809, and the freight earnings amounted to $14,617,368.60. The average rate on this business was 56.62 cents per ton, and .067 cent per ton per mile.

The first thing to strike the reader will be the very considerable difference between the freight rate on Canadian traffic and on American traffic. The former was 189 per cent. higher than the latter. A statement of the facts will, however, explain this disparity. Of the 36,840,812 tons of American business through the canals of Canada in 1912, no less than 34,079,692 tons consisted of iron ore and coal—the ore eastbound and the coal westbound. The transportation of this ore is not on a commercial basis. It is for the most part done in steamers built for the purpose, owned and operated by the iron interests of Pittsburgh. The maximum freight rate returned for the season was 55 cents per ton. The same vessels carried back coal at 30 cents per ton. These rates were being returned side by side with rates of $1 and upwards per ton on wheat passing over practically the same route. While wheat was earning $2.57 per ton to Montreal, iron ore to Lake Erie ports was earning but 55 cents and upbound coal 30 cents. These figures are sufficient to demonstrate the entirely special character of the ore and coal business. On the other hand, the Canadian traffic was strictly commercial and competitive; therefore, for the purpose of any comparison which might fairly be made between freight rates by water and freight rates by rail, it will be proper to have regard more directly to the results established by the Canadian figures in 1912. It will help to a better understanding of the Canadian waterborne trade to give, a little further along, some hitherto unpublished facts with regard to the movement of wheat on the Great Lakes.

Before taking another step, we must pause to see precisely what the rate of .194 cent per ton per mile in 1912 means. If that rate is to be compared with the average rail rate on this continent, it must be made clear at once that another very important factor, which would swell the total, has been left out of the account. That factor is the government contribution to the inland waterborne business of Canada. This contribution is the interest on the capital cost of the artificial waterways placed at the disposal of ship owners, free of charge, and the annual maintenance of this right of way. The figures are readily available. The canals of Canada cost $103,400,589, and the annual interest charge on that capital sum, at 3½ per cent., would be $3,619,021. The cost of maintenance in 1912 was $1,725,738. The total of these two amounts is $5,344,759. By a simple calculation, it will be seen that this contribution by government was equal to 76.99 cents per ton on the whole Canadian freight tonnage of 1912, or .140 per ton per mile.

The account might be summed up in the following fashion:

	Per ton. Cents.	Per ton per mile. Cent.
Actual freight rate	91.04	.194
Government contribution	76.99	.140
Total	$1.6803	.334

How do the foregoing water rates compare with rail rates? Happily, we are not left to conjecture. The facts in relation to the transportation of wheat between Fort William, at the head of Lake Superior and Montreal, both by water and rail, are definitely known. The average rate on waterborne wheat between these points in 1912 was 5.774 cents per bushel, or $1.92 per ton. To this should be added the contribution by government of .140 cent per ton per mile, equal to $1.72 per ton, making the total $3.64 per ton. The rail rate of the Canadian Pacific Railway between Fort William and Montreal is uniformly $4 per ton, or .402 cent per ton per mile. The average rail rate of all the railways of the West on wheat is not higher. On a longer haul, say from Winnipeg to St. John, New Brunswick, it is even lower; so that the comparison is fair. Thus we have on this statement of facts a water rate of $3.64 per ton as compared with a rate of $4 per ton by rail. That comparison, however, is based on an average water rate on wheat of 5.774 cents per bushel. The maximum water rate for the season of 1912 between the same points was 8 cents per bushel, and at that rate the charges by water were 29 cents per ton higher than were the current charges by rail. A fair conclusion is that, on the whole, the water rate paid by the shipper is lower on certain commodities which are peculiarly suitable for transportation in steamers; but there is not a material difference between water and rail rates when all the facts and conditions are taken into account. The difference in favor of the water rate is created wholly by the fact that a considerable part of the actual cost of transportation by water is paid by the people at large.

It would take up a great deal more space than is at my disposal to give a complete analysis of the waterborne traffic of the Great Lakes in 1912, and to deal comprehensively with the exceptions to the rates just indicated which the inquiry revealed. Those exceptions would carry the water rate both far below the average given and also carry it considerably above. It could easily be demonstrated that as soon as the steamers undertook to transport other than highly specialized classes of commodities—package freight, for example—the charges were close up to the rail rate between the same points, and with the government contribution added were actually higher. While there is keen competition in the carrying trade on inland waters, there was a marked uniformity in the rates which prevailed between given points at the same period. There was, however, a wide variation in the rates at different seasons of the year. For instance, the average rate on wheat between Fort William and Buffalo was 2.719 cents per bushel in May; whereas in December it was 3.905. No such adjustability to the law of supply and demand can be made by the railways. The owners of vessels are not subject to the regulating control of either an Interstate Commerce Commission or a railway commission as are the owners of railways. The steamers may bid for traffic practically as they wish, and there is no limitation to their charges. Of course it is only just to say that 1912 was an exceptionally prosperous year for carriers by water. There have been years when they found it difficult to earn operating expenses, to say nothing about dividends, despite the higher rates imposed by railways.

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There can be no question as to the propriety of adding the government contribution, to which allusion has been made, to the actual freight charges on waterborne traffic. If vessel owners had to pay interest on the capital cost of their right of way, and meet the annual operating expenses of that right of way, they would assuredly be compelled to raise their freight rates proportionately. The corresponding charges have to be met by the railways and are reflected in their freight rates. If the railways were exempt from these two calls upon their revenue, they could afford to carry freight at half the current rates and earn a higher net revenue than they now do. Such a statement is too obviously true to call for corroboration or the support of statistical data.

Ship owners, however, have insisted that in fairness the average freight rate charged by railways should also be swollen by the annual interest on the primary subventions given by government to railways. They hold that the cases are parallel in that regard. Let me say at once that my attitude in this matter is absolutely that of the statistician who has been asked to state the facts. It would be highly improper to introduce into the discussion any opinions of my own or to take sides. But frankness compels me to say that the parallel to which carriers by water have called attention is not apparent. If it exists, then no one can say what is the amount involved. Assuming, however, that government has given aid to the railways, without which the rail rates would necessarily be higher, let it be made clear immediately that the account has a countervail. The water rate has been increased to the extent only of the interest on the capital cost of canals and the annual maintenance of these canals. The vast sums expended on harbors, lighthouses, dredging and so on have not been taken into the reckoning, although they are directly connected with inland navigation and have been essential to the shipping trade. The only reason for the exclusion of these large contributions is that the exact amount cannot be ascertained. In other words, the water rate has not been charged with the great cost of terminals and their upkeep, nor the expenditure on other services which the owners would have to provide if government had not already provided them. The aggregate of such outlays would more than offset the aid given by government to railways; so that the case of carriers by water, as regards the freight rate, has not been unfairly presented.

From the comparison which has here been made between water and rail freight rates in Canada, it may be assumed that the former are not lower than the latter when the public contribution is taken into account. Nevertheless, the people of Canada believe in canals and are about to spend fifty or sixty millions for the construction of a new and deeper canal between Lake Erie and Lake Ontario. It may be that this belief on their part is based upon unsound economic premises—for which they may readily be pardoned because of the absence of authentic statistics on the subject—but they are not likely to reverse their judgment when all the facts are clearly before them. Patriotism impels them to stimulate the use of their inland water heritage, which they hold in common with the people of the United States; but back of that is a negative reason which to them is quite as potential. They believe that the development and maintenance of waterways, free of all tolls to shippers, serves as an effective check on railway rates. It may be frankly admitted there is some truth in this assumption; but the open-minded student of transportation problems, with the statistics of waterborne and rail tonnage before him, will not be disposed to attach serious importance to such a view. He will see that the course of commerce is influenced by many other considerations than the immediate cost of moving freight from one point to another. That, however, opens up another field of discussion, having many and varied aspects, which would perhaps carry one away from the somewhat limited subject with which I have been endeavoring to deal in the light of hitherto unavailable facts.

The assumption that carriers by water are in active and constant competition with carriers by rail would seem to rest on a weak foundation. The outstanding phenomenon of the transportation situation on this continent is the relatively gentle rivalry between these interests. Theoretically, the moment the railway rates exceeded the water rates on any particular commodity the flow of traffic would be diverted to the steamers. Nothing of the kind happens, however. The railways appear to be able to charge considerably more per ton per mile than do the steamers without loss of business. But this rule works only one way.

It would also seem to be clear that the steamers can only be certain of cargo when their rates are clearly and substantially below the railway rates. Take the case of wheat coming down by water to Buffalo. At that point the Erie canal ought to pick up all the business it could handle—and, by the way, its capacity is distinctly limited—but it does not get more than a moiety of this export wheat. While the canal rate is, say, three cents a bushel to New York, the railways, charging from four to six cents, get an overwhelming proportion of the traffic. There must be strong reasons for such a condition. Obviously it is to be looked for in factors apart from the freight rate. If the transportation charges constituted the sole consideration it would be impracticable to have a rail rate of half a cent per ton per mile securing 75 per cent. of the traffic between points served also by water while the steamer rate was a quarter of a cent. Since that is precisely what happens every day during the season of navigation, the notion that anything like keen competition is taking place between these two carrying interests is not tenable.

A careful study of waterborne and rail traffic statistics over a period of years has convinced me of three things: First, that the waterways attract only certain bulky commodities as to the transportation of which time is not an important consideration; second, that carriers by water are compelled to quote considerably lower rates than the railways are actually charging in order to make certain of even that class of cargo; and third, that the quotation of these lower rates is only made possible by reason of the government contribution to which I have alluded. Hence it comes to pass that the steamers play an exceedingly useful part in the general scheme of transportation on this continent, handling as they do a swelling volume a more or less specialized traffic, and leaving wholly to the railways the movement of a wide range of other commodities which, by a process of commercial gravitation, falls naturally into the freight car. That, at all events, is the situation as we now have it in North America.

It has been said that a few pertinent and novel facts would be given with respect to the movement of wheat on the Great Lakes. The volume of that movement has been steadily rising for years past. Wheat is peculiarly suitable for transportation by water. It seeks the cheapest outlet to market, although it does not always find it. The popular belief that a fraction of a cent will decide the particular channel which wheat will take is, of course, true when other things are equal. They are seldom equal. If 100,000 bushels of wheat are sold in Winnipeg for delivery in Liverpool by a certain date, the seller is compelled to choose that avenue which will enable him to carry out his contract. He probably has such a contingency in his mind when he fixes his selling price. Hence millions of bushels of export Canadian wheat find their way abroad every year via Buffalo and New York. This occurs even when the freight rate to Montreal is a cent or more per bushel lower—a situation which quite naturally perplexes and disappoints the Canadian people. The causes are to be found in the availability of ocean tonnage at New York, the Atlantic freight rate, and the lower marine insurance at American ports.

Last year 143,075,815 bushels of wheat came down by water from the American and Canadian West, of which 109,842,031 bushels were the product of Canada. A dozen years ago the situation was reversed. The Western States are not necessarily producing less wheat; but they are exporting less. In fact, the day would seem to be near at hand, as J. J. Hill predicted several years ago, when the United States will be importing wheat for domestic consumption. On the other hand, Canadian exports of this commodity are increasing somewhat rapidly, despite a rising home demand. This is due to the filling up of the prairie Provinces with producers. It would be gratifying, and at the

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same time a defense of large capital outlay for the development of waterways, if the surplus farm products of the West on their way abroad clung to wholly Canadian channels. They do not, however. In 1912 precisely 50 per cent. of all the Canadian wheat carried by water took, partly or wholly, American avenues. Nearly 46 per cent. went out directly by way of Buffalo. The freight rates on this wheat averaged as follows:

Fort William to Buffalo:	
Per ton per mile	.103 cent
Per bushel	2.863 cents
Fort William to Georgian Bay:	
Per ton per mile	.163 cent
Per bushel	2.629 cents
Fort William to other Canadian ports:	
Per ton per mile	.115 cent
Per bushel	2.384 cents
Fort William to Montreal:	
Per ton per mile	.169 cent
Per bushel	5.774 cents

There is an aspect of this movement of Canadian wheat which is suggestive. In 1912 nearly 21,000,000 bushels were brought from Fort William to ports on Georgian Bay, whence it was carried by rail to Montreal for export, and to other points in Ontario for grinding. The larger bulk was exported. It was ascertained that the combined water and rail rates equaled the all-water rate to Montreal. The steamers got from 2 to 3 cents per bushel, and the railways from 5 to 6 cents, less handling charges. The steamer rate per ton per mile was slightly lower than the rail rate; but the steamers probably earned relatively more on their share of the haul than did the railways on a little longer haul. The point which calls for emphasis is not so much the approximate parity of the water and rail rate in this case as the disposition of large steamers to avoid artificial waterways. This is indicated by the steady increase of the trade to Georgian Bay ports. If that object lesson were lacking, it would still be true that vessel owners have a strong preference for deep water and sea room. Given a long haul in open water, and there is no question whatever that steamers can underbid the railways; but the moment canals or restricted channels intervene the freight rate goes up. And for a sound reason. Time is the controlling factor in the fixing of a freight rate by water rather than distance, and vessels make slow progress through canals and narrow channels. Interruptions and delays are common. The season of navigation on the Great Lakes does not average much over seven months, and during every moment of that time the operating expenses are constant, with the single exception of the quantity of coal being consumed. Hence the faster the vessel moves the larger is the tonnage actually transported, and in the end the net profits for the season will bear a more or less fixed relation to the volume of cargo handled.

ONE WAY OF KEEPING A STRIKE ALIVE.

An apparent effort to revive the defunct strike of the shop organizations on the Illinois Central, which was called in September, 1911, is indicated by a recent exchange of telegrams between Martin F. Ryan, general president of the Brotherhood of Railway Car Men, and officials of the St. Louis Southwestern.

On account of high water in the lower Ohio and Mississippi rivers the tracks of the Cotton Belt were used to detour trains of other roads between Jonesboro, Ark., and the bridge at Thebes, Ill. During the five days, April 6 to 10, a total of 310 trains of seven roads were handled over this single-track line, a distance of 140 miles. On April 8 Ryan sent the following telegram to T. E. Adams, superintendent of motive power of the Southwestern:

"Information has reached my office that Illinois Central trains and equipment are being detoured over the Cotton Belt on account of high water. You, no doubt, are familiar with the fact that all the shop organizations on the Illinois Central are now and have been on strike for several months. Please advise if it is the intention of the Cotton Belt management to require their car men to inspect and repair such Illinois Central equipment as may be detoured over Cotton Belt tracks. An early answer will be appreciated."

The threat manifestly implied in this message was met by President F. H. Britton in a reply to Mr. Ryan on April 10 as follows:

"Your telegram of the eighth, to Mr. Adams, inquiring if it is the intention of this company to require car men to inspect and repair such Illinois Central equipment as may be detoured over Cotton Belt tracks has been forwarded to me. The message indicates that you are familiar with conditions, and it is not necessary that I state that the damage done by flood waters to railroad and other property, including possible loss of life, through the lower Ohio and Mississippi, amounts to a public calamity and that we are detouring, in addition to Illinois Central business, trains of the Mobile & Ohio, Rock Island, Frisco and Iron Mountain, all of whose tracks have been more or less damaged by flood waters, and are thus performing a service of great importance to the public residing along and dependent upon the railroads mentioned for service, and who cannot be reached except through use of our rails. The work is one of public necessity, and we would be derelict in our obligations to humanity were we to decline to flood sufferers or those threatened with disaster the use of our facilities under existing conditions. Illinois Central equipment is, in a sense, our own while on our rails, the service rendered being provided for by reciprocal agreement granting us the use of their rails under similar conditions, and we shall continue to demand of our car men the same service in the matter of inspection and repairs, as with our own."

Mr. Ryan made no reply, but was quoted in the newspapers as saying he had no intention of interfering but had "merely asked for information."

The train movements between the points named during the five days, including those of the Cotton Belt as well as the roads detouring over its tracks, were as follows:

Date.		S. W.	I. M. C. & E. I.	Frisco.	I. C.	M. & O.	R. I.	Total.
4-6	North....	6	9	4	1	4	4	..
	South....	6	8	3	3	6	4	58
4-7	North....	9	11	3	3	3	2	..
	South....	8	8	5	2	3	4	64
4-8	North....	9	11	4	2	3	0	1
	South....	10	9	4	3	6	1	1 64
4-9	North....	10	12	5	3	1	2	2
	South....	9	6	4	4	2	0	2 62
4-10	North....	9	12	4	4	..	..	3
	South....	10	9	4	4	..	..	3 62
Total								310

Double-Tracking in India.—Two sections of the Bengal-Nagpur Railway, from Adra to the Jerriah Coalfield, and from Adra to Bankura, are being double-tracked at a cost of about $875,000. An interesting point in regard to traffic operation arises in connection with the doubling of the latter section. For some time congestion on the Adra-Midnapore section has been staved off with difficulty and the company has had the question of improvement under consideration. The present capacity of this section as a single line is 24 daily trains; after considering the probable developments of the early future the company has come to the conclusion that 32 daily trains must be provided for. The first idea was to double the section throughout; careful investigation has, however, shown that by doubling from Adra to Bankura—only one-third of the whole section—the capacity of the section as a whole can be increased to 38 trains. This seems at first sight a most extraordinary result. The explanation, however, would appear to be simple. Loaded trains start off from the coalfield during the night, empties are brought in during the night for loading during the next day. These two streams cross one another continuously for some distance from the coalfield, but at Bankura a point is reached where the downward traffic and the upward traffic are traveling at different hours, and the tendency to congestion is of course materially reduced. It thus comes about, as has been said, that by doubling but one-third of the whole section, its capacity is increased by over 50 per cent.

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STEEL PASSENGER TRAIN CAR DESIGN.

Continuation of Account of the New York Meeting of the American Society of Mechanical Engineers Held April 8.

In our issue of April 11 abstracts were given of the papers presented by H. H. Vaughan on the "Introduction to the General Discussion," by C. D. Young on the "Painting of Steel Passenger Cars," and by John A. Pilcher on "Trucks for Passenger Cars." Abstracts of the other papers follow:

PROBLEMS OF STEEL PASSENGER CAR DESIGN.

By W. F. Kiesel, Jr.,

Assistant Mechanical Engineer, Pennsylvania Railroad.

The increasing cost of lumber, the desire for longer and stronger cars, and other considerations indicated the desirability of making a determined effort to develop a satisfactory steel passenger car. The object of this paper is to review a few of the problems encountered, beginning with:

Can we afford it, and what will it cost, compared with wooden cars? Tentative designs were prepared and carefully analyzed by a committee of representatives of car builders and railroads. The summary of its report was that at first steel passenger cars would cost approximately 20 per cent. more per passenger than wooden cars of the best existing types, but that the steel cars would probably cost much less to maintain. It also reported that on account of the increased cost of good lumber, and the probable decreasing cost of manufacturing steel cars, not many years would elapse before the cost of steel cars would be no more than, if as much as, wooden cars. At the present time steel cars cost no more than equivalent wood cars.

Shall the cars be all-steel, or steel frame with wood lining? Differences of opinion still exist on this point. Both types of car have been built, and each has strong advocates. In the all-steel car the steel lining may be securely riveted to the framing and adds somewhat to the strength of the complete structure, but as steel is a good conductor it carries away the heat of a body coming in contact with it, and, therefore, will always feel cold, even when the temperature in the car is sufficiently high. Satisfactory results have been realized from the use of a double steel lining between seats, forming a hot-air duct, extending from the heater pipes to the window sill, with outlet through small holes in the lining proper, located immediately below the window sill.

Wood lining requires considerable wood furring, and adds weight to the car without adding to the strength. As the steel frame of a long passenger car may vary as much as ½ in. between extremes of temperature, it is necessary to make allowance in the construction of the wood lining for this variation in length. As a car with metal lining riveted to the framing has the advantage in strength, weight, and cost, it will gain in favor; in fact, it would be at present universally preferred if all railway shops had practical experience with steel lining, and the necessary proficiency and machinery for its manufacture.

Insulation. Three general principles have been used for car insulation: Wood lining; by placing insulating material on the outside of steel lining; by placing insulating material on the outside of the steel lining, and on the inside of the steel sheathing. Experiments have been made also with other methods, such as completely filling the space between sheathing and lining with block magnesia and magnesia cement. The problem that presents itself is: Given a car body with a comparatively smooth exterior surface protected by several coats of paint, double walls, painted on both sides—if of steel—isolated air spaces rather large in volume between the walls, an inside cubic volume in which the air must be continually renewed, and a window surface of about one-third the area of the side walls. When single windows are used the air close to the windows is cold in winter, and warm in summer. Double windows improve the situation materially.

Experiments made to determine the difference between a wooden and a steel coach, with doors and windows closed, standing on a siding exposed to the sun in hot, summer weather, showed a difference of one to two degrees in favor of the wooden coach. One day's readings showed an average of one degree difference in temperature in favor of the steel coach, which had insulation only on the outside of the lining. The results of several years' experience indicate that the lining must be insulated throughout, and, if the spaces between lining and sheathing are properly isolated, little is gained by insulating the sheathing, and more will be gained by the use of double windows. Furthermore, the heat lost in cold weather by conduction through and radiation from the walls, in cars with insulation on the lining alone, is negligible when compared with the heat carried off by adequate ventilation.

Protection and safety of passengers. This problem involves providing adequate strength for carrying the load, also to prevent collapse or crushing in wrecks, and efficient brakes. The laws governing load-carrying strength are well known, but this cannot be said of the laws governing wrecks. Each wreck forms a separate study, and we seldom find two that can be placed in the same class. The study of wrecks, which, unfortunately, do occur, shows that the car underframe must be reasonably strong to resist end strains, that the ends of the superstructure must be reinforced with strong vertical members, and that the car must not collapse when rolled down an embankment. The gradual elimination of crossings at grade has materially decreased the danger of stresses directed against the sides of the car.

Early experience with steel freight cars showed clearly that the men handling cars in yards believed that all cars built of steel could withstand much rougher handling than wooden cars. Although the resultant damage to both kinds of freight cars had its disadvantages, it developed a better knowledge of the relative value of steel and wood in car construction, led the designer to abandon the basis of ultimate strength of the material, and to substitute the basis of elastic limit, and finally to select a ratio of 4 to 1 as the relation of the elastic limit of steel as used in cars to that of good timber. That not all designers of steel passenger cars had the advantage of this knowledge, or profited by this experience, is evidenced by some of the car designs which have been illustrated in the technical papers in the past years and which proved fundamentally defective.

Selecting from the last generation of wooden cars one used in heavy trunk line service, with four 5-in. by 9-in. wooden sills bunched together near the center, and so located as to be nearly uniformly affected by the end strains, steel platforms with draft gear securely attached, and the remainder of the car to correspond, the analysis of its end-shock resisting capacity leads to the consideration of the elasticity of the material, the transverse bracing preventing buckling, the concentration of strength near the longitudinal center line of the car, and the reinforcement at the platforms. The wooden car, therefore, meets many of the requirements enumerated before. A corresponding steel car should have a center sill area of 45 sq. in. braced against buckling, a strong and efficient draft gear as a substitute for the elasticity of the wood, and a ratio of 0.04 for stress to end force, the calculations to include consideration of lever arm of force below the neutral axis of the center sills. For lighter service a steel car with a center sill area of 32 sq. in. and a ratio of 0.05 for stress to end force may be considered as a substitute for a wooden car with four 4-in. by 8-in. sills bunched near the center of the car. The use of steel permits a distribution of material to better advantage than is possible with wood. The box girder center construction is continually gain-

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ing in popularity; the strong vertical members at car ends, to prevent one car overriding and penetrating the superstructure of another car, are now considered a necessity; and a superstructure, including a roof sufficiently strong to bear the car when turned upside down without collapsing, is very desirable.

Trucks. The impression that cars with six-wheel trucks necessarily have better riding qualities than those with four-wheel trucks has proved to be incorrect. The substitution of four-wheel trucks for six-wheel trucks saves about 18,000 lbs. per car. Increased journal bearing surface obtained by an increase of diameter of journal only is of little or no benefit in preventing hot boxes, because the periphery velocity increases in the ratio of the diameters. The weight per journal should not exceed 1,500 lbs. per in. length. A long spring base, low-lying center plate, and anchoring the dead levers to the car body instead of to the truck frame promote smooth action and easy riding at all times. The equalizing springs should, therefore, be placed as near the journal boxes as possible, or directly over the boxes, and the bolster springs should be on or near the center line of the truck sides. If the dead levers of the truck brake are anchored to the car body, the truck frames have no tendency to tip up when the brakes are applied, and the jarring effect is entirely eliminated. A special axle with 5½-in. by 11-in. journal for passenger cars would be of material benefit, would permit using four-wheel trucks under all coaches and 60-ft. baggage cars, and longer cars with six-wheel trucks would have sufficient margin for the excessive loads sometimes encountered and the danger of hot boxes would be avoided.

ROOF STRUCTURE FOR STEEL CARS.

By C. A. Seley,

Mechanical Engineer, Rock Island Lines.

The advent of the steel car has rather encouraged the use of the oval or round roof, as it is often called, particularly for cars used for baggage, express, and postal purposes. It is cheaper to build and maintain and fulfills requirements for such cars. For passenger cars the clear-story type prevails very generally, as it assists in lighting and ventilation and in decorative effect. The shape of the carlines of either type of roof should be such as to facilitate the fastening of the roof and of the inner ceiling or finish, and between these there should be a generous amount of insulating material to intercept the heat of summer and the cold of winter.

The specification for full postal car construction, which was approved by the Postoffice Department in March, 1912, contains the following paragraphs in regard to the roofs of such cars and is probably as authoritative a statement as there is available. The strength of roofs of some cars that have been rolled over in accidents has been checked against the formula used, and it has been found ample to afford support against serious roof distortion in such cases.

"*General.*—The roof may be of either the clear-story or turtle-back type, depending on the standard contour of the railroad for whose service the cars are built. In the clear-story type, the deck plates shall be in the form of a continuous plate girder, extending from upper deck eaves to deck sill, and either built up of pressed or rolled shapes, or pressed in one piece from steel plates. The carlines may be either rolled or pressed steel shapes, extending in one length across the car from side plate to side plate, or may extend only across the upper deck. In the latter case the lower deck carlines may be formed by cantilever extensions of the side posts or by independent members of pressed or rolled shapes. In the turtle-back type, the carlines may be of either pressed or rolled shapes, extending in one length across the car between side plate and side plate, or may consist of cantilever extensions of the posts.

"*Carlines.*—The projected area of the portion of roof in square feet, supported by carlines, divided by the sum of the section moduli of the carlines, must not be more than 100.

"*Roof Sheets.*—Roof sheets, if of steel or iron, shall be of a minimum thickness of 0.05 in., and either riveted or welded at their edges."

The design of the roof is also subject to the general paragraphs on stresses and details of the postal car specification. There are several bills in Congress having in view the substitution of steel passenger equipment on railroads for present wooden cars. Should any of these become law, specifications for construction will be necessary, and, as the postal car specification has been approved and adopted as standard by the government, no doubt it will be used as a basis in determining the requirements for other steel passenger equipment cars, not only for the roofs, but for the other features of construction.

SUSPENSION OF STEEL CARS.

By E. W. Summers,

President, Summers Steel Car Company.

Unfortunately the roadways we have to contend with cannot be made or maintained in true alinement. Frost and water make constant changes in the track support. Lateral curvature requires super-elevation of the outer rail. In passing from a tangent to a curve, or vice versa, the tracks under one truck are not in the same horizontal plane with those under the other one. Steel car bodies of the enclosed type, such as box cars, mail, baggage, or passenger coaches, are of rigid construction and have high torsional resistance. A three-legged stool on an irregular floor surface will stand upon all of its legs while one having four legs may carry all of its load upon two diagonal supports.

The use of truck springs helps the illusion that we are distributing the car body load on all of the wheels. The uneven deflection of the springs indicates directly the increased load of one spring over the other. When the track surface is warped more than the total spring travel, the whole load is carried at two diagonal corners, tending to twist the car body. This twisting tendency is constantly changing, first in one direction and then in the other, as the super-elevated rail changes from one side of the track to the other. The effect upon wooden passenger cars is to work the joints loose and cause them to screech and grind like the spokes of a wooden wagon wheel in hot dry weather.

The side bearings of steel sleeping cars pop like sledge hammer blows when the car is taking or leaving a curve. The slight twist in the track surface throwing excessive load upon two diagonal corners of the car causes the bearings to grip and adhere to each other coincident with the slewing of the truck. When the twisting of the truck exceeds the play in the parts around the truck bolster the side bearings let loose and jump with the resulting hammer blows. More efficient roller side bearings may prevent the gripping and jumping, but the uneven load is still present. The twisting effect upon the car body is not removed. Failure in roofs of wooden box cars and the resulting damage to merchandise in transit is due to this constant twist. Roof designers have attempted to remedy this by making the roof flexible and with slip joints. To be consistent they should go further and make the whole car of India rubber. A practical construction for the enclosed type of steel car bodies must and always will be rigid and of high torsional resistance.

The necessity for flexibility between the car body and the trucks, and for an even distribution of the load upon all of the wheels seems not to be fully appreciated as yet, but with each succeeding year wrecks due to broken rails, wheels and truck structure will drive this home. Suspension of steel cars, as has been developed by the writer in the past three years, does permit of a more even distribution of the load upon the wheels than with center-bearing trucks.

[Mr. Summers then explained at length the construction and operation of the balanced side bearing truck, which he has developed. *Railway Age Gazette* readers are more or less familiar with it; a description appeared in the issue of March 22, 1912, in connection with an article on the all-steel box cars for the Bessemer & Lake Erie. It has also been referred to frequently in the controversy on locomotive tender derailments which has been carried on in the columns of the *Railway Age Gazette* during the past six months.]

STEEL INTERIOR FINISH.

By Felix Koch,

Assistant Mechanical Engineer, Pressed Steel Car Company.

The use of a small amount of wood in the interior finish, as for instance, window sash moldings, seat arm rests, window capping, etc., should not be objectionable as it has certain advan-

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tages over steel which are desirable; wood is used for such details to a considerable extent, and hundreds of cars are now in service in which the small amount of wood used in the interior finish cannot be detected except by an expert and such cars are to all intents and purposes fireproof cars, but the aim of many designers has been to eliminate the wood wherever possible on account of the many advantages possessed by steel, among which may be mentioned:

(*a*) Steel finish means non-combustion in case of fire.

(*b*) Steel prevents splintering in case of wreck.

(*c*) Steel finish may be easily removed should it become necessary to repaint the car on the inside surface of the steel sheets, as the life of the steel car, to a certain extent, depends on the condition of the paint.

(*d*) Steel finish makes it possible to increase the interior width of the car where outside width is limited. This has been found particularly valuable in designing subway, elevated or suburban steel passenger equipment cars.

(*e*) Steel finish will avoid trouble which may be experienced due to different expansion of materials—steel as compared to wood. This point need not be considered with steel and makes it unnecessary to provide for relief in all members of the finish running longitudinally, such as upper and lower deck sill moldings, etc. In fact, the steel finish has revolutionized to some degree the designs of wood finish in the wooden cars built since steel cars came into vogue. The cars of today are built on more sanitary lines, and fancy moldings, fretwork and carvings have disappeared without losing sight of giving the cars an artistic finish, avoiding thereby lodging and breeding places for all kinds of germs and filth.

(*f*) Steel finish will, by comparison, be cheaper every year for the reason that it becomes more difficult to obtain the right kind of lumber for interior finish, which, of course, means increase in price of wooden cars.

(*g*) It is continuously becoming more difficult to obtain men who have had sufficient experience in applying wood interior finish, whereas it does not take the same experienced men for applying steel finish. A man requires from three to four years' apprenticeship to become an expert in applying wood finish to a car, whereas an average intelligent man who is familiar with tools is able to become an expert in finishing cars with steel finish in from six to twelve months.

(*h*) A more uniform color may be maintained on steel finish than on wood, which comes in different shades, and it is very difficult and expensive to match perfectly all parts in one car with regard to shade without additional expense of glazing. Furthermore, the average life of paint applied to steel finish will be much greater than to wood finish for the reason that wood darkens with age. This, of course, influences the paint which is a disadvantage from the standpoint of illumination. Should it become necessary to repaint a car of wood finish, reworking of the finish by removal of the varnish and scraping is necessary, whereas in the steel finish the scraping is eliminated and the removing of varnish is alone required to be able to repaint the car.

(*i*) Steel finish is of advantage from a building standpoint in the handling and working up of material. Steel details may be worked up to a large extent before they are applied to the cars, which makes it possible to manufacture the interior finish in much less time by the use of more men, than it is possible to employ when applying a wood finish, as only a limited number of men have room to work at the same time in a car when the greater part of the fitting and cutting, etc., has to be done. This has facilitated the establishment of a number of manufacturing concerns who devote their efforts almost exclusively to producing steel interior finishes not only for passenger cars but also for buildings. In addition to these any manufacturing company equipped with the necessary machinery for the making of drawn moldings, breaker presses, and ordinary welding and spot welding machines, is able to handle this class of work for railroads or car builders, who may not have the necessary equipment to do the work in their own shops and prefer to buy the interior finish as they buy other specialties.

All of these advantages are almost exclusively confined to the use of steel or other metals, although a composite material of a wood pulp nature or similar material made fireproof and waterproof by different processes, if applied in a proper way and used for ceilings and below the window sills, is not objectionable, and may be applied in praetically the same manner as steel. The advantages possessed by wood over metal as a non-conductor may be very much reduced by the use of proper insulating material correctly applied. The use of proper insulation is, of course, of great importance; manufacturers of that class of material as well as railroads and car builders are giving a great deal of attention to the subject, and the time does not seem to be far distant when steel cars with interior finish of wood will be as scarce as steel passenger cars were ten years ago.

ELECTRIC LIGHTING OF STEEL PASSENGER CARS.

By H. A. Currie,
Assistant Electrical Engineer, N. Y. C. & H. R.

From a standpoint of practical consideration for the welfare of passengers, the lighting plays one of the most important parts; therefore, every effort should be made to arrange the light units so that no discomfort be occasioned, and to install the apparatus and wiring so that operating failures be reduced to a minimum.

The two essential considerations for the designing engineer to keep in mind in laying out his installation are: (*a*) The arrangement of parts in a manner to allow of easy inspection and repair. (*b*) Protection against mechaniеal injury. Convenience and accessibility of apparatus, fixtures, junction boxes and wiring mean much to the inspector. It is well known that the average inspector will pay little attention to those parts which are difficult of access, and much better inspection work will result where parts are arranged in a get-at-able manner. It is of equal importance that the various parts be protected in such a manner as to avoid all possibility of injury to them while the car is in service.

Axle Generator. It would be a consummation much to be desired if truck designers would provide a generator support built integral with the truck; the requirements are not difficult and it is certain that the generator builders would be glad to make their machines conform to the truck builder's suspension. As the matter is now handled, nothing causes them more delay and inconvenience than obtaining information about the numerous details of truck and underframe construction necessary for making an intelligent layout of the generator suspension.

ELECTRICAL EQUIPMENT ON STEEL MOTOR CARS.

By F. W. Butt,
Assistant Engineer, Electrical Department, N. Y. C. & H. R.

In providing for the electrical equipment on steel motor cars, several important points should be considered. On account of its metallic construction, the car becomes a negative conductor, or, in other words, the car is grounded, and all electrical apparatus must be well insulated against leakage of the electrical current. Switches, circuit breakers, fuses, etc., should be so located that the are when opening a circuit will not reach the metal structure of the car. In cases where space is limited, and it becomes necessary to locate circuit breaking apparatus in such a way that there is danger of the arc reaching the metal structure, suitable arc shields of non-conducting and non-inflammable material should be used.

In the design of new cars it is sometimes found convenient to locate various members of the structure, especially in the underframe, so that the apparatus may be suspended from them without the use of intermediate supports. This is desirable, as it is often found that many parts may be omitted from the car.

The steel car is safer than cars of wood construction, as there is no danger of bad fires on account of short circuits. Parts of the structure of a steel car will not become alive, as is sometimes found in cars of wood construction.

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AIR BRAKES FOR HEAVY STEEL PASSENGER CARS.

By A. L. Humphrey,
Vice-Pres. and Gen. Man., Westinghouse Air Brake Company.

The improvements made in air brakes in recent years, which have made it possible to control the present heavy high-speed passenger trains with approximately the same degree of efficiency as the older forms controlled the equipment of their day, have been based on scientific principles and experience in obtaining reliable information and data. The matter of time of transmission of compressed air was not so important a factor with the shorter trains and slower speeds as it is today, where a train running at 80 miles per hour passes over a distance of 117 ft. per sec.; consequently a few seconds' saving in the time of getting the brakes fully to apply is just so much relative gain in the time and length of stop. With the latest improved pneumatic equipment, the maximum brake cylinder pressure can be obtained throughout a modern train of ten cars in 4 seconds, which is the shortest possible time that this can be obtained by serial quick action through a train of this length. For the purpose of shortening this time serious consideration is being given by some railroad officers to the type of brake equipment used on the New York subway, and known as the "electro-pneumatic," which would not only tend to cut the time of full application in two, but by means of the electric control all brakes are applied simultaneously, which not only assists in shortening the stop but in preventing shocks, etc.

Another equally important factor now coming more prominently into use is the application of brake shoes to each side of the wheel, known as clasp brakes. The virtue of clasp brakes, however, is not so much in the aid they afford in shortening the stop as in the equalizing effects of pressure on the wheels, journal box bearings and trucks, the minimizing of lost motion which affects the brakes through increased piston travel, and the less tendency toward wheel sliding while the brakes are applied.

THE USE OF CAST STEEL.

By C. T. Westlake,
Chief Mech. Engr., Commonwealth Steel Company.

Cast steel as applied to underframes and end frames of railroad cars is the result of careful design, and painstaking and thorough development of the art of casting in sand molds. These large steel castings are made in baked molds, confined in massive metal forms, by a special method that assures positively against swelling due to pressure of the inflowing metal, and yet permits yielding to the pressure of the contracting metal when cooling, so that the castings are very accurate in shape and close to size, and are free from shrinkage stresses.

As recently as 1893, cast steel was comparatively unknown in car construction, and in that year its introduction began in the use of truck bolsters for freight cars. This was followed a few years later by body bolsters or transoms, and it was only after their use on freight cars had demonstrated satisfactorily the reliability of the material and design, that attention was turned to passenger cars. The double body bolster was first to receive consideration for passenger cars, and although, due to casting difficulties, its weight was at first excessive, it was quickly refined and assigned to its proper place with other cast-steel articles. It was found to be so much lighter, stronger and permanently effective than the built-up type, by forming a one-piece cradle or support for each end of the car body, that its use soon became almost universal in construction of passenger cars.

As one of the most valuable properties of cast steel is its adaptability to combine a multiplicity of complex parts into a single one of simple form, it was gradually developed from the double body bolster form, first to include end sills, then end and buffing sills; next the end and buffing sills were combined with longitudinal members extending to, and connecting with the double body bolster. Finally these parts, together with many others, were combined into a single simple member at each end of the car underframe, and comprising so many of the fixed parts that it is now only necessary for the car builder to connect them by center girders and to apply draft and buffing gears and the superstructure to complete the car frame.

The ideal underframe should have all connecting members in the same plane so as to avoid buckling due to eccentric loading; it should be so designed that each member will independently perform its individual functions, passing the stresses from one member to the other through the smallest number of properly alined connections; and all should be so arranged in relation to each other as to form one powerful, compact, shock-absorbing element throughout the length of the car. This may be accomplished to great advantage in cast-steel construction since the metal may be properly distributed in proportion to the stresses. The gusset plates may be placed in the same plane as the flanges of intersecting members, and the whole reduced to minimum weight and to the smallest number of parts with practically no joints. It may be molded to any desired conformation, may be shaped to any curve, useful or ornate, without the use of expensive dies, and may be provided with necessary projections joined to the main members by proper fillets. Openings may be provided with finished and reinforced edges, and all parts may be molded to symmetrical, pleasing contour, all edges rounded and a complete, practical, operative device, emanating from a single source furnished to the car builders ready for application.

As the rounding of curves necessitates the use of convex ends to the car body, the central portion of the ends is most exposed and liable to receive initial impacts, and this portion should be made strongest and most capable of properly transmitting the force of impacts to the balance of the frame. The underframe receives the force of end collision as a column load on its longitudinal members, while the end frame receives it as a transverse load on exposed members supported at their ends. As it is impracticable under these conditions to make the end frame equally as strong as the underframe, provision should be made for protecting the end frame against destructive forces. The underframe should be arranged so as to receive the initial impact, and if the encountered force is sufficient to destroy it, it should fail in such manner as to form additional protection to the end frame. This is accomplished in cast-steel construction by arranging the parts of the longitudinal members so that when loaded to destruction by a collision force, the end portions yield upwardly, thus folding the exposed portion of the platform up against the end of the car body, and forming an addition to the end frame to assist in distributing the force to all the longitudinal members of the superstructure. The advantage of this construction has been demonstrated in wrecks when this action has taken place, the safety of passengers being assured, and the property loss kept low.

The cast-steel platform as now provided for blind end cars, comprises the buffing sill having recesses for the buffer foot plates, holes and brackets for the buffer stems, pockets for the buffing device, brackets for safety chains, lugs for draft gear, brackets for drawbar carry irons, anti-telescoping plate, extensions of the center sills and bottom chords of the side sills, all of the double body bolster members including side bearing arches and extending for a distance of over 14 ft. inward from the end of the car to a point considerably back of the truck center, and counting rivets, gusset plates and connecting angles, combining more than 1,000 pieces into a single, powerful, shock-absorbing element of less weight than fabricated material of the same strength.

The cast-steel platform and double body bolster for vestibule cars comprises all the parts enumerated for blind end cars, and in addition, includes the exposed platform longitudinal members, step risers and end sill, measures over 17 ft. in length, is made of a single piece, and is also of less weight than fabricated material of the same strength.

Since the government has taken a hand in the construction of cars used in its service, stronger body end frames are being used, and as the end of the car is the first to encounter end collision forces, it reasonably deserves closer and more careful con-

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sideration. Most damage is produced by end collisions and to protect life and property from them, the colliding object must be prevented from entering the car. To accomplish this, the end frame and end portion of the underframe should be constructed so as to distribute the force of collision into all the longitudinal members of the car, passing it into the largest mass, utilizing every particle of available inertia to absorb the force without permitting it to reach and act upon the contents or occupants of cars. The end frame proper should be designed so that when a single member is loaded, all will act with it, and this can be accomplished only by connecting them so as to form a single mass, and best by forming them in a single piece as in cast-steel construction.

In designing the cast-steel end frame we assume it to be a beam supported at its upper and lower ends and loaded at a point about 18 in. above its lower end. We provide connections between the end frame and balance of car frame of sufficient value to develop the full transverse strength of the end frame; the vertical members of the end frame are connected by horizontal members so that in case the end frame is loaded to destruction the connections are sufficient to disrupt all the longitudinal members of the car frame, and when they yield all parts will be forced toward the center of the end of the car and tend to prevent one car telescoping the other.

Cast-steel parts weigh less than built-up members carrying the same load since the metal in castings may be properly distributed in proportion to stresses. In built-up construction the metal overlaps at the joints and this, together with the rivet heads, makes an additional weight which in cast construction is avoided. In the latter, reliance is placed in a single solid member and, as there are no joints, there is no chance of their being imperfect or becoming loose.

The advantage in cast steel to the car builder is also very great. To produce a platform of the built-up type at least eight different classes of material are required. This comes from eight different manufacturers, frequently from as many different points of production, much of it in less than carload lots, and all has to be requisitioned, purchased, received, stored and recorded for use on each particular lot; and in order to reduce storage space and avoid congestion in the car plant, all deliveries have to be carefully and accurately timed, and followed up. Then each material has to be passed through the different departments of the car plant to be cut, shaped, punched, drilled and the same timing and tracing methods used, so as to have all parts completed at the proper time. When cast steel is used but one material is purchased from a single plant, only one piece is handled, that in carload lots, and when it arrives it is immediately ready and available for application without storage or re-handling, facilitating completion of the car by leaving more car plant machinery available for other work.

UNDERFRAMES FOR STEEL PASSENGER CARS.

By J. McE. Ames,
American Car & Foundry Company.

This paper will be confined to underframes of steel passenger cars for through service, or those at least 70 feet long. The natural division of such designs is: (*a*) Underframes designed to carry equally on all sills. (*b*) Underframes designed to carry on center sills only. (*c*) Underframes designed to carry on sides only. (*d*) Underframes designed to carry on sides and center sills.

Each of these types has its partisans and each type is in successful operation today. The first is the type used abroad almost universally and at home for repairs under wooden cars, the bodies of which are too good to destroy but need better underframing. In general the deep side sill has been discarded because of the difficulty of inspection beneath the car. The deep center sill is much in vogue at present because it looks strong, but on a car with deep center sills inspection must be made of the parts attached to the underframe from one side of the car at a time, and the introduction of axle light equipment becomes difficult on account of the interference with the deep sills. Again, to sustain its own weight without deflection on a 60 ft. span, too much weight of metal is required to make such a sill economical.

Of the second type, that is, with the whole weight to be carried on the center sills, a common form has center sills of two special 18-in. channels with ½-in. cover plates top and bottom, all sections extending the full length of the car in one piece. The box girder so formed has a square inch section of 50, and the superstructure load is transferred to these sills by means of four cross bearers, two of which take the place of the body end sills in other designs. There are no side sills as such, the angles simply forming the attachment for the superstructure. The parts are usually assembled with the bottom of the sills upward and allowed to deflect. The girder is then reversed and the camber straightens out by the weight of the metal. The sills are the same depth and section throughout their entire length; with this construction a truck of special design must be used, the center plate of which must be nearer the rail than usual. The weight of the body rests upon the side bearings as well as the center plate. The service given by this underframe has been excellent.

The third type, with all the weight carried by the car sides, has the center sills used only for buffing and pulling. An example which may be referred to has two I-beams running the full length of the car in one piece, with a square inch sectional area of 23. They are held up by the three cross bearers which pass under and are attached to them. There are no side sills, the carrying members being the sides of the car. These members are composed of ⅜-in. plates, about 36 in. deep, stiffened vertically by the window posts and having a 6-in. by 6-in. by ⅝-in. angle at the bottom and an equal square inch section of metal at the belt rail, the two girders having a square inch section of 48 in all. With this construction a substantial body bolster is essential, as the weight must be carried at the bolster extremities. Usually a cast-steel structure, built into the underframe and securely riveted to it, is used, as the weight of the metal may thus be economically distributed. With an underframe of this type there is no trouble due to difficulty of inspection or interference with attachment for axle light or other equipment under the car.

The fourth type is a combination of types *b* and *c*. Here deep center sills are used, having a square inch section of, say, 40 at the center and 39 in cast steel at the draw gear. The side girders have a square inch section of 21 in the two. Most underframes of this type now in service are built with cast-steel and in portions which include in one casting the body bolster, platform, side and center sills extending as far back of the bolster as may be necessary to secure a substantial connection to the center sills proper.

While several of these types have been in service for a number of years the required time has not passed in which to develop structural defects due to unseen causes, such as fatigue of metal, crystallization, etc. If such defects exist they should make themselves known during the next three or four years, if freight construction is any criterion. We know fairly well the behavior of these types under unusual service conditions due to wrecks.

SPECIAL ENDS FOR STEEL PASSENGER CARS.

By H. M. Estabrook,
President, Barney & Smith Car Company.

Notwithstanding the frantic efforts of Congress toward the general adoption of steel passenger cars, it has been stated upon reliable authority that no vestibuled wooden passenger car, in the construction of which was employed the anti-telescoping end framing, in a straight-on end to end collision (although frequently having the ends concaved) has ever had the end crushed in to the extent of the adjoining car body telescoping and entering it.

It is, of course, apparent that the weight of the steel car is much greater than a car of the same size of wooden construction,

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and that the wooden car possesses in itself a natural elasticity to absorb buffing shocks such as are produced by collision that the steel car does not furnish. Hence, in the development of the steel car, with the enormous increase in weight of trains and the high speed at which they run, there has been a growing tendency to increase the strength of the structure with the view of making it as nearly indestructible as possible in order to compensate for the absence of elasticity. It is also apparent that, notwithstanding the strength of the structure, if it encountered an opposing force of sufficient magnitude, it might be annihilated, and so this strengthening process and the increasing weight and speed might go on indefinitely without furnishing the result sought for. It is equally true that if the structure is designed for such strength as to be indestructible, when the two opposing forces meet, the movable objects within the cars, which is the human load, must suffer the damage. To avoid this possibility the idea has been evolved to construct that portion of the end of the car between the end of the main body and the vestibule face plates, these members being all such parts as are embraced in the platform, vestibule and hood covering the vestibule, so that it will collapse under a less shock than would be required to crush in the end of the car body itself.

This idea is based on the theory that in a train in which there are, say, ten vestibuled cars, there is the space between the main bodies of each two coupled cars occupied by the platforms and vestibules of approximately 8 ft., or in a ten-car train a space of approximately 80 ft., of shock absorbing space, which, if properly utilized in the instant of collision, would remove to a large degree the shock and resultant damage to the car body itself and likewise lessen the possibility of damage to the persons of the passengers. From this idea has developed what is termed a collapsible vestibule. It is generally conceded that if two vestibuled cars coupled together could maintain their respective horizontal planes at the instant of shock due to collision, there could be no telescoping and that telescoping is due to one car assuming, at the instant of collision, a higher or lower horizontal plane than its adjoining neighbor, causing one to ride the other with the resultant telescoping effects.

It is generally conceded, that in cases of two cars tending to telescope, the point of maximum shock is never over 20 in. above the floor line. In the government postal car specifications, this point has been definitely fixed at 18 in. above the floor line, and with this in view the end posts are reinforced for a distance of about 4 ft. above the floor line by steel angles riveted to the Z-bar end posts.

This collapsible vestibule was described in the *Railway Age Gazette* of January 24, 1913, page 142. In its construction the longitudinal sills and floor members are designed to stop at the end sill of the car body proper, the end of which is sheathed with a heavy steel plate extending in one piece vertically from the roof downward to the bottom of the end sill. If the shock of collision is not entirely absorbed by the vestibule members before the end of the car body proper can be crushed, this plate will tend to pull the roof downward and cause the direction of the oncoming car to deflect obliquely upwards instead of the two cars telescoping. Further to offset the effect, should the two cars change their horizontal planes in collision, pressed steel shapes in the nature of anti-climbers are placed below the buffer beam and platform.

The platform, vestibule and hood members are designed with a view to withstanding all shocks incident to regular service, but in abnormal shocks, such as would result from collision, the rivets connecting the various members would shear off with the exertion of less energy than would be required to crush the end of the car body, thereby causing the vestibule to collapse, absorbing the shock and furnishing a cushion between the two car bodies proper. It is assumed that in case of a collision these would be the only parts seriously damaged, and the car could be repaired and replaced in service with a minimum of expense and delay. The entire collapsible vestibule, comprising the platform, vestibule and hood, is constructed as a unit, detachable and separate from the car body proper and can be applied after the car is built or in the alteration of cars already built and is equally applicable to cars of either steel or wood construction.

The object of the collapsible vestibule is, first, to protect the lives of the passengers and secondly to protect the body proper of the car from serious damage.

THE INTERSTATE COMMERCE COMMISSION.*

By James C. Jeffery.

In 1860, the population of the United States was roughly speaking, 30,000,000, and this population was served by 30,000 miles of railroad. At the close of the Civil War, that great region west of the Mississippi river was as yet untouched, and it was therefore, natural that the railway and financial pioneers of those days should turn their eyes to this virgin territory. In 1869, the first transcontinental line was completed, and by 1871, there were 60,000 miles of road in operation, which by 1888, had increased to 150,000 miles, and was serving a population of 60,000,000. In short, from 1860, to the time of the passage of the first Interstate Commerce Act, in 1887, the population of the United States had doubled, while the railroad mileage had increased fivefold.

The consuming population as well as the producing population of the United States was confined very largely to the regions lying east of the Mississippi, and north and south of the Ohio. These great rivers, with their tributaries, and with the coastwise lines of the Atlantic seaboard, afforded up to this time, almost a sufficient means of transportation to take care of the rapidly growing demands of the country, so that with this large increase in railroad mileage, the carriers by rail were compelled not only to meet the rates of their newly constructed competitors, but also to meet the rates of the long established water carriers, which may be said to have then been at the height of their efficiency. This sudden and enormous expansion in railroad mileage naturally carried with it disastrous effects. The railroad traffic men of the day sought tonnage rather than revenue, with the result that always comes from chasing this elusive rainbow, that is, receiverships. It is needless to say that this competition amongst the carriers was acute to a degree that we of today can scarcely appreciate. A published rate was almost unknown. One shipper had no idea what his competitor was paying, nor did a carrier have any idea what rate its competitor was making. Even rebates were unnecessary, and to put it mildly, the situation was intolerable. The public demanded a remedy, which was presented by Senator Edmunds, in the form of the act to regulate commerce, which was, after going through the various Senate and House committees, approved and passed February 4, 1887. The act was merely a statutory embodiment of what has always been the common law, but which common law had up to this time been rarely enforced, that is, that it is the duty of the common carrier to serve the public by charging not more than a reasonable rate; but furnishing equal service to all, without discrimination; and by giving to the public, adequate facilities. Today, the Interstate Commerce Act, with its various amendments and supplements, seeks but to do these three things.

The act of 1887 failed to accomplish these purposes for the reason that although the five members of the then Interstate Commerce Commission were capable and zealous, yet the inherent weakness was that the congressional act creating it, failed to give the tribunal sufficient power to cure the evils contemplated. Various amendments were made of relatively small importance, until 1906—but in that year the Interstate Commerce Commission was truly vitalized, and in a simple way. Up to 1906, the commission was compelled to go to

*Abstract of an address at the annual banquet of the Transportation Club of Detroit, on February 8, 1913.

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court to enforce its own orders: after 1906, a carrier was compelled to go to court, if the orders of the commission were not to be enforced. And at this time, too, the number of the commissioners was increased from 5 to 7. There were numerous changes, and amendments, other than the one referred to, but there can be little doubt that this shifting of the burden of going to court was the revolutionary one. The Mann-Elkins amendment of 1910 made another fundamental change in giving to the commission the right to suspend any new tariff or rate promulgated by the carriers, and the commission under this amendment claims the right to suspend even a reduction in rate, where it thinks such reduction would work a discrimination.

The cumulative effects of the original Interstate Commerce Act, the amendments of 1906 and 1910, together with the United States Supreme Court decisions construing the act, have vested a vaster power in this judico-legislative tribunal of seven men than is known elsewhere in the civilized globe.

While it may be too soon as yet to judge what the ultimate effect of the concentration of this vast power in the hands of these few men will be, still there are certain results that everyone must admit have been gained; a greater stability of rates, which in itself makes the means of transportation more useful, more economical to the shipper; the substitution of a natural and legal competition between the carriers themselves, for an unnatural and illegal competition, and last and perhaps greatest, gentlemen, it has inculcated in the minds of all of us, whether shipper or carrier, a greater respect for the laws on the federal statute books.

The question today has ceased to be, "Will you have an Interstate Commerce Commission of greater or less power?" but is, on the other hand, "Will you have an all powerful commission, or will you have a government ownership of your public utilities, engaged in interstate commerce?" And the day you decide upon government ownership, you have sown the wind from which you shall reap the whirlwind—you have sown the seeds of destruction of our republican form of government, though, the end may be one or three centuries away. Let me paint you a picture. Some future demagogic president of the United States, drunk with ambition to succeed himself; a political machine composed of 3,000,000 to 5,000,000 government-owned railroad employees; the support of capitalistic interests that would come with the disposition in the hands of such a president, of $5,000,000,000 annual income of these railroads. With these tools your demagogic president would become dictator over an empire vaster than Caesar in his proudest moment ever dreamed of.

Industrial traffic men and railroad traffic men have educated this Interstate Commerce Commission to a degree where it is no longer satisfied with the glittering generalities of 20 years ago; where you may no longer speak to it in general terms of economic demands, water competition, and cost of construction. You have educated it to the stage where you must get down to detail; where you must show an actual direct discrimination if you allege it; where you must demonstrate real reasons for your contentions and not endeavor to shroud your position in a mysterious veil of facts and figures that fool neither yourselves, your opponents, nor the tribunal to whom they are presented.

I ask you to pray with me, that the future Interstate Commerce Commissions of the United States may be constituted of the same capable, fearless, incorruptible types of our American manhood that compose it today. The commercial prosperity of the nation depends in no small degree upon this.

NEW UNDERTAKING OF THE GERMAN RAILWAY UNION.—The German Railway Union has appropriated $7,140 for the preparation and publication of a history of locomotive construction, and has engaged a well known Austrian engineer, Dr. Sanzin, to prepare it. It is to be completed within four years.

THE MANAGERS' AND FIREMEN'S BRIEFS.

Final briefs were submitted on Friday, April 11, to the arbitration committee, which has been hearing the firemen's demand for higher wages. The brief of the firemen laid special emphasis on the request for uniformity of wages and conditions on the 52 eastern roads, which are parties to the arbitration proceedings. The firemen point out that in the present arbitration, the board has been unable to determine what has been the increase in wages even on any one railroad, and claim that if for nothing else uniform conditions and wages should be put in force, so that in a future proceeding, similar to the present one, a basis of comparison will be available. Uniformity in rates and rules are necessary and desirable in other industries as evidenced by the peace, contentment and profit that prevail in the mining industry, where uniform rates and rules are in effect, as compared with the instability of prices, discriminations and abuse, and the continuous unrest of employees where uniformity does not prevail. The firemen's brief goes on to say that the industrial advantages of uniform wages and conditions are proven in the printing and building trades, in contrast with the steel and textile trades where ignorance and misery are the standards of labor as shown by the reports on the Lawrence strike.

"Uniformity of rates is the privilege of the railroads, a privilege guaranteed the railroads by federal legislation . . . and by the regulations promulgated by the Interstate Commerce Commission, requiring of one railroad only that which is required of all, thus placing all on an equality under the law.

"Uniformity in rates and rules should not be influenced by the relative wealth of railroads, because in no other trade or industry does the wealth of the employer fix the wage of the employee. The difference in the bank accounts of an employing printer or builder in no way influences the wage of the journeyman printer, the carpenter or brick-layer. The less prosperous railroads profit as greatly by the labors of the locomotive fireman or hostler as do the wealthiest railroad corporations. The productive efficiency of the locomotive firemen is as great on one railroad as another where the same class and weight of locomotive is used, and the financial returns to a less prosperous railroad from a fireman's labor on the same class of locomotive, is sometimes greater than to the more prosperous railroads, because of higher local freight rates." The brief explains that the firemen are not asking for standardization of wages, but are practically asking for a species of piece-work wage, where the fireman is paid more or less in accordance with what he earns for the railroad company. A lower rate is asked for on locomotives where the fireman produces less profit for the railroad.

THE MANAGERS' BRIEF.

The brief for the railroads was submitted by Elisha Lee, chairman of the committee of managers:

In the original demands made upon the railroads the firemen asked that any increase in wages or changes in working conditions secured in this movement be made effective as of July 1, 1912. In answer to this, the chairman of the railroads' committee says that section IV of the Erdman act provides that the award, having been filed in the clerk's office of the circuit court, shall go into effect at the expiration of ten days from such filing.

Both the firemen and the railroads are on record as desiring to invoke all of the provisions of the Erdman act, and to submit themselves unreservedly to its treatment. The railroads now claim that the impossibility of making the award retroactive is determined by the law.

The railroads have taken strong exception to the demands of the firemen that "rates of wages that are higher and conditions of employment that are better than those asked for in the present movement shall remain in effect."

"There can be no justice in retaining 'high spots' unless the board also allows the 'low spots' to remain.

"As long as these conditions exist the labor organizations will continue to formulate extravagant and unwarranted demands,

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knowing full well that to them there can be no loss, but on the contrary the chances of gaining something more without jeopardizing any advantage already enjoyed, is an incentive for renewed and continued efforts for adjustments in rates and working conditions."

Mr. Lee then points out that a comparison of the amount of work performed by firemen in 1902 and 1912, and the amount of wages paid to firemen in those years, shows that a fireman's pay has increased in that period more than the amount of his work. The roads also contend that nothing has taken place since the adjustment of pay in 1910 (which was satisfactory to the firemen) to necessitate any further increase, or the establishment of a minimum day's pay for this territory.

In answer to the demand of the firemen that a second man be placed on all engines in through freight service weighing 200,000 pounds or over on the drivers, Mr. Lee says that "the weight on drivers is not a governing factor in itself of the work required of firemen." He claims that the question of giving assistance to the firemen can only be properly disposed of by a study of all facts and conditions surrounding the work of the firemen. He says that great improvements to the engines—which are now being rapidly added to the larger locomotives—are reducing the fuel handled by a fireman to a marked extent, and thus the necessity for either a second fireman or further assistance is diminishing rather than increasing.

More attention is devoted to the demand of the fireman that two men be placed on certain locomotives than any of the other articles under arbitration. The railroads still contend—the following was strongly opposed by the firemen in the open hearings before the arbitration commission—that where conditions warrant giving assistance to the fireman it is proper to use the extra brakeman required by the so-called "Full Crew" laws. Mr. Lee says the Pennsylvania Railroad is doing this now. This extra brakeman, he says, has been forced upon the railroads and as he usually rides in the engine, with no work to do, the railroads have a perfect right to have him assist the fireman or perform any other work that may be necessary to successful operation.

In general, the railroads hold that, owing to the many conditions affecting the work of the firemen, each run or set of runs on the several roads, and divisions of those roads, should be treated independently in considering the question of assistance for firemen.

The firemen, in their original demands asked for standardization of wages and working conditions in the Eastern District, but excepted from this demand for standardization, higher rates of pay and better working conditions than those asked for. The railroads claim that standardization is not only wrong, but in some instances absolutely unjust, because: It fails to recognize dissimilar physical characteristics on different parts of the same road. It fails to consider the varied traffic conditions represented by volume of business on different roads or parts of the same road. It fails to recognize the differences in wages paid labor in other employments in different localities embraced within the limits of the district covered by the lines involved. It fails to recognize that a wage scale should at least bear some relation to the ability of the road to pay, as may be reflected in the earnings, which factor more or less reflects the character of the service required of the employee. Standardization is inconsistent with Article 9 of the Firemen's Demands, to the effect that existing rates of compensation that are higher and better working conditions shall not be disturbed.

As proof of this, Mr. Lee quotes President Carter of the firemen's organization, who said:

"I will confess that on some roads it is not as hard to fire as on other roads, because of the character of the track and the character of the machinery."

In concluding the brief says that "to grant the firemen their demand for annual increases in pay of 35.5 per cent. would have a strong and well-nigh irresistible influence toward bringing about large collateral increases in other classes of railroad employees." In this connection attention is called to the recent history of wage demands in the eastern territory.

"Early in the year 1910 the conductors and trainmen made certain demands for increased wages, which were finally disposed of by granting adjustments covering a large part of the territory, either through mediation, arbitration, mutual understandings, or a general advance. Later, the firemen received like adjustments, and still later the engineers' wages were also adjusted.

"In the early summer of 1912 the engineers again made further demands, which were finally arbitrated, when they were granted certain increases throughout the territory. Now the firemen are here again, and the conductors and trainmen have already made further demands, and are now urging the railroads for prompt action. How long such demands, which up to the present time always have resulted in additional burdens on the finances of the railroads, can continue without impairing the credit of the railroads depends very largely on the decision in the case of the firemen."

GREATER EFFICIENCY IN SAFETY WORK.

By George Bradshaw.*

Much has been deserved and much said in praise of the "Safety First Movement." In principle the movement is sound and it has passed the experimental stage. In fact, so much intrinsic merit does it possess that, though it has been tested only in a loose and imperfect manner, most favorable results have been obtained. On some roads the personal injury record has been reduced 10, 20, 30 and even 40 per cent. For this, railroad officers and employees are entitled to much credit; but they will not be entitled to the greatest commendation till they have succeeded in preventing the very highest percentage of accidents that can reasonably be prevented—and 40 per cent. is not the highest. We must not be content with half a loaf.

The favorable results obtained under present methods which, I repeat, are loose and imperfect, are due in no small degree to the interest that always attaches to a new proposition. That interest, in the case of "Safety First," has extended to enthusiasm because of the high and noble sentiments to which the work of accident prevention appeals. But the time will come, perhaps is now appearing, when the novelty of the thing will wear off. It will then be a routine matter of operation and we shall have to depend for results upon correct principles and efficient methods of organization.

I believe it is entirely practicable to reduce the personal injury record 75 per cent. How? By simply applying and carrying out the safety first idea to its logical extent. Do not get the impression that I am about to launch into a description of some gloriously ideal state. Enthusiastic as we may become in our efforts to prevent injuries, we must always bear in mind that we "have got to run the road" and that safety must be wedged in with efficiency of operation. It cannot be allowed to crowd it out.

A Department of Safety.

There should be created on every road having any considerable mileage, a safety department, in charge of a man specially qualified for the work, who should have the title, pay and authority of vice-president, and be responsible only to the president. Considered either from an economic or a humane standpoint, there is no position more entitled to such confidence and reward. Safety is not and will not really be first until some president makes it so by placing the work of accident prevention upon the high plane its importance justifies. "Safety First" was started at the bottom, and its full force has not yet reached the top. The president who first in truth and in fact really establishes safety first on his line will become known both as a benefactor and a breaker of records in reducing operating expenses.

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Complaint is made—and justly made—against drastic legislation, some of which—as for instance, the recent full crew acts—is little short of an outrage. But is not this about the logic of the situation? The record shows a high percentage of accidents which, from an operating standpoint, it is reasonable and practicable to prevent. That much must be admitted; and the fact that we have prevented a fair ratio of accidents can not be pleaded as a justification for not preventing all that should reasonably be prevented. Rather do the results obtained serve to turn the spot light on the greater results possible to obtain. One thing is certain; preventable accidents must be prevented. Public opinion—the court of last resort—has entered this decree. Are they going to be prevented as the result of legislation or by the voluntary effort of railroad officers? One or the other. Legislators, generally speaking, are making an honest effort to solve the problem. The trouble is they don't know how to solve it. Railroad officers know how to solve it, but they are not doing it. Some, it is true, have made an excellent beginning, but none have gone far enough and some of the largest systems, in spite of all the demonstrated merit of the safety first campaign, have done practically nothing. The public is apt to classify all the roads with those which are conspicuous by what they have not done.

The vice-president in charge of safety should have authority over all departments in matters pertaining to safety. It may perhaps be objected that this would interfere with departmental affairs; but let us face the situation squarely. Departmental affairs need interfering with to such reasonable extent as may be necessary to prevent preventable injuries; because it is these same "departmental affairs" that are responsible for the record of one employee injured every four minutes and one killed every two hours and forty minutes from one end of the year to the other, not to mention passengers, trespassers and others. Besides, these affairs are being most seriously interfered with, right now, and that by a class of men who do not know what they are doing, but who are no less determined to do something—our friends, the legislators. Would it not be better to have them interfered with by one of our own number who understands the problem?

But such organization would not interfere to any undesirable extent in matters affecting output or efficiency of operation. Note the qualifying clause: *in matters pertaining to safety*. These are mostly details and for that reason are overlooked by the heads of departments, who are kept too busy with problems of efficiency to give serious and prolonged attention to matters relating solely to safety. For example, 40 to 50 per cent. of the injuries received by shop employees are eye injuries caused by flying sparks, dust, metal chips, etc. That record has been going on for years. No superintendent of motive power ever did anything to prevent, or perhaps ever gave a serious thought to any systematic means of preventing this class of injuries until a "safety man" found that they could be almost entirely prevented by the simple means of wearing proper goggles. Now, the wearing of goggles is solely a matter of safety, separate and apart from efficiency, and all such matters should be decided directly and finally by the officer in charge of the safety department.

The trouble at present with the safety first campaign is that it is wholly an easy-going scheme of co-operation. But co-operation is not a universal virtue. Even if every one were disposed to co-operate, much valuable time and energy are wasted in enlightening and convincing every member of the compact to the co-operating point. One man—the right kind of man—should be given authority and held responsible for the prevention of injuries. Of course, this power in the hands of the wrong kind of man might cause trouble, but the same is true of power vested in the head of any department.

Of course, the general manager is supposed to see accident reports and to apply preventive measures. But, as a rule, he never sees reports of other than the most serious cases. The daily grind of accident reports which make the big total at the end of the year and which present the serious problem for consideration in any systematic plan for accident prevention, he never sees except through the seasoned judgment of a fifteen-dollar-a-week clerk. True, such reports are referred by the clerk to the heads of the various departments. That is just where they should not be referred, because the head of a department where an accident occurs is responsible, actually or technically, for the accident in the first place, and we should not expect him to sit in judgment on his own cause and give a fair trial. Even if this were not true, the limit placed upon him in incurring expense is an insurmountable obstacle to his efforts. If the superintendent of motive power has to be everlastingly pleading for appropriations sufficient to keep engines in running condition, he is not going to borrow trouble by asking for funds to construct safeguards. If the chief engineer is allowed barely enough help to keep the track in such condition that the cars will stay between the engine and caboose, it is safe to say that his forces will not be worked overtime cleaning up yards of rubbish or in removing dangerous side and overhead obstructions. They simply do what any one would do under the circumstances —"keep in the clear" from the man above and take chances of accidents occurring. I am now referring, not to collisions, wrecks and derailments, but to the ordinary every-day accident occurring here, there and yonder every hour of the day and night.

THE CENTRAL OR GENERAL SAFETY COMMITTEE.

The division and shop safety committees, composed of officers and employees, afford a most practicable means of conducting safety work, but, in my opinion, the committee idea should not be carried beyond divisions and shops. The central or general safety committee is a cumbersome and ill fitting wheel in the safety machine and should be taken out. Such committee has no authority and no responsibility. Every subject for its consideration must be handled in one of two ways. It must be referred to the member to whose department it relates and his opinion concurred in by the other members, in which case there is no advantage in having a committee decision, or it must be decided by vote of the various members, each guided by his own judgment, which results in the head of one department, as a member of the committee, determining action upon matters within another department. The principle is wrong whichever way you apply it. Of course, such a committee generates a certain amount of interest in accident prevention and fosters a spirit of co-operation. It serves to keep alive—sometimes barely alive—on the altar the sacred fire of safety. But this article relates to *greater efficiency* in safety work.

THE NEED.

The need is for a practical and easy working method of getting results. The greatest obstacle in the promotion of safety has always been departmental restrictions, and the central safety committee simply adds another obstacle. From its very nature, it is a machine of deliberation and delay. What is needed is action. The problem is not complicated. Let me illustrate. The roof of a roundhouse becomes weakened and is in need of braces and supports to keep it from falling. The foreman reports the condition to the master mechanic, he to the division superintendent, who directs the division engineer to give the matter the necessary attention. The latter investigates and reports that the cost of repairs will require special authority. The ball of red tape is then unwound till it reaches headquarters, 500 or 1,000 miles away, where it is strung in, out and around two or three offices, and in six months it gets back to that particular roundhouse, provided the tape doesn't get broken and the ends lost. This was an actual case; and what really happened was that the roof fell in and injured two men while departmental routine was being observed to the extent necessary to get the carpenters at work. I do not contend that the roundhouse foreman should have arranged directly for the repairs (except in a case of great emergency), but if there had been on that road a vice-president in charge of safety to whom the roundhouse foreman could have reported the condition by wire, that officer would have directed the head of the proper department to make the repairs at once, and they would have been made. Two personal injuries would

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not have occurred and it *would not have cost any more* to make the actual repairs through this channel than to make them by the more circuitous route.

From the standpoint of efficient work in preventing accidents, the trouble with existing methods is this: The men who have authority to "do things" are too far from the scene of action, and have too many other and more pressing duties. The men who are "on the ground" are not vested with authority, and when it comes to getting authority (for safety purposes) there are too many references, too much circumlocution and too many obstacles.

The "Safety First Movement" is a beacon light leading to the haven of safety. But its rays come to us over a broad expanse of troubled waters beneath whose surface there are rocks and shoals to be avoided. While we are on a good ship it must be remembered that she will not steer herself.

PICKED UP ON THE ROAD.

By Gulf.

Certainly the superintendent who tries to get his trains over the road on time is up against it hard when he encounters the indifference of his men. Where discipline is lax or impossible to maintain, the men dawdle in their work and the maintenance of the schedule is out of the question. To point the statement I was on a local the other day that was scheduled at 26½ miles an hour, with stops every 3 miles. It carried express matter for small villages averaging eight or ten packages for each stop. Yet on that schedule the train lost 18 minutes in 45 miles, simply because of the long station delays. The expressmen handled their freight with the deliberation of government employees. They gossiped and used up the seconds faster than the enginemen could make them up. They knew that the train was late, delayed by them and by others of their kind and by other trains in the opposite direction that had probably been held up in the same way. A little hustle, a little springing to the work, a little interest in the reputation of their road, would have kept that train on time over the whole run, and saved a corresponding amount of despatcher work. But how to get that hustle, that springing, that interest; ah, that is the question that involves the effort that must be constant, personal and unremitting.

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Does it just happen so, or is it the rule? I mean about library and observation cars. Why does it happen that they are not only the worst riding cars on the train, but that their riding qualities are so decidedly bad that one can only read in them at the sacrifice of comfort and eyesight. It would seem that of all cars, especial care should be taken to have these ride easily and without the jar that is warranted to ruin the best of eyesights in the briefest of times. Again, I would like to ask, is it the location on the train that produces the effect? Is it the weight of the car? Has it just happened so with me, or is it just pure carelessness on the part of the builders or designers?

* * * * *

I know of a road that has a line that ought to be a heavy travel route, between large centers of industry, but it isn't. Its cars are well equipped and comfortable, barring the parcel rack which lacks just an inch of being what it ought to be. The reason why it is not a great route is due probably to the fact that its time table and train performances do not agree. There are other competitive routes, so I never travel that way if I can avoid it. That there must be thousands of others like me, there is no doubt, for I can count personal acquaintances by the score that feel and act as I do. I recently made a hundred and fifty mile trip, in spite of myself, and shared with two others a new, freshly carpeted, gas lighted car. Our combined fares would hardly have paid for the light, heat and lubrication, to say nothing of the power, to haul the car. Now the foolishness of this, as it seems to me, lies in the ostrich-like hiding of the head, and thinking that it pays to publish a fast schedule that cannot be run. If the managers of that road would be honest with themselves, and simply open out their schedule, and make it what they can run by, the added income would more than pay for the balm for their dethroned pride in their fast traffic that exists only on paper.

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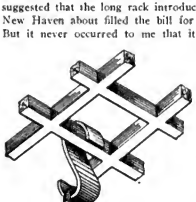
I have taken occasion from time to time to comment on the insufficiency of many of the parcel racks in coaches and have suggested that the long rack introduced many years ago on the New Haven about filled the bill for convenience and comfort. But it never occurred to me that it was necessary to read a lecture on the necessity of making it strong enough to carry its load. It seems, however, that such is the case. I traveled in a car the other day in which the racks were all right in appearance, but no one was allowed to put a dress suit case in them lest they break down. There were thirteen other passengers and the rack contained six hats, a lady's jacket and a small parcel; while on the floor jammed in between the chairs and the windows, were ten dress suit cases. The question is, if you are going to have a rack why not make it strong enough to do its work? There are also some cars with racks not only too weak to hold the dress suit case, but with no hook for the coat. This latter inconvenience can be remedied by carrying an ordinary picture hook, such as goes over mouldings, and catching one hook in the grid of the bottom of the rack, while the other will serve to take the loop in the collar of the coat.



Coat Hanger.

AXLE LIGHTING EQUIPMENT.

A new axle lighting outfit involving a number of radical departures has been developed by the Electric Storage Battery Company, of Philadelphia, Pa. The dynamo is of the Rosenberg type which has been extensively used abroad, modified, however, to give constant voltage characteristic rather than constant current. The field excitation is controlled by a Wheatstone bridge combination of circuits without any moving parts or contacts. The inherent characteristic of the Rosenberg type of machine, which gives the same polarity for either direction of rotation, eliminates the necessity for any pole changer. The variation in voltage is reduced to narrow limits and no lamp regulator is required. The system adjusts itself automatically to different conditions of load produced by variations of schedule or by change of season, so that no manual adjustment is required to meet these different service conditions. At the same time useless overcharge of the battery is eliminated, establishing conditions favorable to long battery life. The Atchison, Topeka & Santa Fe, after a test of this system, has ordered 62 sets. The equipment which was tested has now made over 60,000 miles without a failure.

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Maintenance of Way Section.

THE word "efficiency" has been much misused and made to cover many theories within the past two or three years. Nevertheless it expresses a condition toward which all enterprising and ambitious railway officers are striving. In the bridge, building and water service departments, excellent opportunities are afforded for those in charge to make very favorable showings. The labor employed is of a higher standard than in other branches of the maintenance department, the work is scattered over a wider area, and the variety of duties is greater. All of these conditions afford opportunity for the economical handling of forces and the development of special methods. The routine repair and renewal of bridges under traffic introduces one type of problems, while the construction of a new bridge presents others of a somewhat different nature. The building or repair of station or yard buildings gives rise to still another class of problems. The installation and maintenance of water stations is a smaller but nevertheless important field, where efficient methods are to be found to as great an extent as in any other department. These indicate a few of the numerous fields covered in the next contest on "Efficient Methods in the Bridge, Building and Water Service Departments," which closes April 25. Contributions describing the organization, distribution and management of regular and extra gangs, special methods or kinks developed in the construction or repair of any structures, and, in fact, any means tending to promote efficiency in these departments will come within the limits of the contest, including, as it does, all work ordinarily coming under any of these departments. Special attention will be given by the judges to data regarding the actual results secured by the means described, so that all information of this nature should be included. Prizes of $25 and $15 will be paid for the two best contributions, while our space rates will be paid for all others accepted and published. All contributions should be sent to the Civil Engineering Editor of the *Railway Age Gazette*, Transportation Building, Chicago, and must be received before April 25 to be considered in the award.

THE lack of definite information regarding the service obtained from the various materials and tools used in maintenance work is often a serious handicap when ordering additional supplies. On many roads little attempt is made to collect such data unless it refers to some new device which is being tried out experimentally. Much of the material used today is to a large degree standard, and is made by a number of firms. In such instances the quality and the price are the two things to be considered. Where the quality is the same, the price will, of course, determine where the purchase shall be made, but very frequently the materials vary in quality, and then comparative data regarding service is of much assistance in deciding intelligently which material is the most economical to purchase. Generally this data is not available, and as a result the material which is cheapest in first cost often is bought, even though it may be more expensive in the end, because the officer doing the buying knows that he cannot intelligently defend the purchase of the higher priced product even though he may be convinced in his own mind that it is the cheaper. It is for this reason that the manufacturers so often complain that little but first cost is considered by railways. The supervisor to whom the materials are furnished takes little interest in their relative service. He, or his superiors, may watch the results in a general way and draw their own conclusions, which may, or may not, be shown to be correct when analyzed with the actual data. Service statistics can be readily collected if the higher officers make it a point to gather this information and impress its value upon their subordinates. The collection of such data need not extend over the entire system, but if several of the more progressive supervisors are selected who will watch the results fairly and with interest, the sum of their observations will be fairly close to the truth. With such data at hand the officer specifying the material, whether he be the engineer maintenance of way or the purchasing agent, can select it to better advantage and know that he is getting the best for the money.

THE building of a hump yard with a capacity of 6,000 cars and provision for increasing this to 12,000, is an indication of the favor with which this type of yard construction is looked upon by the Canadian Pacific. The operation of hump yards is not an experiment on this road, as one has been in service for a number of years in the city of Winnipeg and a smaller yard in Fort William was rebuilt for classification by gravity in 1911. While hump yards in this country have been almost confined to a few large companies, of which the Pennsylvania Railroad is notable, in recent years numerous smaller yards have been built, such as the Centralia yard of the Illinois Central, the Mannheim yard of the Chicago, Milwaukee & St. Paul, the Silver Grove yard of the Chesapeake & Ohio, and the Louisville yard of the Kentucky & Indiana Terminal. The question of the relative economy of hump yards and flat yards is by no means finally settled in favor of the former, however, as is shown by the recent construction of the Proviso yard of the Chicago & North Western as a flat yard having a capacity of 6,000 cars. The construction of the Clearing yard near Chicago for interchange between roads entering from the east, south and west, has apparently been justified by the decision to operate this yard and the work which has been started on its reconstruction and enlargement (see *Railway Age Gazette* of March 21, 1913). This yard is unusual not only because it will be, so far as is known, the largest hump yard in existence, having a capacity of 12,000 cars, but also because of the number of tracks over the hump. Even the largest hump yards have been built heretofore with a single track over the hump, but at Clearing four tracks are operated over the single hump, two in each direction. The two yards at Winnipeg are probably the most northerly hump yards in service, making the conditions for the successful operation of this type of construction particularly adverse. From the hump grades adopted, however, the weather in this locality during the winter months apparently has little more effect on the operation than that in our northern states. The accelerating grade on the hump in the old yard at Winnipeg was 3.7 per cent. for a horizontal distance of 300 feet. This grade has been increased since the construction of the yard and the operating department still reports that under some conditions it is not steep enough. The grade adopted for the new yard is 4 per cent. for a horizontal distance of 75 ft.

THE importance of the careful classification and distribution of second hand rail in the economical prosecution of maintenance work is not always realized. It too frequently happens, as pointed out elsewhere in this issue, that the higher officers confine their attention to the manufacture and inspection of the rail up to the time it is received, and then leave it to the care of subordinate officers. While the careful study of the manufacture of rail is vitally important and worthy of all the attention given it, the possibilities for economy or confusion in the handling of relaying rail would seem to justify the careful supervision of some person having jurisdiction over the entire system. The uniform classification of rail released from main tracks is essential so that an officer making a requisition for rail of a certain grade for a definite purpose may know that he will receive rail suited to his needs. On some roads where the classification of released rail is left to the individual roadmasters there are al-

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most as many different standards of classification as there are roadmasters. Under such conditions rail may be shipped to work which is entirely unfit for the purpose desired, resulting in delay and expense, or the material may be better than actually required, and if used deprive some other work of the material. Equally important with the uniform classification of material is the careful arrangement of a schedule of relaying operations so that the work may proceed smoothly from main line to secondary line and then to branch line, without delay either to men or material. Obviously, rail cannot be laid on branch lines until it is released from main lines, and any delay in laying new rail on the main lines will affect the operations of the entire season. Likewise, if rail is not used promptly after release, the work on the branch lines will be carried unnecessarily late into the fall, thereby delaying ballasting and other operations on these lines. The proper time to remove rail from the main line to secure its greatest total service is another point to be considered. On most roads with a large proportion of branch line mileage it is not advisable to allow rail to remain in the main line until it is unfit for further service. Indeed, not infrequently the demands for rail for branch line use govern relaying operations on the main line. Closely allied with the handling of rail is the gradual elimination of odd sections. Most roads in this country have absorbed at one time or another numerous small roads, and in this way have come into possession of a varied assortment of rail sections. Obviously, these sections must be continued in use until the material is ready for the scrap pile. While all new material is bought to the prevailing standards of the system fastenings, switches, etc., must still be kept in stock for all the various sections as long as they are used. While the difficulties incident to this condition can be minimized by confining the various odd patterns to certain divisions, they can only gradually be entirely eliminated. Thus, while the entire subject is largely one of details, these details are important, and if proper attention is given to them important economies can be effected.

THE VALUE OF A PROGRAM OF WORK.

THERE is no branch of the railway service in which the value of a systematic program of work is greater than in the maintenance of way department. While the duties in many other departments are largely the same from month to month, in the maintenance department, from its very nature, certain work can be done to the best advantage at certain definite times of the year, and if it is not done, not only is it not done as well as it could be, but the schedule of all following work is deranged.

The year's work in the maintenance department really begins with the opening of spring, and therefore spring should be the starting point of a schedule or program. While realizing the value of such a program in the abstract, many supervisors and other officers in direct charge of maintenance fail to definitely apply the principle of it to their own duties. On nearly all roads the budget of expenditures has now been decided on and the local officers know the amount of work they will be called upon to do during the year. If a schedule is arranged immediately upon receipt of the budget, material can at once be ordered to be delivered at the various places on definite dates determined on in such a way that the forces can proceed from one piece of work to another with the minimum delay. By keeping his program clearly before him, the supervisor can transfer his forces from place to place with little loss of time in moving.

One disadvantage of not providing a supervisor with statements of the cost of his work from day to day is that he does not then realize the amount of the unproductive time for which the company pays and therefore does not realize the importance of keeping this to a minimum. An advantage of a systematic program of work which is intangible but nevertheless important, is its effect upon the foreman and men. Nothing tends to break the interest of a foreman in his work more than to be transferred back and forth at the will of the supervisor to the detriment of his efficiency. The efficient supervisor will not only arrange the general details of the work for his foremen to the best advantage, but will encourage the individual foreman to do the same thing within his gang. The average section or extra gang suffers a great deal of lost motion which can be converted into productive effort under the proper supervision. The poorer the class of labor employed, the greater becomes the necessity of guarding against such lost motion. By outlining his work with the foreman the supervisor can encourage him to feel his responsibility.

Another phase of the subject which promises to become very important this year is the necessity of securing the most from the labor, for the supply bids fair to be considerably below the demand. In former years when labor was more plentiful it was possible for a road to neglect its work in the early part of the season and make up for the delay by putting on larger forces later. The experience of last year indicates that in future work left undone in the spring will either remain undone or will interfere with other work. As important as a definite program has been in the past, it is becoming a necessity under present conditions. A supervisor can ill afford to allow the time of his men to be consumed unproductively when he probably will not have enough of them in any event to do all that is necessary.

THE LESSONS OF THE RECENT FLOODS.

THE floods of the past three weeks in Indiana, Ohio and neighboring states have commanded the attention of the people of the entire country, but their significance to the railways in the territory affected has not been realized by the public. The immediate effect has been to make it necessary to concentrate all the resources of these roads in the way of construction materials, equipment and labor, in the flooded districts to restore the tracks as rapidly as possible. The second effect has been to place a very heavy financial burden on the railways in question, the loss to them in property only in the state of Ohio alone being estimated, after a careful inspection, at $10,000,000.

The promptness with which the railways have met the emergency is best evidenced by the fact that in spite of the great damage done the main lines were in most cases reopened for service within a few days and nearly all tracks were reopened within two weeks. This has required the prompt assembling of thousands of men from a wide area, the gathering of hundreds of car loads of piling and other bridge timber, stone and other filling material, etc., and the collection of many pile drivers, derricks and other equipment with their crews. The mobilization of these forces, which were brought together hurriedly, without any warning or preparation, into a working organization, has called for a high degree of ability and efficiency. Nor is the experience of the past few weeks exceptional, for other emergencies have been dealt with as skilfully by the railways. Our readers are familiar with the situation that developed in southern California a few years ago when, after all other resources had failed, the Southern Pacific successfully took charge of the problem of returning the Colorado river to its proper channel after it had flowed for some time into the Imperial valley and threatened the destruction of the entire valley. A more recent instance of the same nature is that of the closing of the crevasse in the levee at Beulah, Miss., within the past few weeks. After unsuccessfully attempting to return the flood waters to their proper channel, the government called for the assistance of the Illinois Central. This road placed its construction equipment and men at the service of the government with the result that this crevasse now bids fair to be permanently closed.

Obviously the financial loss suffered by the railways in such disasters must be made good from their earnings. Within recent years the tendency has been to greatly curtail earnings and, as a result, when such unusual conditions develop, the money intended for improvements must be diverted and used to tide over the emergencies. President Willard of the Baltimore & Ohio is

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quoted as saying that it will be necessary to use a very large part of all the funds intended for betterment work on that system this year in the reconstruction of its damaged lines. The loss suffered by the roads is not confined to the actual damage to their property, but an even larger loss results from their inability to handle traffic while their tracks are out of service, and also from the decreased business, originating within the flooded territory for several months. In considering how much railways should be allowed to earn the public and public authorities are apt to overlook emergencies such as these which come at irregular intervals, but which must nevertheless be provided against.

The ultimate effect of such a policy of regulation as is now being followed is to force the weaker roads into the hands of receivers when such disasters occur. Several receiverships during 1912, for example, were in a large measure brought about by the severe weather of the winter of 1911-12. It is to be hoped that the heavy damages incurred by the roads in the recent floods will impress upon those having to do with the regulation of railways the necessity of allowing the roads to earn enough to enable them to accumulate funds to tide them over emergencies, which always have come, and which always will come.

NEW BOOKS.

Proceedings of the American Railway Bridge & Building Association. Paper bound, 6 in. x 9 in., 330 pages. Published by the American Railway Bridge & Building Association, 226 W. Jackson Boulevard, Chicago. Price, $1.

This volume contains the proceedings of the twenty-second annual convention of this important railway organization, held at Baltimore, Md., October 15-17, 1912. It contains the reports of eight committees on the following subjects: Fire resisting paint; derricks and other appliances for handling material in supply yards; concrete tanks; stand pipes and reservoirs; reinforced concrete culvert pipe; the construction and maintenance of long pipe lines for water supply, intakes, pump pits, reservoirs, etc.; turntables; painting of structural iron or steel for both bridges and buildings, and relative merits of brick and concrete in railway buildings and platforms. The discussions of the various reports appear in full with the reports. The reports included in these proceedings are among the most valuable ever presented before the association, those on concrete tanks, reinforced concrete culvert pipe and turntables being especially good. The report on turntables is one of the most complete discussions of this subject which have been prepared, and there has been a wide demand for it in advance of the publication of the proceedings. Dealing with subjects of particular importance to the railway officer having in charge the supervision of bridges and other structures, these proceedings will prove a valuable reference book for those directly in charge of such departments.

Earthwork Haul and Overhaul. By J. C. L. Fish, Professor of Railroad Engineering, Leland Stanford University. Size 6 in. x 9 in., 165 pages, 66 illustrations, cloth binding. Published by John Wiley & Sons, New York City. Price $1.50.

The author of "Earthwork Haul and Overhaul," has had in mind, in the preparation of the book, a number of different classes of readers, including railway engineers, contractors, computers, teachers and students. The material is divided into two parts, the first including seven chapters, covering such subjects as the mass curve, computation of the center of mass, overhaul, free-haul and crosshaul, and the computation of overhaul by eight methods for two different cases. Part II is devoted to "The Economic Distribution of Material Along the Profile," and discusses at length the economic balancing line for mass curves. An incidental feature of the book which has merit is the brief statement at the head of each chapter as to the contents of that chapter, enabling the reader to locate rapidly the material in which he is interested.

Letters to the Editor.

PLACING STONE BALLAST IN ONE LIFT.

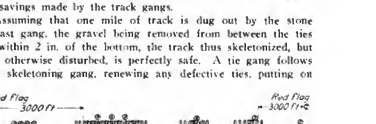
BATAVIA, N. Y., March 1, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The method which I have used when making a raise of from 10 to 12 in. in one lift, with stone ballast, was described in the *Railway Age Gazette* of May 17, 1912. Since the publication of this article I have received many inquiries regarding this method and desire to bring out a few points which may not have been made sufficiently plain in the article referred to.

The purposes of the system outlined are, first: to haul and unload the stone so that it will be put under the track the day on which it is received and unloaded; second, to distribute the men in the gang in such a way as to check their work, and, third, to keep the track in such line and level at all times that slow orders will not be necessary. While the cost of train service in order to arrange the work in this manner may be a little above the ordinary charges, this is more than regained by savings made by the track gangs.

Assuming that one mile of track is dug out by the stone ballast gang, the gravel being removed from between the ties to within 2 in. of the bottom, the track thus skeletonized, but not otherwise disturbed, is perfectly safe. A tie gang follows this skeletoning gang, renewing any defective ties, putting on



Distribution of Ballast Gang.

tie plates and regaging the track. As soon as enough track is thus prepared a train of stone is unloaded in quantities sufficient to raise the track the full height. This can be done by repeated dumping and plowing out. After the last dumping the ballast should be plowed from the ends of the ties and the men can then start in lifting the track, the gang being distributed as shown in the accompanying chart.

The forward jacks keep from 1½ to 2 rail lengths ahead of the rear ones, which pull the track up out of the freshly unloaded stone slightly above the finished grade. The two men marked (3) working at the ends of the ties, spade the stone roughly under the joint ties, the greatest part of the stone running down under the ties of its own weight. Tampers follow the rear jacks, spading the stone in under the tie and as far under the rail as they can reach. Immediately behind them are other men forking in ballast for them, who also carry sledges for tapping the ties down until they are level and at the proper elevation determined by the foreman and the leveiman. Then, most important of all, come the tampers using spades and accompanied by forkers with ballast forks, who bring the ballast in to them. Each group of four tampers is numbered 1, 2, 3 or 4, and these numbers are marked on each half rail on the track being raised, or on the adjacent track. Each gang then tamps the half rail marked with its number and moves forward. In this way the work of each group can be noted and no confusion results. The lining gang follows up, keeping the track in perfect line as the work progresses.

Flags are put out in both directions as prescribed by rule

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books and all trains are flagged while the lifting is in progress, but when trains are seen approaching, or when any regular train is due, a proper run-off is made. When everything is known to be in safe condition the train is signaled to proceed at the usual speed. Under ordinary traffic conditions and with the force of men outlined on the chart, from 800 to 1,000 cu. yds. of stone can be put under the track in the manner described in from 4.5 to 5 hours. The gang then goes back and tamps for 18 in. alongside the rail on each side, trims up the ballast and then goes ahead and digs out for the following day's work. Where necessary, the track can be kept filled in lightly close up to the tie gang.

A regular section force following up the lifting gang 8 to 10 days later does not find as much work to do as in an ordinary spring surfacing. A very light back fill, which is dressed down by the stone gang at the rate of a mile a day, completes the operation.

Among the advantages of this method are that the men always see the end of the day's work in advance, and therefore work to better advantage; the foreman of the gang is at all times engaged in directing his men and managing the work rather than in personally raising and lining, and no delay to trains is necessary.

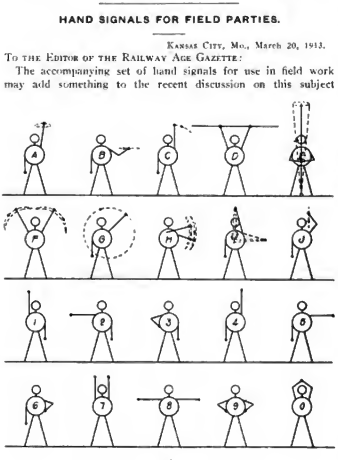
A. M. CLOUGH,
Supervisor, New York Central & Hudson River.

HAND SIGNALS FOR FIELD PARTIES.

KANSAS CITY, MO., March 20, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The accompanying set of hand signals for use in field work may add something to the recent discussion on this subject



Hand Signals for Field Parties.

which has appeared in your columns. (See *Railway Age Gazette*, February 21, 1913, page 351, and March 14, 1913, page 491.) The number signals are practically the same as those shown in Fig. 2 in your issue of March 14. It should be noted that in this system the vertical arm signals are used for the straight line numbers, 1, 4 and 7. In addition to the numbers, I have used signals for fill, cut and decimal point, which are attempts to make with the hands and arms, a minus, plus and point, respectively, as shown in the illustration. For additional transit party signals I have used those lettered A to I. The significance of these signals is as follows: A, "Rod up or give line." Wave a small horizontal circle high overhead with hand or rod. B, "Move to, right or left." Move hand at shoulder height in direction required, slightly for a small, arm length for a big move. C, "Plumb rod to right or left." Extend arm vertically and swing slowly in direction required. D, "Set a hub or give a turning point." Hold any visible object horizontally overhead with both hands. E, "Set on this." With point of rod on tack, swing top of rod in small circle. F, "All right or go ahead." A half circle swing of one or both arms overhead. G, "Come to point signaled from." A full circle swing with either arm. H, "Go back." Face to the right of man signaled to, wave both arms up and down, raising one while dropping the other. I, "Can't get you." Describe an "L" or inverted "T" by a vertical motion followed by a horizontal motion of the arm. For a level party the same signals are used and in addition the one shown as J, "Move target up or down." Move hand up or down in direction required. Motion of hand only means move 0.01 of a foot, half arm 0.1, and full arm 1.0 ft.

It often becomes desirable in field work to send messages which are not covered by ordinary field signals. For this purpose I have used the number signals for code signaling by dividing the alphabet into three frames of nine letters each, the letters in each frame being numbered consecutively from one to nine, and each frame being given a distinguishing signal. The following chart shows the use of this code:

Frame Name.	Frame Signal.	Letter Numbers. 1 2 3 4 5 6 7 8 9
R(igid)....	Hold arm rigid in number signal position for a moment	a b c d e f g h i
S(wing)...	Wave small circle twice with arm extended in number signal position.....	j k l m n o p q r
P(unch)...	Punch into number signal position three times	s t u v w x y z "

The ninth signal in the third frame is the letter repeater or ditto signal. The hip signals in the swing and punch frames are replaced by corresponding signals with the arms extended vertically downward. The abbreviation msj is used for "message." A space between words is indicated by zero, and the end of a sentence by zero ditto. To use this code in the field it is only necessary to recognize the number and frame signals, messages being recorded by number and frame and worked out afterwards from a table similar to the one shown above. For example, "bring up hubs" would be received as follows:

29957	37	8321	9	
	0	0	0	
rsjsr	ps	rprp	p	

ROBERT S. BEARD.

[Since the publication of the hand number signals used on the Burlington lines west, it has been brought to our attention that this particular set of signals was devised to require the use of only one arm and hand. With this system, a rodman may hold his rod with one hand and give all necessary signals without changing his position, or in difficult locations, such as hanging on a bridge, on the side of a canyon or up in a tree, the signals can be given as readily as where both hands are free.—EDITOR.]

NEW RAILWAYS IN CENTRAL AFRICA.—The contract between the Nyasaland Protectorate and the British Central Africa Company for the extension of the Shire Highlands Railway has been signed. The Nyasaland government guarantees 4 per cent. for a period of ten years on $2,000,000, and it is understood that a new company is to be formed. A large tract of rich and populous country will be opened up by the construction of this extension.

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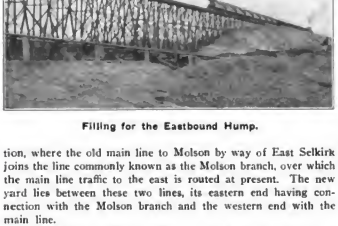
NEW CLASSIFICATION YARD AT WINNIPEG.

Canadian Pacific Is Now Building the First Section of a Gravity Yard Designed for Twelve Thousand Cars Ultimate Capacity.

The old classification yard of the Canadian Pacific for the Winnipeg district is just west of the passenger station in the heart of the city, and on this account, further expansion to care for the constantly increasing freight traffic has not been possible. The congestion in this yard, especially during the movement of grain from the western provinces to the lake ports during the fall has been a serious problem for several years. In order to relieve this situation and to provide for further increases in traffic, it was decided to build an entirely new yard near Winnipeg, which would handle all the classification of through business and would be so located as to be capable of expansion to almost any desired extent. The location selected for this yard is about five miles east of the city and just east of Whittier June-



Filling for the Eastbound Hump.

tion, where the old main line to Molson by way of East Selkirk joins the line commonly known as the Molson branch, over which the main line traffic to the east is routed at present. The new yard lies between these two lines, its eastern end having connection with the Molson branch and the western end with the main line.

A careful study of the requirements for a complete yard development in this vicinity was made by representatives of Westinghouse, Church, Kerr & Company in conjunction with the engineers of the Canadian Pacific, and as a result of this study, plans for an initial development to care for present demands of traffic and a maximum development to provide for expansion in the future were prepared. It was planned to have at least a portion of the yard in service in time to relieve the congestion during the grain rush last fall, but the unusual shortage in labor during the season made the accomplishment of this purpose very difficult. It is expected that the initial development will be completed during the present season. The yard that is being built at present, shown by solid lines in the accompanying drawing, provides the follow capacities:

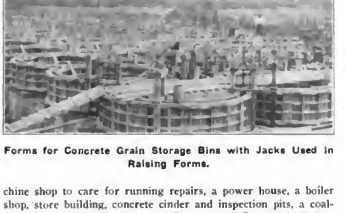
Westbound receiving yard	20 tracks	1,440 cars
Westbound classification and departure yard	20 tracks	1,440 cars
Eastbound receiving yard	20 tracks	1,440 cars
Eastbound classification and departure yard	20 tracks	1,440 cars
Westbound hold yard	5 tracks	325 cars
Eastbound hold yard	5 tracks	325 cars
Westbound caboose yard	4 tracks	24 cars
Eastbound caboose yard	4 tracks	24 cars
Repair yard	12 tracks	180 cars
Transfer yard	4 tracks	125 cars
Icing yard	4 tracks	140 cars
Cold storage yard		40 cars
Total car capacity		6,943 cars
Engine yard		24 engines

The maximum development which is shown by dotted lines in the drawing provides for the following capacities:

Westbound receiving yard	30 tracks	2,090 cars
Westbound classification and departure yard	40 tracks	2,740 cars
Eastbound receiving yard	30 tracks	2,090 cars
Eastbound classification and departure yard	40 tracks	2,880 cars
Westbound hold yard	24 tracks	600 cars
Eastbound hold and stain yard	24 tracks	1,160 cars
Westbound caboose	7 tracks	40 cars
Eastbound caboose	7 tracks	40 cars
Repair yard	32 tracks	410 cars
Transfer yard	8 tracks	225 cars
Icing yard	6 tracks	200 cars
Cold storage yard		80 cars
Total car capacity		12,555 cars
Engine yard		48 engines

The cars will be classified by gravity over separate humps for eastbound and westbound business. The hump profile, shown in the accompanying drawing, shows steep grades at the hump, which experience with the operation of hump yards in northern latitudes has proven to be essential during the winter months. In the yard which the Canadian Pacific is now operating in Winnipeg, the hump has been raised once and operating men still complain that in some cases it is necessary for the hump engines to push the cars down the grade. As shown in the profile, runaround tracks are provided at both humps to allow movements to be made between the receiving and departure yards without pushing over the hump. Additional tracks on a lower grade are provided for incoming engines to reach the engine terminal after cutting off from their trains in the receiving yards. The yard is designed to allow facility of movement between the various parts and an ample number of thoroughfare tracks has been provided. The repair yard is located between the humps and the engine terminal is adjacent to the eastbound hump. This arrangement allows the hump tracks to be carried straight into the classification yards and utilizes the space between the humps to good advantage. It also serves to bring all the buildings into a very compact group.

The engine terminal which is being built to serve the initial development of the yard, includes a 30-stall engine house of brick on concrete foundations, having a 100 ft. turntable, a ma-



Forms for Concrete Grain Storage Bins with Jacks Used in Raising Forms.

chine shop to care for running repairs, a power house, a boiler shop, store building, concrete cinder and inspection pits, a coaling station of the T. W. Snow Construction Company's design, coaling on four tracks with provision for an extension to a fifth track, and a 60,000 gal. water tank. The water supply for this terminal is secured from the Red river through a 12 in. pipe line about four miles long. A pumping plant and continuous water softening plant has been installed at the river. The plans for the maximum development of the yard call for the extension of the present engine house to 55 stalls and the building of a second engine house adjacent to it, also of 55 stall capacity, the building of a freight car shop and a woodworking shop along-

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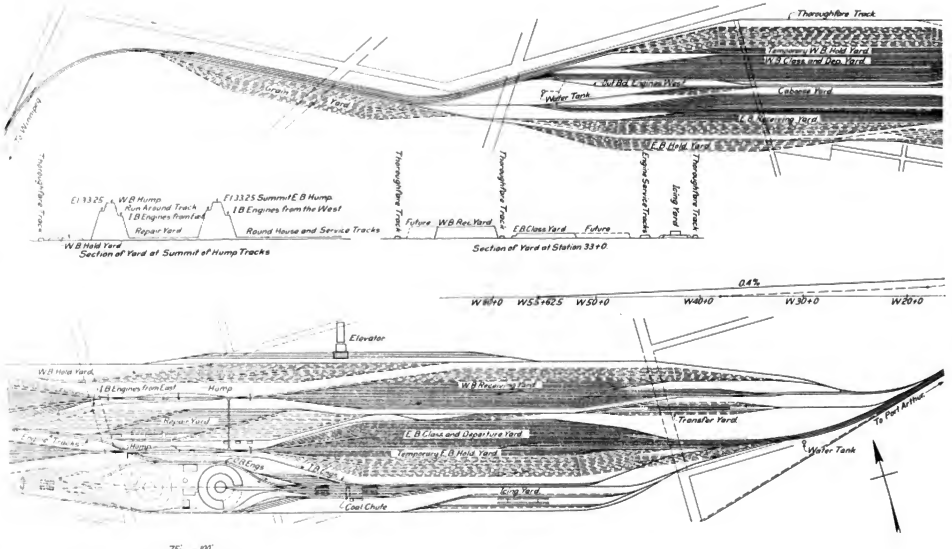

Plan, Profile and Cross Section of Canadian Pacific Yard Near Winnipeg.

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side the blacksmith shop which is now located in the repair yard, and the addition of the necessary cinder and inspection pits, coaling stations and water cranes.

The construction of the yard will require about 2,500,000 yds. of filling material for the initial development. The yard is located on a level prairie, and no excavation is required except for the buildings. The maximum fill under the humps is about 38 ft. Gravel is being used for the fills, which is secured from a company pit at Mouse Nose, about six miles east. It is excavated with a 90 ton Bucyrus shovel equipped with a five yard dipper, and is hauled to the yard in 60 12 yd. Western air dump cars and 60 16 yd. cars by eight standard gage locomotives. The contractor's equipment for the work also includes a Jordan spreader and a Brown hoist locomotive crane for use in the material yard. The line between the yard connection and the gravel pit was double-tracked in order to facilitate the handling of the 20 or more gravel trains which were operated each day. The operation of these trains on the main line was safeguarded by issuing train orders for each one and placing a pilot on each engine. In making the fill for the yards, trestles were built under the humps and in all fills exceeding 12 ft. The trestle under the hump was built to the grade of the runaround track and the additional material was placed by raising tracks on this

Stock Piles, Cement Houses, Mixer Plant and Distributing Tower at Elevator.

fill. For the yard tracks, the fill was started under the track in the middle of the yard and this embankment was widened on both sides by spreading and shifting tracks. No system of cross drainage was laid in the construction of these yards, but in each of the streets crossing the site of the yards, which were closed when construction work began, a culvert was laid. In order to secure an outlet for this drainage, a 24 in. sewer almost four miles long was built. If any difficulty is experienced with the drainage, it is possible that a system of subsurface cross drainage will be installed.

The yard tracks are laid with soft ties untreated and new second grade 85 lb. rail on ladders and humps and relaid 75 lb. and 85 lb. rail for yard and thoroughfare tracks. All switches will be tie plated. No. 7 turnouts will be used with 1 deg. curves beyond the frog point.

Four subways will be built under the humps, three for footways and one for two engine tracks. The latter structure is being built on a skew of 52 deg. 29 min., requiring an unusual design of abutments and retaining walls, which is illustrated in the accompanying drawings. As shown in these drawings, the abutments are offset between tracks forming square bridge seats on which are carried deck plate girders. The span is 63 ft. face to face of abutments. Reinforced concrete is used for these abutments, and in order to insure stability, a system of concrete struts or tie rods, shown in the plan, was included. The footings are supported on wooden piles spaced about 3 ft. x 3 ft. 6 in., with a row of batter piles 3 ft. apart driven under the toe of the retaining wall. The batter piles and the front rows under the abutments are 30 ft. long, the others 25 ft. long.

In connection with the yard there is being built a transfer elevator served by four tracks alongside the westbound receiving yard. This elevator has a capacity of 1,000,000 bushels, and is being built of reinforced concrete throughout. It will be possible to receive, clean, and load out 12 cars an hour at this elevator, and to dry 1,000 bus. of grain an hour. The storage capacity will be secured by 140 cylindrical concrete bins so that the individuality of grain passing through the elevator can, to a large extent, be maintained. The general arrangement of the plant provides for the possible increase of capacity to 15,000,000 bushels. The elevator machinery will all be electrically operated.

In the construction of this elevator an extremely complete and well designed concrete mixing plant was used. Two 28 cu. ft. Smith mixers were installed alongside the building with towers equipped with elevating buckets and distributing spouts. Narrow gage tracks, on which were operated 1 yd. dump cars, connected these mixer towers with the material piles alongside the standard gage spurs and cement houses, each of the latter having a capacity of 1,500 bbls. In operating the mixer plant a narrow gage car was filled with a specified amount of aggregate at the material piles and pushed up to the cement house in front of which was a platform level with the top of these cars. Here the required amount of cement for the aggregate contained in the car was dumped and the entire mixture was pulled up an incline to a platform above the mixer from which the charge could be placed in the mixer. The mixer dumped into the elevating bucket, which was of a capacity sufficient to hold the entire mixer batch and which was dumped into a hopper feeding the distributing spouts by a man stationed at the top of the tower. The construction of the head houses and bins required from 16,000 to 18,000 yds. of concrete. With each of the plants described, it was possible to place about 250 yds. in a ten hour shift and the average was not less than 200.

A special jack for raising the forms used in construction of the cylindrical storage bins was developed by the contractors, and has now been made standard by them for this work. This jack is shown in the accompanying photograph. It consists of two 6 in. x 6 in. timbers placed over a section of the form about 4 ft. high and rigidly connected to it. These timbers are yoked together at the top, and through this yoke extends a 1 in. rod about 8 ft. long, the lower end of which can be brought to bear on the finished concrete when it is desired to raise the form. By operating the screw in this yoke the entire form is raised, the downward thrust being carried by the hardened concrete. Four of these jacks are commonly used on a tank of 14 ft. 4 in. diameter. The lift is ordinarily 12 in., although sometimes the forms are moved for distances not exceeding 4 in. This work was handled by the Barnett & McQueen Company, Minneapolis, specialists in elevator construction.

The contract for grading, track laying and subway construction was let to Foley Brothers, Welch & Stewart. The grading and track laying was sublet to the John Marsch Construction Company. The engine house and other buildings in the yard were contracted for by the Lyall Mitchell Contracting Company. The work was handled under the general supervision of J. G. Sullivan, chief engineer, and Frank Lee, principal assistant engineer. W. D. Pender was in direct charge of the work.

NEW LINE IN THE UGANDA PROTECTORATE.—The 47-mile Jinja-Kakindu Railway from Jinja, on Lake Victoria, to Kakindu, toward Lake Kioga, was formally opened for freight traffic on January 1. This railway will form an important link in the rail, river, and lake service between Cairo and Mombasa.

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THE FOREMAN PROBLEM.*

By A. Swartz,
Engineer, Maintenance of Way, Toledo Railways & Light Co., Toledo, O.

A track foreman today must be better educated than he was years ago. His duties require that he be in closer touch with the public at large, as well as better informed on the laws of different states which require things of railways that years ago were not thought of. As the territory east of the Mississippi river becomes more thickly populated, the source of supply of section foremen naturally decreases, for the average young man today looks upon this position as a menial one. This is a wrong view of the matter, for it is only a question of time before railways will pay salaries more commensurate with the ability demanded of the section foreman. It is therefore necessary to interest young men in this question, and it is possible to do this if roadmasters will take the trouble to visit small towns on their division, trying to find young men who, if they see before them in two or three years a position which will give them $65 to $75 per month can be talked into going on the section.

It is necessary, however, to have on each section a leading man, who is paid from 10 to 20 cents per day more than the rest, because of his trustworthiness and capability. This man should be allowed ten hours pay per day all the year around, and if extra time is to be put in, he should be given a chance for the extra money. A foreman who is properly talked to is usually very glad to help a young man and teach him how to run a section gang, as well as to take care of all reports necessary. One of the duties of this first man should be to handle the gang and reports, under the supervision of the foreman. A good class of young men to interest, are the teachers of county schools. They are generally educated enough, and know the people in their district well enough to become good foremen, provided of course they are physically able to carry on the work. One of the greatest hardships for a section foreman, is his reports. They scare the ordinary individual, even though for a man of ordinary education they are very simple to make. The prevalence of foreign labor on railways today requires a man who has a great deal of patience, which is generally one of the perquisites of a school teacher, and this surely is more marked in a man with a fair education. Foreign labor will, if handled with discretion, do good work, but if handled by a strong-minded, uneducated person, will not give good results.

There is a great deal of responsibility attached to a foremanship, which requires an honest man. The average foreigner is not, in the writer's opinion, the proper man to trust with such responsibility, although there are cases where Italians or other classes of foreign laborers have been developed into very fair track foremen.

It has been the practice on the Erie, with which I served until recently, to give the leading man more pay than the rest of the laborers. The roadmasters themselves, watch this matter closely and keep in touch with such men. When extra gang work is at hand, these men are placed in charge of a small squad doing the more unimportant work and their results are watched. In this way it is easy to see whether the man will make a fit foreman or not, for in no other place will a man's patience be tried as with an extra gang. A division engineer should know these men just as well as his roadmasters, so that the question which is so vital to him may be properly taken care of.

One of the things which will help educate foremen is for the railway to develop certain rules or practices which can be put in a printed form and distributed to the foremen. The first man should have access to these forms so that he may become acquainted with the practices and rules of the railway for which he is working. This naturally results in a uniformity of practice over the entire road, so that the foreman or a first man may be transferred to any section, taking up the work where it was left off, and under ordinary conditions be sure of the men working for him being able to carry on the work without any very great change in the method. Meetings should be held occasionally to see if the men themselves have developed any ideas which would be well to use on the whole system or on one particular division.

*Received in the contest on The Foreman Problem, which closed March 25, 1912.

ABSTRACT OF ENGINEERING ARTICLES SINCE MARCH 14.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since March 14, 1913:

Important Improvement Work on the C. M. & St. P.—A typical example of the double tracking and grade revision which is being undertaken on a considerable mileage of central western roads is that of the C. M. & St. P. on its Hastings and Dakota division. The most unusual feature of this work was the very extensive use of drag line excavators. The engineering features of this improvement work were described and illustrated in the issue of March 21, page 623.

New Classification Yard at Chicago.—Plans have just been announced by the Belt Railway of Chicago for enlarging the clearing yard to a capacity of 12,000 cars, which will make it, so far as is known, the largest hump yard in the world. The plans for this enlarged yard were given in the issue of March 21, page 679.

Report on Glen Loch Derailment.—An abstract of the Interstate Commerce Commission report on the derailment of a passenger train on the Pennsylvania Railroad at Glen Loch, Pa., which includes the recommendations of the commission's representatives as to inspection of steel bridges, was published in the issue of March 28, page 747.

Economical Limits of Grade Reduction, by Walter Loring Webb.—This paper presented a very complete discussion of the factors entering into an analysis of train resistances and their respective importance. It was published in the issue of March 28, page 750. An editorial commenting on this subject appeared in the same issue, page 740.

A Novel Design for a High Abutment.—An unusual design for an abutment on the Lehigh Valley, which is known as a pier abutment, was described by E. F. Ackerman, assistant engineer, in the issue of March 28, page 759.

The Sand Patch Tunnel Improvements.—The construction of a new double track tunnel on the Baltimore & Ohio at Sand Patch, Pa., which was complicated by two disastrous slides over the existing single track tunnel, was described in the issue of April 4, page 789.

The Design of Concrete or Reinforced Cross Ties.—Paul M. La Bach, assistant engineer, Chicago, Rock Island & Pacific, Chicago, presented a discussion of the mechanics to be considered in the design of crossties in a letter to the editor published in the issue of April 11, page 829.

National Valuation Convention Urged.—A discussion by H. Bortin, in which concerted action by the railways was urged to make the appraisal of railways economical, intelligent and just, was published in the issue of April 11, page 836.

Southern Railway Freight Station and Office Building at Atlanta, Ga.—The design and construction of a large modern freight station on the Southern Railway was described and illustrated in the issue of April 11, page 839.

The Southern Pacific Bridge at Sacramento.—An unusual swing span has been built by the Southern Pacific over the Sacramento river, Sacramento, Cal. It is a double track, double deck structure with a highway on the upper level, having a concrete floor under the highway. It is believed to be the heaviest swing span ever built. The structure was described and illustrated in the issue of April 11, page 846.

The Otis Inclined Freight Elevator.—A description of the inclined elevators for moving truck loads of freight from a steamer to the Union wharf at Boston, Mass., including the amount of freight handled in the last three years and the cost of power, was published in the issue of April 11, page 849.

Indian Railway Needs.—The Indian press is urging the necessity of encouraging feeder railways. If all feeders and branches, and, where possible, extensions, were financed by private enterprise, then the whole, or almost the whole, of the railway budget could be devoted to the needs of the open lines. The composition of the present railway board is blamed for the difficulties at present attending the promotion of these schemes, and the solution suggested is the appointment of a single railway controller, attaching to the post a salary sufficient to attract a first-class man, as is done with the finance member, and giving him the full status of a member of the Executive Council.

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DESIGN AND MAINTENANCE OF TRACK TANKS.*

Discussion of the Location, Length and Width of Troughs, the Two Types of Heating Systems and Roadbed Drainage.

By George W. Vaughan,
Engineer Maintenance of Way, Exterior Zone, New York Central & Hudson River.

The railroads of England felt the need of supplying water to moving trains as far back as the middle of the nineteenth century and for this purpose J. Ramsbottom invented an outfit, including a track tank between the rails and a scoop on the locomotive tender, in 1861. The track tank or trough was of cast iron, in lengths of about 6 ft., these sections being bolted together by means of flanges and the ends separated by strips of vulcanized rubber. It has been supposed that this was the first track tank ever put in service, but a few years ago F. W. Webb, chief mechanical engineer of the London & Northwestern, claimed that they were introduced on that road in 1857, and that he was engaged in preparing the first equipment.

The first track tank in the United States was built at Montrose, between New York and Albany, on the Hudson division of the New York Central & Hudson River, and was put in service in 1870. It was for the use of the fast Saratoga trains at that time and was supplied with water by a hand pump, no provision being made to prevent freezing, as its use was discontinued in the winter. William Buchanan designed the first scoop, then called a "jerk water." It was attached back of the rear trucks and the conductor pipe was placed back of and outside of the tender tank. The first track tank on the Mohawk division was installed at Palatine bridge about 1886, and the first one on the Western division at Churchville in 1892. They were first installed on each of the four main line divisions of the Lake Shore & Michigan Southern in 1893, and at Forks Creek, Tilbury and Waterford on the Michigan Central in the same year.

The use of track tanks on the main division of the New York Central Lines has now become quite general. There are 14 on the New York Central & Hudson River, between New York and Buffalo, 10 on the Lake Shore & Michigan Southern, between Buffalo and Chicago, and 14 on the Michigan Central, between Buffalo and Chicago, so that trains can now run from New York to Chicago without making a single stop for water, except at the terminals, where the locomotives are regularly changed.

LOCATION.

Track tanks are generally used on lines and divisions where traffic is dense. From 25 to 50 per cent. of the water supplied is usually wasted by the engine scoops forcing it over the sides and ends. It is, therefore, essential that they be located where the supply of water is abundant, and since on account of the large waste the ground under them will be continually soaked, they should be placed on ground that can be thoroughly and quickly drained.

They can be operated and maintained on light curves, the Philadelphia & Reading having one, a large portion of which is on a 2 deg. curve, but they give much better satisfaction and are cheaper to install and maintain on tangents. The grades approaching them must be such that all trains which are to take water can attain a speed of at least 25 miles per hour before reaching them and, for the same reason, they should not be near stations, yards, railroad crossings, drawbridges, etc.

TYPE.

Many roads followed the early practice of making the tanks of cast iron and bolting the sections together. The Chicago, Milwaukee & St. Paul had such a tank in use until recently between Chicago and Milwaukee. The general practice now is to make the tank of sheet steel or iron, 3/16 in. to ¼ in. in thickness, bent to the desired form. In England many of them are supported on wooden stringers fastened to the ties, the top edge of the tank being bent over and bolted to the top of the stringers, but in this country they are usually supported directly on the ties, angle and half-round irons being riveted to the upturned sides and top edge to furnish stiffness and a means of attachment by spiking or otherwise to the ties.

The new standard of the New York Central & Hudson River deviates essentially from general practice, in that, instead of the customary plate turned up to form the sides, it has two channels, with flanges turned in, which form the sides, and a flat plate which forms the bottom. It has the following advantages: It is cheaper to construct, considering the same dimensions and weight of material. The bottom of the troughs wear out much more quickly than the sides, on account of being scraped by the scoop, and this type permits the renewal of the bottom separately, thus saving considerable on repairs. Repairs are made more easily.

DEPTH.

The Midland Railway of England has on its locomotives an adjustable scoop which is lowered on approaching track tanks to a fixed point ½ in. below the top of the rail. The track is depressed at the trough, 6 in., the grade at the beginning and end being 1 in 360, so that the scoop dips automatically into the trough about 3 in. This arrangement permits the trough to be made as deep as desired, without even cutting into the ties.

In America the bottoms of the hopper cars, the brake rigging and other apparatus does not have as great a clearance as in England, and it is not considered good practice here to allow anything between the rails that projects above the top of them. This fixes the upper limit for the top of the track tank.

The ties under the troughs are usually 8 in. thick, and it is not considered safe to dap them more than 2¼ in. This fixes the lower limit for the bottom of the tank. The tanks, after a time, become somewhat uneven, often varying in height ½ in. or more. It is not practical, therefore, with a 6 in. rail to increase the depth of the tank beyond 7½ in. or 8 in. The general practice is from 6 in. to 7½ in.

Adjustable scoops are arranged so that they cannot be lowered beyond a certain point, that point being determined by the requirements of any particular railroad. The pins and bearings of the scoop, also the bearings and tires of the tender wheels wear appreciably, making a difference in adjustment sometimes as much as ¾ in. The springs under the tender become weaker with age, allowing the tender, with the scoop, to sag. Therefore, unless the adjustment is watched closely and carefully regulated it is apt to vary considerably.

The height of the tender and scoop will sometimes vary an inch or more between light and loaded conditions. Tests show that the pressure of the water against the scoop when traveling at speeds from 40 to 60 miles per hour, will pull the tender down from ½ to 1 in., while at speeds from 25 to 40 miles it will be affected very little. Therefore, when a scoop is lowered into a trough it is necessary to allow for a possible variation in elevation of about 2 in.

It is desirable to adjust the scoop high enough so that it will not scrape the bottom of the trough. The troughs, after a time, become uneven, making it difficult to maintain the water level less than an inch from the top. Observations indicate,

*Abstract of Appendix A of the Report of the Committee on Water Service, American Railway Engineering Association.

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and it is generally conceded, that the scoop, under all conditions must dip at least 2 in. below the surface of the water, in order to deliver an adequate supply into the tender tank. To meet all these conditions it is evident the track tank must be made as deep as construction considerations will permit.

Therefore, a depth of 7½ in. should be used if a track tank of the usual type is adopted, or a depth of 7 in. if a type similar to the New York Central & Hudson River standard is adopted, so as to use a standard channel.

WIDTH.

The most usual width of track tanks is 19 in. This gives about the least clearance permissible in this country, as American scoops are generally from 12 to 13 in. wide, and allowance must be made of about 2 in. on either side for swaying. The Midland Railway of England uses tanks 17½ in. in width, but their scoop dippers are only 10 in. wide. Tanks with widths all the way up to 29 in. are being used in this country.

The only reason of any consequence for employing an inside clearance greater than 19 in. is to create sufficient storage capacity so that water may be scooped by the second engine of a double header, or by a second train following the first so closely that enough time has not elapsed for the refilling of the tanks. On the other hand, the use of the wide tank is objectionable, as experience indicates that with it considerably more water is wasted by the splashing of the scoop, and this is especially true when the scoop is adjusted too low, as is often the case.

The Pennsylvania Railroad made some exhaustive tests in 1906 with its standard scoop, which showed that when the locomotive was traveling at 40 miles per hour, which is considered the most economical scooping speed, 75 per cent. more water was wasted with a 29 in. trough than with one 19 in. wide. The results of the 1910 tests by the same road indicate that, with the narrow trough, the waste is much less at all scooping speeds. It requires more steam to prevent the wide tank from freezing, the difference being about in proportion to the surface exposed. It is stated by some authorities that the difference is even greater than the proportions of exposed surface would indicate.

The New York Central & Hudson River made some tests in 1910 on a 27 in. trough, which showed that the amount of water taken by the second engine of a double-header was approximately 25 per cent. of the amount taken by the first engine, in the same distance, each scooping at the same time. When double-headers are used, generally the engineers arrange that one will take water for the first half of each trough, and the other for the second half, and, of course, with wide troughs the second gets some additional water, while the first is scooping, but this small extra amount can be more economically supplied by using a narrow tank and increasing its length. This will increase the first cost and the cost of maintenance a very little, but will reduce the expense of operation quite a little, on account of the reduction in waste of water, which in turn will reduce the cost of maintaining the roadbed. It is customary to place at least three inlets in each trough, so that they may be refilled quickly. Enough additional inlets may be installed at very little expense to accomplish the refilling in as short a time as it is practical to operate one train after another, so there is no excuse for putting in a wide tank to enable the operation of trains following each other closely. It follows, therefore, that a width should be adopted that will provide an inside clearance of 19 in.

LENGTH.

The length of various track tanks varies from 1,300 ft. to 2,500 ft. The standard lengths adopted by some railroads are as follows:

New York Central & Hudson River	1,400 ft.
Pennsylvania	1,500 ft.
Midland Railway of England	1,693 ft. 6 in.
Michigan Central	1,500 ft.
Lake Shore & Michigan Southern	2,000 ft.

The last-named road has installed some 2,500 ft. long in order to furnish an adequate supply for heavy freights and double-headers, but on account of the difficulty in maintaining such a long pan level, it found it advisable to cut the length down to 2,000 ft., which appears to be about the practical limit.

The most desirable length for any road must be determined by a consideration of the usual train tonnage, the grades and the distance between track tank stations, which in turn is generally governed by the available supplies and convenient locations.

Some observations were taken on the New York Central & Hudson River, where the grades are moderate, in 1910, which show that heavy passenger trains of eight to twelve cars consume from 80 to 100 gal. of water per mile, and that freight trains of about 50 loaded cars consume from 110 to 130 gal. per mile. Other observations taken by the same road during a test, show that its standard scoop will normally deliver into the locomotive tank about 230 gal. per 100 ft. scooped at usual speeds.

The large locomotives have water reservoirs with capacities ranging from 7,000 to 8,000 gal., which is sufficient to carry a heavy freight train at least 50 miles. On the New York Central & Hudson River the divisions where track tanks are used are from 140 to 150 miles long, and the track tanks are from 20 to 40 miles apart, the average distance being about 30 miles. Trains will, therefore, consume from 2,500 to 4,000 gal. of water, on the average, for a division in going from one track tank to the next.

The pans being 1,400 ft. long, permit scooping for a distance of 1,300 ft., and in that distance the scoops will deliver 3,000 gal., which equals the consumption in the majority of runs. In the case of those trains consuming upwards of 4,000 gal., it may be stated that the reserve supply in the locomotive tank at the beginning of the run will supply the deficiency. The conclusion is therefore reached that the present standard length is sufficient, except on rare occasions, under adverse conditions, and when double-headers are used. The proper length under other conditions could be determined in the same manner.

END SECTIONS.

Track tanks are generally none too long to furnish an adequate supply, and frequently enginemen, trying to get all the water possible, will leave the scoop down so long that it hits the end of the trough. Sometimes this occurs at night, when the markers have been extinguished accidentally or otherwise. Therefore, in order to avoid the cost of repairs, and more especially to prevent interruptions to the service, it is desirable to construct the end sections so that the scoop will ride over them without inflicting damage.

The incline plate of the Pennsylvania is very short, constructed on an eased curve and is backed by wood. That of the Lake Shore & Michigan Southern is extremely long and solidly constructed. Those used on the Michigan Central, the Philadelphia & Reading, and the New York Central & Hudson River are of medium length, the first two being backed with wood and the last backed with plates of iron at the lower end and stiffened by angles throughout the remainder.

Every one of these examples is reported to be giving excellent satisfaction and there appears to be little to choose between them. It would, therefore, seem advisable to adopt a straight incline of medium length, say, 10 ft., the trailing incline to be of the same length so that traffic may be reversed when desired. The plate should be ½ in. in thickness and backed with hardwood or stiff angle irons.

ROADBED AND DRAINAGE.

Every railroad that operates track tanks in a cold climate realizes how difficult it is to dispose of the water spilled from scooping quickly enough to prevent it from freezing and heaving the roadbed, and throwing the track out of alinement. In the first place, the plant must be located where drains and ditches can be constructed that will carry away the water

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quickly and thoroughly. In the second place, the roadbed must be built up or constructed in such a way as to prevent, as far as possible, the water from seeping down through it, and so that the water may be carried away over a surface or paving that will not be easily washed out, to properly constructed and located surface drains, ditches, catch basins, subsurface drains or tunnels, or some combinations of these arrangements.

It is regarding these details that the practices of various railroads differ. The Lake Shore & Michigan Southern has developed its drainage system further than most companies. They cover the ballast between the tracks with heavy flat stones and grade them to catch basins about 55 ft. apart. This paving prevents the ballast from being washed out and drains the water quickly into the catch basins. Subsurface tile drains, extending longitudinally between the tracks, carry the water from the bottom of the catch basins into underground transverse tunnels, spaced about 333 ft. apart.

A considerable percentage of the spill always soaks through the ballast between the ties and between the paving blocks. If the subgrade is not of a character to readily dispose of this, a layer of slag 2 ft. in depth is placed below the ballast. This allows the water to find its way gradually to the catch basins and subsurface longitudinal drains, which are laid with open joints.

The New York Central & Hudson River also lays a graded stone pavement between the tracks, but instead of removing the surface water through catch basins and subsurface drains, they install transverse surface box drains every 50 ft., which are very effective for this purpose, and have the advantage of being easily kept open in winter. They install graded trenches filled with cobbles under the pavement longitudinally between the tracks and place transverse subsurface tile drains every 100 ft. This arrangement very readily removes the water which finds its way through the pavement and ballast.

No figures were available to show the comparative cost of the two schemes; however, the cost of the former should certainly exceed that of the latter considerably, the amount depending somewhat on local conditions. It is pointed out that the tunnels serve the double purpose of providing an outlet to the drainage system and an accessible conduit for the water pipes, but the water pipes can be installed and maintained easily without the tunnels, so that most of this cost should be charged up to the drainage.

It would seem that this layout should be provided with the means to more readily dispose of the surface water in winter, when the catch basins become frozen over, by the addition of transverse box drains on the surface at each catch basin.

The New York Central & Hudson River Railroad layout disposes of the surface water quickly and is easily kept open in winter. It will dispose of the subsurface water more quickly than the other scheme and is preferable, as it will cost less to install and maintain.

STEAM AND WATER PIPING.

The water in all track tanks on the New York Central Lines must be heated in winter to prevent it from freezing, the amount of heat required depending upon the temperature of the supply and the atmosphere, the amount of water surface exposed, the frequency of scooping and the method of applying the steam to the water. The character of the heating system determines to a large extent the arrangement of water supply piping, necessitating a consideration of both piping systems at the same time.

Modern installations comprise in general one or more water pipes, extending nearly the full length of the troughs, with several branches connected to trough inlets. The supply is controlled by automatic valves actuated by a change in level of the water in the trough. If water is supplied through an inlet faster than it can flow along the trough by gravity, it will overflow at that point, causing considerable loss without increasing the rate of filling. This restriction is modified somewhat by the use of baffle plates in the inlet boxes or by dividing the inlet, discharging the water from the two sides of the pan instead of from the bottom; but, at best, the rate of flow is limited, and it is necessary to provide three or more inlets to each trough, the number depending upon the desired rate of filling.

At Herkimer, on the New York Central & Hudson River, where the troughs are 1,400 ft. long and 27 in. wide, and supplied by three inlets each, tests showed that after an engine had scooped full length, the pan would refill in from four to six minutes, the time depending upon the adjustment of the valves and somewhat upon the wind. After one engine had scooped full length, a second engine following in one and one-half minutes took one-half of a normal supply, and in three minutes a full normal supply. The reason a full supply could be obtained before the trough was entirely refilled was due to the fact that the scoop was given a deeper immersion than necessary, taking in more water when the trough was full than it could deliver into the tender.

There does not appear to be much data available regarding the rate of refilling troughs, but our observations indicate that with the inlet valves adjusted to give the maximum permissible rate of discharge and with the inlets spaced about 450 ft. apart, the trough will refill quickly enough to enable trains to get a full supply when operated on a three-minute headway, which meets all practical requirements.

There are in general use two methods of applying steam to the water to prevent it from freezing, known as the "direct" and "circulatory" systems, respectively. The former requires one or more pipe lines extending the full length of the troughs, with branches at frequent intervals, discharging steam through small nozzles directly into the bottom or sides of the trough. There is always more or less surging of the water in the trough, due to scooping and refilling and to the action of the wind, so that, with the nozzles spaced at intervals of 33 ft. (as in the New York Central & Hudson River standard), the heat is very evenly distributed. It is, therefore, unnecessary to maintain the temperature of the water at any point much above the freezing point, which insures a minimum loss of heat, due to exposure to the atmosphere. The steam pipes, whether laid below or above ground are thoroughly covered to prevent loss of heat from that source as much as possible.

The circulatory system, as used at various places, differs somewhat in the details, but its application on the Lake Shore & Michigan Southern, is typical, and is probably more perfectly developed there than anywhere. The standard, which applies to troughs 2,000 ft. long, shows a 4-in. water main for each trough extending nearly the full length. These are called circulatory pipes, and each has seven connections with its trough, three connections being inlets and four outlets, the inlets and outlets alternating. Steam is discharged into each inlet connection by means of ejectors, so that the water is forced to circulate while being heated.

The distance between inlets and outlets is about 333 ft., and when the trough is full it is not permissible to maintain a much greater depth at the inlet than at the outlet; the rate of circulation is therefore limited, and it is found necessary in severe weather to maintain a temperature at the inlet of about 60 deg. Fah., in order to prevent the water from freezing at the outlet. Accordingly, the loss of heat due to exposure to the atmosphere is much greater than when the direct heating system is used.

The troughs must be watched closely, when scooping is not frequent, in order that any ice which may happen to form can be promptly removed, otherwise the ice will impede circulation, allowing a considerable section of the trough to freeze up quickly, with no means of thawing it out. After scooping the trough is refilled by means of automatic valves at each inlet connection, the water being supplied through a separate water main, which extends to each inlet pit.

It would appear that, under similar local conditions and re-

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quirements, the circulatory system would necessitate more piping, and, as the loss in heat must be greater, a larger boiler plant would be required, each condition operating to increase the cost of installation and maintenance. The fact that more heat is required would also cause the cost of operation to be greater. If it was desired to multiply the number of inlets, the difference in cost of installation would be increased, while the difference in cost of operation would probably be decreased, as it would not be necessary to heat the water to as high a temperature.

CONCLUSION

Track tanks should, preferably, be located on tangents and where good drainage can be provided, also where good water is abundant, and at sufficient distances from stations and all other facilities which would permit trains attaining a speed of at least 25 miles per hour. Modern power equipment is capable of hauling an enormous tonnage, and the tendency is to still further increase the size and capacity of locomotives. Therefore, in order to avoid the necessity of unreasonably increasing the water tank capacity of engines, the distance between trough stations should not exceed 40 miles, unless other controlling conditions require it.

The design of the power plant required cannot be outlined in detail for standardization, because this depends much on local conditions. Boiler capacity of 100 h. p. will, in general, heat about 7,000 sq. ft. of water surface in troughs, by means of direct heating system, sufficiently to prevent the water from freezing during the most severe weather encountered on the New York Central Lines. Accordingly, four standard troughs, as recommended, would require about 220 h. p. of boiler capacity for heating purposes.

Duplicate pumps should be installed to insure continuous service. The capacity of each pump should, in general, be about double the average hourly consumption of the plant. A boiler capacity of from 40 to 80 h. p. will be required for pumping. Pumping may be dispensed with when a good supply of water can be obtained by gravity. Sometimes the water is obtained from deep wells and can be most advantageously elevated into the storage tanks by means of the air lift, compressors in this case replacing the pumps. Usually water from deep wells is comparatively warm, so that, if scooping is frequent, very little heat is required to prevent freezing.

Some scoops are very inefficient, and it would seem reasonable to expect that the best could be improved. The design of the scoop used on the Lake Shore & Michigan Southern appears to be the best of any used on the New York Central Lines. Any improvement in the efficiency of the scoop not only reduces the cost of operating the plant and the cost of maintaining the roadbed, but is equivalent to increasing the capacity of the track tanks. There also appears to be a greater opportunity to economize in this way than in any other in connection with the operation of troughs. It is, therefore, recommended that the design of the scoops be given further consideration.

RECOMMENDATIONS FOR STANDARD PRACTICE.

The trough should be 2,000 ft. long, 7 in. deep, and having a width that will provide an inside clearance of 19 in. It should consist of two standard 7 in., 9.75-lbs. channels, with flanges turned in to form the sides and a flat plate ½ in. thick and 23¼ in. wide, riveted to one flange of each channel, to form the bottom. The ties should be dapped 2¼ in. to receive the trough. This can be done safely and is sufficient to maintain the top edges of the trough below the top of the usual 100-lbs. rail, when the trough has become somewhat uneven, as it always does after it has been in service for a time.

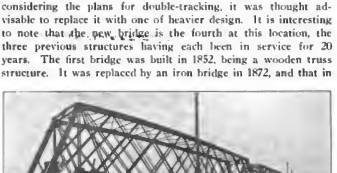
The end sections should be constructed with the bottom plate inclined at an angle so that the length of incline will be 10 ft. The plate should be ½ in. thick and secured to the side channels by angles riveted to each. The beginning of the incline where the scoop would first hit should be backed by an iron wedge and the balance backed by hardwood.

The direct heating system is advised. Since the headway of trains is being considerably reduced, five inlets to each trough should be provided in order that it may be refilled quickly enough. Five inlets in connection with the circulatory system would render the cost of installation excessive.

AN INTERESTING METHOD OF BRIDGE RENEWAL.

The Chicago, Rock Island & Pacific replaced a single track through truss bridge over the Cedar river near Moscow, Iowa, with a double-track deck plate girder structure during last season, without interruption to traffic and without the use of any falsework for supporting the superstructure. This bridge is on the main line from Chicago to Omaha, which has been double-tracked for several years as far as Iowa City, Iowa, with the exception of this bridge. Traffic on this portion of the line is so heavy that delays at the bridge have been frequent and the necessity for adding the second track had become very urgent. The old structure was not designed for present loadings and in considering the plans for double-tracking, it was thought advisable to replace it with one of heavier design. It is interesting to note that the new bridge is the fourth at this location, the three previous structures having each been in service for 20 years. The first bridge was built in 1852, being a wooden truss structure. It was replaced by an iron bridge in 1872, and that in turn by a steel truss bridge which has now been removed after 20 years' service.

Erecting Down Stream Line of Girders.



Building Substructure for New Deck Girder Structure.

The old bridge consisted of five latticed through trusses of the following lengths starting from the west end: 150 ft. 11⅞ in., 155 ft. 8¾ in., 156 ft. 7⅛ in., 174 ft. 11⅞ in., and 155 ft. 5¼ in. As the old stone piers remodeled in 1892 were still in good condition, it was possible to use them as part of the substructure of the new bridge, and as the river is shallow at this point and the foundations comparatively good, it was decided to shorten the span lengths by building intermediate concrete piers between

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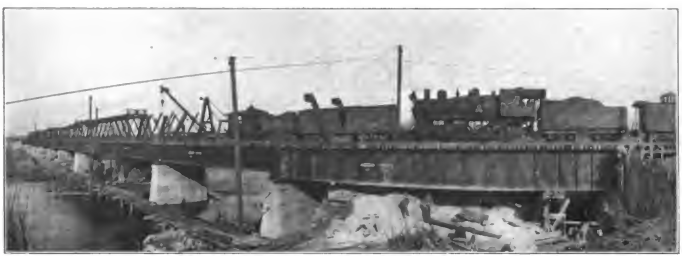
the old ones in order to use deck plate girders for the superstructure. It was desired to lengthen the bridge somewhat at the east end so that a new abutment had to be built, and as the span lengths could not be economically adjusted to use the easterly pier, the one abutment and the adjacent pier were removed and one 90 ft. and four 77 ft. 9 in. girders resting on the new abutment and four new piers were used to replace the easterly two truss spans. The next two spans were replaced by four 77 ft. 9 in. girders and the remaining span by two 75 ft. girders. The west abutment and the three old piers that are used in the new structure had to be remodeled and extended to carry the double-track, and seven new concrete piers and one new abutment were built. These new piers and the abutment required 4,500 cu. yd. of concrete. The piers are carried down from 7 to 15 ft. below the bed of the stream, far enough in all cases to place the footings a sufficient distance below the top of the bed of blue clay to prevent damage from scour. The footings are supported on piling in all cases. The piers are from 30 to 35 ft. high, the difference in elevation between high and low water being about 15 ft.

The alinement of the present single track was adopted for the new westbound track, the second track being added on the down stream side of the structure. In order to keep traffic moving during the reconstruction of the bridge, the old structure was retained in service and operated as a gauntlet track during the building of the piers and the erection of the girders under the new down stream track. The traffic was then turned over this track, which was operated as a single track, while the old trusses were dismantled and the new girders erected for the westbound track. The substitution of a deck structure for a through, made necessary a raise in grade of nearly 6 ft. in order to use the same piers. The approach fill for this higher level was made on the eastbound track by temporarily moving the old trusses nearly 3 ft. up stream and the location of the new second track about the same distance down stream. This gave a distance between track centers of about 18 ft., which allowed the fill to be made for the new approach without blocking the operated line. The length of this approach was kept as short as possible by using a very steep runoff. The girders for the down stream track were placed by a derrick car working along that track, beginning at the west end. When this line of girders was completely erected and the approach at the east end connected up, traffic was turned over this track during the dismantling of the old truss and the erection of the new girders for the up stream track.

This replacement of through trusses by deck girders was handled by a method developed during the previous season for a similar bridge over the Iowa river near Columbus Junction, Iowa. (See *Railway Age Gazette*, January 19, 1912.) Beginning at the east end, as many rivets as could be spared from the floor system of the truss were cut out in advance. Two steel beams with steel pins from which block and tackle could be suspended, were then placed across the top chords of the old trusses near the ends of the girders to be placed. The girder span was riveted up and brought out to place on two flat cars which were spotted directly above the final location. The block and tackle from the overhead beams were hooked to the ends of the girders, the lines from these blocks were attached to a flat car next to the engine, which then moved slowly forward, lifting the span clear of the cars. The cars were pushed out of the way, and while the girders were held suspended by the engine, the floor system of the old bridge was removed so that the girder span could be lowered into place by the engine. After the placing of the girders, the derrick car dismantled the old trusses, working from the east end. The accompanying photographs show the three stages of the work, the first near the beginning of the construction of the new piers, the second near the end of the construction of the down stream track, and the third beginning to dismantle the old trusses after the erection of both lines of girders. About 700 tons of old steel were removed, and about 1,015 tons of new steel placed.

This work was handled under the general direction of J. B. Berry, at that time chief engineer of the Chicago, Rock Island & Pacific, and since made assistant to the president. I. L. Simmons, bridge engineer, had charge of the design and erection, and C. E. Ziegenbein handled the field work. The Cedar Rapids Construction Company had the contract for the substructure; the American Bridge Company fabricated the superstructure, and the erection was done by company forces.



Dismantling Old Trusses After Completion of Erection of New Girders.

THE FOREMAN PROBLEM.*

By JAMES RYAN,

Supervisor, Chicago & Eastern Illinois, Villa Grove, Ill.

The prevalent idea that when a man is a track laborer he is down about as far as he can get and takes that work as the last resort, should be dispelled. The best place to attract native labor to the track is on the sections outside of terminals, and the inducements needed are good wages and steady work. Men should be picked from such places because at the terminals the men are always looking to the better positions in the transportation or mechanical departments, and it is generally necessary to hire foreigners as common laborers.

To keep a supply of foremen one man should be picked on

*Received in the contest on The Foreman Problem, which closed March 25, 1912.

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each section and paid about 25 cents more per day than the laborers. These men in the absence of the foremen should make all reports, keep the books and take charge of the work. Put these men in extra gangs as assistant foremen to familiarize them with handling large numbers of men on construction work; give them a few months as time-keepers and then about six months in the busiest yard. When placing them on sections, put them where they join old experienced foremen so that in doubling up sections experienced foremen will always be present and the new men can learn from them.

Native labor should always be paid more than foreign, and the companies should be careful to avoid the native laborers getting the idea that foreign laborers are better paid and often furnished fuel and house of some sort. When other departments are increased, do the same with the trackmen, and you will have more satisfied men. The further education of foremen should be accomplished by having them in every three months to explain the work and reports to them. In sections of the country where native labor is scarce the foremen should be paid higher in order to get English speaking men if at all possible.

PROTECTION OF MEN IN THE MAINTENANCE OF WAY DEPARTMENT.*

By B. A. West,
Roadmaster, Atchison, Topeka & Santa Fe, Pueblo, Colo.

We have what is known as a "Safety Habit" organization on the Santa Fe, with local organizations on each division, with representation from the maintenance of way department. At this time the largest percentage of our track laborers are of foreign birth, which is accountable, to a large extent, for the large proportion of personal injuries to our employees. With this class of labor, no amount of experience or foresight on the part of the foreman or roadmaster will entirely prevent accidents, but this condition calls for intelligence, coolness and eternal vigilance on the part of the supervising officers and foremen.

In selecting foremen for work trains or extra gangs, I endeavor to secure those whom I know to be competent, careful and fully aware of the responsibilities which are attached to these positions. In this country they must have a knowledge of the Spanish language, must know how to handle men and be able to instruct them how to use the various tools. They must carefully inspect tools and cars to discover and remove any defective material. The foremen, as well as the roadmaster, must make it a practice to show new men the proper way to handle the tools, and especially how to place and drive spikes, as an inexperienced or careless spiker is almost as dangerous as a machine gun in a crowd of men. Whenever one has to use inexperienced men as spikers, they should be placed by themselves where there is no danger of flying spikes hitting other men.

While it is a difficult matter to handle men who do not understand our language, and probably do not comprehend a word one says, much can be accomplished by being patient and persevering and giving many object lessons. A foreman who has no sympathy for the man who does not speak "United States," and cares little whether these men are crippled or not, should be promptly discharged.

Among the most common forms of carelessness are running hand cars in foggy weather or at night, going through deep cuts on curves, and crossing long trestles where the view is obstructed, without flagging; overloading hand cars with men or running them at too high speeds, etc. In handling rail or other heavy material, it is advisable not to allow talking by other than the foreman. Whenever it becomes necessary to send out a red flag, a man should be sent who can speak English, or if there are none such in the gang, the man sent should carry a note from the foreman telling the nature of the obstruction and where it is to be found. Each engineman stopped by this flagman should be required to sign the note before proceeding.

In operating hand cars I have found it advisable to limit the number of men on one car to 10, including the foreman, and one man should always ride backwards in order to watch for trains coming from the rear. Racing should never be permitted, and where there is more than one car they should be run at least 200 ft. apart.

Track jacks should never be placed on the inside of the rail and they should always be set vertically to avoid throwing the track out of line. The man operating the jack should be fully instructed regarding its working, so that it can be removed quickly if necessary.

All material, tools, hand cars, etc., should be placed far enough from the track so that they will not be struck by passing trains. In this country, with almost continual winds, it is necessary to exercise great care to keep frogs, switches, guard rails and flangeways at crossings free from drifting sand and debris, for frequently accidents result from lack of attention here.

Work about steam shovels is dangerous at best, and especially so if blasting has to be resorted to. The foreman, as well as the train and enginemen must be very careful to avoid injury to laborers for the risks from an unexploded shot, from material falling, and from working about trains is great.

The maintenance of way employee is subject to special risks when working about wrecks. At such times he must go regardless of weather conditions and remain until the line is open for traffic. A foreman should be very careful never to send a man to work under or around cars unless they are well blocked to prevent their overturning upon him. It is also essential that the work is well lighted at night to prevent the men stumbling over objects in their way. The most intelligent men should be used in more dangerous places because of their ability to comprehend the danger and to avoid too great risks.

In handling outfit cars for extra gangs I have found it advisable, where possible, to place these cars on tracks that are not used or to spur them out. All bunk and commissary cars should open from the side opposite the main line or passing tracks so that there will be no danger of train employees falling over steps or rubbish at the camps. In this way the cars will also present a neater appearance from the main line. Where cars are liable to be moved at any time, men should not be allowed to sleep under them or to make swinging beds on the truss rods. No wood or other material should be allowed to be stored under the cars where it might fall onto the track during the movement of the cars.

*Received in the Safety contest which closed October 25, 1912.

COMBINED SIGNAL AND TRACK MAINTENANCE.

The Chicago & Alton has just combined the maintenance of track and automatic signals on 30 miles of its heavy traffic main line between Bloomington, Ill., and Odell. In this experimental plan the position of the signal maintainer who in the present organization has supervision over the signals on about 15 miles of line, is abolished and the work divided between the section foremen on the individual sections. The division supervisor of signals will continue to have the same duties as formerly, and will instruct the section foremen in all details relating to the maintenance of signals. The pay of the section foremen has been raised from $60 to $70 per month, and it is expected that in this way a better class of section foremen will be obtained, while at the same time, the performance of the signals will be improved, owing to the concentration of all duties affecting them under one foreman.

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CLASSIFICATION OF SECOND HAND RAIL.

Outline of Method Used for Grading and Handling the Many Weights and Patterns of Relaying Rail on a Large System.

By Jay See.

The economical distribution and handling of second-hand rail on large systems is a matter that requires close attention, and presents an opportunity for much waste or saving. The rail question has been very prominent for the past few years, the glare of talent, however, being focused upon the material until it is purchased and in service. The inspection and distribution of rail released in relaying is left to the judgment of men in subordinate positions on many railroads. It is to the handling of this rail that the following pertains:

Most large railroad systems have resulted from the combination of small independent lines, by virtue of which there have resulted properties, with a variety of standards for buildings, bridges and track materials. With the demands of increased business, many buildings and bridges are found to be inadequate, and are then replaced by others of the adopted standard for the larger system, the salvage in either case being of comparatively little value, as the materials recovered are seldom used again in the same sort of construction. With rail, however, the conditions are somewhat different. When the requirements of service demand heavier steel, the lighter rail released in relaying is transferred to secondary main and branch lines, is used to repair rail of the same weight still in service, or, is used for passing and industry tracks, and it is repeatedly transferred and relaid until it is only fit for scrap.

On many railroads 15 to 20 different rail sections are now maintained, and the reduction of the number of these various sections to two or three adopted standards is a gradual and slow process. Such plans are being rapidly followed, however, permitting a smaller stock to be carried on hand for repairs and renewals. The section of rail that it is desired to discontinue must be maintained in branch and yard service until it is worn out and frogs and switches used in such lines are, in many cases, manufactured from such rail released from track, this being the only source from which suitable rail can be obtained. Railroads also purchase the standard A. S. C. E. or A. R. A. sections that correspond very closely to the obsolete sections in their tracks. This rail is also sometimes used for the manufacture of frogs and of switches, which makes the reclaiming of the obsolete rail for the purpose unnecessary.

The necessity for establishing a standard for the classifying and grading of rail released in relaying is apparent on most railroads. By so doing they get the maximum service there is in the rail, and a service that uses and disposes of the rail to the very best advantage.

More or less loss and delay is experienced on account of the shipping of rail unsuitable for the purpose for which it is to be used, from one end of the system to the other. This rail is usually inspected and graded by division roadmasters, but more frequently by some of their men. In shipping rail to the "other fellow," or, off their territory, the division men generally do not give it as close inspection as if it were intended for their own use. Sometimes they intentionally "unload" on other divisions, particularly if they are a long distance away.

It is also found that there are as many different ideas as to what constitutes a number one rail as there are roadmasters. In order to avoid such difficulties as these one of the larger western railroads has rail inspectors that inspect all second-hand rail recovered in relaying. These men are sent out from the office of the engineer of maintenance of way and assist the division men in inspecting, classifying and recording all rail released in relaying, thus securing more uniform rail classification. The following instructions are the basis on which this rail is inspected:

RULES FOR CLASSIFYING AND INSPECTING SECOND-HAND RAIL.

A second-hand rail is any rail irrespective of grade or quality that has been used in track.

All rail released by relaying will be classified and marked, according to the grade, in one of the following seven classifications:

Number one—marked by one strip	1
Number one saw—marked by one strip and dash	1—
Number two—marked by two strips	11
Number three—marked by three strips	111
Number three saw—marked by three strips and dash	111—
Scrap—marked by cross	×
Reclamation rail—marked by circle	○

Number one rail is second-hand rail suitable for renewals in main tracks; also rail that can be used for the manufacture of frogs, switches, etc. Number one rail must be 24 ft. or over in length for use in main lines. Calipered rail from the rail saw will grade as number one.

Number one saw rail is second-hand rail which, after sawing, will produce a number one rail as outlined above. Generally the only defect is that of batter.

Number two rail is second-hand rail suitable for renewals and repairs in passing tracks, thoroughfare tracks in yards and other similar tracks. It is usually physically defective rail, although serviceable. Number two rail must be 18 ft. or over for use in passing tracks.

Number three rail is second-hand rail suitable for use in industry and storage tracks, less important yard tracks, mine spurs and tracks that engines do not frequent.

Number three saw rail is second-hand rail that requires drilling, sawing or other labor before it can be used in track—generally the result of broken rails. Number three saw rail will produce, after sawing, number one or number two rail.

Scrap rail is second-hand rail which it is impracticable to use again in track on account of its physical condition.

Reclamation rail is rail that has failed on account of some physical defect within the period of five years from the date of the brand on the rail.

All rail under 15 ft. in length, regardless of grade or quality, is considered scrap and should be so classified. This rail is so classified on account of a ruling of the auditor.

Number one rail may be any length over 24 ft. It must be of sound steel, free from physical defects, straight as to line and surface, full drilled and in shape for repairs or renewals in main tracks. Number one rail shall not have a top surface wear of over 1/16 in., or a side surface wear of over 3/32 in.; measurements to be made at the center of the surface considered. It shall not have a batter of over 1/32 in.

Number one saw rail is rail that is defective only as to batter, and which after sawing will produce a number one rail, as outlined above.

Number two rail is so classified for the following causes and defects: wear on any surface of over 3/32 in., measurement to be made at the center of the surface considered; rail thrown out of line mechanically by the use of a Jim Crow or rail bender; rail that has been used on curves of such a degree that necessitates their being curved before use; rail badly pitted, burnt or with any perceptible head flaw; rail with slight metal flaw, but not ragged or saw edged; rail line and surface bent, but still usable; rail, flange broken, with only one piece broken from the base, such piece to be not over 30 in. in length, or nearer than 36 in. to the end of the rail; rail battered, the end

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showing no other defect; batter limited to ¼ in. in excess of top wear; rail broken, but spliced with angle bars. The short pieces must be over ten ft. in length; rail curve worn to such an extent that it cannot again be used for main line repairs; limit of wear ten per cent. of area of head.

Number three rail is so classified for the following causes and defects: Rail badly curve worn when wear of ball exceeds ten per cent. of area of head; rail that has a ball wear on side of ball of ¾ in. and top wear ⅜ in.; rail with excessive metal flaw, ragged; rail with base broken in more than one place; rail with batter exceeding ¼ in. and which would produce, by being sawed, a number two rail; any rail that can be used without additional labor for sawing and drilling, but which would otherwise be scrap.

Number three saw rail is so classified for the following causes and defects: Rail full length, damaged, line or surface bent, from which can be recovered by sawing a number one or two rail full length for track use, or a piece of steel six ft. in length or over, to be used for the manufacture of frogs and switches; broken base rails with over one piece broken from base, but from which there can be recovered by sawing a number one or two rail over 15 ft. in length; rail battered ¼ in. or more at end; split end or split head rail, where observed conditions are not such as would indicate defective steel throughout the entire

View of Rail Yard.

rail; rail that has any defect that would prevent its use in track, but from which, after being sawed and drilled, there can be recovered a number one or two rail over 15 ft. in length.

Scrap rail includes all rail less than 15 ft. in length regardless of quality. It is rail so physically defective that it cannot be classified in any of the grades above outlined.

All rail must be inspected before and after relaying; before it is marked or finally classified.

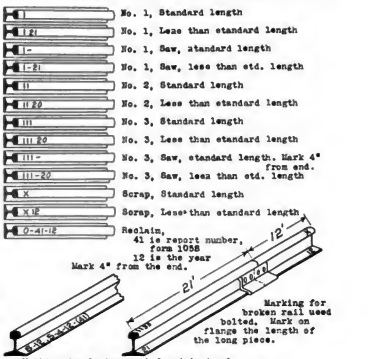
On the preliminary or first inspection made before the relaying begins rail inspectors must observe the condition of the rail as to curve, side and top wear, batter, head flaws and condition of line and surface. Only such rail as will grade number one is to be marked at this time; marking to be done by crayon on the gauge side of the web near the end of the rail. A preliminary report of the first inspection must be sent to the engineer maintenance of way in order that he may be advised as to probable amount of suitable relaying rail that will be recovered.

On the final inspection, after the rail has been released from track, the rail inspector must personally inspect the base of all rail which, on first inspection, was classified as number one, and know that such rail is physically sound steel. At this inspection all rail is to be finally marked on the ball with white paint. On all rail less than the standard length of 30 or 33 ft., according to the weight, the length shall be marked on the ball in addition to the classification marking; standard marking to be as shown on the accompanying chart.

Reclamation rail is rail that shows physical defects on final inspection. It can only be so classified when the relaying is done within a period of five years from the date of the brand on the rail. Such rails are to be marked and reported consecutively—the reports and rail numbers to correspond." On the ball of this rail should also be marked the month and year found.

Rail that is to be transported from any job of relaying to another territory and there relaid in the same position that it originally occupied in track will be called "pedigreed" rail. Inspectors will mark the line rail on the ball, with consecutive odd numbers; the gage rail with the even numbers, marking the number on each end of each rail. "Pedigreed" rail must receive the same final inspection as number one rail; to insure its being physically sound.

Inspectors will be furnished with a copy of the estimated amount of relaying to be done. They must keep an accurate



Methods of Marking Rail.

record of all rail released from any relaying they inspect; this record to show the grade and class of rail recovered. Final reports are to be sent to the engineer maintenance of way and division superintendent, showing accurately the amount of rail of each classification.

The rail inspectors will be supplied with calipers, straight edge, tallies, wedges, etc., as may be necessary. On preliminary inspection five track miles, and on final inspection, two track miles of rail will be considered a day's work. Accuracy is to be given preference at all times.

Without some standard system of rail classification, the inspection of rail released will be more or less superficial, ball inspection being the usual limit. This naturally allows many dangerous and defective rails to find their way again into main line track and has been known to result in serious derailments. It is also impossible to properly grade rail in any other way. Oftentimes a division officer will classify rail improperly and ship the wrong rail from his division, resulting in considerable loss for

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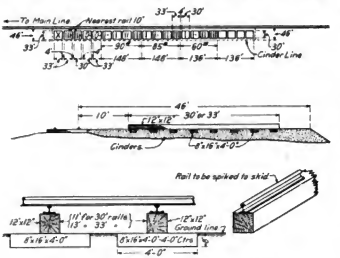
handling and hauling it a considerable distance, before finding that it is unfit to use for the purpose intended. Cases are known where as a small job of relaying was being done the roadmaster would select good rail released, and use it "up the line" to repair rail of the same weight, releasing a poor grade of rail, and shipping it to some order he was holding. By the above system of inspection this is avoided and rail is of the same grade over the entire system.

A rail yard was built on each division, generally at headquarters, in which is stored all rail recovered from repairs and relaying, except that which is sent to the saw or the scrap, which is sent to the general storehouse. These yards are built at some permanent location, and each weight and class of rail is piled separately.

All sets of skids are given pile numbers, beginning with pile No. 1 for scrap. All rails are piled flush, the same end of all rails on all piles being marked; that is all marking of each pile is at the same end, and all piles in the yard are marked at the same end. Rails are not "balled in." No. 3 saw rail may be mixed in piling, but all other rail is kept separate.

The reclamation rail is piled separately only one tier high, and in consecutive order, according to reported failure. The num-



Layout of Rail Yard with Details of Skids.

ber three saw rail is piled separately as to classification only, no effort being made to keep separate the various weights. All rail that is to be sawed is generally sent to the rail saw at once.

The division superintendent makes a monthly report of the rail on hand available for shipment, showing the weight and grade. Its disposition is handled by the engineer maintenance of way, who orders it from one division to another, or for use on the division, as required. He has in his possession, at all times, the information as to the grade of rail available, so that he can dispose of it to the best advantage. By having these rail yards located on each division much of the rail recovered in relaying, which is to be used on that division, can be stored there with a minimum haul until it is required for A. F. E. work.

The usual allowance of one rail every track mile for main line, and one rail every odd track mile for branch lines and yards is all the "inactive stock" that is held on the various divisions. All other rail on the division is shown "available for shipment," either at division rail yards or at the saw mill yard, giving resource to the maximum amount of repair material.

In traveling over almost any railroad one can observe more or less rail distributed along the line, and at section tool houses. The amount of money invested in this one track supply alone is indeed large. Section foreman sometimes "like the crow" hide the material for "future use" which, in the majority of cases, never occurs.

The scheme for the handling and inspection of rail, as outlined above, is very simple, but must be followed closely. Its simplicity may commend it. This plan, however, was not produced on first trial, but is the result of experience and trials.

The reasons for its application are that it allows an easy and accurate invoice by auditors; assures physically sound rail for relaying and repairs on main lines; classifies all rail so that the best distribution can be made according to the use for which the rail is required; keeps all rail at headquarters as "active stock," available for use at all times; permits grading the rail the same the system over; and reduces the haul of a large amount of rail off the division until it is assigned to some particular work.

"SAFETY FIRST."*

By E. B. FITHIAN,
General Roadmaster, Missouri Pacific, Little Rock, Ark.

Very few railway men who have given thought to the injuries that occur to maintenance of way employees will take exception to the statement that at least 50 per cent. and possibly 70 per cent. of such injuries are due either to the carelessness of the employees themselves, or to the improper supervision of the foreman directly in charge of the men, who does not observe closely the action of his men and enforce the rules of common sense and of the company. This condition particularly exists in the south where a large per cent. of the section laborers are negroes, and who, unfortunately, do not receive the consideration that they should at the hands of their foremen.

The remedy is to make the laborers and foremen realize the tremendous number of maintenance of way employees injured and then impress them with the fact that their own self-preservation depends on the observation of the rules of the company, and of common sense. The laborers who are constantly changing and of various nationalities, are hard to interest in the subject, and it requires time and persistent effort to attain the object desired. They have to be reached through the foreman and this means that the efforts should be concentrated on him.

The foremen, as a rule, are men who have been in the service for years. Most of them can be readily interested in any subject that will advance the interest of themselves and the company. They are particularly loyal to their roadmaster or supervisor, and will be constantly on the alert to make the subdivision on which they are located, the banner subdivision. The best way to interest foremen is collectively, and a meeting once in two months, or possibly oftener, at some convenient point, will bring out ideas and stir up a rivalry that will result in untold benefit to all concerned.

A careful record should be kept of the number of injuries in each gang of section men and carpenters, with the cause of the injury. This record should be bulletined each month and issued before the meeting of the foremen, so as to bring out the discussions. Where foreigners are employed to any extent, these reports or bulletins should be written in languages that can be read by all the laborers. There is no better place to post a report than on a bulletin board, protected if necessary, outside of the tool house where the laborers are sure to have time and sufficient light to read it.

Finally, we should not overlook the necessity of providing the very best sanitary conditions in connection with our camps. The greatest enemy that the soldier has to meet and conquer is sickness resulting from unsanitary conditions of the camps. Similar conditions at times surround our camp outfits and too often these are overlooked. The roadmaster and foremen should take a particular interest in each individual camp, arousing in some way a rivalry among the camps, to have each outdo the others to win some praise or comment from superior officers as one of the best camps. This condition can probably be best secured if closer supervision of the camps is given by the division officers and surgeon, with periodical inspections, without notice when the inspections are to be made.

*Received in the Safety contest, which closed October 25, 1912.

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1913 A. R. E. A. COMMITTEE ASSIGNMENTS.

Complete List with Names of Members Appointed and Subjects Assigned for Investigation and Report This Year.

The new committees selected by the Board of Direction of the American Railway Engineering Association, together with the subjects assigned to the various committees for study during this year are as follows:

COMMITTEE I.—ROADWAY.

1. Report on and recommend unit pressures allowable on roadbed of different materials, conferring with Committee on Ballast.
2. Report on tunnel construction and ventilation.
3. Economics in roadway labor.

W. M. Dawley, Erie, chairman; J. A. Spielmann, B. & O., vice-chairman; Ward Crosby, C. C. & O.; W. C. Cord, M. P.; Paul Didier, B. & O.; R. C. Falconer, Erie; S. B. Fisher, M. K. & T.; Frank Merritt, G. C. & S. F.; F. M. Patterson, C. B. & Q.; W. D. Penor, Univ. of Wisconsin; A. C. Prime, P. R. R.; M. J. Corrigan, B. & O.; H. J. Slifer, Cons. Eng.; J. E. Willoughby, Caribbean Constr. Co.; W. F. Wiltsee, N. & W.; L. M. Perkins, N. P.; E. G. Ericson, P. L. W.; L. G. Murphy, B. & A.; W. H. Petersen, C. R. I. & P.

COMMITTEE II.—BALLAST.

1. Further investigation of proper depth of ballast of various kinds to insure uniform distribution of loads on roadway, conferring with Roadway Committee.
2. Revise ballast sections with particular reference to the use of a sub- and top ballast.
3. Investigate methods of cleaning stone ballast and obtain cost of same by various methods.

H. E. Hale, M. P., chairman; J. M. Meade, A. T. & S. F., vice-chairman; L. W. Baldwin, I. C.; D. C. Brook, P. L. W.; W. J. Bergen, N. Y. C. & St. L.; A. F. Blaess, I. C.; T. C. Burpee, Intercolonial; O. H. Crittenden, I. & G. N.; F. T. Darrow, C. B. & Q.; J. M. Egan, I. C.; T. W. Latherson, C. R. I. & P.; H. L. Gordon, B. & O.; G. H. Harris, M. C.; C. C. Hill, M. C.; S. A. Jordan, B. & O.; William McNab, G. T.; A. S. More, C. C. C. & St. L.; J. V. Neubert, N. Y. C. & H. R.; S. B. Rice, R. F. & P.; E. V. Smith, B. & O.; F. J. Stimson, G. R. & I.; S. N. Williams, Cornell College.

COMMITTEE III.—TIES.

1. Report on the effect of design of tie-plates and track spikes on durability of ties.
2. Continue study of the stresses to which cross-ties are subjected, and determine size required.
3. Report on economy in labor and material effected through use of treated ties compared with untreated ties.

L. A. Downs, I. C., chairman; G. W. Merrell, N. & W., vice-chairman; H. W. Brown, P. L. W.; W. J. Barton, M. P.; F. D. Jackson, B. & O.; H. C. Landon, Watauga & Yadkin River; F. R. Layng, B. & L. E.; E. R. Lewis, D. S. S. & A.; R. J. Parker, A. T. & S. F.; J. G. Stiltinger, Rutland; G. D. Swingly, B. & O.; D. W. Thrower, I. C.; H. S. Wilgus, P. S. & N.; Louis YagER, N. P.; E. C. Yonng, N. Y. P. & N.; A. M. Acheson, M. K. & T.; C. C. Albright, Purdue Univ.; O. P. Allee, Fort Smith & Van Buren; S. B. Clement, Temiskaming & Northern Ontario.

COMMITTEE IV.—TRACK.

1. Continue study of main line turnouts and crossovers.
2. Report on the economics of track labor.
3. Study the relation between worn flanges and worn switch points, with a view to correcting the cause and decreasing the number of derailments due to the combination of a worn switch point and worn flanges on wheels.

J. B. Jenkins, B. & O., chairman; G. J. Ray, D. L. & W., vice-chairman; Geo. H. Bremner, C. B. & Q.; Garrett Davis, C. R. I. & P.; J. M. R. Fairbairn, C. P. R.; T. H. Hickey, M. C.; E. T. Howson, *Railway Age Gazette*; J. R. Leighty, M. P.; C. Millard, C. G. W.; P. C. Newbegin, Bangor & Aroostook; H. T. Porter, B. & L. E.; W. G. Raymond, State Univ. Iowa; S. S. Roberts, Cons. Eng.; L. S. Rose, C. C. C. & St. L.; H. K. Safford, G. T.; C. H. Stein, C. R. I. & P.; F. J. Stevens, P. S. & N.; H. M. Church, B. & O.; L. J. F. Hughes, C. R. I. & P.; A. H. Stone, K. C. T.; E. Raymond, A. T. & S. F.; F. B. Oren, I. C.; Raffe Emerson, Cons. Eng.

COMMITTEE V.—BUILDINGS.

1. Present principles covering design of inbound and outbound freight houses.
2. Report on the advantages and disadvantages of the various designs of freight houses and shop floors.
3. Report on methods of heating, lighting and sanitary provisions for medium sized stations.

Maurice Coburn, Vandalia, chairman; M. A. Long, B. & O., vice-chairman; G. W. Andrews, H. & O.; J. F. Canty, B. & M.; D. R. Collin, N. Y. C. & H. R.; C. G. Dels, C. G. W.; C. H. Fake, M. R. & B. T.; C. F. W. Felt, A. T. & S. F.; G. H. Gilbert, Q. & C.; A. T. Hawk, C. R. I. & P.; H. A. Lloyd, Erie; W. S. Thomlson, P. R. R.; O. P. Chamberlain, T. & L. W.; P. B. Roberts, G. T. R.

COMMITTEE VI.—WOODEN BRIDGES AND TRESTLES.

1. Complete report on formulae for use in determining the strength of sheet piling.
2. Complete report on the use of guard rails for wooden bridges and trestles.
3. Report on relative economy of repairs and renewals of wooden bridges and trestles.

I. L. Simmons, C. R. I. & P., chairman; W. S. Bonton, B. & O., vice-chairman; H. Austill, Jr., M. & O.; F. E. Bissell, A. C. & Y.; E. A. Frink, S. A. L.; E. A. Hadley, M. P.; H. S. Greenwood, C. N.; A. O. Ridgway, D. & R. G.; H. S. Jacoby, Cornell Univ.; P. B. Motley, C. P. R.; W. H. Hoyt, D. M. & N.; D. W. Smith, H. V.; W. F. Steffens, C. & O.; H. B. Smart, G. T. R.; F. J. Backelder, B. & O.; J. E. Barrett, L. & H. R.

COMMITTEE VII.—MASONRY.

1. Report on waterproofing of masonry and bridge floors, including methods, cost and results, with definite recommendations.
2. Report on the effect of concrete structures of rusting of the reinforcing material.
3. Report on the principles of design of plain and reinforced concrete retaining walls, abutments and trestles.

G. H. Tinker N. Y. C. & St. L., chairman; F. L. Thompson, I. C., vice-chairman; R. Armour, G. T.; C. W. Boynton, Universal Portland Cement Co.; T. L. Condron, Cons. Eng.; J. S. Conner, L. E. & W.; W. A. Clark, D. & I. R.; Frank Taylor, C. P. R.; G. W. Hegel, C. J. & L. J. Hotchkiss; R. L. Humphrey, Cons. Eng.; J. H. Prior, C. M. & St. P.; F. E. Schall, L. V.; G. H. Scribner, Jr., Constr. Eng.; A. N. Talbot, Univ. of Illinois; J. Tothill, K. C. T.; J. J. Yates, C. R. R. of N. J.; John C. Beye, C. R. I. & P.

COMMITTEE IX.—SIGNS, FENCES AND CROSSINGS.

1. Continue the investigation of ways and means for securing a proper quality of fence wire to resist corrosion and secure durability.
2. Concrete and metal for signs and signals as compared with wood.
3. Concrete and metal as compared with wood for fence posts.

C. H. Stein, C. R. I. & P., chairman; R. Boyd, D. L. & W., vice-chairman; R. B. Abbott, P. & R.; J. A. Stocker, T. & O. C.; H. E. Billman, M. P.; Maro Johnson, I. C.; E. T. Brown, B. & O.; J. T. Frame, C. G. W.; C. M. James, A. C. L.; L. C. Lawton, A. T. & S. F.; A. C. Cotland, C. & O.; F. N. Crowell, P. L. W.; Arthur Crumpton, G. T.; L. E. Haislip, B. & O.; G. L. Moore, L. V.; J. R. Meyers, B. & O.; C. H. Substone, Erie; W. F. Strouse, B. & O.; W. D. Williams, Cin. Nor.; B. M. Cheney, C. B. & Q.

COMMITTEE X.—SIGNALS AND INTERLOCKING.

1. Report on economics of labor in signal maintenance.
2. Formulate and submit requisites for switch indicators, including method of conveying information on condition of the block to conductor and engineman.
3. Investigate and report on automatic train control.

Thos. S. Stevens, A. T. & S. F., chairman; C. C. Anthony, P. R. R., vice-chairman; A. H. Rudd, P. R. R.; Arel Ames, Cons. Eng.; H. S. Balliet, N. Y. C. & H. R.; W. B. Causey, C. G. W.; C. A. Christoffersen, N. P.; C. E. Denney, L. S. & M. S.; W. J. Eck, Southern; W. H. Elliott, N. Y. C. & H. R.; G. E. Ellis, K. C. T.; M. H. Hovey, Cons. Eng.; A. S. Ingalls, L. S. & M. S.; J. C. Mock, Detroit River Tunnel Co.; F. P. Patenall, B. & O.; J. A. Peabody, C. & N. W.; W. B. Scott, S. P.; Edwin F. Wendt, P. & L. E.

COMMITTEE XI.—RECORDS AND ACCOUNTS.

1. Make a comprehensive study of the forms in the Manual which were adopted a number of years ago, and bring forms up to date.
2. Continue study of the economical management of store supplies.
3. Recommend feasible and useful subdivisions of I. C. C. classification account No. 6, with a view of securing uniformity of labor costs.
4. Study the subject of reports required by National and State Railway Commissions.

M. C. Byers, G. N., chairman; J. H. Milburn, B. & O., vice-chairman; J. M. Brown, C. R. I. & P.; W. A. Christian, C. G. W.; H. J. Graves, A. T. & S. F.; J. D. Hill, L. & N.; Henry Lee, N. Y. C. & H. R.; O. K. Morgan, C. C. & O.; F. Ringer, M. K. & T.; Guy Scott, P. L. W.; W. S. Dawes, Wabash.

COMMITTEE XII.—RULES AND ORGANIZATION.

1. Revise rules and instructions heretofore adopted by the association and recommend such changes and additions thereto as may seem desirable.
2. Formulate rules for the guidance of field parties:
   (a) When making preliminary surveys for railroad location.
   (b) When making location surveys.
   (c) When in charge of construction.

J. D. Brooke, B. & O., chairman; F. D. Anthony, D. & H., vice-chairman; J. B. Carothers, B. & O.; S. E. Coombs, N. Y. C. & H. R.; C. Dougherty, Q. & C.; K. Danger, C. R. I. & P.; E. F. Robinson, B. R.

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& P.; Jos. Mullen, C. C. C. & St. L.; B. Herman, Southern; E. T. Reisler, L. V.; R. P. Black, K. & M.; C. E. Lindsay, N. Y. C. & H. R.

COMMITTEE XIII.—WATER SERVICE.

1. Report on the design and relative economy of track pans from an operating standpoint.

2. Report on water treatment and result of study being made of water softeners from an operating standpoint.

3. Report on recent developments in pumping machinery.

J. L. Campbell, E. P. & S. W.; chairman; A. F. Dorley, M. P., vice-chairman; C. C. Cook, B. & O.; E. G. Lane, B. & O.; R. H. Gaines, K. C. S.; W. L. Robbeck, W. & L. E.; A. Mordeaii, Cons. Eng.; W. A. Parker, St. J. & G. I.; W. S. Lacher, C. M. & St. P.

COMMITTEE XIV.—YARDS AND TERMINALS.

1. Report on typical situation plans of passenger stations, of both through and stub types, with critical analysis of working capacity, and include a review of the different methods of estimating their capacity.

2. Report on developments in the handling of freight by mechanical means.

3. Report on developments in the design and operation of hump yards.

4. Report on track scales.

C. H. Spencer, Washington Term., chairman; E. B. Temple, P. R. R., vice-chairman; W. G. Arn, I. C.; H. Baldwin, C. C. C. & St. L.; G. H. Burgess, D. & H.; A. E. Clift, I. C.; H. T. Douglas, C. & A.; A. C. Everham, K. C. T.; H. B. Johnston, P. L. W.; H. A. Lane, B. & O.; G. P. Johnson, D. T. & I.; L. J. McIntyre, N. Y. C. & H. R.; Mann, M. P.; A. Montzheimer, E. J. & E.; L. S. Seddon, S. A. L.; E. E. R. Tratman, *Engineering News*; W. L. Webb, C. M. & St. P.; J. G. Wishart, C. R. I. & P.; R. Ferriday, C. C. C. & St. L.; E. P. Weatherly, K. C. T.; C. C. Wentworth, N. & W.; H. J. Pfeifer, T. & R. A. St. L.; G. H. Herrold, Department of Public Works, St. Paul, Minn.

COMMITTEE XV.—IRON AND STEEL STRUCTURES.

1. Report on the methods of protection of iron and steel structures against corrosion.

2. Study the design of built-up columns, co-operating with other investigators and committees of other societies.

3. Report on design and length of turntables.

4. Report on the relative economy of various types of movable bridges for varying lengths of spans.

A. J. Himes, N. Y. C. & St. L.; chairman; C. E. Selby, C. C. C. & St. L., vice-chairman; J. A. Bohland, G. N.; A. W. Buel, W. M.; Charles Chandler, I. C.; C. L. Crandall, Cornell University; J. E. Crawford, N. & W.; J. E. Greiner, B. & O.; W. H. Moore, N. Y. N. H. & H.; A. F. Reichmann, American Bridge Co.; G. P. Tebbetts, K. C. T.; L. F. Van Hagen, Univ. of Wisconsin; F. C. Dubour, Univ. of Illinois; C. E. Smith, M. P.; I. F. Stern, Cons. Eng.; F. E. Turneaure, Univ. of Wisconsin; A. W. Carpenter, N. Y. C. & H. R.; W. R. Edwards, B. & O.; A. R. Rayner, P. & L. E.; William Michel, H. V.

COMMITTEE XVI.—ECONOMICS OF RAILWAY LOCATION.

1. Continue the study of analyses of operating accounts affected by changes in the physical characteristics of location with special attempt to reach as easily as possible some approximate values for gradient, distance, rise and fall, and curvature, in order to assist the field engineer with reference to the questions of the values of location.

R. N. Begien, B. & O., chairman; C. P. Howard, Cons. Eng., vice-chairman; A. K. Shurtleff, C. R. I. & P.; F. H. Alfred, P. M.; A. C. Dennis; F. W. Green, L. & A.; P. M. La Bach, C. R. I. & P.; F. W. Smith, C. C. C. & St. L.; H. J. Simmons, E. P. & S. W.; W. L. Webb, Cons. Eng.; M. A. Zook, Cons. Eng.; J. F. Burns, L. & N.; E. C. Schmidt, Univ. of Illinois; L. C. Hartley, C. & E. I.; J. G. Sullivan, C. P. R.; C. W. P. Ramsey, C. P. R.; J. deN. Macomb, A. T. & S. F.

COMMITTEE XVII.—WOOD PRESERVATION.

1. Continue investigations of the merits as a preservative of oil from water gas and the use of refined coal tar in creosote oil.

2. Continue the compilation of available information from service tests.

3. Continue the investigation of the proper grouping of the different timbers for antiseptic treatment, conferring with Committee on Grading of Lumber.

4. Report on methods of accurately determining the absorption of creosote oil.

Earl Stimson, B. & O., chairman; E. H. Bowser, I. C., vice-chairman; H. B. Dick, B. & O. S. W.; C. F. Ford, C. R. I. & P.; V. K. Hendricks, St. L. & S. F.; G. E. Rex, A. T. & S. F.; C. M. Taylor, P. & R.; Dr. Hermann von Schrenk, Cons. Eng.; T. G. Townsend, Southern; Jos. O. Osgood, C. R. R. of N. J.

COMMITTEE XVIII.—ELECTRICITY.

1. Continue the consideration of the subject of clearances.

2. Report on the effect of electrolyzing action on metallic structures and the best means of preventing it.

3. Continue the preparation of a standard specification for overhead transmission line crossings.

4. Continue the investigation on electrolysis and insulation.

5. Report on maintenance organization with relation to track structures.

Geo. W. Kittredge, N. Y. C. & H. R., chairman; J. B. Austin, Long Island, vice-chairman; D. J. Brumley, L. & N.; R. D. Coombs, Cons. Eng.; A. O. Cunningham, Wabash; L. C. Fritch, C. & W.; George Gibbs, Long Island; G. A. Harwood, N. Y. C. & H. R.; E. B. Katte, N. Y. C. & H. R.; C. E. Lindsay, N. Y. C. & H. R.; W. S. Murray, N. Y. N. H. & H.; A. F. Robinson, A. T. & S. F.; Frank Rhea, General Electric Company; J. W. Reid, C. & A.; J. R. Savage, Long Island; M. Schreiber, Public Service Railway; W. L. Trench, B. & O.; H. U. Wallace, Northern Colorado Power Company; A. G. Shaver, C. R. I. & P.; Walt. Dennis, C. R. I. & P.

COMMITTEE XIX.—CONSERVATION OF NATURAL RESOURCES.

1. Continue the study of tree planting and general reforestation.

2. Continue the study of coal and fuel oil resources.

3. Continue the study of iron and steel resources.

William McNab, G. T., chairman; C. H. Fisk, Cons. Eng., vice-chairman; R. H. Aishton, C. & N. W.; M. Burpee, Bangor & Aroostook; F. F. Busteed, C. P. R.; A. W. Carpenter, N. Y. C. & H. R.; W. A. M'Gonagle, D. M. & N.; G. A. Mountain, Canadian Railway Commission; W. L. Park, I. C.; G. H. Webb, M. C.; R. C. Young, L. S. & I.

SPECIAL COMMITTEES.

Grading of Lumber.

1. Continue the collection of current specifications, grading and inspection rules for maintenance of way timber and lumber, not heretofore reported on, and present same for all classes of maintenance of way timber and lumber, which will conserve the interests of railways and be acceptable to manufacturers' associations; conferring with committees of this association and with other organizations whose work is affected.

2. Prepare standard specifications for timber for treatment, conferring with Committee on Wood Preservation.

Dr. Hermann von Schrenk, Cons. Timber Eng., chairman; B. A. Wood, M. & O., vice-chairman; W. McC. Bond, B. & O.; D. Fairchild, N. P.; R. Koehler, S. P.; A. J. Searle, D. L. & W.; W. H. Norris, Me. C.; J. J. Taylor, K. C. S. R.; R. C. Sattley, C. R. I. & P.

Uniform General Contract Forms.

1. Continue the study of general contract forms, including forms for bonds and proposals.

W. G. Atwood, L. E. & W., chairman; C. A. Wilson, Cons. Eng., vice-chairman; J. C. Irwin, Cons. Eng., B. & A.; C. Frank Allen, Mass. Inst. of Technology; E. F. Ackerman, L. V.; Thos. Earle, Pennsylvania Steel Company; J. P. Congdon, Cons. Eng.; R. G. Kenly, M. & St. L.; E. H. Lee, C. & W. I.; C. A. Paquette, C. C. C. & St. L.; H. C. Phillips, A. T. & S. F.; J. H. Roach, L. S. & M. S.; C. A. Wilson, Cons. Eng.; H. A. Woods, G. T. P.

FLOOD DESTRUCTION ON THE BALTIMORE & OHIO.

The damage done to the railways in Ohio, Indiana and adjacent states by the floods following the storms of the last week in March have been covered from week to week in these columns. A brief description of the organization now engaged in the reconstruction of the damaged lines of the Baltimore & Ohio—one of the principal sufferers—will indicate how this emergency has been met by the various railway systems. In less than two weeks' time, train service has been restored on nearly all the lines affected and much headway has been made in permanently rebuilding the damaged lines.

After a careful inspection of the devastated territory by Daniel Willard, president; A. W. Thompson, vice-president, and Francis Lee Stuart, chief engineer, it was estimated that the damage to the Baltimore & Ohio lines will reach $2,500,000 to $3,000,000, and that the damage in Ohio alone will be between $1,500,000 and $2,000,000. From their observation of the condition of other lines, they estimated that the damage to all railways in Ohio may reach $10,000,000. This inspection showed that in addition to many miles of track covered with water and broken by washouts, 12 bridges on the main line of the Baltimore & Ohio were put out of service, including those over the Muskingum river at Zanesville, Ohio, and at Marietta, Ohio, over the west fork of the White river at Washington, Ind., over the big Miami river at Lawrenceburg, Ind., over the little Miami river at Hamilton, Ohio, over the east fork of the White river at Brownsville, Ind., and over the Blue river at Morristown, Ind.

Immediately upon receipt of information regarding the extent of the floods, an emergency organization was effected in both the operating and engineering departments. Portions of the lines which had been damaged were temporarily divided into separate divisions with despatching organizations and division officials in charge. These local organizations were maintained until repair

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work was gotten under way, when the division organizations were restored.

The resources of the entire system were placed at the disposal of the affected lines. By the time the water receded enough to enable work to be done, 6,000 laborers with camp trains, tools, equipment and commissaries were waiting at various points between Parkersburg, W. Va., and Pittsburgh to enter the flood districts. Large forces were also gathered west of the trouble. Eighteen pile drivers were immediately put in operation, six of these machines having been secured from western railways. Divers were employed to examine the abutments and piers of the damaged bridges, as well as those that remained intact. The reconstruction work has been pushed night and day, pile drivers, derricks, steam shovels and other equipment being operated in double shifts.

The work of reconstruction has been divided into districts, being placed in charge of different officers of the engineering staff as follows: Paul Diddier, principal assistant engineer, Pittsburgh, in charge of Zanesville territory and rebuilding Zanesville bridge; A. M. Kinsman, engineer of construction, Cincinnati, in charge of the Indiana division, B. & O. S. W., west from Cincinnati; J. T. Wilson, district engineer, Baltimore, in charge of the B. & O. S. W., east from St. Louis; L. G. Curtis district engineer, Chicago, in charge of the Indianapolis division, C. H. & D., including Hamilton yards and bridge; J. B. Carothers, special engineer, Baltimore, in charge of the Columbus district; F. E. Lamphere, assistant engineer, Chicago, in charge of the Louisville district and Lawrenceburg bridge; B. R. Hundley, assistant engineer, Chillicothe, Ohio, in charge of the Chillicothe district and yards; and Claude Brown, assistant engineer, Chicago, in charge of the Toledo division, C. H. & D. and Dayton district. Plans for new bridges and buildings and the repair of existing structures are being made under the direction of W. S. Bouton, engineer of bridges, and A. M. Long, assistant to chief engineer.

In order that no time shall be lost in the replacement of bridges options were immediately taken on bridge steel, and contracts have already been let for the rebuilding of the bridges at Zanesville, Hamilton and Lawrenceburg, while other contracts will be placed as soon as possible for the remaining structures. Further contracts have already been let for a retaining wall to protect the railroad tracks at Kent, Ohio, where a heavy washout occurred, and for rebuilding the outbound freight station which collapsed at Dayton.

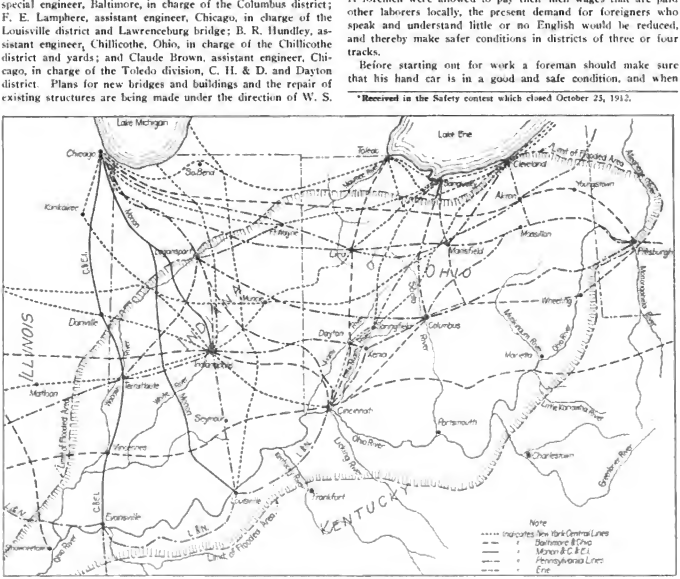
CARE IN TRACK WORK.*

By John A. Johnson,
Section Foreman, Peninsula Division, Chicago & North Western.

In hiring men a track foreman should make a special effort to impress upon them the necessity for carefulness and thoughtfulness during their service, and explain very plainly the dangers and accidents that will result from recklessness. Safety demands this. When foremen must employ foreigners, they should see that the men are first supplied with a book of rules and regulations pertaining to the work on or about the track, that they may become thoroughly acquainted with their duties. If foremen were allowed to pay their men wages that are paid other laborers locally, the present demand for foreigners who speak and understand little or no English would be reduced, and thereby make safer conditions in districts of three or four tracks.

Before starting out for work a foreman should make sure that his hand car is in a good and safe condition, and when

*Received in the Safety contest which closed October 25, 1912.



Principal Main Lines in the Flooded District.

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going to and from work should never allow his men to place a track jack or a water keg on the front end of the car. He should also see that the necessary tools are placed so as to leave a clear and safe footing, and never under any circumstances, allow men to jump off and on the car while it is in motion.

During the daily work of laying or digging out ties, for instance, the foremen should watch that their men do not pile the gravel too high in the center of track, for an engine striking the piles might throw the gravel and stones with sufficient force to injure men standing near by. They should also see that tamping bars and track picks are not left in an upright position on the shoulder of the track while trains are passing, and should never let men work with defective tools. When a train is approaching, foremen should see that their men leave their work in time to reach a safe distance from the track. In unloading track material, such as rails and ties along the track, great care should be taken to leave a proper clearance, especially at switches. These are simple ideas, but if lived up to, many injuries and accidents will be avoided.

RAIL LAYING.*

BY ENGINEER.

The most active season for track work should be the months of May and June. Probably more work per dollar can be obtained during the month of May than during any other month in the year. The weather is usually good; the temperature is such that men can work in comfort; they are usually willing to work and need money more than later in the season, and they have not reached the restless stage that comes with hot weather, when they desire to change their jobs and ask for higher pay. Of late, each year has seen this benefit of an early start more clearly recognized, one of the western roads having 3,800 men in extra gangs at work on April 1, this year, besides increasing the regular gangs. The additional labor required on account of the recent floods is likely to add to the expected scarcity of help during the present year.

The most important work under way in May is rail relaying. Methods of doing this are almost as varied as there are roads in the country. It may be done by large or small gangs. Where there is a large mileage to be relaid a large gang will be found more economical. It should be composed of chosen men, who as far as possible should be of large size on account of the character of the work. Seventy-five or 80 men is not too many to make rapid progress.

The gang should have a competent foreman with about three assistants, one to handle the men preparing for the rail laying, one to supervise the throwing of the rails out and in, and one to follow behind the rail laying with men finishing up. The foreman should have general supervision and should see that the parts of the gang are varied as the work may necessitate. As curves, switches, crossings, difference in men and other causes make one part of the work go faster than another, the men should be transferred accordingly.

The following arrangement of a gang has been found fairly typical and can be varied from at will: eight men pulling spikes, four men taking out bolts, two men putting in tie plugs, 12 men adzing ties, four men placing tie plates, 16 men handling rail, one man cleaning ties and one inserting shims, eight men bolting up rail, 14 men spiking and gaging the rail, two men distributing spikes and bolts and two men putting on rail anchors. These, with two water boys, would make up a gang of 80 men with foremen. A gang of this size properly officered and well housed should relay over a mile of track complete per working day, including unbolting the old rail ready to pick up, but not including any surfacing or tie spacing.

*The third of a series of articles on timely maintenance topics. The first appeared on page 351 of the issue of February 21 and the second appeared on page 498 of the issue of March 14.

Adzing is a very important detail of rail relaying, as on this depends the support of the rail on the ties and its degree of slant or cant. Ties should be adzed to a true plane, so that the tie plates on the rail may lay perfectly flat and bear on the tie over their entire area. If the rail is to be canted this may be accomplished by the tie plate or by adzing. Canting the rail is not a universal practice and with the heavy rail is not as necessary as formerly.

Spikes should be pulled on the inside of each rail only, except where the size of rail is changed when it may be necessary to pull three rows. Where possible bolts should be unscrewed, but frequently they will be found so rusted that it will be necessary to break them off. The practice of oiling bolts at intervals to prevent rusting is becoming more frequent, and where this is done no trouble will be found in removing the nuts.

The best method of spacing the rail to insure the proper expansion at the joints is to use steel shims, although many roads still use wooden shims, in spite of their objectionable features. With the heavy rail now in use, the amount of expansion can be cut down very much from what was formerly the practice, a reduction of ½ in., the expansion formerly provided for 65 lb. rail, being sufficient for 90 lb. rail.

Rail gangs should always be supplied with switch points, so that the track may be quickly closed for use without any rail cutting. On sharp curves the rail should be curved before laying either in the rail yard before shipment or by a small gang working ahead of the rail gang.

There are two methods of laying rail. One is to throw out a long string of rail on one side and throw in a string behind it, connecting up the new string before the old one is taken out, but this has the disadvantage that the expansion is lost in throwing in the new rail. The most generally adopted method is to throw out a string on one side and insert the new rails one at a time with the proper expansion. The laying on each side should as far as possible be carried along together, but this cannot always be done on account of curves, switches and traffic considerations.

In order to save handling when laying, the rail should be unloaded in the proper place when it is taken off the cars. Rail should never be thrown or dropped from the cars, but should be handled by an unloader of some kind, and so placed that it will have to be moved a minimum distance by the rail laying gang. If the gang has to carry the rail one-half length or more it lessens the amount of work they can accomplish very materially. Some roads have extra gangs and train crews especially organized and held for this work, who become skilled in it.

All material should be delivered before it will be needed, so that there will be no delays on account of a lack of material. A rail laying gang costs approximately $150 per day. An hour's delay means $15 lost, and ten minutes' delay $2.50 wasted. It is not uncommon to find rail laying gangs out of spikes or bolts, or tie plugs, which is usually a result of expensive carelessness on the part of somebody.

When a rail laying machine is used the number of men in the rail laying portion of the gang may be reduced accordingly. These machines are of recent invention and some of them are of advantage in handling rail, especially as the rail relaid is gradually becoming heavier every year.

Cutting new rail should be avoided as far as possible. Short rails should be used on the inside of curves to make the joints space properly, and can also be used between switches in station grounds. Second quality rails should not be placed in main tracks but in yard tracks and on leads or running tracks.

Rail taken up out of the track should be classified before being picked up by men specially trained, so that there will be no variation in the rail of any given quality over the road or system. After marking it should be picked up by an unloading machine or derrick, and the rail of each kind and quality loaded in lots by itself. This avoids much re-handling in the

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rail yards if the rail is sent in for sawing or for distribution to other points.

It is customary on many roads to follow the rail laying gang closely with surfacing gangs, whose duty is to re-adjust the ties at the new joints and to surface the track in finished condition. However, this is not always done, and it is an open question as to whether it is not better to use stronger joints and lay the new rail without regard to where the joint comes on the ties, as is being done by some roads with very heavy traffic. Although this may be said to be in an experimental stage, it has several advantages, one of which is that it costs much less money and another that rail laying can go on in all seasons of the year, winter as well as in summer. If rail can be laid in the winter it is out of the way of other work, and gives an opportunity to employ men at a time when work is slack and they are easily obtained. It is also much easier to obtain and hold good men when they can have employment the entire year. Eliminating the spacing of ties saves disturbing the bed and does away with much of the consequent surfacing throughout the season. On the other hand, it requires a heavier and stiffer joint, as there is unquestionably a greater strain on the joint than when ties are spaced for it.

Rail laying should be pushed at this season of the year not only because it is a large and important part of track maintenance work, but also because much other important track work cannot be done until after the rail laying is out of the way. Ballasting must wait, tie renewals cannot be made, while surfacing also cannot be done.

THE GALESBURG TIE PLANT OF THE C. B. & Q.

The Chicago, Burlington & Quincy has given much attention during recent years to the subject of timber preservation and now operates two treating plants with a combined rated capacity of 2,800,000 ties. The first plant was built at Edgemont, S. Dak., in 1900, and was moved the following year to Sheridan, Wyo., where it is still located. Two retorts with an annual rated capacity of 800,000 ties are operated at this plant, all timber treated being pine cut locally in that vinicity. In 1907 a second plant with three retorts and a rated capacity of 1,200,000 ties was built at Galesburg, Ill., and has been in continuous operation since December of that year. During the past year this plant has been enlarged and two retorts added, while arrangements have been made for the addition of a sixth retort at an early date. These new facilities have been completed and were placed in service about the first of the present year. This plant is now probably the largest treating plant operated by a railway company to treat timber for its use exclusively, and is one of the largest commercial or railway plants in the country in output of treated material.

The annual requirements of the Burlington are now about 3,000,000 ties. The capacity of the Galesburg plant as now enlarged is 2,500,000 ties, based upon treating red oak. However, as about 40 per cent. of the material treated at this plant previous to the enlargement consisted of piling and lumber, it is anticipated that only about three-fourths of the ties required will be treated at the two plants combined. All ties treated at Sheridan are used on the lines west of the Missouri river, while over 305,000 ties were also shipped to the same territory from

Fig. 2—General View of Treating Plant.

the Galesburg plant last year. Nearly all the ties treated at Galesburg come from the south; the larger proportion coming from the Tennessee and Green river countries in Tennessee and Kentucky, and being delivered to the Burlington at Metropolis, Ill., on the Ohio river. Some ties are also secured at St. Louis and locally along the line. Of the ties handled at Galesburg last year, 60 per cent. were red oak, 26 per cent. short leaf pine, and

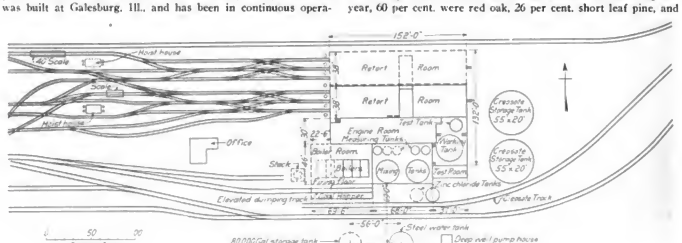

Fig. 1—Plan of New Facilities at Galesburg Tie Plant.

10 per cent. cypress, while the percentages of red oak and short leaf pine ties received the preceding year were 74 and 12, respectively.

The type of construction originally adopted in the Galesburg plant and which has been followed in the additions, is reinforced concrete throughout. Provision was made for future additions when the plant was originally constructed, so that the enlarge-

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ment made the past year was carried on without interfering with the operation of the existing plant. The facilities added last year are shown clearly by the dotted lines in the accompanying drawing. The principal additions were in the retort room, which was doubled in size, and in the boiler room, where provision was made for three additional boilers, although only two are installed at the present time.

While concrete has not been generally adopted in the construction of wood preserving plants largely because of its increased cost, it adapts itself readily to this work. Although that the solution used in the card process attacks either steel or wrought iron. Similar substitution is being made in pipe lines carrying the treating solution throughout the building as fast as they require renewal.

Two 80,000 gal. working tanks were replaced with steel tanks of the same dimension, and these tanks, in common with three 10,000-gal. measuring tanks previously installed and two new ones, were housed over to protect the tanks and to prevent the loss of heat during the winter. A new shallow well was dug to replace a deep well, the water from which had caused some

Fig. 3—Retort Room with Doors Open—Two New Retorts on Left.

no attempt was made to bring out pleasing architectural details in the Galesburg plant, the building presents a neat appearance, especially in view of the purpose for which it is intended. With concrete floors and walls, the plant can be readily kept clean, as the oil will not penetrate it as it does timber, and it is, of course, fireproof.

The roof is of reinforced concrete slab construction 5 in. thick, waterproofed with Ceresit, the slabs being supported on concrete walls and pillars. Two skylights are provided in the new addition to assist in lighting the interior. The new retorts

Fig. 4—Creosote Storage Tanks.

are of the same size as the original ones, namely: 132 ft. long by 6 ft. 2 in. in diameter, and will hold 16 trams of ties or an average of 1,952 cu. ft. of timber in one charge. The new retorts vary from the old ones in that swinging doors are provided at each end so that access to the retorts may be gained at either end in case of an accident. Only one door will be used except in such cases. The steel steam pipes within the retorts have also been replaced with cast iron, as it has been found trouble in the boilers. A 125-ft. Wiederholt concrete stack was built just outside of the boiler room, this type of stack being lined both outside and inside with tile and the area between these tile faces being filled with concrete. The inside diameter of the stack is 8 ft. 10½ in. at the bottom and 6 ft. 6 in. at the top.

During 1912, 10,914 cars of material of all kinds were handled

Fig. 5—Looking Down Loading Platform Toward Treating Plant.

in and out of the Galesburg tie yard. In the three retorts 623,926 oak and 303,942 soft wood ties were treated last year. Approximately 1,375,000 ft. B. M. of decking and sills for stock cars, 5,000,000 ft. B. M. of switch ties and 141,776 lineal ft. of

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piling were also treated in addition to considerable quantities of wood blocks and other miscellaneous material.

In loading ties for treatment they are grouped into three classes based upon their moisture content, and these classes are further subdivided into No. 1, No. 2 and No. 3 ties, according to their condition. Class A ties are those absorbing less than 22 per cent. by volume of preservatives and include principally oaks, hickory, beech, hemlock and tamarack. Class B ties are those which absorb from 23 to 30 per cent. by volume of preservatives, and include hard maple, ash, sycamore and Douglass fir. Class C ties are those absorbing over 30 per cent. by volume of preservatives, and include elm, the pines, maple, birch and cypress. For Class A ties a mixture of 77 per cent. of 5 per cent. zinc chloride solution and 23 per cent. of creosote is injected at a pressure of 175 lbs. per sq. in. For Class B ties a mixture of 81 per cent. of 4 per cent. zinc chloride solution and 19 per cent. of creosote is injected at a pressure of 150 lbs. per sq. in., and for Class C ties a mixture of 85 per cent. of 3 per cent. zinc chloride solution and 15 per cent. of creosote is injected at a pressure of 125 lbs. per sq. in. The No. 1, No. 2 and No. 3 ties are for main line, branch line and side track use, respectively. Only ties of one general class are treated in one retort, while each tram contains only ties of the same class and number.

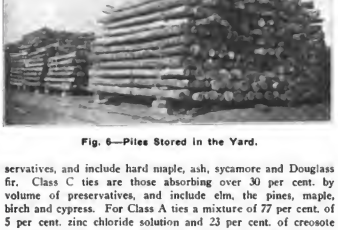

Fig. 6—Piles Stored in the Yard.

Practically all material is handled at this plant by piece work, including such heavy material as piling, which is loaded with cranes. In unloading ties from the car to the pile and in loading them from the pile to the tram, each man works alone, while in unloading ties from the tram into a car after coming out of the retort, two or three men work together and divide their earnings equally. All the men, however, are carried individually on the pay roll. A foreman is assigned to each class of work, who sees that the work is done properly and who keeps a record of the work done by each man. One Browning crane and two small steam shovels rebuilt into cranes assist in loading piling, some switch ties and all other heavy lumber. Piece work rates are applied here as in the other part of the yard, except that the crane engineers are on a monthly basis. All foremen are also paid on a monthly basis. The piece work rates vary with the kind of wood carried, a higher price being paid for heavy hardwood than for lighter soft woods. No variation is made, however, for the height of piles, these depending largely upon the condition of the yard and the amount of room available. From 80 to 100 men, mostly Austrians, are employed in the yard. For the month of February, 1913, 96 per cent. of all unskilled labor was paid on the piece work basis. The average cost of unloading the ties from the car to the pile last year was $0.708 per hundred, of loading from the pile to the trams $0.666 per hundred, and of unloading from the trams into cars after treatment $0.596 per hundred.

To provide against delays at the retorts, sufficient trams have been provided to keep all the retorts going 48 hours if the loading in the yard should be stopped for any reason. While this number of trams is larger than usually found in plants of this size, sufficient ties are thus continually loaded to enable

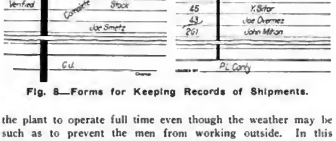

Fig. 8—Forms for Keeping Records of Shipments.

Fig. 7—View in Tie Yard Showing Method of Stacking Ties.

In loading cut switch ties on requisitions where material is loaded for more than one station, care is taken to load the sets complete with those for the station nearest Galesburg on the top, unless a reverse order is specified on the requisition. The top layer for each station is marked with the requisition number, station and number of pieces, and the material for each station is separated from that for other stations by strips laid crosswise on the car. In this way the material for each station can be unloaded without any rehandling and without the necessity of getting the shipment confused. No car is loaded for points on more than one division. A rule recently put into effect also requires that all requisitions for switch ties must state specifically the numbers and lengths of each size of ties

the plant to operate full time even though the weather may be such as to prevent the men from working outside. In this connection it is interesting to note that there were only 284 retort hours delay last year from all causes, including charging the retorts and repairs, in comparison with 22,423 retort hours actually operated, or 1.25 per cent. delay. The plant is closed on Sundays and holidays, but operates 24 hours per day otherwise throughout the year.

The tie yard covers 95 acres, and is provided with 10 standard gage tracks connected to ladders at each end, permitting cars to be set in or pulled out with the minimum interference. This yard layout was described in detail in the *Railway Age Gazette* of February 16, 1912. All switching is done with a small standard gage locomotive which also places the loaded trams in front of the retorts. The trams are drawn from the retorts to the loading plant by a cable wound on a drum at the end of this platform.

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required, instead of simply ordering a set complete, as was frequently done previously.

To simplify the clerical work incident to tracing and answering inquiries about the large number of shipments into and out of this yard, a card system has been adopted in which cards printed in red are used for inbound shipments and cards printed in black for outbound cars. On these cards is placed a complete record of the shipment. The sample card shown for outbound shipment, for instance, gives the kind of ties, method of loading, number of ties in each tram loaded and the names of the men loading the car. Two cases are provided in the office for filing the cards by the last two figures, each case having 100 pigeonholes. Horizontally, the pockets are numbered from 1 to 10 for the last figure, and vertically from 1 to 10 for the next to the last figure. In this way a full record of the shipment can be readily secured when the car number is known.

This plant is operated under the direction of J. H. Waterman, superintendent of timber preservation of the Chicago, Burlington & Quincy, and A. Meyer, supervisor of the Galesburg plant. W. T. Krausch, engineer of buildings, was in charge of the design and construction of the additions to this plant.

TABLE FOR ESTIMATING COST OF TRACK.

The accompanying table is in use on the Morgan's Louisiana and Texas road for making quickly approximate estimates for the cost of building short spur tracks or sidings. Frequently an estimate for such a track is demanded of a roadmaster without

Statement Showing Figures and Method of Approximating The Cost of a Spur Track or Siding.

Table 1 showing cost of installation. Table 2 showing cost per track foot of switch and lead for weights of rail track for different weights of rail using varying from 50 to 90 lb. Total length 8 and 9 ft. ties of lead.

Weight of Rail	Cost of Lead 176 Long	Wt of rail	Cost per Track ft using 8' Ties	Cost per Track ft. using 8' Ties
50 lb.	$ 523.27	90 lb	$ 6.16	$ 13.29
60	614.40	80	7.70	13.83
70	705.33	76	14.04	13.77
75	459.33	70	14.05	13.81
80	348.41	60	12.60	11.74
85	344.36	50	12.17	11.50
90	329.77	56	11.66	10.80
80	288.30	50	11.20	10.30

Note: Labor and 8% for incidentals and use of tools was included in the above.

Table 3 Total Yardage For 100 Ft of Track 16 Ft Crown.

Fill	6" fill	12" fill	18" fill	24" fill	30" fill	36" fill	42" fill	48" fill	54" fill	60" fill	66" fill	72" fill
Yards	31	65	101	141	183	228	275	326	435	555	687	830

Cost of grading and team work with very often 18 to 25 cents per yd. Team haul 40 cts.

Illustration.

To find the Approx cost for Construction of a 600 Ft Spur Rail in Main Line 76 lb Spur to be of 60 lb Steel Switch and lead will always be same weight as in main line.

Main Line.

76 Rail = 176' = 424 60 Rail

From Table 1: 76 lb. Lead cost = $428.33
Track 600 ft long minus 176 Ft for lead = 424 Ft of 60 lb Steel

From Table 2: 1 Ft of track 60 lb Steel and 8 Ft Ties Cost = $1.50
424 Ft @ $1.50 = $636.00 Cost of 60 lb Track

Yardage: Assuming an average of 1 Ft Fill @ 20 per yard
1 Ft fill = 65 cu yds x 600 = 100 x 20 = 3 1/3 @ 20 Total cost of Grading
= Total cost of Track $428.33 + $636.00 + $66.60 = $1,128.93

Cost of Miscellaneous Items which may be added to Estimate.

In block signal territory $100.00 is to be added to estimate for the installation of each switch. Ordinary pile trestle figured at $5.00 per linear ft. Creosoted pile trestle figured at $7.00 per lin ft. Ordinary pen cattle guards figured at $75.00 each. Creosoted pen cattle guards figured $95.00 each. Crib cattle guards figured at $400.00 each.

Cost per Ft for Ordinary Wooden Boxes 1x2 Box @ 1 Cost Lin Ft		Cost per Ft for Creosoted Wooden Boxes 1x2 Box @ 1 per lin ft	
8 x 8	1.50	8 x 8	3.00
8 x 8	2.50	8 x 8	3.00
8 x 8	3.00	8 x 8	4.50
Add	3.25	Add	4.50
Telegraph Poles	$1.00 for Cost of moving 1 to 5 poles		$2.00 per pole
	" " "	5 to 10	15.00
	" " "	10 or more	10.00

Wooden Boxes: 8 x 8 = 3.00 (for Wiring) = 3.00 Wolfs
Creosoted Wooden Boxes: 8 x 8 = 4.50 (for Wiring) = 4.50 Wolfs

sufficient time to enable him to consult with the engineer. The accompanying table based upon the cost of material on this road is sufficiently accurate for all practical purposes. If more detailed figures are required, it would, of course, be necessary to make a survey on the ground. This table was prepared by John H. Gardiner, to whom we are indebted for this information.

General News.

The Colorado legislature has defeated a full crew bill, and also an anti-pass bill.

The Chicago & Eastern Illinois was fined $10,000 in the federal court at Chicago on April 9 for 100 violations of the federal hours of service law during the month of November, 1912.

Senator Cummins, of Iowa, has introduced in Congress a bill forbidding carriers to limit their liability for loss of freight as one of the considerations imposed for making reduced rates for transportation.

The number of pensioners on the lines of the Pennsylvania Railroad system who are over ninety years old is nine, as indicated by the list of names printed in our last issue. The number of pensioners more than eighty years of age is 296.

The legislature of the state of Washington has passed a law making it a misdemeanor for trespassers to enter a railroad right of way on which more than one main track is in use. The bill was introduced by a senator who was formerly a Northern Pacific conductor.

The first conviction under the law recently enacted by Congress providing the penalties for stealing, or attempting to steal, from freight cars containing interstate shipments, is reported from St. Louis, where Philip Nagle was found guilty in the United States district court and sentenced to a term of five years in the federal prison at Fort Leavenworth.

A bill has been introduced in the Illinois legislature to amend the present union station statute adopted in 1874, to provide that companies formed for the purpose of building union stations may be organized with a capitalization not to exceed $50,000,000. The present limit is $3,000,000. The bill was introduced in the interest of the proposed new stations in Chicago.

The government has begun suit in the United States district court at Columbus, Ohio, against the Union Depot Company of Columbus; the Baltimore & Ohio, and the Cleveland, Cincinnati, Chicago & St. Louis for violation of the hours of service law. The suits call for penalties aggregating $97,000, and the cases apparently refer to the work of telegraphers in offices where the nine-hour limit is or should be applied.

The New York State College of Forestry, Syracuse, co-operating with the New York Central & Hudson River, is to plant trees on fifteen acres of the railroad company's experimental farm at North Chittenango, N. Y., with a view of finding out the best kinds of wood to grow in that locality for use as ties. The New York Central uses annually about 3½ million ties in its tracks in the state of New York, and the object of the College of Forestry is to see if some of the millions of dollars now sent to other states and countries for sleepers cannot be kept in New York.

At the trial of Messrs. Horn and other officers of the New York, New Haven & Hartford for manslaughter, at Bridgeport, Conn., on Tuesday of this week, President Charles S. Mellen and Vice-President E. H. McHenry, who were present in court, were indicted on charges of manslaughter, and were held in $5,000 bail each. These indictments, issued by the court in connection with the derailment at Westport, last October, appear to be a result of the dissatisfaction of the state's attorney with the progress of his cases against the four men who had been previously indicted. The despatches indicate that none of the trials will be again taken up until some time in May.

Senator Gronna has introduced in Congress a bill to amend the interstate commerce law by empowering the Interstate Commerce Commission to regulate the speed with which freight shall be carried. There is a clause requiring twenty miles an hour to be maintained with live stock. For unreasonable delays the carrier may be penalized to the extent of the losses caused by the delays, and, in addition, five dollars per car per hour. Representative Lafferty has introduced in the House a bill extending the authority of the Interstate Commerce Commission in Alaska, and instructing the War Department to build a railroad in Alaska from Controller Bay to the coal fields on Bering river.

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Car No. 999 of the Erie, the business car of President Underwood, has been equipped with six telephones for speaking between the different parts of the car—the staterooms, the observation-room, the stenographer's desk, and the kitchen. The telephones are hand sets made by the Western Electric Company. Being held in the hand, the vibration of the wheels on the rails has no disturbing effect on the telephones. For calling, buzzers are used, each telephone having a set of call buttons arranged on a dial plate. The car has connections by which its occupants can converse over outside telephone lines when the car is standing at a station, calls being made by an interrupter, operated from a battery. Other business cars on the Erie are to be equipped with telephones.

Steel Corporation's Unfilled Tonnage.

The report of the United States Steel Corporation shows that the volume of unfilled tonnage on March 31 was 7,468,956 tons, compared with 7,686,714 tons at the end of February, a decrease of 187,758 tons. On January 31, the unfilled tonnage was 7,827,368 tons; on December 31, 1912, 7,932,164 tons; and on March 31, 1912, 5,304,841 tons.

Derailment on the Central Vermont.

In the derailment of a special passenger train on the Montreal-Chambly line of the Central Vermont, in Quebec, last Sunday afternoon, the fireman and six passengers were killed and 15 persons were injured. The derailment occurred about four miles from St. Lambert and 16 miles from Montreal. The train carried several hundred passengers, guests of a real estate company returning to Montreal. It is said that the speed of the train was not over 30 miles an hour. The cars were so crowded that many persons were standing on the car platforms, and it was mostly among these that the fatalities occurred. The cause of the derailment is reported as defective track. The engine was running tender first.

Derailment at Tula, Mexico.

Press despatches of April 20 report the derailment of a passenger train on the Mexican Central near Tula, state of Hidalgo, April 10, in which 20 passengers were killed and 40 injured. It is said that the derailment was due to excessive speed and that the engineman ran at unsafe speed around a curve, because of the importunities of the passengers, who feared an attack of the rebels who are fighting the government.

Railway Museum at the University of Illinois.

For some months past the railway engineering department of the University of Illinois has been collecting pictures, relics and models illustrating the historical development of the railroad and representing also current practice. This material forms a permanent exhibit in the new Transportation building, and it will be added to from time to time. A very generous response to requests for such material has been made by railway officers and by manufacturers. Other persons having interesting material of this sort are invited to contribute if they feel so disposed. Everything put into the collection will be well cared for and it will be of general benefit. Communications may be addressed to Prof. Edward C. Schmidt, Urbana, Ill.

Latest Phase of Railway Regulation in Texas.

The suit instituted by the attorney general to prevent the carrying out of the provisions of the consolidation bill passed by the legislature is most unfortunate. That the bill was overwhelmingly and imperatively demanded by the people is true beyond all question. The consolidation affected the people living in all the territory from Wichita Falls to Waco, and from Waco to Trinity, and from Trinity to Beaumont and Port Arthur. The people demanded that the bill be passed, and their servants obeyed their behest.

While the governor was opposed to the bill from the first, he was justified in submitting it to the attorney general for his opinion as to its constitutionality, and when that opinion was adverse he was justified, on that ground, in vetoing it; hence the governor may be eliminated from the equation. The attorney general is now responsible for the stay of building railroad connections sorely needed.

As the completion of the Panama canal draws near, all the great trunk lines are making every possible effort to get to tidewater, and the people in Texas are profoundly interested. The people have the unrestrained and unrestrainable right to say what railroads they want and where they shall be built, and neither the attorney general nor any other man has the right to seek to thwart their purposes.

Conceding that the constitutionality of the law is debatable, every doubt should be resolved in favor of the will of the people. The action of the attorney general has very much the appearance of trying to get even with the legislature because it disregarded his opinion by passing the bill over the gubernatorial veto.

Who is going to be harmed by giving the state new lines of railway? What evil can follow upon allowing a great railway system to get in touch at tidewater with the commerce of the world? Why should not the people of the imperial realm of the Northwest. . . .

The home town of the attorney general is indebted for the larger part of its gratifying growth to the very railroad whose progress into other fields he now seeks to obstruct. It has spent millions of money in Texas. It asks the privilege of spending millions more, but now one man, who was nominated by the very narrowest of margins, rises to say, "The people be damned. I will not permit their commands to be executed." How long will the people stand such trifling with their wishes? —*Houston Chronicle.*

Headlight Laws.

The legislature of Colorado has passed a bill requiring all locomotives to be equipped with headlights of not less than 1,500 c. p. Headlight bills have also been passed at this session by the legislatures of seven other states—Nevada, Vermont, North Dakota, Iowa, Oregon, Missouri and Minnesota. The Nevada, Missouri and Minnesota bills provide for 1,500 c. p.; the North Dakota bill for 1,200 c. p., and the Vermont bill leaves the determination of this point to the railroad commission. In Oregon and Iowa the laws provide that the light shall be sufficiently strong to enable the engineman to see a person on the track at distances of 800 and 1,100 ft. respectively.

Pere Marquette Investigation.

President S. M. Felton, of the Pere Marquette, resumed his testimony before the legislative committee that has been investigating the affairs of the road at Detroit on April 10. He produced statistics regarding operating expenses and revenues to show that passenger rates under the 2-cent fare law are not sufficient to provide for satisfactory service, and declared that it should be self-evident that in a state like Michigan, with a population of only 40.2 per square mile, the density of passenger traffic must be less than in states where the population is much greater. He pointed out that in Pennsylvania, with a population of 171 per square mile, the courts had decided the 2-cent fare law unconstitutional, and that in New York, with a population of 191 per square mile, Governor Hughes had vetoed the 2-cent fare law. He said the Pere Marquette's passenger business, which yielded $4,023,039 in 1912, would have yielded $741,677 more under the old rates. For 1912 the earnings from passengers, mail, express, baggage, parlor and chair cars, and miscellaneous passenger service revenues, were $4,946,796, while the expenses properly charged against this service were $5,283,198, a cost per passenger mile of 2.35 cents. The average fare was 1.79 cents per passenger mile. He thought the rate should be advanced to 2½ cents a mile.

On April 11, W. D. Trump, manager of the Detroit Terminal Railroad, and formerly general superintendent of the Pere Marquette, was a witness before the committee. He testified in detail regarding various expenditures and improvements made during his connection with the road, saying that the property had not been properly maintained in recent years. In one year, he said, no new steel was laid, and some of the rails had been in the track for 30 years. He was inclined to criticise the financial management of the road, and declared that much of the money spent was wasted. He criticised the purchase of the Chicago, Cincinnati & Louisville, and the extension to Chicago.

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He disagreed with President Felton's figures regarding the expenses of the passenger service, saying he believed it was profitable to the company, even with the 2-cent fare.

Several shippers testified regarding the quality of the service rendered by the Pere Marquette.

Chicago Council Renews Electrification Agitation.

At the first meeting of the new city council in Chicago on April 14, a committee on railway terminals, consisting of 15 aldermen, with Ellis Geiger as chairman, was appointed to deal with such subjects as electrification of railway terminals and the location of proposed new passenger stations. One of the first ordinances introduced at the meeting was one to require the railroads to use electric power or other power that will not produce smoke on their terminal lines in the city by July 1, 1914. It was referred to the new committee. An ordinance providing for the discontinuance of the use of steam locomotives within the city has been lying dormant with the committee on Local Transportation for about two years, the agitation for electrification having practically ceased following the appointment of a committee of the Chicago Association of Commerce, which has been making a thorough investigation of the subject. The resolution was introduced on the alleged ground that the investigation is being unduly protracted.

St. Louis Railway Club.

At the meeting of the St. Louis Railway Club, held April 11, J. R. Cavanagh, superintendent of freight transportation, New York Central Lines, made an address on Car Efficiency.

Association of Railway Electrical Engineers.

The annual convention of the Association of Railway Electrical Engineers will be held at the hotel La Salle, Chicago, October 18-24.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

American Association of Demurrage Officers.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

American Association of General Baggage and Ticket Agents.—W. C. Hope, New York.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

American Association of Railroad Superintendents.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Electric Railway Manufacturers' Assoc.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

American Railway Association.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

American Railway Engineering Association.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

American Railway Tool Foremen's Association.—A. R. Davis, Central of Georgia, Macon, Ga.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

American Wood Preservers' Association.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 75 Church St., New York.

Association of Water Line Accounting Officers.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

Bridge and Building Supply Men's Association.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—A. S. Macrory, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Fairest Claim Association.—Warren F. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

General Superintendents' Association of Chicago.—E. S. Keller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

International Railway Congress.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

International Railway Fuel Association.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

International Railway General Foremen's Association.—Wm. Hall, 828 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

Maintenance of Way & Master Painters' Association of the United States and Canada.—W. G. Wilson, Lehigh Valley, Easton, Pa.

Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

Master Car and Locomotive Painters' Assoc. of U. S. and Canada.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-11, Ottawa, Can.

National Railway Appliance Assoc.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Ry. Sup. Assoc.

New England Railroad Club.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railroad Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Peoria Association of Railroad Officers.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.

Railroad Club of Kansas City.—C. Manlove, 1006 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Business Association.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

Railway Club of Pittsburgh.—J. D. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except July and August, Pittsburgh.

Railway Electrical Supply Manufacturers' Assoc.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Am. Elec. Ry. Assoc.

Railway Gardening Association.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

Railway Development Association.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa. Meetings, June 10-11, New York; convention, October 14, Nashville, Tenn.

Railway Storekeepers' Association.—L. P. Sheldon, C. & N. W., Galewood, Ohio. Annual convention, May 19-21, Chicago.

Railway Supply Manufacturers' Assoc.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

Railway Tel. and Tel. Appliances Assoc.—W. E. Harkness, 284 Pearl St., New York. Meetings with Ry. Sig. Assoc.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

Roadmasters' and Maintenance of Way Association.—J. C. Ryan, C. & N. W., Sterling, Ill. Convention, May 21-23, 1913, Chicago.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Signal Appliance Association.—W. Hendrickson, 1868 Lexington Ave., New York. Meetings with annual convention Railway Signal Association.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & S. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Track Supply Association.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; Wednesdays monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Traffic Club of St. Louis.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Las Angeles, Cal.

Transportation Club of Buffalo.—M. E. Smith, 43 Exchange Street Building, Buffalo, N. Y. Meetings, 2d Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

Utah Society of Engineers.—R. R. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

A press despatch from Albany says that the Erie Canal will not be opened until June 1, much damage having been done by floods at Vischer's Ferry. The Champlain Canal will be opened for traffic May 15.

The meeting of the National Industrial Traffic League called for April 15, was postponed on account of the meetings of the Western and Southern classification committees and flood conditions along the Ohio river and its tributaries.

Following the recommendation of the governor of New Hampshire, the legislature of that state has considered a report from a special committee proposing a scheme for the regulation of railway rates during the next two years; and has instructed the committee to reconsider its action, and to report a measure giving the Boston & Maine more liberal terms.

As a result of arrangements made by the Illinois Central, it is announced that a monthly steamship service between New Orleans and Argentine will be started on June 15, by Andrew Weir, of London, making connections with all lines entering New Orleans. The ships for the service will be of over 8,000 tons capacity. The first boat will be berthed at New Orleans on June 15, and will sail on June 30.

Motion pictures showing the effects of the recent floods at Dayton, O., were presented at an entertainment given by the Traffic Club of Chicago on April 10. The pictures were described in a lecture given by H. F. Miller, business manager of the Chicago Association of Commerce, who was in charge of the relief work of the association in Ohio, and who obtained the pictures during the first week of the flood.

The Chicago, Burlington & Quincy has established on the first floor of its new general office building at Chicago, a permanent agricultural exhibit, consisting chiefly of samples of products of Nebraska, Colorado, Wyoming and Montana. Lectures on farming in these four states will be given from time to time by prominent agricultural experts. James J. Hill attended the opening of the exhibit on April 10.

The Board of Estimate and Apportionment, New York City, has taken action to acquire, on behalf of the city, extensive tracts of land for terminal facilities along the shore of the East river, south of the Brooklyn bridge, the purpose being presumably to provide for the barges which will carry freight through the Erie canal after it has been enlarged. The property named in the resolutions of the Board of Estimate is valued at $1,182,200.

Following the announcement, last week, of the decision of the Interstate Commerce Commission, concerning the issuance of free passes to shippers in Colorado, it is now definitely stated that the commission asked for the indictment of the Colorado Fuel & Iron Company, the Victor American Fuel Company, the Colorado Porcelain Cement Company, the United States Porcelain Cement Company, the Great Western Sugar Company, the Colorado & Southern Railroad Company, and the Denver & Rio Grande Railroad. The commission says that the Atchison, Topeka & Santa Fe for about ten years resisted the movement to give passes to influence traffic, but finally, because of the persistency of its competitors, it deliberately resorted to the means practiced by them for stimulating the good will of shippers. The commission suggests that the courts should be more severe in dealing with these offenses against the law.

The Pennsylvania announced on Monday of this week that all of its lines in Ohio and Indiana which had been damaged by the recent floods had been rebuilt so that regular trains would be restored; though for a time through cars would be operated subject to delay. On Thursday of this week the company announced the re-establishment of regular freight service throughout its lines. The Illinois Central resumed through passenger traffic by way of Cairo on the 12th, except that the Panama Limited was not restored, through travel being almost suspended in the Southern states because of the general flood conditions in the Mississippi valley. Through traffic was suspended on the Illinois Central for ten days—April 2 to 11, inclusive. The Cleveland, Cincinnati, Chicago & St. Louis began running passenger trains to Cincinnati last week by using the line of the Detroit, Toledo & Ironton from Springfield to Washington, C. H., and the Baltimore & Ohio thence to Cincinnati. The Chesapeake & Ohio was re-opened for traffic through to Chicago on the 10th.

The New York, New Haven & Hartford announces that arrangements have been made for the prompt transmission of information concerning delayed trains to offices of the company at New York, New Haven, Providence, Boston, Hartford, Springfield and Worcester. In New York City the information will be recorded at Room 3624, Grand Central Terminal. For the benefit of passengers who may wish to find this room, it may be remarked that this number means room 24, in corridor 6, on the third floor. Anything happening to a train which will delay it for more than 30 minutes will be at once reported by telegraph to these centers of information. If a train is likely to be more than one hour late, the fact will be noted at the bulletin board in the Grand Central Station concourse with a note that detailed information can be had by going to the room upstairs. If there should be an accident causing injury to passengers, the names of the injured persons would be sent as early as possible to the information rooms. These special information bureaus will also keep informed concerning sleeping cars which are delayed and are attached to other than their regular trains.

Car Location.

The accompanying table, which is taken from car location bulletin, No. 4-A of the American Railway Association, gives a summary of freight car location by groups on March 15, together with surpluses and shortages on the same date.

CAR LOCATION ON MARCH 15, 1913.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	90,082	677,535	284,148	202,848	172,362	467,972	16,427	150,947	30,830	129,803	117,983	2,340,937
Home Cars on Home Roads	43,630	357,471	88,480	104,506	74,145	284,028	3,160	70,626	12,945	86,213	73,927	1,179,141
Home Cars on Foreign Roads	46,452	320,064	195,668	98,342	98,217	183,944	13,267	80,321	17,885	43,590	44,056	1,161,796
Foreign Cars on Home Roads	57,443	304,936	197,023	102,077	86,879	206,952	12,020	71,690	25,810	60,665	54,214	1,179,709
Total Cars on Line	101,073	662,407	285,503	206,583	161,024	490,980	15,180	142,316	38,755	*126,878	128,151	2,358,850
Excess or Deficiency	10,991	*15,128	1,355	3,735	*11,338	23,008	*1,247	*8,631	7,925	*2,925	*10,168	12,913
Surplus	323	6,160	1,355	3,844	1,455	8,559	1,455	3,077	4,189	1,765	1,617	60,299
Shortage	1,193	2,765	1,845	2,333	3,994	3,483	100	193	59	654	3,965	20,584
Shop Cars—												
Home Cars in Home Shops	4,445	28,207	16,081	8,606	10,495	19,906	457	8,266	1,601	4,339	3,468	105,871
Foreign Cars in Home Shops	1,554	8,604	7,168	2,335	2,467	5,027	501	2,188	887	2,547	681	33,959
Total Cars in Shops	5,999	36,811	23,249	10,941	12,962	24,933	958	10,454	2,488	6,886	4,149	139,830
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	48.43	52.76	31.14	51.52	43.02	60.69	19.24	44.79	41.99	51.01	62.67	50.19
Total Cars on Line	109.61	97.77	100.42	101.84	93.42	104.92	92.41	92.65	125.71	97.75	108.62	100.77
Home Cars in Home Shops	4.93	4.16	5.66	4.24	6.09	4.54	2.78	5.48	5.19	3.34	2.94	4.58
Foreign Cars in Home Shops	1.07	1.27	2.52	1.15	1.43	1.14	3.05	1.37	2.88	1.96	.58	1.47
Total Cars in Shops	6.00	5.43	8.18	5.39	7.52	5.68	5.83	6.85	8.07	5.30	3.52	6.05

*Denotes deficiency.

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Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 141, giving a summary of car surpluses and shortages by groups from December 20, 1911, to April 1, 1913, says: The total surplus on April 1 was 68,792 cars; on March 15, 1913, 57,968 cars; on March 27, 1912, 52,682 cars. Compared with the preceding period; there is an increase in the total surplus of 10,794 cars, of which 5,411 is in box, 1,156 flat, 2,342 coal and 1,885 miscellaneous cars. The increase in box car surplus is in all groups, except 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), and 9 (Texas, Louisiana and New Mexico). The increase in flat car surplus is in groups 1 (New England Lines), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8, 9 (as above), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona). The increase in coal car surplus is in all groups, except 3 (Ohio, Indiana, Michigan and western Pennsylvania), 8 and 10 (as above). The increase in miscellaneous car surplus is in groups 1 (as above), 6 (Iowa, Illinois, Wisconsin and Minnesota), 7, 8, 9 and 10 (as above).

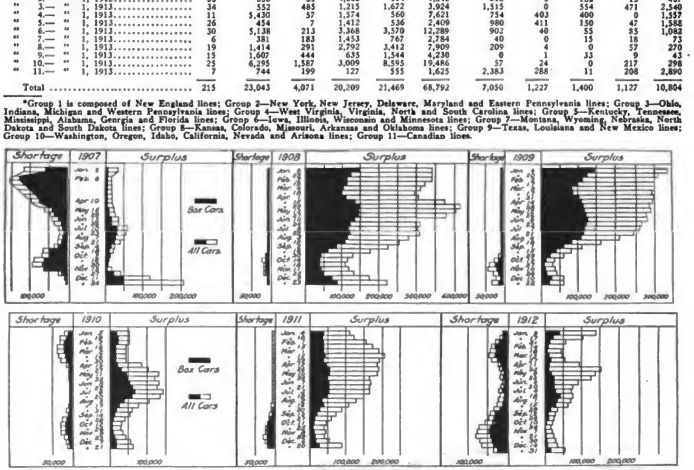
The total shortage on April 1 was 10,804 cars; on March 15, 1913, 20,223 cars; and on March 27, 1912, 33,974 cars. Compared with the preceding period; there is a decrease in the total shortage of 9,419 cars, of which 5,601 is in box, 629 in flat, 2,376 in coal and 813 in miscellaneous cars. The decrease in box car shortage is in all groups, except 2 and 8 (as above). The decrease in flat car shortage is in all groups. The decrease in coal car shortage is in all groups, except 3, 9 (as above), and 11 (Canadian Lines). The decrease in miscellaneous car shortage appears in groups 1, 3 (as above), 4 (the Virginias and Carolinas), 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 6, 9 and 11 (as above).

Compared with the same date of 1912; there is an increase in the total surplus of 16,110 cars, of which 8,362 is in box, 7,669 in coal, 2,318 in miscellaneous and a decrease of 2,239 flat cars.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1—April 1, 1913	7	670	540	321	144	1,675	0	56	0	0	56
" 2— " 1, 1913	33	358	65	4,303	114	4,840	210	0	182	15	407
" 3— " 1, 1913	34	552	485	1,215	1,672	3,924	1,515	0	554	471	2,540
" 4— " 1, 1913	11	5,430	57	1,374	560	7,421	754	403	400	0	1,557
" 5— " 1, 1913	26	454	7	1,412	536	2,409	980	411	150	47	1,588
" 6— " 1, 1913	30	5,138	213	3,360	3,570	12,289	902	40	55	85	1,082
" 7— " 1, 1913	6	381	183	1,453	767	2,784	40	0	15	18	73
" 8— " 1, 1913	19	1,414	291	2,792	3,412	7,909	209	4	0	57	270
" 9— " 1, 1913	15	1,607	444	635	1,544	4,230	0	1	33	9	43
" 10— " 1, 1913	25	6,295	1,587	3,009	8,595	19,486	57	24	0	217	298
" 11— " 1, 1913	7	744	199	127	555	1,625	2,383	288	11	208	2,890
Total	215	23,043	4,071	20,209	21,469	68,792	7,050	1,227	1,400	1,127	10,804

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

There is a decrease in the total shortage of 23,170 cars, of which 12,363 is in box, 6,759 in coal, 4,371 in miscellaneous and an increase of 323 flat car shortage.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report, and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association in presenting statistical bulletin No. 142 covering car balances and performances for December says:

The miles per car per day, for December was 24.4 compared

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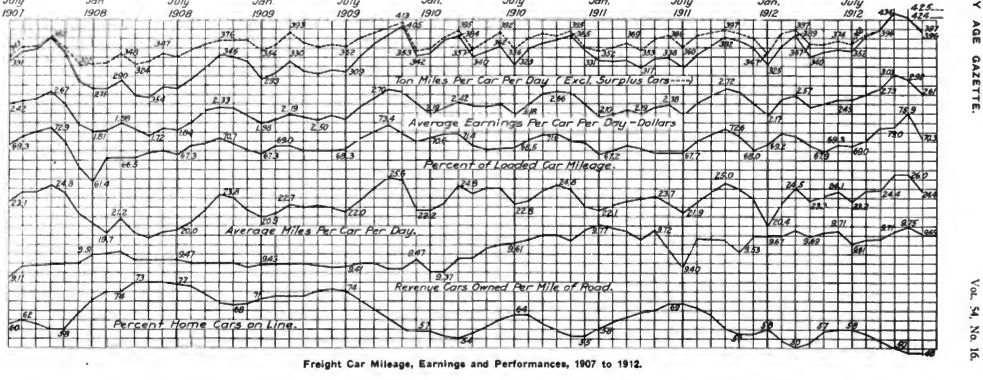
CAR BALANCE AND PERFORMANCE IN DECEMBER, 1912.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	83,477	673,017	222,376	189,638	168,783	405,413	17,175	141,289	29,984	144,160	129,264	2,204,576
Average number of system cars on line	27,861	308,787	99,678	84,438	63,709	247,214	4,160	55,103	16,449	60,110	85,544	1,063,053
Railway-owned cars: Average foreign on line	58,017	334,412	119,598	78,817	78,963	174,969	11,710	80,957	40,621	65,611	62,367	1,106,042
Total Railway-owned cars on line	104,302	643,199	219,276	163,255	142,672	422,183	15,870	136,060	57,070	125,721	147,911	2,177,519
Excess	12,401	*29,818	*2,100	*26,383	*26,111	16,770	*1,305	*5,229	27,086	*18,439	18,647	*35,481
Per cent. of cars on line to total owned;												
Home	45	46	45	45	38	61	24	39	55	42	66	48
Foreign	70	49	54	41	47	43	68	53	135	45	48	50
All railways	115	95	99	86	85	104	92	92	190	87	114	98
Private cars on line	4,310	43,349	11,129	5,563	9,519	16,480	1,675	10,104	4,666	13,349	3,670	123,814
Total, all cars on line	108,612	686,548	230,405	168,818	152,191	438,663	17,545	146,164	61,736	139,070	151,581	2,301,333
Per cent. of cars in shop	6.80	5.30	7.86	6.60	7.60	6.09	5.69	6.51	4.95	4.19	3.96	6.00
No. of freight engines owned	1,412	10,246	3,137	3,456	2,826	6,578	539	2,777	852	3,047	2,154	37,024
Average cars on line per freight engine owned	77	67	73	49	54	67	33	53	72	46	70	62
Total freight-car mileage	57,407,641	528,409,959	157,450,449	135,068,682	124,461,088	314,398,413	26,283,227	99,928,180	43,309,153	134,718,145	118,187,274	1,739,622,216
Average miles per car per day	17.1	24.8	21.7	25.7	26.1	22.8	49.7	23.3	22.7	31.3	25.2	24.4
Per cent. loaded mileage	72.4	66.8	71.7	68.0	73.2	72.1	78.1	71.1	68.0	72.6	74.7	70.1
Ton-miles of freight, including company freight	673,185,280	9,039,053,765	2,764,806,887	2,221,660,447	1,756,239,904	3,812,455,407	468,957,574	1,521,464,156	540,423,167	1,990,861,182	1,893,378,018	26,682,485,787
Average ton-miles, including company freight:												
Per car-mile	11.7	17.1	18.4	16.7	15.3	15.8	18.3	15.2	12.5	15.0	16.0	16.2
Per loaded car-mile	16.2	25.6	25.6	24.5	21.0	22.0	23.4	21.7	19.2	20.7	21.4	23.2
Per car per day	200	425	446	429	398	360	370	354	264	470	403	396
Gross freight earnings	$7,184,229	$50,245,379	$14,872,003	$13,696,383	$13,181,102	$34,366,934	$3,234,714	$12,880,917	$5,084,698	$19,856,631	$11,919,153	$186,522,643
Average daily earnings: Per car owned	$2.48	$2.41	$2.16	$2.33	$2.52	$2.73	$6.08	$2.84	$5.47	$4.46	$2.92	$2.72
Per railroad car on line	2.16	2.52	2.19	2.71	2.98	2.63	6.58	2.94	2.87	5.12	2.60	2.76
All cars on line	2.08	2.36	2.08	2.62	2.79	2.53	5.95	2.84	2.66	4.63	2.54	2.61

*Denotes deficiency.



Freight Car Mileage, Earnings and Performances, 1907 to 1912.

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with 26.0 for November. This figure for December, 1911, was 23.4.

Ton miles per car per day was 396, this figure for November was 424. This is an increase of 9.70 per cent. over the figure for December, 1911.

The proportion of home cars on line was 48 per cent., maintaining the same figure as in November. This figure for December, 1911, was 56 per cent.

There is a decrease of 5.6 points to 70.3 per cent. in the percentage of loaded car mileage compared with November, 1912 The per cent. of loaded car mileage in December, 1911, was 68.0 per cent.

The average earnings per car per day of all cars on line were $2.61, compared with $2.92 in November, 1912. This is an increase of 9.21 per cent, over the earnings for December, 1911, which were $2.39.

The table on page 914 gives car balance and performance in the tuonth covered by the report, and the diagram shows car earnings and car mileage and different car performance figures monthly from July, 1907.

Wells-Fargo Conferences.

Under the administration of B. D. Caldwell, who came to it in October, 1911, as president, Wells Fargo & Company has entered upon a pretty thorough scheme of reorganization. Mr. Caldwell's long experience as a railroad man has stood him in good stead in facing the situation of the express business at a particularly difficult time in its history. Without any great disturbance of the personnel of the system he has brought to his aid a number of railroad men who have been instrumental with him in the important work of bringing Wells Fargo & Company in line with the best transportation practices of today.

One of Mr. Caldwell's innovations has been the holding of a conference semi-annually of his heads of departments and chiefs of staff. While this had been done to some extent before, he has made the conferences institutions of great service to the company. The most recent of these was held in St. Louis during the week beginning Tuesday, April 8. To it came all Wells Fargo officers from general superintendents up and a complete discussion was held of the various routine as well as special topics affecting express companies at the present time. Wells Fargo & Company is a keen believer in the efficiency of committee work, and this conference saw the appointment of many committees which will report to the next gathering of a similar sort. These committees are charged with study of and recommendation upon operating problems and problems relating to the public efficiency of the company. The management of Wells Fargo & Company has the idea that the working of the express could and should be utilized to a large extent in an improvement of the movement of food products. It believes that the express can be a large agent in the expedition of perishable food between the grower and the various markets, and so a real factor in a possible solution of the cost-of-living problem

Of the general value of these conferences there is little donbt in the ranks of Wells Fargo & Company. It is difficult to operate any transportation organization employing some thousands of men and covering a large territory, but when that organization embraces 36 states, some 90,000 miles of steamship and railroad lines, and has its executive offices in New York, with its operating headquarters at both Chicago and San Francisco, these difficulties multiply. To talk over personally, with the men of this company, the many problems that confront them was what Mr. Caldwell sought in inaugurating these conferences, knowing that a general discussion held well to the point is far more valuable than any amount of correspondence upon a topic. The conferences which he has now so well inaugurated have already proved themselves worthy of the time and effort they require.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended until June 20 the supplement to the tariff of the St. Louis & San Francisco, which increases rates for the transportation of potatoes, in carloads, from points in Oklahoma to points in Colorado from 4 to 14 cents per 100 lbs.

The commission has suspended until July 26, certain schedules published in a supplement to the tariff of the Kansas City Southern, which proposed to increase rates on lumber from points in Missouri, Oklahoma and Arkansas to Des Moines, Iowa, one cent per 100 lbs.

The commission has suspended from May 1 until July 8, the tariff of the Wabash, Chester & Western. This tariff proposed to advance rates on flour in carloads, from Chester and other stations in Illinois to Paducah, Ky., from 9 cents to 10½ cents per 100 lbs.

The commission has suspended from April 1 until July 17, the supplements to Agent C. J. Pierce's tariff, which would cancel joint through rates on news printing paper from stations located on the Grand Trunk to points on the Bangor & Aroostook routing via the Maine Central.

The commission has suspended from March 31 until September 30, certain schedules in supplements to the tariffs of the Southern Railway and the Norfolk & Western, which would advance rates on furniture from High Point, N. C., and other stations to Boston, New York, Philadelphia, Baltimore and other points.

The commission has suspended from April 1 until July 30, certain supplements to Agent William Cameron's tariff, which contain increased rates on bituminous coal and bituminous coal briquettes, carloads, from Illinois mines to St. Louis, Mo. The proposed advance amounts to 5½ cents per net ton from all mines.

The commission has suspended from April 9 to October 9, certain schedules in Agent R. H. Countiss' tariff, which contain advanced rates for the transportation of lumber, shingles and other articles subject to lumber rates from stations located on the Washington Western in the state of Washington to eastern destinations.

The commission has suspended until July 30 the schedules in certain tariffs, which would increase switching charges for the movement of cars containing coal and coke over the Chicago & North Western from junctions with connecting carriers to Ravenswood, a station within the switching limits of Chicago. The increase would amount to approximately 15 cents per ton.

The commission has suspended from March 27 until July 25, a supplement to the tariff of the Chicago, Milwaukee & St. Paul, which proposed to increase rates on wheat, flour, corn, rye, oats and barley from Spencer, Iowa, and other points to Sioux City, Iowa, and intermediate points, the increases ranging from 1 to 6.2 cents per 100 lbs. on wheat and flour, and from 1.05 to 7.65 cents per 100 lbs. on other grain.

The commission has suspended until July 30 the supplement to the tariff of the Delaware, Lackawanna & Western, which would cancel commodity rates applicable to the transportation of butter and cheese, any quantity, from points on the Cincinnatus branch to New York and other points, leaving in effect class rates, which would result in advancing rates on butter 5 cents, and on cheese 1 cent per 100 lbs.

The commission has suspended from April 1 until July 30, a provision changing the classification of bridge iron and bridge material in carloads, from Class N to Class 1, Note 28, contained in a supplement to the Southern classification. The proposed change would increase as much as 200 per cent. rates applicable to the commodity in question moving over the lines of the Louisville & Nashville. For example, the present rate from Memphis at Athens, Ala., is 11 cents, and the proposed rate 33 cents per 100 lbs.

The commission has suspended until July 17 certain tariffs, which would cancel all joint rates between points on the lines of certain eastern roads, the Grand Trunk and points located on the Bangor & Aroostook on shipments routed via the Maine Central, which action is understood to be the result of a dispute between these carriers over a proper division of the through rates in effect. On and after the dates above named the use of combination rates, as provided for in the suspended tariffs, would have resulted in an advance in all class and commodity rates, varying in amount according to the commodity and length of haul.

The commission has suspended until August 4, the schedules in the tariffs of certain boat lines which proposed to add to the list of articles the transportation of which is prohibited, butter,

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eggs, fresh meats and live or dressed poultry. The tariffs of the carriers involved name class and commodity rates from Duluth and other upper lake ports to Buffalo and interior eastern points, including Boston, New York and Philadelphia, reached by lake and by lake and rail, and the proposed change would compel shippers to forward the commodities above specified via all rail routes. The present lake and rail rate on eggs from Duluth to New York is 65 cents per 100 lbs., any quantity, and the all-rail rate for the same commodity between the same points is $1.09 in carloads and $1.12 in less than carload quantities.

Commodity Rates Increased.

Corporation Commission of Oklahoma v. Abilene & Southern et al. Opinion by Commissioner Clements:

In the original report the commission decided that the defendants' class and commodity rates from Oklahoma into Texas were unreasonable and unjustly discriminatory. The commission did not at that time prescribe any reasonable rates for the future, but held the case open for the parties to submit a proposed scale of mutually satisfactory class rates, if such a scale could be agreed upon. A conference was held, but the parties failed to agree. The commission in this report prescribed reasonable rates for the future. (26 I. C. C., 520.)

Improper Charges Assessed.

C. C. Follmer & Co. v. Canadian Pacific et al. Opinion by the commission:

The complainant shipped a carload of shingles weighing 40,800 lbs. from Abbottsford, consigned to itself at Menasha, Wis. The shipment moved via the Canadian Pacific and the Minneapolis, St. Paul & Sault Ste. Marie. It was loaded in a Canadian Pacific 36 ft. car, but before reaching Menasha, was reloaded by the Soo line into two smaller cars. Upon arrival at Menasha, the shingles were re-consigned as one shipment to Rochester, N. Y., and were carried forward in the two cars via the Soo line to Manitowoc, Wis., and thence via the Pere Marquette and the New York Central & Hudson River to the destination. From Abbottsford to Manitowoc charges were assessed on the actual weight of the shipment, but from Manitowoc to destination they were assessed on a weight of 27,300 lbs. for the first car, and on a minimum weight of 24,000 lbs. for the second car. The complainant contends that the charges were unreasonable to the extent that they exceeded a through rate of 80 cents per 100 lbs. based on the actual weight of the shipment. The commission found that there was no through rate applicable to this shipment, but decided that the intermediate rates were improperly assessed, and also that the Soo line was not justified in transferring the shipment from one to two cars and charging for more than the actual weight of the shipment. Reparation was awarded. (26 I. C. C., 512.)

Texas Common Point Case.

In re investigation and suspension of advances in rates by carriers for the transportation of certain commodities between certain stations located in Texas common Point territory, and St. Louis, Mo., and other points. Opinion by Commissioner Harlan:

The defendants desire to reduce the extent of the Texas Common Point territory by excluding certain towns near the western border, including Sweetwater, Big Springs, San Angelo, Brady and Ballinger. The only reason given by the defendants for this move is that Amarillo, Tex., which competes with the towns just mentioned, and which is located just west of the Texas Common Point territory, now takes higher rates than Texas common points, with the result that Amarillo is discriminated against in favor of the towns above mentioned. The defendants contended that the loss of revenues attending lowering of their rates by putting Amarillo in common point territory would be substantially offset by the gain resulting from raising the rates of the points in question by excluding them from common point territory. The commission decided that the defendants had not justified the proposed increased rates. The traffic of the towns in question has grown rapidly, they have assisted the defendants in new construction, and in some cases the short line mileage is less now, than when those towns were first put in common point territory. If the defendants want to narrow the boundaries of the common point territory, they must do so in fair regard to the rights of the communities, which they propose to exclude, in their relation to the communities which would remain in the territory. The merchants and shippers of Amarillo urge that the boundaries of the common point territory be extended to include Amarillo. The commission found that if this were done, it would not be long before common point territory would cover the entire state of Texas, which was not desirable, and therefore decided not to grant the plea of the Amarillo shippers in full. The commission decided, however, that the defendants should be required to carry out the suggestion, at one time practically agreed upon, of giving Amarillo rates upon certain commodities on a parity with common point rates. No order was deemed necessary. (26 I. C. C., 529.)

Pig Iron Rate Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of pig iron from points in upper Michigan and Minnesota to Kansas City, Mo., and other destinations. Opinion by Commissioner Harlan:

The tariffs under suspension would raise the rates on pig iron from Duluth, Ashland and other points in Minnesota, Wisconsin and the northern peninsular of Michigan to a territory of distribution in which Kansas City and Omaha are the most important markets. To Kansas City and Omaha, the proposed schedules provide rates of $4.16 and $3.58 per ton respectively, in place of the present rates of $3.08 and $2.50. The Lake Superior Iron & Chemical Company has recently greatly improved its plants at points from which it is proposed to increase the rates. This company contends that these improvements were made with the understanding that the rate adjustment would not be changed and claims that the proposed rates would seriously injure its business. The commission decided that an investment made in an industrial enterprise in reliance upon an existing rate or relation of rates, cannot act as a hindrance to the re-adjustment of the rate structure if it is found to be unreasonable. The commission decided further that the present rate might be properly advanced, but that the proposed advances would be excessive. The commission ordered that in future the rate to Kansas City should not exceed $3.58 per ton, from Duluth, Ashland, Chocolay, Manistique, Newberry and other points involved; and that the rates to Omaha from those points should not exceed $3.08 per ton. (26 I. C. C., 284).

Crushed Stone and Sand and Gravel Rates Reduced.

Waukesha Lime & Stone Company v. Chicago, Milwaukee & St. Paul et al. Opinion by the commission:

In this case the complainant contends that the rates on sand and gravel, crushed stone and lime from Waukesha, Wis., to Chicago, are unreasonable and discriminatory. The Chicago, Milwaukee & St. Paul charges 2¼ cents per 100 lbs. on sand and gravel and 3½ cents per 100 lbs. on crushed stone from Waukesha to Chicago, 106 miles. The Chicago & North Western charges 4 cents per 100 lbs. on sand and gravel, and 3½ cents per 100 lbs. on crushed stone between the same points, 105 miles. The commission found that the complainant was discriminated against in favor of certain competitive points as regards the rates on sand and gravel and crushed stone. Crushed stone is more valuable than sand and gravel and therefore should take a slightly higher rate. The commission ordered the defendants to establish a rate of 2 cents per 100 lbs. on crushed stone in carloads and 1¾ cents per 100 lbs. on sand and gravel in carloads from Waukesha to Chicago. Reparation was denied. All the defendants charge 6 cents per 100 lbs. on lime between Waukesha and Chicago. The commission decided that this rate was not shown to have been unreasonable or discriminatory, and dismissed the complaint against it. (26 I. C. C., 515.)

COURT NEWS.

The decision of the Texas State Railroad Commission imposing a fine of $14,000 on the Missouri, Kansas & Texas for violation of the law requiring passenger trains to be run within thirty minutes of their regular time has been reversed by the Court of Civil Appeals. The court holds that the trains which were the subject of the commission's action were engaged in interstate traffic, and therefore the commission had no jurisdiction over them for the purpose of issuing an order of this kind.

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	Miscellaneous.	Total.					
Alabama & Vicksburg	143	$97,607	$31,679	$141,502	$27,711	$33,962	$3,522	$51,235	$5,321	$121,751	$19,751	—$131	$5,300	$14,320	—$8,602
Ann Arbor	292	160,197	34,281	246,026	22,920	23,035	3,745	58,709	6,072	114,431	131,595	4,694	13,930	12,971	—20,064
Arizona Eastern	260	183,624	37,328	232,582	31,607	21,956	2,627	60,676	4,611	121,483	111,099	—7	11,800	99,292	9,856
Atchison, Topeka & Santa Fe	8,242	4,980,981	2,034,676	7,660,437	1,073,995	1,267,286	182,207	2,326,884	158,897	5,011,269	2,649,168		339,933	2,309,255	102,090
Atlantic & St. Lawrence	167	123,180	19,623	159,250	20,241	27,131	5,004	99,531	4,812	151,719	7,531		16,152	—8,621	—2,980
Atlanta, Birmingham & Atlantic	643	191,411	41,486	250,491	41,470	44,124	14,944	102,104	11,312	213,954	36,537		13,375	23,162	—12,596
Atlanta & West Point	93	57,136	35,180	102,115	11,504	19,042	4,279	47,738	4,738	87,572	14,543	—54	6,343	21,284	—8,833
Atlantic City	167	53,645	44,213	103,962	23,963	15,273	2,555	78,439	847	121,077	—15,215	—3,782	9,000	—27,997	—4,139
Atlantic Coast Line	4,613	2,252,309	877,227	3,360,451	391,580	419,419	53,578	1,696,389	159,316	3,760,666	1,602,404	—57,344	267,716	1,277,344	—32,932
Baltimore & Ohio	4,455	5,917,541	961,016	7,362,570	1,043,140	1,143,164	164,848	3,169,598	159,316	5,760,666	1,602,404	827	319,113	1,283,118	59,673
Baltimore & Ohio Chicago Terminal	27		1,507	121,040	7,505	24,028	651	66,101	4,847	103,132	17,908		19,110	—1,202	—111,808
Bangor & Aroostook	631	161,057	32,049	206,787	36,559	26,357	2,831	116,335	12,908	213,043	—6,781		13,500	—17,281	—11,838
Belt Ry. Co. of Chicago	21			243,875	1,669	34,709	438	121,364	4,469	172,587	71,288		7,928	63,360	4,158
Bessemer & Lake Erie	204	333,380	22,153	365,141	66,367	137,577	8,473	138,649	10,747	361,813	3,328		6,000	—2,672	2,726
Boston & Maine	2,244	2,302,339	1,000,280	3,496,715	409,821	516,784	34,408	1,948,649	98,204	3,107,847	388,868	15,139	184,721	219,286	—295,355
Buffalo & Susquehanna R. R.	265	137,491	6,660	148,103	25,183	26,999	1,100	54,631	5,780	113,693	34,410		2,200	32,210	19,553
Buffalo & Susquehanna Ry.	91	40,661	6,558	49,254	12,226	10,965	426	23,377	2,612	68,606	—19,352	—5	1,700	—21,057	—4,765
Buffalo, Rochester & Pittsburgh	574	711,302	71,060	803,424	74,460	168,764	10,695	293,253	19,412	565,560	237,864	—1,187	19,000	217,677	—7,103
Butte, Anaconda & Pacific	46	86,667	7,803	104,866	10,885	26,220	640	57,377	2,622	97,744	7,122		10,000	—2,878	—4,100
Canadian Pacific Lines in Maine	233	126,829	26,915	162,017	13,285	30,091	5,650	7,147	6,243	126,406	35,611		8,000	25,611	11,059
Carolina, Clinchfield & Ohio	233	174,886	12,032	191,505	13,569	22,124	6,711	35,089	8,054	85,547	105,958		8,000	97,958	10,629
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	10,180	1,263	11,669	1,618	841	1,160	2,592	553	6,103	5,566		500	5,066	2,358
Central of Georgia	1,815	726,949	274,071	1,095,355	115,747	141,697	20,357	403,717	37,865	875,442	223,913	5,185	50,830	178,268	—160,359
Central of Georgia	676	1,653,514	357,704	2,158,798	167,012	347,700	26,023	655,931	43,892	1,240,618	918,180	—17,527	124,979	775,674	39,436
Central of New Jersey	277	219,727	23,459	258,491	27,457	36,104	937	78,191	4,747	147,432	111,053	—2,294	10,000	97,759	—40,925
Central New England	377	219,727	23,459	258,491	27,457	36,104	937	78,191	4,747	147,432	111,053	—199	16,927	6,109	16,765
Central Vermont	411	200,902	62,574	286,823	25,992	54,009	7,428	169,550	6,609	263,588	23,235		4,238	19,000	39,238
Charleston & Western Carolina	341	132,142	24,050	164,534	27,407	25,237	2,877	59,279	5,496	120,296	44,238	—779	127,155	695,330	—60,793
Chesapeake & Ohio Lines	2,324	3,481,647	380,010	4,078,427	273,324	640,571	58,904	1,021,405	65,461	2,056,565	1,021,862	—2,138	39,000	—7,259	202,041
Chicago & Alton	1,026	845,282	297,877	1,049,480	172,287	264,388	48,535	492,193	38,162	1,015,565	33,915	—2,138	40,000	367,224	100,133
Chicago & Eastern Illinois	1,075	994,655	225,827	1,330,420	124,878	295,866	26,350	514,965	37,381	1,115,591	214,829	—2,605			
Chicago & Erie	770	1,196,496	45,319	1,296,647	144,052	172,813	20,886	260,932	12,218	465,295	—17,648	—371	13,333	—31,352	—52,238
Chicago & Northwestern	7,976	4,076,419	1,414,631	6,092,448	640,705	988,847	116,449	2,677,753	134,736	4,558,490	1,533,958	—23,205	336,170	2,001,481	110,795
Chicago, Burlington & Quincy	9,129	4,798,015	1,194,470	7,038,296	1,009,413	1,210,196	118,066	2,452,212	154,902	4,944,789	2,360,856	940	436,395	2,311,636	116,279
Chicago Great Western	1,496	1,196,860	202,701	1,670,607	100,179	167,982	45,458	454,795	34,902	803,316	867,291	509	57,583	42,490	—16,230
Chicago, Indiana & Southern	359	315,499	21,148	353,609	40,172	45,677	7,298	174,515	11,355	295,257	58,352				
Chicago, Indianapolis & Louisville	617	321,927	111,828	481,354	71,663	65,657	15,774	202,950	12,883	391,947	93,377		23,214	70,143	—10,805
Chicago Junction	1			145,250	13,044	13,592	996	85,666	3,137	116,435	28,815		2,250	26,565	1,146
Chicago, Milwaukee & St. Paul	9,593	4,847,104	1,027,654	6,564,397	599,957	1,311,992	143,834	3,195,216	180,032	5,430,631	1,063,766	—10,887	328,391	857,483	26,849
Chicago, Peoria & St. Louis	161	73,455	22,828	123,357	14,745	25,092	6,924	70,105	6,784	122,650	—4,293		4,300	—8,593	—19,143
Chicago, Rock Island & Gulf	255	209,106	53,278	279,692	29,036	39,829	10,056	105,988	6,450	193,359	86,333	—672	9,000	76,661	—2,277
Chicago, Rock Island & Pacific	7,566	3,285,242	1,281,168	4,916,733	483,432	772,484	157,334	2,126,670	138,612	4,019,927	896,824	20,654	236,459	639,711	—175,367
Chicago, St. Paul, Minneapolis & Omaha	1,744	1,139,972	346,482	1,547,358	96,567	181,282	30,973	581,006	34,996	924,734	322,624	—3,431	67,432	251,760	93,840
Chicago, Terre Haute & Southeastern	351	123,288	15,034	141,823	16,018	30,573	2,826	62,324	17,661	137,438	111,488	—341	10,000	101,147	—25,932
Cincinnati, Hamilton & Dayton	1,015	566,672	104,590	729,329	57,706	131,127	18,420	362,324	17,661	637,438	111,488		34,213	77,175	1,371
Cincinnati Northern	245	82,077	12,780	99,451	16,679	27,251	2,995	45,747	3,254	95,926	3,525		1,935	1,590	—16,230
Cleveland, Cincinnati, Chic. & St. Louis	2,014	1,881,844	$32,091	2,656,525	275,028	527,246	48,839	1,464,832	54,927	2,135,822	$20,903	—3,905	103,890	413,198	68,726
Colorado & Southern	1,330	84,796	19,852	108,486	14,734	23,016	6,512	53,478	5,694	113,424	—4,935	—176	8,000	—13,111	—18,821
Colorado & Southern	1,060	546,687	90,015	681,652	63,103	166,033	9,495	225,138	21,962	485,727	195,925	—965	39,175	155,785	24,096
Cumberland Valley	161	126,042	47,188	207,503	16,374	39,011	4,340	110,115	7,652	207,382	80,121	—374	5,702	74,145	24,606
Delaware & Hudson	854	1,691,757	192,884	1,944,913	138,990	286,525	20,308	687,607	58,235	1,191,665	753,248	—1,958	49,700	701,590	102,535
Delaware, Lackawanna & Western	958	2,159,547	535,458	2,896,011	267,860	492,159	62,004	963,870	66,098	1,794,000	1,102,011	38,910	165,000	975,921	156,115
Denver & Rio Grande	2,565	1,303,803	294,562	1,707,656	129,460	257,759	42,297	590,842	51,333	1,147,691	559,965	—6,611	80,400	475,954	177,436
Denver, Northwestern & Pacific	215	50,289	9,532	63,857	9,670	15,429	1,742	27,770	6,566	61,177	2,680		4,500	—2,820	—2,163
Detroit & Mackinac	411	61,948	19,924	89,213	8,592	14,725	2,516	36,814	3,023	65,623	23,590	—126	8,379	15,185	—2,263
Detroit & Toledo Shore Line	79	125,510		129,412	12,702	7,485	1,377	34,586	2,252	51,154	74,548		7,237	67,311	21,253
Detroit, Grand Haven & Milwaukee	191	101,000	35,000	159,897	18,965	29,425	6,427	109,250	4,719	168,786	—8,889	—667	6,000	—14,889	6,281
Detroit River Tunnel	2			109,434	2,228	2,737	9,311	73	13	14,449	94,985		6,000	88,985	18,506
Detroit, Toledo & Ironton	441	100,734	9,325	120,430	35,069	66,666	2,567	74,860	4,898	184,060	—63,630		5,000	—68,630	—8,854
Duluth & Iron Range	272	79,798	20,011	108,082	35,264	39,014	847	45,911	4,403	125,439	—53,870		2,738	5,541	—62,101
Duluth, Missabe & Northern	350	254,544	29,476	302,901	47,323	70,272	1,964	72,939	12,297	204,795	—101,894	—1,031	5,495	—108,420	—8,690
Duluth, South Shore & Atlantic	627	172,035	52,613	237,387	37,379	36,055	8,274	113,088	7,237	202,033	35,354	—703	18,000	16,651	76,817
El Paso & Southwestern Co	2,230	613,705	101,652	743,916	93,325	107,995	14,758	214,805	27,685	458,598	285,318	—1,543	35,000	248,775	1,075
Elgin, Joliet & Eastern	814	948,240	7	1,016,915	108,487	179,114	5,218	333,672	16,275	642,766	374,149		49,720	324,429	29,245
Erie	1,980	3,008,679	604,824	3,992,458	304,957	789,231	100,197	1,487,426	94,664	2,776,475	1,215,983	—60,900	152,835	1,002,248	189,429
Florida East Coast	644	246,957	338,342	663,498	61,424	75,021	9,388	219,765	10,669	376,267	287,231	—1,796	18,500	266,935	20,726
Fort Worth & Denver City	454	285,413	98,939	405,006	48,328	85,047	6,490	166,223	12,647	318,744	86,262	—500	9,087	76,675	2,787
Galveston, Harrisburg & San Antonio	1,338	628,246	266,726	955,784	123,412	215,344	17,973	455,281	28,259	859,269	96,515	7,888	27,726	76,677	—72,552
Georgia, Southern & Florida	395	127,128	74,878	235,233	25,594	35,127	7,297	90,247	8,983	167,248	57,985		10,333	47,652	6,130

Average mileage operated during previous period—3 8,201; 4 662; 5 4,526; 6 4,434; 8 628; 9 572; 10 672; 11 2,281; 13 7,928; 15 9,074; 16 9,570; 17 7,551; 18 2,012; 20 1,053; 23 852; 24 2,545; 25 358; 28 274; 30 342; 32 624; 33 902; 34 841; 36 1,995; 38 630. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1913.—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Operating expenses—Maintenance—Way and structures.	equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Grand Rapids & Indiana	578	$588,825	$95,706	$382,846	$63,353	$81,667	$10,891	$189,595	$15,703	$361,119	$21,727	.....	$23,641	—$1,914	—$14,685
Grand Trunk Western	247	352,090	132,009	517,794	59,648	79,186	20,857	270,274	14,922	424,888	92,906	.....	29,871	61,661	7,316
Great Northern	7,782	3,278,361	938,034	4,589,743	584,373	752,671	97,928	1,651,401	112,751	3,200,024	1,389,719	—14,745	290,028	1,084,946	—242,813
Gulf, Colorado & Santa Fe	1,595	753,639	189,271	1,011,212	172,987	170,988	22,256	416,443	20,008	826,162	185,046	68,948	.....	8,726	68,233	10,773
Houston, East & West Texas	192	80,297	26,238	108,892	23,259	11,548	2,186	41,828	3,842	81,663	28,229	.....	3,833	24,396	—347
Houston & Texas Central	289	347,995	114,174	504,662	81,867	68,181	15,218	221,397	16,815	426,816	67,926	—791	19,957	46,278	116,630
Illinois Central	4,763	3,494,193	1,017,349	5,108,257	531,491	1,052,995	109,354	2,058,037	124,058	3,817,037	1,241,200	1,835	245,750	997,285	486,829
Indiana Harbor Belt	105	.....	.....	940,619	92,179	26,013	2,499	140,127	8,424	269,253	65,426	369	5,500	61,195	—98
International & Great Northern	1,160	592,194	174,803	827,734	105,420	94,570	20,230	294,955	19,455	704,116	123,624	—1,129	30,000	92,494	—36
Kanawha & Michigan	172	291,935	20,149	333,319	37,201	55,837	2,291	73,128	6,948	189,407	52,912	—10	8,524	44,378	—8,680
Kansas City Southern	327	660,644	174,916	906,278	68,140	102,205	26,321	301,127	23,788	531,954	274,294	.....	41,142	233,152	4,089
Lake Erie & Western	906	377,870	59,409	464,522	58,073	100,492	17,718	209,409	12,480	398,460	66,207	81,263	20,000	61,263	476
Lake Shore & Michigan Southern	1,467	3,320,108	826,660	4,636,664	653,837	898,536	70,518	1,625,181	88,547	3,286,719	1,351,925	—4,176	150,000	1,197,749	143,823
Lehigh & Hudson River	97	228,165	57,974	340,627	9,910	20,886	1,318	58,615	3,274	92,505	47,152	.....	4,000	43,122	—19,764
Lehigh Valley	1,457	2,668,240	781,035	3,571,330	326,014	584,236	68,253	1,131,764	67,970	2,187,357	683,973	—27,238	118,500	737,735	35,592
Long Island	393	537,23	410,065	1,077,146	115,216	109,371	9,327	395,616	15,949	655,481	21,665	—1,029	59,936	—39,302	9,131
Louisiana & Arkansas	255	145,347	15,369	182,792	19,353	29,478	2,698	68,852	3,950	84,330	48,462	.....	4,800	43,662	—5,229
Louisiana & Navigation	1,920	1,444,389	348,746	1,989,900	208,294	392,900	67,208	930,130	63,041	1,670,575	319,324	—3,742	95,000	220,582	77,479
Louisiana Western	298	157,153	56,931	236,789	28,582	39,666	7,376	76,653	5,824	147,934	44,871	—601	7,200	37,070	—1,814
Louisville & Nashville	4,319	3,508,240	994,678	4,792,819	850,990	906,470	102,973	1,665,715	129,467	3,655,615	1,142,204	6,247	154,741	993,710	—155,155
Louisville, Henderson & St. Louis	200	235,525	23,315	292,452	21,649	31,567	4,195	58,670	2,943	129,114	18,338	192	3,000	15,530	—11,657
Maine Central	1,206	574,784	199,470	824,670	118,838	132,779	9,436	240,645	12,984	530,607	294,062	—6,199	46,737	163,326	—7,009
Michigan Central	1,817	1,867,929	540,563	2,681,351	294,130	428,879	60,932	1,225,208	51,096	2,114,165	567,186	—4,323	116,000	446,864	96,348
Midland Valley	172	111,063	31,502	154,463	23,629	24,463	2,424	45,518	5,117	98,918	6,684	—89	5,984	631	—16,056
Minneapolis & St. Louis	1,886	599,450	122,584	761,175	77,899	102,831	18,264	308,791	20,514	527,799	233,376	.....	31,995	201,381	14,156
Minneapolis, St. Paul & Sault Ste. Marie	3,990	1,658,805	371,622	2,149,913	162,814	335,456	47,341	881,861	55,729	1,562,201	646,714	587	128,190	519,111	115,205
Missouri, Kansas & Texas System	1,817	1,013,674	213,674	1,309,160	165,317	278,496	60,127	1,044,417	91,972	1,528,112	220,848	—3,967	105,572	476,309	77,479
Missouri Pacific	3,920	1,444,389	348,746	1,989,900	208,294	392,900	67,208	930,130	63,041	1,670,575	319,324	—3,742	95,000	220,582	77,479
Mobile & Ohio	1,114	794,161	180,602	972,824	125,158	153,702	37,941	376,578	32,467	752,711	226,112	—1,812	30,140	194,161	—196
Monongahela	65	142,015	2,411	146,576	11,694	17,060	237	82,869	1,959	95,743	86,833	.....	2,200	84,632	10,911
Morgan's La. & T. R. & S. S. Co.	404	276,977	93,460	394,936	85,812	50,629	13,233	170,076	11,733	333,483	11,452	—1,965	18,500	—9,012	—2,771
Nashville, Chattanooga & St. Louis	1,114	797,700	220,267	1,109,721	172,294	139,755	39,864	344,645	26,474	723,032	233,029	—222	26,110	206,698	—6,424
Nevada Northern	165	118,702	12,119	133,478	13,059	16,955	896	35,925	1,327	69,712	53,465	.....	2,650	50,815	—4,240
New Orleans & North Eastern	196	228,174	34,909	311,304	29,078	57,619	9,714	121,583	12,147	230,141	83,163	—1,336	11,250	71,555	—2,194
New Orleans Great Northern	283	119,008	27,857	156,633	31,080	15,814	2,451	67,647	6,742	123,858	60,075	—5	2,523	66,547	30,198
New Orleans, Texas & Mexico	227	110,209	16,840	134,852	18,822	13,396	3,339	63,595	8,111	107,563	27,289	.....	4,250	27,918	—2,871
New York Central & Hudson River	3,725	15,172,866	6,064,326	23,184,790	1,048,121	1,650,750	154,544	3,446,302	240,334	6,560,981	1,690,359	5,811	547,005	1,149,165	514,723
New York, Chicago & St. Louis	534	916,953	79,990	1,027,651	84,857	189,454	48,945	497,739	17,644	838,483	189,168	—2,632	32,000	154,536	5,243
New York, New Haven & Hartford	2,091	5,458,094	3,490,829	9,934,514	511,209	816,446	26,075	2,315,609	161,063	3,830,393	1,122,161	—23,825	310,000	789,336	—550,925
New York, Ontario & Western	566	570,236	67,384	669,293	63,268	112,712	10,786	261,150	16,344	501,251	167,940	—4,024	15,166	145,750	—9,650
New York, Philadelphia & Norfolk	112	220,332	30,453	267,813	21,222	32,762	3,590	140,263	12,651	220,643	45,702	—1,965	18,500	25,237	—19,870
New York, Susquehanna & Western	444	254,656	40,061	327,447	34,000	39,023	2,582	104,210	5,807	158,674	68,773	—16,955	14,673	35,145	—23,741
Norfolk & Western	2,019	2,984,727	311,116	3,411,532	346,327	716,390	54,466	1,113,618	64,324	2,295,574	1,102,054	—1,196	122,000	978,858	143,204
Norfolk Southern	562	304,863	51,692	378,882	30,093	38,476	4,864	96,147	16,242	182,804	96,078	—558	7,309	88,031	12,712
Northern Central	427	1,267,256	368,286	1,692,099	110,865	240,973	5,818	524,498	27,698	948,763	63,233	168	42,268	21,133	12,499
Northern Pacific	6,240	3,366,786	938,127	4,511,326	548,672	599,960	114,446	1,899,621	43,965	3,236,664	1,274,934	7,054	328,464	1,053,525	—90,974
Northwestern Pacific	401	264,067	123,099	420,695	38,041	41,409	4,032	107,530	13,228	199,245	31,380	.....	12,579	18,781	18,863
Oregon Short Line	1,923	1,171,036	283,911	1,564,591	134,592	195,974	41,457	517,251	30,457	1,078,457	706,014	—2,060	99,345	604,609	—61,705
Oregon-Washington R. & N. Co.	1,919	855,009	301,369	1,235,671	167,010	147,740	39,199	358,210	52,112	964,271	294,690	—2,265	90,674	195,661	—61,705
Pecos & Northern Texas	479	142,832	15,930	185,509	21,214	40,174	7,493	79,251	6,030	149,960	35,669	.....	6,325	29,284	—23,554
Pennsylvania Co.	1,751	3,271,176	634,870	4,327,191	764,469	970,372	61,890	1,701,934	101,974	3,611,639	577,902	—2,087	238,264	337,551	—208,594
Pennsylvania Railroad	4,025	10,225,314	2,374,604	13,715,461	1,856,241	2,979,417	183,853	5,458,891	354,698	10,833,220	2,885,241	—177,442	569,750	2,138,049	—183,097
Peoria & Eastern	352	96,036	45,040	292,993	31,225	65,623	6,931	98,211	5,272	211,717	61,276	.....	10,466	51,376	—1,943
Pere Marquette	2,330	904,320	240,859	1,244,568	182,245	215,054	30,679	555,384	33,330	1,036,702	207,866	39,799	43,023	164,842	31,169
Philadelphia & Reading	1,015	3,347,375	1,546,259	5,918,238	223,868	709,529	39,060	1,782,871	58,546	2,863,695	1,454,692	39,136	86,530	1,407,298	293,558
Philadelphia, Baltimore & Washington	713	732,956	613,059	1,507,912	164,248	168,857	30,492	444,624	41,295	1,023,837	484,075	.....	139,379	344,695	118,014
Pittsburgh & Lake Erie	230	1,279,234	131,468	1,455,637	157,085	230,060	11,506	377,907	26,333	802,971	652,656	—668	36,200	615,788	51,872
Pittsburgh, Cincinnati, Chic & St. Louis	1,427	2,590,064	1,366,906	3,452,218	455,319	774,207	60,955	1,441,822	73,896	2,774,249	644,429	—1,763	135,877	506,789	—118,360
Pittsburgh, Shawmut & Northern	279	176,759	7,387	186,461	35,241	42,431	1,056	62,222	3,841	144,791	41,670	.....	1,575	40,094	—22,982
Port Reading	21	135,898	.....	138,606	7,167	78	30	45,339	110	48,874	79,732	5,392	8,000	77,124	—5,689
Rochester & Pittsburgh	885	116,115	98,083	241,614	17,383	22,674	2,802	89,798	7,084	139,742	101,872	—176	722	101,024	15,465
Rutland	468	136,613	70,884	239,448	27,057	52,815	6,639	114,467	6,392	207,370	31,878	.....	2,665	29,213	—2,252
St. Joseph & Grand Island	219	64,350	23,166	100,419	17,422	18,959	4,738	34,640	5,142	100,971	—552	268	6,244	—6,528	—12,018
St. Louis & San Francisco	4,742	3,267,621	764,198	4,273,751	259,462	451,994	86,679	1,246,645	98,334	2,143,374	1,130,377	.....	163,190	967,187	196,006
St. Louis, Brownsville & Mexico	518	110,362	29,480	227,194	38,903	27,428	4,020	118,522	10,586	199,461	27,733	.....	5,500	22,233	—18,909
St. Louis, Iron Mountain & Southern	3,365	1,979,994	496,602	2,691,743	306,181	373,421	63,659	881,386	66,443	1,691,100	1,000,643	—9,128	88,695	905,820	36,339
St. Louis Merchants' Bridge Terminal	9	.....	.....	360	168,795	36,014	10,845	748	100,066	6,426	154,899	14,696	.....	5,600	9,096	—24,589

Average mileage operated during previous period—[a] 586; [b] 7,345; [c] 1,597; [d] 886; [e] 1,775; [f] 1,450; [g] 4,705; [h] 1,204; [i] 3,770; [j] 3,399; [k] 3,915; [l] 1,230; [m] 3,597; [n] 562; [o] 152; [p] 2,014; [q] 473; [r] 6,034; [s] 404; [t] 1,762; [u] 1,920; [v] 1,760; [w] 4,018; [x] 215; [y] 1,467; [z] 278; [aa] 83; [ab] 4,232; [ac] 310; [ad] 3,314. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1913.—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Maintenance—Way and structures.	Of equipment.	Operating expenses—Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
St. Louis, San Francisco & Texas	244	$82,170	$20,459	$115,540	$17,472	$14,655	$2,272	$51,456	$6,431	$92,386	$23,154	.....	$1,225	$21,929	$19,822
St. Louis Southwestern	906.85	557,627	108,007	703,851	11,527	83,970	30,310	204,015	25,158	354,990	348,861	—$1,332	26,796	320,733	53,336
St. Louis Southwestern of Texas	703	242,544	68,880	346,233	79,395	66,895	14,030	173,235	19,373	352,928	—16,695	—152	11,228	—28,075	16,786
San Antonio & Aransas Pass	737	222,721	56,903	316,227	72,986	56,544	5,642	165,764	11,483	312,419	23,808	.....	11,000	12,808	—29,116
San Pedro, Los Angeles & Salt Lake	1,135.00	492,361	246,805	797,570	83,272	146,532	32,301	262,426	18,524	543,055	254,515	—952	34,007	219,556	83,629
Seaboard	3,070	1,479,173	451,260	2,161,399	250,482	302,197	66,068	772,234	91,468	1,453,446	707,950	186	115,000	592,136	115,100
Southern	7,631.27	3,605,174	1,257,844	5,286,551	740,978	862,914	140,021	1,979,963	353,873	4,370,202	916,349	5,564	284,565	1,127,210	—60,866
Southern in Mississippi	281	43,626	17,630	67,344	31,524	7,269	2,496	40,080	4,273	85,642	—18,298	.....	8,081	—26,379	—44,921
Southern Kansas of Texas	176	84,163	15,015	103,806	15,758	23,796	2,082	35,956	3,584	76,876	26,930	.....	2,328	24,602	24,336
Southern Pacific Co.	6,323.96	3,934,936	2,319,367	6,739,731	830,501	1,051,425	181,731	2,135,640	225,432	4,424,729	2,315,002	103,022	373,451	2,044,573	—255,785
Spokane, Portland & Seattle	556.00	215,442	96,515	337,109	52,596	37,053	6,163	108,119	13,770	217,701	119,408	—1,155	53,400	64,853	—45,431
Tennessee Central	274	92,594	29,699	130,791	23,336	14,853	4,982	47,062	7,761	97,986	32,805	.....	6,265	26,540	10,904
Terminal R. R. Ass'n of St. Louis	34.00	.....	277	236,351	36,201	17,014	972	101,657	6,383	162,227	74,124	8,651	25,560	57,215	—16,265
Texas & New Orleans	455	230,978	89,245	366,459	52,733	51,159	8,698	156,762	11,937	306,583	59,876	1,403	12,672	21,542	—13,593
Texas & Pacific	1,885	939,987	306,041	1,324,284	170,975	228,047	32,785	658,678	43,248	1,133,733	190,551	—1,335	48,648	140,568	30,181
Toledo & Ohio Central	443	335,962	62,776	395,671	63,232	73,838	6,829	162,884	9,141	315,924	79,747	—517	21,604	57,626	12,175
Toledo, Peoria & Western	248	71,236	33,895	110,138	19,139	25,030	1,909	42,846	3,431	92,375	17,763	.....	5,900	11,863	—5,761
Toledo, St. Louis & Western	451	319,523	21,376	360,835	30,848	44,687	15,320	138,529	8,596	237,980	122,855	.....	15,000	107,855	60,134
Trinity & Brazos Valley	463	164,163	52,275	241,552	46,144	29,164	11,115	79,149	14,130	238,798	—12,590	.....	3,500	—16,090	—59,171
Union Pacific	3,576.81	2,433,353	667,179	3,504,652	292,817	472,352	86,296	1,079,456	116,778	2,047,699	1,456,953	—10,395	168,350	1,278,208	155,583
Union R. R. of Baltimore	9	129,919	20,714	152,330	7,183	.....	1,140	5,174	2,958	16,455	135,875	.....	5,527	130,348	33,753
Union R. R. of Pennsylvania	25	.....	.....	151,552	29,166	31,219	112	145,932	2,692	209,161	—17,559	—599	15,500	—33,058	—21,782
Vandalia	827	178,973	178,235	870,712	111,014	190,130	24,106	365,560	17,800	910,610	160,102	.....	30,316	129,786	—28,009
Vicksburg, Shreveport & Pacific	171	82,997	34,926	131,228	22,520	27,882	3,650	49,902	5,001	108,955	22,273	—131	6,900	15,242	—14,558
Virginia & Southwestern	240	78,830	11,776	145,115	21,093	30,400	1,640	40,124	3,445	96,704	48,412	.....	12,232	40,980	344
Virginian	503.00	506,751	22,661	541,762	59,543	97,559	4,918	126,169	8,852	297,041	244,721	5,830	17,600	232,951	103,613
Washington Southern	36	34,124	42,999	108,950	11,173	15,778	1,234	45,432	3,079	76,796	32,030	—160	3,298	28,572	—2,316
West Jersey & Seashore	356	120,982	197,264	340,588	73,629	65,485	10,146	192,600	13,316	355,176	—14,588	—6,246	25,336	—46,170	2,526
Western Pacific	937	341,941	69,384	422,148	69,355	37,856	26,702	191,274	24,619	349,806	72,342	—2,131	25,474	44,720	63,205
Western Ry. of Alabama	133	75,254	41,524	122,153	17,555	20,714	3,579	34,129	5,701	81,678	36,675	291	4,979	31,273	7,076
Wheeling & Lake Erie	459.00	467,279	37,013	538,281	54,323	129,919	7,433	216,391	18,734	426,850	111,431	1,265	29,177	83,519	—67,500
Yazoo & Mississippi Valley	1,374	604,301	172,854	847,082	174,797	145,992	14,076	377,316	24,845	737,026	110,056	419	37,000	73,475	—86,201

EIGHT MONTHS OF FISCAL YEAR, 1913

Alabama & Vicksburg	143	$822,534	$335,982	$1,243,495	$180,925	$225,561	$29,053	$428,498	$45,265	$918,352	$325,143	—$1,434	$46,386	$275,323	$31,045
Ann Arbor	292	914,993	286,158	1,395,027	185,821	183,561	23,209	407,827	30,038	959,534	435,538	—4,410	41,438	389,690	—74,240
Arizona Eastern	366	1,356,406	301,171	1,743,349	173,474	158,121	20,290	442,217	68,117	845,219	908,130	582	68,742	839,970	314,993
Atchison, Topeka & Santa Fe	8,247	44,367,384	17,220,665	66,716,427	11,031,164	11,089,788	1,374,133	19,040,721	1,301,412	43,837,284	22,879,259	.....	2,719,268	20,159,991	2,354,235
Atlantic & St. Lawrence	120	276,929	218,566	1,126,096	108,277	176,660	36,625	356,864	31,355	1,039,818	86,280	.....	—445	86,725	—27,315
Atlanta, Birmingham & Atlantic	645.8	1,581,117	459,374	2,182,604	357,536	343,987	125,753	861,466	92,718	1,781,460	401,144	.....	107,810	293,294	—172,192
Atlanta & West Point	93	435,155	325,753	851,493	105,359	152,141	43,949	278,330	40,264	617,143	235,350	—3,226	50,751	185,325	—12,804
Atlantic City	167	567,209	893,004	1,494,750	192,284	197,912	34,129	767,211	11,436	1,147,566	337,184	—29,847	72,000	235,337	74,521
Atlantic Coast Line	4,613.9	15,852,320	6,005,328	23,594,040	3,303,453	3,610,710	412,007	8,256,700	612,095	16,094,965	7,499,075	.....	780,052	6,516,985	204,018
Baltimore & Ohio—System	4,455.1	53,809,983	10,462,652	68,251,249	9,393,256	12,662,110	1,314,490	24,425,241	1,324,756	48,489,565	19,726,647	—578,627	1,956,203	17,261,817	1,777,896
Baltimore & Ohio Chicago Terminal	77	.....	16,926	1,203,286	164,361	189,261	5,711	552,420	36,363	948,116	255,170	7,039	152,922	109,287	75,780
Bangor & Aroostook	631.0	1,469,036	428,383	2,016,660	362,231	258,899	27,051	698,926	97,818	1,441,915	574,745	.....	84,000	490,745	—218,593
Belt Ry. Co. of Chicago	21	.....	.....	2,125,149	127,207	252,292	3,911	996,541	43,981	1,423,932	701,217	.....	90,000	611,217	68,615
Bessemer & Lake Erie	204	5,517,504	355,576	5,860,532	632,207	1,079,215	24,978	1,439,510	91,102	3,317,013	2,543,509	.....	90,000	2,453,509	768,292
Boston & Maine	2,244	19,319,983	11,061,230	32,886,170	3,892,893	5,002,839	270,615	15,469,956	803,327	25,439,630	7,446,540	121,587	1,440,664	6,005,876	104,286
Buffalo & Susquehanna R. R.	265	1,104,162	67,685	1,205,767	232,557	179,640	9,605	413,834	47,144	882,780	322,987	.....	17,600	305,387	93,071
Buffalo & Susquehanna Ry.	91	334,109	77,344	430,680	91,098	222,063	3,739	181,054	21,197	519,061	—88,381	119	12,400	—100,662	—33,361
Buffalo, Rochester & Pittsburgh	574.6	6,749,306	771,790	7,789,558	1,197,191	1,482,824	52,042	2,465,926	153,408	5,351,391	2,260,098	—3,227	301,000	1,956,871	—1,247,457
Butte, Anaconda & Pacific	46	701,427	91,856	871,947	111,318	179,007	5,916	429,232	23,708	749,181	122,766	.....	16,639	106,127	—31,647
Canadian Pacific Lines in Maine	233	607,074	214,138	881,320	124,692	130,247	47,062	383,143	41,145	836,289	45,031	.....	60,000	—14,969	—31,545
Carolina, Clinchfield & Ohio	238	1,469,732	122,606	1,627,179	110,632	167,126	54,497	281,357	59,278	672,890	954,289	.....	64,000	890,289	189,149
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	89,350	13,349	104,556	6,661	722	8,437	20,382	3,502	39,704	64,852	.....	4,000	60,852	6,103
Central of Georgia	1,915	6,052,729	2,668,212	9,571,947	1,368,001	1,722,623	283,539	3,246,912	311,445	6,932,506	2,639,440	49,573	402,950	2,286,051	—289,533
Central of New Jersey	676.7	14,531,721	3,737,418	19,334,796	1,645,564	2,766,324	241,960	5,694,888	340,965	10,689,701	8,645,095	22,798	994,167	7,673,726	820,734
Central New England	277	2,130,983	234,830	2,484,443	235,229	9,457	69,876	1,995,763	28,215	2,396,963	1,157,480	—3,597	84,000	1,069,883	68,109
Central Vermont	411	3,799,969	773,544	5,700,555	325,949	495,243	65,856	1,395,812	70,197	2,353,057	437,498	1,537	105,471	333,564	—90,012
Charleston & Western Carolina	341	945,365	251,807	1,261,970	227,406	200,133	26,283	476,428	37,578	967,828	294,142	.....	40,000	254,142	—41,966
Chesapeake & Ohio Lines	2,324.8	18,862,118	3,959,670	23,872,181	2,745,574	3,059,206	449,095	7,498,192	525,882	16,267,954	7,554,227	28,868	867,240	6,715,855	—231,407
Chicago & Alton	1,026	6,814,596	2,894,429	10,493,335	1,585,626	2,418,749	346,601	3,850,701	264,652	8,466,329	2,027,006	—18,672	307,700	1,700,634	—463,970
Chicago & Eastern Illinois	1,275	8,144,847	2,081,033	11,098,702	1,361,718	2,263,647	202,214	4,125,838	334,650	8,293,067	2,805,635	—21,783	351,045	2,432,807	—195,753
Chicago & Erie	250	2,916,470	501,189	3,770,309	649,056	799,391	167,611	1,918,836	88,709	3,623,603	146,666	—8,901	105,355	32,363	—249,842
Chicago & Northwestern	7,976.8	37,038,875	14,159,805	56,365,266	7,039,964	7,907,395	917,001	21,669,611	1,035,514	38,569,485	17,795,781	13,663	2,424,000	15,384,444	3,945,930
Chicago, Burlington & Quincy	9,129.00	44,255,314	15,240,919	65,372,143	6,507,532	10,667,836	1,046,396	20,224,548	1,715,223	40,161,535	25,210,608	—115,804	2,272,549	22,831,815	4,195,844

Average mileage operated during previous period—[a] 843; [b] 1,116; [c] 7,089; [d] 6,203; [e] 551; [f] 35; [g] 3,537; [h] 475; [i] 457; [j] 1 8,081; [k] 662; [l] 4,526; [m] 4,434; [n] 628; [o] 572; [p] 672; [q] 2,281; [r] 7,928; [s] 9,014.

— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

EIGHT MONTHS OF FISCAL YEAR, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Maintenance		Operating expenses				Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Chicago Great Western	1,496	$6,579,019	$2,161,090	$9,455,443	$1,069,989	$1,334,199	$370,819	$3,706,898	$275,587	$6,757,492	$2,697,951	$129	$282,267	$2,415,813	$621,835
Chicago, Indiana & Southern	339	1,657,204	203,984	2,959,747	375,125	734,200	64,361	997,219	74,409	2,243,316	716,431	3,478	134,271	585,638	291,741
Chicago, Indianapolis & Louisville	617	3,092,576	1,137,011	4,657,596	656,924	634,441	143,805	1,746,643	119,895	3,301,708	1,355,888	.....	183,341	1,170,547	70,036
Chicago Junction	12	.....	.....	1,313,830	9,264	6,344	2,920	63,144	28,602	910,324	403,506	.....	13,099	392,407	45,490
Chicago, Milwaukee & St. Paul	9,592	46,521,249	12,620,999	64,358,302	6,886,328	9,120,056	1,283,096	23,773,253	814,099	41,876,832	22,473,470	130,906	2,521,717	20,082,649	7,829,479
Chicago, Peoria & St. Louis	255	202,037	43,355	260,347	34,515	44,040	14,522	136,308	14,546	244,551	15,796	.....	8,600	7,196	—4,851
Chicago, Rock Island & Gulf	477	1,717,616	463,869	2,342,364	263,877	267,845	81,796	809,509	64,912	1,627,944	914,420	—4,906	57,005	852,429	166,983
Chicago, Rock Island & Pacific	7,566	30,448,965	13,208,901	46,473,752	6,808,606	6,619,557	1,255,996	18,546,521	1,106,312	34,337,042	12,136,710	—130,632	1,908,541	10,097,537	1,166,767
Chicago, St. Paul, Minneapolis & Omaha	1,744	7,498,446	3,465,019	11,730,351	1,471,312	1,490,336	231,567	2,611,254	258,882	6,063,372	5,667,979	—2,548	359,689	5,113,742	520,435
Chicago, Terre Haute & Southeastern	351	1,165,308	143,550	1,441,885	209,065	256,205	24,787	428,423	61,317	979,797	462,088	—1,517	80,000	280,571	—80,254
Cincinnati, Hamilton & Dayton	1,015	5,231,315	1,728,740	7,088,544	809,898	1,228,948	159,097	2,959,250	155,670	5,312,853	1,775,691	.....	285,525	1,490,166	—8,868
Cincinnati Northern	45	80,005	149,248	249,253	29,611	40,220	21,085	79,923	16,328	208,168	41,085	.....	6,862	34,223	—8,868
Cleveland, Cincinnati, Chic. & St. Louis	2,014	16,092,798	5,463,468	23,403,948	2,635,898	4,206,291	562,872	9,004,044	461,831	16,970,936	6,433,012	—10,717	827,843	5,594,452	837,832
Colorado & Southern	328	1,149,017	188,475	1,361,111	168,578	273,045	56,230	580,444	44,853	1,113,869	247,242	746	69,600	160,048	—34,049
Colorado & Southern	1,069	4,634,861	982,335	6,001,628	769,410	1,311,440	83,866	1,783,003	174,960	4,132,679	1,868,949	—6,140	234,559	1,628,250	—34,660
Cumberland Valley	162	1,738,305	479,552	2,324,760	413,788	279,534	35,486	769,841	65,392	1,564,401	760,359	251	48,431	712,179	139,090
Delaware & Hudson Co. & R. R. Bds.	854	13,606,572	1,163,453	16,241,174	1,267,220	2,126,630	189,244	5,497,544	447,594	11,709,864	4,531,309	—62,236	405,266	4,063,808	472,761
Delaware, Lackawanna & Western	958	20,094,357	5,467,355	27,485,177	3,052,537	4,099,652	527,842	8,348,655	527,804	16,556,450	10,928,727	422,912	1,088,340	10,263,299	1,985,089
Denver & Rio Grande	2,359	11,714,462	3,601,162	17,067,588	2,091,515	3,016,978	374,959	5,520,360	457,531	11,461,334	5,606,254	4,123	641,300	4,967,077	1,103,641
Detroit, Toledo & Ironton	415	561,601	211,424	809,283	122,730	132,252	15,301	267,532	38,232	576,047	233,236	.....	28,000	205,236	—30,698
Detroit & Mackinac	411	509,742	235,468	803,664	119,952	112,019	18,045	294,292	23,399	566,807	236,857	1,214	69,961	168,110	30,736
Detroit & Lehigh Valley	29	90,662	.....	104,837	18,699	22,793	9,702	49,903	18,665	118,178	13,121	.....	40,392	432,729	60,914
Detroit, Grand Haven & Milwaukee	191	1,020,992	452,284	1,704,100	432,292	212,801	56,383	864,035	39,702	1,605,206	98,952	516	23,625	74,811	—162,249
Detroit River Tunnel	2	.....	.....	842,153	17,516	22,288	.....	66,788	344	108,936	713,219	.....	37,507	675,712	—87,112
Duluth, Tusdale & Pontiac	441	973,800	116,266	1,179,356	254,181	344,218	31,369	574,212	42,272	1,076,453	93,903	312	47,000	46,891	—85,875
Duluth & Iron Range	272	4,510,069	170,495	4,755,096	560,717	465,106	7,613	1,045,349	102,827	2,181,612	2,573,484	13,895	229,909	2,362,470	—23,790
Duluth, Missabe & Northern	356	7,353,102	295,462	8,369,144	793,173	975,975	16,524	1,769,644	107,459	2,451,369	5,917,775	12,110	342,084	2,811,803	499,498
Duluth, South Shore & Atlantic	627	1,459,563	656,900	2,417,233	455,155	264,462	78,952	877,251	84,572	1,758,392	658,959	3,371	143,914	520,416	—103,500
El Paso & Southwestern Co.	974	4,750,361	725,178	5,731,914	643,136	763,877	108,767	1,550,411	209,943	3,276,134	2,455,780	—15,749	238,953	2,201,078	437,816
Erie Belt & Terminal	14	1,097,974	55	1,098,029	116,214	162,347	26,982	2,414,244	144,284	2,854,753	243,345	.....	24,000	219,345	—2,739,019
Erie	2,088	27,058,754	6,367,604	36,329,844	4,040,505	6,385,073	769,945	13,056,965	695,862	23,948,350	12,381,494	—241,579	1,479,214	10,960,101	1,275,602
Florida East Coast	1,104	1,309,033	1,189,942	3,083,183	1,124,402	1,041,202	64,151	1,134,222	75,270	3,041,178	1,980,166	—10,721	80,000	1,890,444	157,686
Fort Worth & Denver City	454	2,489,961	1,104,039	3,771,138	364,332	641,628	55,449	1,239,282	117,437	2,418,228	1,353,110	—4,201	88,372	1,260,536	48,959
Galveston, Harrisburg & San Antonio	1,358	5,746,418	2,144,508	8,325,384	801,692	1,750,674	268,938	3,262,803	247,338	6,330,725	1,994,659	—33,398	255,981	1,705,290	204,181
Georgia, Southern & Florida	305	1,204,918	556,030	1,760,887	203,656	240,010	61,533	476,867	52,892	1,034,957	725,930	—3,315	71,307	657,308	—6,045
Grand Rapids & Indiana	576	2,188,811	1,068,879	3,753,241	480,812	576,070	92,812	1,559,612	125,405	2,834,711	918,530	180	190,501	728,209	83,740
Grand Trunk Western	344	3,055,840	1,143,954	4,498,891	549,714	681,376	172,435	2,056,187	128,071	3,587,731	1,311,160	—11,907	239,017	1,060,184	48,988
Great Northern	7,093	37,230,511	10,110,063	52,350,930	6,271,307	7,324,268	1,134,548	14,940,848	860,636	28,957,360	23,393,570	113,579	2,327,976	21,065,594	2,825,875
Gulf & Ship Island	308	1,000,008	282,552	1,379,829	189,873	244,618	22,328	365,969	66,542	889,324	490,505	.....	51,955	438,550	29,573
Gulf, Colorado & Santa Fe	1,915	7,972,262	2,108,249	11,253,531	1,519,188	1,226,236	194,227	3,147,109	271,607	6,430,256	4,810,256	.....	693,960	4,116,296	649,220
Hocking Valley & West Texas	191	636,312	241,449	929,204	198,219	124,544	16,949	303,516	30,160	673,388	255,816	—241,579	28,407	227,409	—24,307
Houston & Texas Central	780	3,153,892	1,301,348	4,763,833	645,150	811,807	137,457	1,861,138	135,532	3,591,084	1,172,749	—10,705	153,437	1,008,607	332,554
Illinois Central	4,762	38,733,852	9,319,625	52,622,035	5,794,178	7,286,194	917,253	16,018,893	1,006,449	33,299,075	9,822,960	—61,487	1,950,000	7,811,547	3,026,033
Illinois Harbor Belt	105	.....	.....	2,134,483	231,613	254,531	21,391	928,027	52,544	1,488,106	646,377	17,250	44,553	619,074	179,522
International & Great Northern	1,190	5,893,752	1,793,905	8,125,451	1,070,110	1,361,264	221,499	2,536,356	172,593	5,361,822	2,763,629	—14,714	150,000	2,598,915	132,554
Kanawha & Michigan	127	1,096,583	256,492	2,200,792	301,744	400,992	18,681	631,825	51,633	1,404,875	795,917	—144	71,475	724,298	—33,355
Kansas City Southern	837	5,363,981	1,143,054	7,210,761	686,684	896,999	207,468	2,366,272	259,769	4,417,192	2,793,571	.....	300,772	2,492,799	675,248
Lake Erie & Western	706	5,265,046	1,416,815	7,127,126	1,273,926	1,236,392	96,855	1,564,040	860,636	28,957,360	1,311,579	2,275	163,130	1,033,184	148,459
Lake Shore & Michigan Southern	1,872	26,118,086	8,388,574	38,755,433	4,602,348	6,573,699	650,859	12,310,871	649,560	24,787,137	13,968,096	104,313	1,231,098	12,841,311	1,497,345
Lehigh & Hudson River	97	1,338,307	33,267	1,420,104	208,802	160,582	10,583	435,452	34,806	1,075,254	344,850	.....	47,000	297,850	12,580
Lehigh Valley	1,452	24,759,093	3,258,278	29,010,624	3,938,122	4,816,707	632,795	9,293,375	554,205	19,235,204	9,775,420	—116,124	942,000	8,717,296	1,339,861
Long Island	399	2,323,374	4,925,749	7,673,259	1,018,888	864,198	114,592	3,323,293	189,340	5,510,311	2,162,948	407,986	467,438	2,103,496	278,312
Louisiana & Arkansas	755	2,899,163	1,161,255	4,330,184	573,194	660,883	108,114	1,290,114	99,124	2,931,313	1,398,871	.....	32,902	1,365,969	24,787
Louisiana Ry. & Navigation	351	995,219	190,600	1,277,507	176,144	149,632	47,231	508,025	52,156	933,188	344,319	.....	42,000	302,319	—25,500
Louisiana & Western	208	1,993,458	464,366	2,524,014	354,004	344,553	34,533	1,014,889	45,527	1,603,504	920,510	99	61,176	859,433	139,227
Louisville & Nashville	4,911	28,759,467	8,705,377	39,941,712	6,615,874	7,537,532	838,313	12,985,759	920,907	28,898,385	11,043,327	—7,161	1,234,933	9,801,233	—796,119
Louisville, Henderson & St. Louis	200	517,651	214,328	828,923	221,537	107,658	35,191	309,881	25,032	699,299	129,624	1,907	24,000	107,531	—94,278
Maine Central	1,206	4,570,254	2,421,559	7,515,740	1,171,111	1,036,255	378,270	2,822,617	197,698	5,201,311	2,233,429	—25,466	250,818	1,857,145	192,233
Michigan Central	1,817	15,071,872	5,849,823	23,257,097	2,727,628	3,401,302	530,122	9,222,587	409,997	16,291,636	6,965,461	25,110	902,985	6,087,586	165,241
Midland Valley	373	661,960	325,083	1,041,118	254,273	171,794	21,041	340,252	44,290	831,650	209,468	1,904	47,741	163,631	—34,194
Minneapolis & St. Louis	1,566	5,078,639	1,281,713	6,858,017	858,017	843,907	141,801	2,577,976	167,311	4,589,012	2,150,960	—263	251,437	1,899,260	980,414
Minneapolis, St. Paul & Sault Ste. Marie	3,976	15,257,640	4,597,176	21,469,885	2,131,102	2,563,118	428,092	6,637,704	435,542	12,195,558	9,274,327	120,006	1,140,025	8,254,308	2,261,203
Missouri, Kansas & Texas System	3,817	15,012,390	6,458,669	22,790,995	3,016,869	2,785,426	591,431	8,205,483	692,555	15,201,764	7,589,231	—41,352	871,023	6,676,856	2,131,508
Missouri Pacific	3,920	14,260,487	3,516,965	19,353,609	2,945,657	3,428,969	489,014	8,021,528	538,118	15,423,286	3,930,323	—24,450	758,430	3,147,443	1,951,720
Mobile & Ohio	1,114	6,686,123	1,010,103	8,167,992	947,285	1,542,456	300,348	2,916,709	251,474	5,958,272	2,209,720	—11,649	239,984	1,958,087	38,983
Monongahela	65	1,083,709	19,268	1,117,582	126,670	80,789	2,726	213,188	16,178	439,560	678,002	.....	45,559	632,559	21,251
Morgan's La. & Tex. R. R. & S. S. Co.	404	2,232,899	765,217	3,174,329	574,499	497,564	102,897	1,319,622	89,640	2,584,222	590,107	—15,264	149,289	425,554	—403,326

†Figures shown here are for period January 1 to February 28, 1913.

Average mileage operated during previous period—1: 9,570; 2: 7,551; 3: 2,012; 4: 1,053; 5: 852; 6: 2,545; 7: 358; 8: 274; 9: 342; 10: 624; 11: 902; 12: 841; 13: 1,995; 14: 630; 15: 586; 16: 7,345; 17: 1,597; 18: 886; 19: 1,775; 20: 1,450; 21: 4,705; 22: 1,204; 23: 3,770; 24: 3,399; 25: 3,915. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

EIGHT MONTHS OF FISCAL YEAR, 1913— CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Operating expenses—Maintenance—Way and structures.	Equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Nashville, Chattanooga & St. Louis	1,231.38	$6,144,408	$2,112,499	$8,869,059	$1,367,539	$1,564,451	$316,620	$3,381,850	$233,196	$6,863,656	$2,006,303	—$4,758	$204,022	$1,797,523	$103,583
Nevada Northern	163	908,187	123,014	1,060,252	119,053	122,907	3,297	235,112	27,737	509,106	552,146	.....	49,306	502,840	52,748
New Orleans & North Eastern	196	1,829,121	438,857	2,456,967	257,405	472,094	78,965	958,095	98,586	1,865,145	591,822	—459	99,932	491,431	—130,856
New Orleans Great Northern	263	816,189	340,040	1,145,376	176,419	114,159	19,819	344,231	53,030	769,753	436,072	—866	17,385	418,221	87,496
New Orleans, Texas & Mexico	577	861,357	144,161	1,084,949	168,235	94,996	16,832	470,244	51,517	831,824	253,125	.....	16,280	236,845	80,507
New York Central & Hudson River	3,753.26	45,379,605	22,753,226	76,039,196	10,137,243	13,941,873	1,455,733	27,432,298	1,850,051	54,817,159	21,222,037	321,798	4,092,943	17,450,892	1,689,315
New York, Chicago & St. Louis	564.87	7,276,061	1,073,312	8,644,292	829,910	1,120,341	411,593	3,849,083	130,078	6,310,662	2,511,630	—11,751	265,383	2,262,275	262,840
New York, New Haven & Hartford	2,091	23,113,841	18,764,829	46,277,229	5,127,901	6,052,873	247,583	18,073,553	1,278,355	30,780,265	15,496,964	740,318	2,585,000	13,652,282	101,460
New York, Ontario & Western	566	4,899,561	1,211,287	6,425,181	796,840	965,845	84,352	2,491,203	134,000	4,356,246	2,070,435	—4,451	145,333	1,920,651	394,114
New York, Philadelphia & Norfolk	231.31	2,351,231	340,799	3,411,190	479,421	419,954	31,935	1,047,037	103,480	2,083,743	607,887	.....	63,400	544,487	53,254
New York, Susquehanna & Western	154.91	1,308,515	385,670	1,920,091	221,299	242,721	15,425	825,680	38,422	1,343,547	576,544	—24,218	126,369	426,017	—230,101
Norfolk & Western	2,031.77	23,598,771	3,123,747	29,374,140	3,416,027	4,156,832	450,457	8,862,737	536,595	18,357,438	10,736,702	—20,634	964,000	9,752,068	1,446,748
Norfolk Southern	562	1,443,465	531,626	2,184,595	264,710	293,922	38,826	689,268	113,446	1,448,192	736,403	—9,312	60,078	707,013	54,237
Northern Central	472.41	6,685,417	1,628,887	8,895,566	1,043,740	1,731,803	122,324	4,225,588	212,720	7,341,175	1,554,391	5,094	332,095	1,227,390	332,383
Northern Pacific	6,340.05	35,959,615	13,044,146	52,567,581	6,243,863	6,579,926	870,047	15,851,286	690,457	29,193,947	20,373,634	276,628	2,349,957	18,099,641	2,491,878
Northwestern Pacific	401.1	986,794	1,328,897	2,497,353	355,079	309,001	29,355	904,180	104,614	1,702,229	795,124	.....	108,632	694,492	75,588
Oregon Short Line	3,344.31	11,097,308	3,319,697	15,344,227	1,520,385	1,656,535	243,486	3,813,747	537,251	7,871,851	7,472,356	—3,348	1,028,007	6,750,657	520,442
Oregon Washington R. R & Nav. Co	1,191.96	4,107,172	3,144,452	12,305,425	1,581,700	1,540,753	363,107	3,015,805	185,709	8,159,513	4,209,912	—26,161	760,766	3,414,885	340,725
Pecos & Northern Texas	479	1,294,168	342,112	1,749,396	207,377	329,517	29,053	551,158	49,950	1,167,055	582,343	.....	38,910	543,433	224,661
Pennsylvania Co.	2,131.31	32,976,604	6,852,779	44,820,242	6,422,777	8,644,268	664,104	15,433,618	800,988	31,964,253	12,855,989	—21,194	1,946,579	10,887,244	1,900,911
Pennsylvania *Railroad*	4,035.57	68,272,568	24,615,224	120,987,633	15,504,793	25,495,139	1,545,755	43,219,358	2,791,533	88,556,578	32,431,055	—757,302	4,942,105	26,731,648	2,483,749
Peoria & Eastern	152	836,026	497,529	2,507,516	293,150	463,223	36,621	930,371	46,017	1,769,562	737,936	.....	89,548	648,388	144,667
Pere Marquette	1,230	8,880,997	2,949,256	13,909,609	1,772,324	2,017,523	269,062	4,967,797	260,417	9,710,623	4,198,986	24,222	424,634	3,798,574	1,299,995
Philadelphia & Reading	1,015	27,782,340	5,748,312	34,192,331	3,009,499	5,313,198	332,960	10,791,399	488,100	20,134,156	14,058,175	282,651	690,391	13,650,435	2,876,819
Philadelphia, Baltimore & Washington	713	14,359,163	5,242,163	23,911,899	2,287,246	4,557,822	226,794	7,662,129	349,525	15,086,560	8,825,339	.....	2,025,139	6,800,200	1,387,863
Pittsburgh & Lake Erie	263.81	11,517,502	1,157,174	13,149,564	1,262,317	1,918,281	113,083	2,914,895	203,703	6,412,279	6,737,285	—2,494	259,189	6,475,602	1,614,300
Pittsburgh, Cincinnati, Chic. & St. Louis	1,472.26	21,785,714	5,644,318	30,612,296	4,539,346	5,879,877	567,786	10,949,861	571,022	22,507,892	8,104,400	—6,681	1,124,585	6,973,134	478,227
Pittsburgh, Shawmut & Northern	129.79	1,207,200	75,729	1,303,768	164,213	190,790	9,391	414,158	30,730	852,215	371,573	.....	31,500	340,073	20,738
Port Reading	21	1,068,263	.....	1,089,383	76,821	2,506	243	289,786	1,242	370,598	718,795	52,262	64,000	707,547	183,812
Richmond, Fredericksburg & Potomac	84.96	968,524	645,074	1,850,274	180,286	216,005	22,609	674,348	54,544	1,161,712	688,562	—1,219	53,000	634,343	54,856
Rutland	468	1,344,383	838,861	2,503,743	299,331	489,423	65,717	995,759	52,213	1,902,441	601,300	.....	112,373	488,927	—72,941
St. Joseph & Grand Island	319	710,345	272,061	1,079,799	218,254	154,338	38,976	474,923	44,198	930,691	149,159	—1,044	49,042	99,073	—14,951
St. Louis & San Francisco	4,276.27	20,005,041	7,506,789	29,507,709	3,774,324	2,017,523	869,062	4,967,797	260,417	19,710,623	10,333,414	.....	1,124,644	9,208,770	1,299,995
St. Louis, Brownsville & Mexico	51.86	1,155,833	613,205	1,891,655	305,484	207,161	37,511	890,549	74,906	1,515,611	376,044	.....	46,447	329,597	—101,488
St. Louis, Iron Mountain & Southern	3,365.58	17,210,119	4,465,453	24,202,994	2,987,246	4,457,822	226,794	7,662,129	349,525	15,086,560	8,825,339	—6,100	1,124,585	6,973,134	478,227
St. Louis Merchants' Bridge Terminal	9	.....	2,922	1,439,588	237,845	98,701	5,485	75,256	50,382	1,008,163	251,425	.....	46,850	304,575	135,134
St. Louis, San Francisco & Texas	244	760,198	247,767	1,073,881	180,070	128,268	20,048	422,726	44,558	795,670	278,213	.....	8,438	269,775	122,816
St. Louis Southwestern	906.9	4,515,032	1,081,243	5,967,210	1,030,769	907,113	236,527	1,355,692	207,375	3,740,526	2,226,684	.....	198,018	2,028,666	1,481,960
St. Louis Southwestern of Texas	703	2,382,317	799,902	3,393,362	634,284	632,070	108,453	1,332,118	158,136	2,865,061	528,301	—1,596	86,163	440,542	—75,075
San Antonio & Aransas Pass	727	2,507,682	920,457	3,649,527	537,615	441,171	48,659	1,329,055	85,005	2,441,505	1,208,022	.....	95,000	1,113,022	159,616
San Pedro, Los Angeles & Salt Lake	1,135	4,126,229	2,081,139	6,818,163	1,031,990	742,841	216,534	1,852,658	152,459	4,996,481	1,821,682	—2,217	263,364	1,556,101	1,419,964
Seaboard	3,070	10,871,655	3,500,064	15,981,179	2,183,921	2,200,914	507,993	5,781,715	453,489	11,128,032	4,853,147	—18,033	648,000	4,187,114	498,130
Southern	7,337	33,106,071	7,419,357	46,004,433	6,027,325	6,253,916	1,734,914	15,547,999	1,332,877	31,570,123	14,434,310	—49,579	1,655,840	12,696,891	569,210
Southern in Mississippi	281	485,688	754,982	801,962	222,897	71,152	19,469	340,553	33,423	687,494	114,468	.....	36,580	57,638	—110,659
Southern Kansas of Texas	125	845,903	149,006	1,033,076	81,093	203,240	17,661	307,447	29,004	640,445	392,631	.....	16,858	375,773	234,497
Southern Pacific Co.	6,135	38,866,856	21,429,292	63,660,450	6,940,369	8,831,142	1,014,031	17,358,525	1,718,916	36,796,166	27,094,284	1,158,965	2,955,000	20,054,119	2,015,822
Spokane, Portland & Seattle	356	2,208,489	1,126,226	3,634,527	403,784	308,294	60,152	879,030	102,574	1,753,834	1,880,693	1,975	427,200	1,455,468	95,261
Tennessee Central	294	760,134	292,670	1,134,839	232,382	116,273	46,453	395,747	57,495	849,206	285,633	.....	34,131	251,453	56,544
Terminal R. R. Ass'n of St. Louis	34	.....	2,263	2,041,054	309,995	131,772	7,416	759,549	54,479	1,263,241	86,374	217,645	646,572	158,629
Texas & New Orleans	458	1,836,094	777,135	2,791,845	522,244	640,175	64,525	1,086,821	96,870	2,410,635	381,210	—588	101,892	278,730	26,633
Texas & Pacific	1,985	8,270,420	4,142,967	13,114,661	1,940,407	1,977,434	266,196	3,695,341	170,982	8,049,361	5,065,300	—22,180	440,039	2,368,281	—644,113
Toledo & Ohio Central	343.5	3,115,510	442,930	3,763,343	533,947	686,296	55,048	1,307,842	73,044	2,656,177	1,107,166	—5,881	171,002	930,283	24,727
Toledo, Peoria & Western	248	570,473	334,264	957,608	165,345	195,360	19,222	346,097	27,860	753,884	203,724	.....	40,600	163,124	25,783
Toledo, St. Louis & Western	451	2,445,810	848,086	2,964,959	376,277	369,160	59,102	1,005,468	73,033	1,883,040	954,139	.....	118,680	835,459	221,999
Trinity & Brazos Valley	463	1,677,049	402,501	2,160,917	340,694	263,868	82,096	973,197	179,555	1,950,665	401,252	.....	32,513	368,739	72,234
Union Pacific	3,576	25,439,375	7,250,096	35,186,102	3,629,477	4,146,419	706,259	9,488,831	884,118	18,848,771	16,996,264	—24,641	1,484,398	15,487,225	1,239,757
Union R. R. of Baltimore	9	982,929	181,652	1,177,874	194,994	.....	4,354	211,819	14,623	1,031,201	.....	.....	44,895	986,306	170,630
Union R. R. of Pennsylvania	31	.....	.....	3,069,578	228,793	690,277	916	1,150,046	31,891	2,101,923	967,655	18,128	51,250	934,533	111,321
Vandalia	827	5,343,441	1,643,691	7,749,256	1,017,127	1,496,295	201,836	2,890,903	149,666	5,662,854	2,086,402	.....	247,000	1,839,402	1,839,402
Vicksburg, Shreveport & Pacific	171	687,667	361,962	1,146,054	229,367	200,636	26,893	357,987	40,833	855,716	290,338	—3,428	47,634	239,276	22,913
Virginia & Southwestern	240	1,038,511	118,815	1,189,382	182,206	272,643	15,206	328,930	27,735	826,729	362,653	.....	44,332	318,321	—12,840
Virginian	503.98	2,312,450	206,634	3,821,267	485,737	715,229	6,294	908,167	70,459	2,221,866	1,599,401	47,427	140,700	1,506,108	432,474
Washington Southern	36	301,509	315,955	835,192	105,597	102,002	9,867	328,474	22,902	568,842	266,350	—1,838	27,354	237,158	14,259
West Jersey & Seashore	356	1,250,883	2,872,634	4,404,711	622,881	667,686	117,081	1,778,685	104,122	3,300,457	1,104,254	—32,926	172,515	897,813	288,505
Western Pacific	937	3,155,412	867,524	4,145,489	622,585	349,483	230,809	1,602,995	201,666	3,007,538	1,137,951	—7,158	173,186	957,607	398,713
Western Ry. of Alabama	133	309,335	380,627	964,104	155,853	173,758	46,485	264,458	45,445	685,999	278,105	—1,668	38,490	239,766	4,197
Wheeling & Lake Erie	459	4,732,284	447,783	5,491,344	689,463	1,039,581	64,784	1,752,864	131,214	3,677,896	1,803,438	21,611	243,085	1,581,964	9,725
Yazoo & Mississippi Valley	1,374	5,102,760	1,846,017	7,472,750	1,375,681	1,080,246	121,537	2,938,584	212,266	5,728,314	1,744,436	983	296,000	1,449,419	198,068

Average mileage operated during previous period—2,230; 2,597; 562; 152; 2,014; 473; 6,034; 404; 1,762; 1,920; 1,760; 4,018; 215; 1,462; 278; 83; 4,232; 510; 3,314; 843; 1,116; 7,089; 6,203; 551; 35; 3,537; 475; 457. — Indicates Deficits, Losses and Decreases.

Railway Officers.

Executive, Financial and Legal Officers.

M. W. Wells, hitherto general superintendent of the Chicago, Terre Haute & Southeastern, has been appointed assistant to the president, with headquarters at Chicago.

J. G. Wilson, who has been assistant interstate commerce attorney of the Harriman Lines at Chicago, has been appointed interstate commerce attorney of the Southern Pacific Lines, with headquarters after May 1 at New York.

Clark B. Ferry, whose election as vice-president and assistant secretary of the Chicago, Milwaukee & St. Paul, with headquarters at New York, has been announced in these columns, was born on May 18, 1859, at Bethel, Conn. From 1868 to 1873 he was a student at the Trinity Institute, Tivoli, N. Y., and in 1875 he graduated from Essex Hall Institute, Orange, N. J. On June 30, of the same year, he began railway work as a clerk with the Chicago, Milwaukee & St. Paul, and has been in the continuous service of that road ever since. In January, 1883, he was elected assistant secretary, and on April 8, was elected also vice-president of the same road, with headquarters at New York, as above noted.

C. B. Ferry.

H. L. Ingersoll, assistant general manager of the New York Central & Hudson River at New York, has been appointed assistant to senior vice-president of the New York Central Lines, with headquarters at New York, and will perform such duties as may be assigned to him by the senior vice-president.

Operating Officers.

J. C. Barton, trainmaster of the Atchison, Topeka & Santa Fe at Pueblo, Colo., has been transferred to Las Vegas, N. M., in a similar capacity, in place of E. Dowling, promoted.

The authority of D. E. Spangler, superintendent of transportation of Norfolk & Western, with headquarters at Roanoke, Va., has been extended over the Williamson & Pond Creek.

Ira L. Burlingame, for the past eight years general superintendent of the Terminal Railroad Association of St. Louis, has been appointed general manager, succeeding to part of the duties of President W. S. McChesney, Jr.

J. H. Rightmeyer, formerly trainmaster of the Illinois Central, at Waterloo, Iowa, has been appointed superintendent and car accountant of the Kentucky & Indiana Terminal Railroad, with headquarters at Louisville, Ky., succeeding T. H. Hayden, resigned, effective April 15.

H. E. Jones has been appointed assistant superintendent of the San Antonio & Aransas Pass, having supervision over the lines east and north of Yoakum, Tex., with headquarters at Yoakum. F. T. Bowles, assistant superintendent, with headquarters at Yoakum, will have supervision over the lines west of Yoakum.

D. H. Ryan, chief dispatcher and trainmaster of the Canadian Pacific at Brownville Junction, Me., has been appointed assistant superintendent District 1, Atlantic division, with office at St. John, N. B., succeeding W. B. Brown, transferred, and A. C. Brady, has been appointed assistant superintendent, District 2, Eastern division, with office at Montreal, Que., with special jurisdiction over station staffs and service.

Henry J. Curry, whose appointment as superintendent of the Albany division of the Boston & Albany, with headquarters at Springfield, Mass., has been announced in these columns, was born in March, 1877, at Grand Pre, Nova Scotia, and began railway work in March, 1893, with the Dominion Atlantic Railway as operator and agent. In May, 1896 he left that company to go to the Boston & Albany as an operator, and ever since has been in the continuous service of that road. In November, 1901, he was made train despatcher, and in August, 1907, became chief train despatcher at Boston, Mass. He was promoted to trainmaster with headquarters at Beacon Park, Allston, Mass., in March, 1910, which position he held at the time of his recent appointment as superintendent of the same road as above noted.

Arthur Bointon Shafer, whose appointment as assistant superintendent of the New York, Susquehanna & Western, and the Wilkesbarre & Eastern, with headquarters at Jersey City, N. J., has been announced in these columns, was born on April 19, 1871, at Milford, N. J., and was educated at the high school of his native town. He began railway work as an operator on the Lehigh Valley in August, 1888, and from January, 1890, to September, 1891, was operator on the Belvidere division of the Pennsylvania Railroad. He was then for about one year agent of the Lehigh & Hudson. From October, 1892, to October, 1894, he was operator and agent on different roads, and then went to the New York, Susquehanna & Western, and the following year was appointed train despatcher, becoming chief train despatcher in September, 1904. He was later trainmaster on the Wilkesbarre & Eastern, and now becomes assistant superintendent of the New York, Susquehanna & Western, and the Wilkesbarre & Eastern as above noted.

Willis E. Morse, who has been appointed general manager of the Denver, Northwestern & Pacific, with headquarters at Denver, Colo., was born September 27, 1864, at Belvidere, Ill. He received a high school education and attended Wayland University one year. He began railway work in December, 1881, as a telegraph operator for the Chicago & North Western, and the following two years he filled various positions in the station service. From 1884 to 1889, he was train despatcher, and in the latter year was promoted to trainmaster, which position he held for four years. He was then made assistant superintendent, and from 1897 to January, 1906, was superintendent of various districts. On the latter date Mr. Morse was appointed general superintendent of the lines east of the Missouri river, and on November 1, 1910, he became assistant general manager, with headquarters at Chicago, resigning in March, 1912, on account of ill health. In a recent item regarding Mr. Morse's new position his name was incorrectly given as William E. Morris.

W. E. Morse.

Traffic Officers.

T. B. McGill has been appointed contracting freight agent of the Union Pacific, with headquarters at Chicago.

Martin L. Schultz has been appointed commercial agent of the Missouri & North Arkansas, with headquarters at Chicago.

L. J. McFaul has been appointed district freight and passenger agent of the Southern Pacific, with headquarters at Salt Lake City, Utah.

George B. Hugel has been appointed soliciting freight agent of the Denver & Rio Grande and the Western Pacific, with headquarters at Chicago.

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A. Engelhardt has been appointed traveling freight agent of the Delaware & Hudson Company, with office at Pittsburgh, Pa., succeeding Gordon Edwards, resigned.

F. H. Erhart has been appointed traveling freight agent of the Illinois Central and the Yazoo & Mississippi Valley, with headquarters at Kansas City, Mo., in place of H. W. Rogers, deceased.

R. H. Crozier has been appointed assistant general passenger agent of the Spokane, Portland & Seattle, Oregon Electric, Oregon Trunk and United Railways, with headquarters at Portland, Ore.

C. M. Agnew, traveling freight agent of the Southern, with headquarters at Kansas City, Mo., has been transferred to Omaha, Neb., as commercial agent in place of J. R. L. Wulff, promoted.

W. J. Berger, city passenger agent of the Chicago, Burlington & Quincy, at New York, has been appointed general agent of the passenger department, with headquarters at New York, succeeding to the duties of W. J. O'Meara, deceased, who was eastern passenger agent.

C. J. Jones, who, on April first, became general freight agent of the Southern Pacific, with headquarters at San Francisco, Cal., began railway work in 1880 with the Burlington, Cedar Rapids & Northern at Muscatine, Iowa, as a telegraph operator and clerk in the local freight office, after completing a high school course. He went to the Arizona & New Mexico in 1883 as trainmaster and agent at Lordsburg, N. M., and entered the service of the Southern Pacific in 1887. He was employed by that company as local agent and trainmaster at various places until 1901, when he was appointed district freight and passenger agent at Sacramento, Cal. Two years later he was made freight agent at the San Francisco local station, and in 1904 he was promoted to assistant general freight agent. He left the Southern Pacific in 1910 to accept the position of traffic manager of the Alaska Steamship Company and the Copper River & Northwestern, with headquarters at Seattle, Wash., and now returns to the Southern Pacific as general freight agent, as above noted.

C. J. Jones.

Engineering and Rolling Stock Officers.

W. R. Roof has been appointed engineer of bridges and buildings of the Chicago Great Western, with headquarters at Chicago, succeeding C. Chandler.

The headquarters of W. L. Kellogg, superintendent of motive power of the Missouri, Kansas & Texas, have been transferred from Parsons, Kan., to Denison, Tex., effective April 8.

A. P. Walker, assistant division engineer, Ontario division, of the Canadian Pacific, at Toronto, Ont., has been appointed division surveyor, Ontario division, with office at Toronto.

N. E. Brooks, division engineer of the Canadian Pacific, at Calgary, Alta., has been appointed engineer maintenance of way, Western lines, with headquarters at Winnipeg, Man., in place of R. C. St. John.

Edward A. Park has been appointed superintendent of motive power and equipment of the Peoria & Pekin Union, with headquarters at Peoria, Ill. The position of master mechanic, held by J. W. Hill, is abolished.

J. R. Greiner, general foreman of the Cincinnati, Hamilton & Dayton, at Lima, Ohio, has been appointed master mechanic of the San Pedro, Los Angeles & Salt Lake, with headquarters at Milford, Utah, succeeding T. M. Vickers, resigned.

L. F. Lonnbladh, formerly superintendent and chief engineer of the Tennessee Central, has been appointed engineer maintenance of way of the Missouri, Kansas & Texas, with headquarters at Parsons, Kan., to succeed F. Ringer, promoted; effective April 10.

A. M. Lupfer, chief engineer of the Spokane, Portland & Seattle, the Oregon Trunk and the Spokane & Inland Empire, will also have jurisdiction over the Oregon Electric and the United Railways, with headquarters at Portland, Ore., succeeding L. B. Wickersham, who has been appointed chief electrical engineer of the two latter roads, with office at Portland, Ore.

R. A. Rutledge, assistant chief engineer of the Gulf, Colorado & Santa Fe, at Galveston, Tex., has been appointed chief engineer, Eastern lines of the Atchison, Topeka & Santa Fe, with office at Topeka, Kan., succeeding C. F. W. Felt, promoted, and F. M. Bisbee, principal assistant engineer at La Junta, has been appointed chief engineer Western lines, with office at Amarillo, Tex.

C. Chandler, engineer of bridges and buildings of the Chicago Great Western, has been appointed assistant bridge engineer of the Illinois Central, with headquarters at Chicago, succeeding M. Johnson, promoted, effective April 15. Mr. Chandler was born September 30, 1875, at Bushnell, Ill., and attended Swarthmore College, 1892-1896. He began railway work July 15, 1897, as draftsman in the bridge and building department of the Illinois Central. In 1902 he was made chief draftsman of that road, which position he held until December 1, 1910, when he resigned to become engineer of bridges and buildings of the Chicago Great Western. He now returns to the Illinois Central as assistant bridge engineer, as above noted.

William Frederick Steffens, whose appointment as assistant chief engineer of the Chesapeake & Ohio, the Chesapeake & Ohio of Indiana and the Hocking Valley, with headquarters at Richmond, Va., has been announced in these columns, graduated as a civil engineer from the Massachusetts Institute of Technology in 1898. The same year he entered the service of the New York, New Haven & Hartford as structural draftsman, and left that company in 1901 to go with the Erie as transitman. From November, 1901, to November, 1905, he was with the New York Central & Hudson River, first as draftsman and structural designer, and subsequently as assistant engineer. He was then for about four years engineer of bridges and buildings on the Carolina, Clinchfield & Ohio. In December, 1909, he was appointed engineer of structures of the Boston & Albany, which position he held at the time of his recent appointment as assistant chief engineer, as above noted.

Daniel Joseph Brumley, whose appointment as engineer maintenance of way of the Illinois Central and the Yazoo & Mississippi Valley, with headquarters at Chicago, has already been announced in these columns, was born March 19, 1865, near Belmore, Ohio. He was graduated in civil engineering from the Ohio State University in 1895, and began railway work in June of that year as assistant section foreman on the Louisville & Nashville at Evansville, Ind. From August to December, 1896, he was with the Columbus & Hocking Coal & Iron Company as assistant engineer at New Straitsville, Ohio, and during the two succeeding years he was successively assistant supervisor of the Louisville & Nashville, at Belleville, Ill., section foreman at Evansville, rodman at Louisville, Ky., and assistant engineer at Clarksville, Tenn. He was then on December 3, 1898, transferred to the chief engineer's office at Louisville as assistant engineer, and in April of the following year was made assistant engineer of that road, with headquarters at Louisville. He left the Louisville & Nashville in September, 1901, to go to the Mexican National as roadmaster at Laredo, Tex., but returned to the former road one month later as roadmaster at Elizabethtown, Ky., where he remained until October, 1904. On the latter date he was appointed division engineer of the Indianapolis Southern at Indianapolis, Ind., and in March, 1905, was made principal assistant engineer of the Illinois Central, the Yazoo & Mississippi Valley and the Indianapolis Southern, with headquarters at Chicago. In June, 1910, he became engineer of construction of the two former roads, which position he held until his recent promotion on April 1 to engineer of construction, as above noted.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE GRAND TRUNK has ordered 50 mikado locomotives from the Montreal Locomotive Works.

THE FLORIDA EAST COAST is said to have ordered 24 Pacific type locomotives from the American Locomotive Company. This item has not been confirmed.

THE PEKING-KALGAN RAILWAY, China, has ordered 4 Mallet locomotives (2-8-8-2) from the American Locomotive Company. The dimensions of the cylinders will be 18½ in. and 29 in. x 22 in., the diameter of the driving wheels will be 42 in., and the total weight in working order will be 300,000 lbs.

THE BUFFALO, ROCHESTER & PITTSBURGH, as mentioned in the *Railway Age Gazette* of March 28, has ordered 12 mikado locomotives and 3 Pacific type locomotives from the American Locomotive Company. The specifications and special equipment for these locomotives are as follows:

	PACIFIC.	MIKADO.
Simple or compound	Simple	Simple
Weight on drivers	165,000 lbs.	218,000 lbs.
Total weight	262,000 lbs.	277,000 lbs.
Diameter of cylinders	24½ in.	26½ in.
Stroke of pistons	26 in.	30 in.
Diameter of drivers	73 in.	63 in.
Type of boiler	Extended wagon top	Extended wagon top
Working steam pressure	200 lbs.	180 lbs.
Heating surface, tubes	3,391 sq. ft.	3,391 sq. ft.
Heating surface, arch tubes	30 sq. ft.	30 sq. ft.
Heating surface, firebox	204 sq. ft.	204 sq. ft.
Heating surface, total	3,625 sq. ft.	3,625 sq. ft.
Tubes, number	240 32	240 32
Tubes, outside diameter	2 in. 5½ in.	2 in. 5½ in.
Tubes, length	20 ft. 0 in.	20 ft. 0 in.
Firebox, type	Radial stayed	Radial stayed
Firebox, length	108 in.	108 in.
Firebox, width	75⅛ in.	75⅛ in.
Firebox, material	Open hearth steel	Open hearth steel
Grate area	56½ sq. ft.	56½ sq. ft.
Tank capacity for water	9,000 gals.	9,000 gals.
Coal capacity	15 tons	15 tons

SPECIAL EQUIPMENT.

Axles	Open hearth steel
Bell ringer	Hammett
Boiler lagging	Franklin sectional magnesia
Brakes	Westinghouse—American
Brake beams	Waycott
Brick arch	American Arch Co.
Couplers	Sharon
Driving boxes	Lawrenceville Bronze Co.
Headlight	Pyle electric on the Pacifics
Readlight	Dressel on the mikados
Injector	Nathan Monitor
Piston and valve rod packings	"King"—U. S. Metallic
Safety valve	Consolidated
Sanding devices	Leach
Sight-feed lubricators	Nathan
Steam gages	Ashcroft
Steam heat equipment	Safety Co., on the Pacifics
Superheater	Schmidt
Tires	Midvale
Valve gear	Walschaert
Wheel centers	Cast steel

CAR BUILDING.

THE GRAND TRUNK has ordered 2,000 box cars from the Pressed Steel Car Company, and 1,000 box cars from the Western Steel Car & Foundry Company.

IRON AND STEEL.

THE PENNSYLVANIA LINES WEST have ordered 1,400 tons of bridge material for replacements.

GENERAL CONDITIONS IN STEEL.—Consumers are holding off in expectation of lower prices following the tariff revision. Orders have consequently been light, but specifications continue heavy. The damage to the industries by the flood is being rapidly repaired, and full resumption of activity in the flooded district is expected within a week. A considerable volume of tonnage will be necessary to replace the bridges destroyed by the flood. In most cases the old structures are being replaced with better ones.

Supply Trade News.

The Gould Coupler Company has moved its New York offices from 341-347 Fifth avenue, to 30 East Forty-second street.

Hiram J. Slifer, a consulting civil engineer, specializing in steam railway practice, has moved his office to the Rookery, Chicago.

The Western Railway & Mill Supply Company, San Francisco, Cal., which makes and sells railway supplies, has changed its name to the Edward S. Sullivan Company.

The two Chicago plants of the Allis-Chalmers Company were bid in for $1,000,000 by the purchasing committee of the reorganized company at a judicial sale held in Chicago on April 8.

The Horace L. Winslow Co., contractors and heating experts, have recently found it necessary, on account of expansion resulting from increase of business, to move into new and larger offices at 590 Old Colony building, Chicago.

The Yale & Towne Manufacturing Company, New York, has moved its general offices from 9 Murray street, to 9 East Fortieth street, New York. The new building, built and owned by the company, is twelve stories high and occupies a plot 50 ft. by 100 ft. The entire ground floor will be devoted to exhibit rooms.

Charles Robbins, manager of the industrial and power department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., with office in Pittsburgh, has been made assistant sales manager, with office at East Pittsburgh. J. M. Curtin, assistant manager of the industrial and power department has been made manager of that department, succeeding Mr. Robbins.

During the week of April 7 the heads of departments and managers of various offices of Robert W. Hunt & Co. met with the firm at the general office in Chicago in annual conference. Papers on the various methods of conducting the work of inspection and testing were discussed, and on Thursday and Friday a party was taken on inspection trips to Gary, South Chicago and Buffington.

The Dearborn Chemical Company, Chicago, is building a reinforced concrete manufacturing plant at Toronto, Ont., at a cost of about $100,000. This plant, which will be completed during the coming summer, will have railroad connection with both the Canadian Pacific and the Grand Trunk. A. W. Crouch will have charge as vice-president and general manager, with office in Toronto. Mr. Crouch has for the past eight years been district manager of the company, with office in Pittsburgh, Pa.

The Kennicott Company, Chicago Heights, Ill., has been awarded the John Scott legacy medal for its water weigher or measuring device. The medal was awarded by the city of Philadelphia upon recommendation of the Franklin Institute for promotion of the mechanic arts. The award was made after a thorough investigation "in consideration of its novelty, its simplicity of design, and its accuracy as a water measuring device." The principle of the operation of the weigher is described in bulletin No. 38, issued by the company.

TRADE PUBLICATIONS.

DUMP CARS.—The Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio, has published an attractive folder entitled Some Snap Shots, illustrating the operation of its automatic, air, dump cars. The booklet also tells how rapidly and simply these operations are accomplished.

STEEL SASH.—The David Lupton's Sons Company, Philadelphia, Pa., has devoted catalog No. 7 to detailed descriptions and illustrations of its products, including steel sash for side walls, steel partitions and doors, Pond continuous sash, Pond operating device, rolled steel skylight, hollow metal windows, etc.

CONCRETE POSTS.—The National Reinforced Concrete Corporation, of San Francisco, has issued an illustrated folder devoted to its reinforced concrete hollow and solid poles and posts for electric lighting, fencing, telegraph, telephone and trolley wires. The pamphlet includes illustrations and descriptions of various installations of these posts.

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Railway Construction.

ABILENE & SOUTHERN.—Plans are being made to build an extension, it is said, from Hamlin, Tex., northwest to Matador, through the counties of Stonewall, Dickens and Motley, about 100 miles. Later it is planned to further extend the line from Matador to a point on the Forth Worth & Denver City, probably at either Clarendon or Claude. Col. Morgan Jones is in charge of the preliminary work of this prospective extension. Large bonuses in aid of the project are being raised in the towns and rural communities along the route.

BIRMINGHAM-TUSCALOOSA RAILWAY & UTILITIES COMPANY (Electric).—An officer writes that the plans call for building from Birmingham, Ala., southwest via Bessemer to Tuscaloosa, 54 miles. Contract for the work has been given to the Tidewater Construction Company, Birmingham. As soon as the location is made, grading work will be started. It is to be a high speed electric line for freight and passenger service. The Tuscaloosa Belt Railway, operating 14 miles of track in Tuscaloosa is now being reconstructed, the work includes filling in the old trestles and reducing the grades and curves. It is to form part of the through line. C. R. Carter, C. S. Gannon and W. S. Adams are incorporators. (March 28, p. 779.)

BRULE LAKE.—Incorporated in Alberta, Canada, to build from the Grand Trunk Pacific east of Brule Lake, at mileage 994, southeasterly to township 49, range 26, west of the 5th meridian. The provisional directors include G. G. S. Lindsay, Toronto, Ont.; S. R. Woods, O. M. Biggar, S. W. Field and J. T. J. Collison, Edmonton, Alta.

CAMPBELLFORD, LAKE ONTARIO & WESTERN.—See Canadian Pacific.

CANADIAN NORTHERN.—Application has been made by this company for permission to build a branch from mileage 111.89 on the Oak Point branch, in Manitoba, through sections 29, 32 and 33, township 26, and sections 16, 15 and 22, township 27, range 7, west principal meridian.

CANADIAN PACIFIC.—The Canadian parliament has extended the time for building the Campbellford, Lake Ontario & Western. The route is south from Glen Tay, Ont., to the Lake Ontario shore, thence west parallel to the Grand Trunk on the north side via Port Hope to Agincourt. The entire line is under contract, and track laying will be started this month.

CHESAPEAKE & OHIO.—An officer writes that a contract has been given to the C. D. Langhorne Construction Company, Beaver, Ky., to build the Elkhorn & Beaver Valley from Beaver Creek station on the C. & O.'s Big Sandy district to the mouth of Steels' Creek, through Floyd county, Ky., 21 miles. (April 11, p. 863).

CHICAGO, MILWAUKEE & ST. PAUL.—An officer writes that the line which has been under construction for about a year from Plummer, Idaho, to Bell, Wash., about 20 miles, is expected to be finished this season. H. C. Henry is the contractor.

The Priest Rapids line of the Puget Sound Lines, extending southeast from Beverly Junction, Wash., has been opened for freight traffic to Hanford.

CUMBERLAND & SHIPPENSBURG (Electric).—An officer writes that a contract will be let in the near future to build from Chambersburg, Pa., northeast to Shippensburg. There will be two steel bridges on the line. P. M. Mahon is president, Chambersburg.

DELAWARE & HUDSON.—See Watervliet, N. Y., under Railway Structures.

GULF, FLORIDA & ALABAMA.—An officer writes that work on the twenty-mile extension on the northerly end, for which a contract was recently let to J. P. McCarthy & Company, of Gainesville, is expected to be completed and the section open for operation by August. On the completion of that work, the company expects to build a fifty-mile extension to a connection with the Mobile & Birmingham branch of the Southern at Pine Hill. On the latter section there will be some fairly heavy steam shovel work, involving the handling of about 1,250,000 cu. yds. There will also be a bridge at a point five miles from Pine Hill over the Alabama river, involving some heavy sub-structural work. (March 7, p. 759.)

LEWISTON-CLARKSTON VALLEY (Electric).—An officer writes that the plans call for building from a point in Idaho west via Lewiston to Clarkston, Wash., and then south to Asotin, about 12 miles. In addition there will be an 8-mile branch southeast from Lewiston to Lewiston Orchards. Track has been laid on 6,000 ft. F. L. Sturm, president, and P. T. Ohler, chief engineer, Lewiston.

MONTEZUMA SAN JUAN SOUTHERN.—We are told that this company will ask for incorporation soon to build about 200 miles of railroad from a point near Dolores, Colo., south via Cortez and Mancos, and along the La Plata river via Fruitland, N. Mex., thence across the Indian Reservation to a point at or near Grants, N. Mex., where a connection is to be made with the Santa Fe line. The route is through a flat country, with the exception of a 20-mile section over the continental divide. The company expects to develop a traffic in coal, live stock, potatoes, fruit and lumber. Emil Stein, Durango, Colo., and W. A. Venter, New York, are interested. Roy F. Goodman is chief engineer.

NORFOLK & WESTERN.—The extension of the Dry Fork branch, from Canebrake, W. Va., to a connection with the Clinch Valley district, at Cedar Bluff, Va., 15.84 miles, was opened for operation on April 15.

PALATKA-HASTINGS INTERURBAN.—A franchies has been given to this company, it is said, to build a 10-mile line from Palatka, Fla., northeast to Hastings. C. A. DuPont, president, Palatka.

PIGEON VALLEY.—Incorporated in Wisconsin, with headquarters at Pigeon Falls, Trempealeau county, to build from that place to Hay creek, in the town of Bridge Creek, Eau Clair county, 20 miles.

PORTAGE RADIAL RAILWAY & CANAL.—Incorporated in Manitoba, Canada, to build from Portage la Prairie to Winnipeg, and from Portage la Prairie to Delta, with branch lines; also a canal from Lake Manitoba through Portage la Prairie to the Assiniboine river. The provisional directors include: W. Richardson, H. Stephens, F. G. Taylor, Portage la Prairie; B. L. Grant, St. Francois Xavier; A. H. Oakes, Winnipeg, Man.

RIVIERA BEACH & WESTERN.—An officer writes that construction work is about finished on this line from Riviera, Tex., east through a farming district, to Riviera beach on the Gulf coast, 9.7 miles. At Riviera a connection is made with the St. Louis, Brownsville & Mexico. Steam is used as the motive power for freight traffic, and gasolene motor cars for passenger traffic. T. F. Koch, president, Houston, and M. W. Jones, general manager, Riviera.

SALEM, FALLS CITY & WESTERN.—A bridge over the Willamette river at West Salem, Ore., has been completed and put into service, thereby connecting up the line recently completed from Dallas to Salem, Ore.

SEABOARD AIR LINE.—The extension from Mulberry, Fla., east to Bartow is open for business, and through trains are now in operation between Bartow and Tampa.

SHENANDOAH VALLEY (Electric).—Final surveys are being made, it is said, in Berkeley and Jefferson counties, West Virginia, and in Frederick and Clark counties, Virginia, for an electric line to be built this spring. Surveys at Martinsburg and near that place have been completed. C. W. Watson, of Fairmont, is back of the project.

TABER TRANSIT.—Incorporated in Alberta, Canada, to build from section 31-9-16 west of the 4th meridian, northwesterly to section 12-10-7, with branches to section 33-9-17 and section 7-10-7; and a second line also from section 31-9-16 north and northeasterly to Bow City, Alta. The provisional directors include: J. F. Kramer, V. O. Eastland, Calgary, Alta.; C. D. Holder, Dunmore; J. Schissil, Canmore; W. E. Bullock, F. Barton, Taber, and E. S. Kramer, Philadelphia, Pa.

TUSCALOOSA BELT.—See Birmingham-Tuscaloosa Railway & Utilities Company.

WETASKIWIN, YELLOWHEAD & PACIFIC.—Incorporated in Canada to build from Wetaskiwin, Alta., west along the Saskatchewan and the Brazeau rivers to the Yellowhead Pass, thence south to Revelstoke, B. C., about 500 miles. The names of the incorporators are not given.

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WILLAPA BAY & EASTERN.—Incorporated in the state of Washington with $2,000,000 capital, and headquarters at Seattle, to build from Lincoln Creek, in Lewis county, Wash., west to a point near South Bend, thence along the North river to the O-W. R. & N., at South Bend. The incorporators include W. H. Bogle, F. T. Merritt and C. P. Bissitt.

RAILWAY STRUCTURES.

CHARLESTOWN, W. Va.—An officer of the Norfolk & Western writes regarding the report that a station is to be built at Charlestown, that the company has bought land as a site, but has not yet decided when the station will be built.

CHICAGO, ILL.—The Baltimore & Ohio has let a contract to James Stewart & Company, New York and Chicago, for the construction of a grain elevator in the Calumet river district at South Chicago, to have a capacity of 875,000 bushels. The elevator will have a steel frame and be fireproof throughout, and will be erected on concrete foundations. The work house will contain 55 bins, with a capacity of 250,000 bushels, and there will be 70 storage bins with a capacity of 625,000 bushels. There will be three receiving elevators in the building, three shipping elevators, two cleaning elevators and a screening elevator. It is planned to begin work at once in order that it may be completed in time to receive this year's crop.

The Chicago & Alton has let a contract to George B. Swift & Co. for a 30-stall roundhouse, a coal tepple and ash pit at Glenn Yards, Chicago.

DEL RIO, TEX.—Plans have been prepared for a new 18-stall roundhouse and repair shop.

GREEN BAY, WIS.—The Chicago & North Western will build a new 40-stall engine house, brick power house, store and oil houses, mechanical coal chute, water tank, ice house, and other buildings in connection with track changes and other improvements, to cost approximately $350,000 in all.

MUSKEGON, MICH.—The Pere Marquette is planning to build a new two-story freight house.

PINE HILL, ALA.—See Gulf, Florida & Alabama under Railway Construction.

WATERVLIET, N. Y.—The report of the Delaware & Hudson Company for the year ended December 31, 1912, shows that during the year a program was inaugurated covering extensive bridge renewals and betterments to make all bridges capable of carrying heavy engines. Part of the work was completed in 1912, and will be continued throughout the years 1913 and 1914. During the year there were completed and put in operation the shops and terminals at Watervliet; cold storage plant at Glenville; roundhouse and coaling facilities at Carbondale, Pa.; grade reduction and change of line Oneonta, N. Y., to Nineveh; one mile of double track north of Binghamton, N. Y., and a large number of spur tracks and sidings. New passenger stations were built at Lake George, N. Y., and at Dennemora, and the freight house facilities at the latter place were improved. Work is now under way on an under-crossing, including solid floor three track through girder bridge, 78 ft. long, at Slingerlands, N. Y.; a concrete over-head bridge, concrete cattle pass and approaches, at Bainbridge, N. Y., and a three-crossing at Robinson street, Binghamton. Substantial improvements in the station and yard layout at Sidney, N. Y., have been started. The improved facilities at this place will be used jointly by the D. & H. Co. and the New York, Ontario & Western. The freight house at Green Island is now being enlarged and additional tracks constructed.

WICHITA, KAN.—The Atchison, Topeka & Santa Fe is planning to begin work shortly on a 12-stall roundhouse and shops.

BETTER ROADS IN ARGENTINA.—A considerable amount of work has been carried out by the Argentine road commission during the latter half of the calender year of 1912 improving the access to the stations within the district reached by the Buenos Ayres Great Southern. This has proved of great benefit in connection with the cartage of the crops.

Railway Financial News

BALTIMORE & OHIO.—The syndicate which underwrote the $62,250,000 convertible 4½ per cent. bonds which were offered to stockholders at 95½ has been dissolved and members are at liberty to dispose of their bonds.

CHICAGO, MILWAUKEE & ST. PAUL.—The $30,000,000 4½ per cent. bonds which were sold by the railway company to Kuhn, Loeb & Co. and the National City Bank, both of New York, as mentioned in these columns last week, is being offered to the public by the bankers at 99½. These bonds are secured by a direct mortgage on 6,315 miles of first track and on terminal properties in Chicago, Milwaukee and other cities and on the entire equipment of the company. The general mortgage bonds are secured by an absolute first mortgage on 3753 miles of road, including the main lines entering Chicago and Milwaukee.

The total general mortgage bonds outstanding, including prior liens, are at the average rate of $22,193 per mile on the 6,315 miles of road on which they are secured. Of the total authorized issue of $150,000,000 general mortgage bonds, there are outstanding $8,950,000 3½ per cent. bonds; $46,841,000, 4 per cent. bonds, $9,852,000 bonds in the treasury; $52,357,000 bonds reserved to retire prior liens and the $30,000,000 now being offered. The bonds are a legal investment for savings banks in New York, Massachusetts and Connecticut.

DELAWARE & HUDSON.—See editorial comment on this company's annual report.

DENVER & SALT LAKE.—C. E. Mitchell & Co., New York, are offering $488,000 Equipment Trust 5 per cent. notes, dated March 1, 1913, at prices for different maturities to yield about 5¾ per cent. on the investment. The Denver & Salt Lake is the successor company to the Denver, Northwestern & Pacific. Title to the equipment purchased under these notes remains with the trustee of the notes.

DETROIT SOUTHERN.—The Protective Committee representing the Ohio & Southern division first mortgage bonds, has adopted a plan of reorganization subject to the lien of this mortgage, and it is understood that more than 92 per cent. of the bonds outstanding under this mortgage have been deposited with the committee.

Under the general plan of reorganization provision is made for raising the sum of $2,247,500 of new money to provide funds for payment of receivers' certificates and indebtedness of the receiver chargeable against the Ohio Southern division, cost of contemplated betterments to the railroad and its equipment, working capital, etc. This amount shall be raised by requiring the holders of the present $4,495,000 of outstanding Ohio Southern division mortgage bonds to purchase the following amounts of securities of the new company: Adjustment mortgage, 5 per cent. 40-year gold bonds, $2,247,500; preferred stock $4,495,000, and common stock $2,247,500. Each holder of an Ohio Southern division mortgage bond, par value $1,000, will thus be required to pay $500 in cash and receive therefor $500 in new adjustment mortgage bonds, $1,000 in new preferred stock and $500 in new common stock.

It is proposed that the new company shall authorize the following securities: (1) $1,500,000 first mortgage 5 per cent. 40-year gold bonds, dated July 1, 1913. (2) $2,250,000 adjustment mortgage 5 per cent. 40-year gold bonds, dated July 1, 1913, on which the interest is cumulative, with the provision that there is to be no right of foreclosure for non-payment of interest until maturity of the principle. (3) $4,500,000, par value preferred stock, entitled to non-cumulative dividends of 4 per cent. per annum. (4) $4,500,000 par value common stock.

GRAND TRUNK PACIFIC.—Stockholders have authorized a further issue of $25,000,000 debenture stock.

Howard G. Kelly has been elected a director, succeeding F. H. Fitzhugh, resigned.

HOUSTON & TEXAS CENTRAL.—The Texas legislature has authorized this company to consolidate with it the Hearn & Brazos Valley, which runs from Hearn to Stone City, Texas, 19 miles.

HEARN & BRAZOS VALLEY.—See Houston & Texas Central.

LONG ISLAND RAILROAD.—A. J. County, assistant to the president of the Pennsylvania, and Percival Roberts, Jr., have been elected directors, succeeding James McCrea and Charles E. Pugh, both deceased.

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MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The Michigan Railroad Commission has authorized this company to issue $2,703,000 consolidated mortgage, 4 per cent. bonds to pay for 135 miles of new road which has recently been built.

MISSOURI, KANSAS & TEXAS.—H. E. Andrews, president of the New York State Railways, and F. H. Davis, of Hawley & Davis, New York, have been elected directors, succeeding A. A. Allen, until recently president, and A. W. Smithers, resigned.

See comments made by the Houston *Chronicle* on the merger bill passed by the Texas legislature reprinted in general news.

NEW YORK CENTRAL & HUDSON RIVER.—This company has sold in London £2,000,000 ($10,000,000), one-year, 5 per cent. notes on a basis, according to the *Commercial and Financial Chronicle*, of 5¾ per cent.

OKLAHOMA CENTRAL.—The sale of this road, which is in the hands of the receiver, has been ordered by the United States District Court for October 9.

ST. LOUIS SOUTHWESTERN.—The Texas legislature has authorized the consolidation of the Stephenville, North & South Texas with the St. Louis Southwestern.

See comments of the Houston *Chronicle* printed elsewhere.

SOUTHERN PACIFIC.—This company has asked authority of the California Railroad Commission to issue $10,120,000 4½ per cent. Equipment Trust certificates.

Charles W. Harkness and L. E. Loree, president of the Delaware & Hudson, have been elected directors, succeeding C. H. Kelsey and George B. Leighton.

TEXAS & PACIFIC.—See an item in regard to merger bill passed by the Texas legislature, reprinted in another column from the Houston *Chronicle*.

[ADVERTISEMENT.]

ANNUAL REPORT

THE DELAWARE AND HUDSON COMPANY—EIGHTY-THIRD ANNUAL REPORT.

GENERAL OFFICE.
NEW YORK, N. Y., March 31, 1913.

To the Stockholders of
The Delaware and Hudson Company:

The President and the Board of Managers submit the following statements of the affairs of the Company for the year ended December 31, 1912:

The results from operation of the Coal Mining Department were:

Year.	Coal Mined.	†Revenues.	†Expenses.	Net Revenue.
1912	6,438,555 tons.	$13,397,557.48	$12,811,520.34	$586,037.14
1911	7,280,939 "	13,355,014.38	13,238,304.12	116,710.26
Increase	*842,384 tons.	$42,543.10	*$426,783.78	$469,326.88

†Excluding dividends received from stock of Coal Companies owned.
‡Excluding taxes.
*Decrease.

The results from operation of the Railroad Department were:

Year.	Miles Operated.	Operating Revenues.	‡Operating Expenses.	Net Operating Revenues.	Percentage of Expenses to Revenues.
1912	877.60	$22,480,102.95	$14,066,778.74	$8,413,324.21	62.57
1911	877.60	21,421,816.83	12,758,159.48	8,663,657.35	59.56
Increase		$1,058,286.12	$1,308,619.26	*$250,333.14	3.01

†Excluding taxes.
*Decrease.

RAILROAD DEPARTMENT.

REVENUES AND EXPENSES.

The general distribution of the Operating Revenues and of the Operating Expenses of the Railroad Department was as follows:

REVENUES:	1912.	1911.	Increase or Decrease.
From Coal Freight Traffic	$10,346,094.92	$9,847,193.63	$498,901.29
" Merchandise Freight traffic (including switching)	8,476,850.69	8,053,787.79	423,062.90
" Passenger Traffic	3,076,507.07	3,019,229.53	57,277.54
" Express Traffic	305,119.40	235,338.64	69,780.76
" Transportation of Mails	119,449.88	119,349.88	99.63
" Miscellaneous Sources	156,085.36	146,917.36	9,168.00
Total Operating Revenues	$22,480,102.95	$21,421,816.83	$1,058,286.12
EXPENSES:			
For Maintenance of Way and Structures	$1,940,352.37	$1,488,756.81	$451,595.56
" Maintenance of Equipment	3,230,742.16	3,060,739.03	170,003.13
" Traffic Expenses	289,754.01	250,285.23	39,468.78
" Transportation Expenses	7,979,041.22	7,414,071.40	564,969.82
" General Expenses	626,888.98	544,307.01	82,581.97
Total Operating Expenses	$14,066,778.74	$12,758,159.48	$1,308,619.26
Net Revenue from Operation	$8,413,324.21	$8,663,657.35	—$250,333.14
Percentage of Expenses to Revenues	62.57	59.56	3.01

GENERAL INCOME ACCOUNT OF THE DELAWARE AND HUDSON COMPANY, YEAR ENDED DECEMBER 31, 1912, IN COMPARISON WITH YEAR ENDED DECEMBER 31, 1911.

	1912.	1911.	Increase or Decrease.
COAL MINING DEPARTMENT:			
Gross Revenues	$13,397,557.48	$13,355,014.38	$42,543.10
Gross Expenses	12,811,520.34	13,238,304.12	—426,783.78
Net Revenues	$586,037.14	$116,710.26	$469,326.88
Taxes Accrued	335,092.68	141,081.00	194,011.68
Operating Income	$230,944.46	Loss $24,300.74	$255,245.20
OTHER INCOME:			
Dividends and Interest	792,923.61	308,519.84	484,403.77
Gross Income Coal Department	$1,023,868.07	$284,219.10	$739,648.97
RAILROAD DEPARTMENT:			
Gross Operating Revenues	$22,480,102.95	$21,421,816.83	$1,058,286.12
Gross Operating Expenses	14,066,778.74	12,758,159.48	1,308,619.26
Net Operating Revenues	$8,413,324.21	$8,663,657.35	—$250,333.14
Taxes Accrued	600,944.31	562,409.66	38,534.65
Operating Income	$7,812,379.90	$8,101,247.69	—$288,867.79
OTHER INCOME:			
Hire of Equipment	$99,596.29	$150,503.27	—$50,906.98
Outside Operations	Loss 20,733.16	Loss 12,435.79	Loss 8,297.37
Dividends and Interest	1,154,195.92	1,167,020.41	—12,824.48
Miscellaneous Items	36,359.60	69,908.94	—33,549.34
Total Other Income	$1,269,418.66	$1,374,996.83	—$105,578.17
Gross Income Railroad Department	$9,081,798.56	$9,476,244.52	—$394,445.96
DEDUCTIONS FROM INCOME:			
Rentals	$2,034,256.69	$2,022,925.80	$11,330.89
Interest on 1st and Refunding Mortgage Bonds (1943)	1,108,160.00	1,087,159.96	21,000.02
Interest on 1st Mtge. Bonds (1917)	350,000.00	350,000.00	.....
Interest on Debenture Bonds (1916)	558,920.01	558,926.22	—6.21
Interest on 1st Lien Equipment Bonds (1922)	436,288.26	436,454.88	—166.62
Interest on Debenture Bonds (1914)	12,000.00	20,000.00	—8,000.00
Interest on Divisional Bonds	75,000.00	75,000.00	.....
General Interest and Discount	95,310.15	35,199.70	60,110.45
Total Deductions	$4,669,935.11	$4,585,666.58	$84,268.53
Net Income Railroad Department	$4,411,863.45	$4,890,577.94	—$478,714.49
GENERAL:			
Miscellaneous Income: Dividends and Interest on Securities Owned	$11,276.00	$11,296.00	—$20.00
Rentals, Real Estate	42,310.97	21,069.98	21,240.99
General Interest and Discount	25,469.23	39,280.44	—13,811.21
Total Income	$79,056.20	$71,646.42	$7,409.78
Taxes Accrued	8,698.30	8,762.59	—64.29
Net Income General	$70,357.90	$62,883.83	$7,474.07
Net Income Carried to General Profit and Loss	$5,506,089.42	$5,237,680.87	$268,408.55
Percentage to Capital Stock	12.95% on $42,503,000.00	12.325% on $42,503,000.00	.....

FINANCIAL.

CAPITAL STOCK AND FUNDED DEBT.

The Capital Stock of The Delaware and Hudson Company on December 31, 1912, was $42,503,000, no additional shares having been issued during the year.

The Debentures of 1914, outstanding at the close of the year were $300,000, having been reduced by the payment, on January 1, 1912, of $200,000, maturing as of that date.

The amount of First Lien Equipment Bonds of 1922, outstanding December 31, 1912, was $9,694,000, bonds aggregating $4,000 having been retired during the year through the operation of the Sinking Fund established in connection with their issue.

FLOATING DEBT.

The Floating Debt of the Company amounted to $3,500,000 on December 31, 1912, having increased $2,600,000 during the year. This increase was made necessary in order to finance temporarily addition and betterment work, and to cover advances to subsidiary companies for construction.

SINKING FUNDS.

During the year there was paid into the Sinking Fund under the First and Refunding Mortgage the sum of $277,040, being one per cent. of the par value of the First and Refunding Mortgage Gold Bonds outstanding May 1, 1912, making the total paid to date, $896,510. In accordance with the terms of the trust agreement, this money has been expended in additions and betterments to the property coming under the mortgage.

A summary of the operations of the Sinking Fund under the First Lien Equipment Trust Indenture, from the date of its creation to December 31, 1912, follows:

RECEIPTS:	
Annual payments to Trustees, years 1908, 1909, 1910, 1911 and 1912, $650,000 per year	$3,250,000.00
Interest on cash balances and investments	111,967.68
Total	$3,361,967.68

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DISBURSEMENTS:

Sixty-two locomotives acquired		$1,546,678.57
Five Milk Cars acquired	$17,000.00	
One Gas-Electric Car acquired	25,075.00	
One Pintsch Gas Transport Car acquired	2,500.00	
Two Gasoline Tank Cars acquired	1,700.00	
One Snowplow acquired	5,040.42	
Fifteen Cabooses acquired	10,500.00	
		61,815.42
Three hundred and six (306) The D. & H. Co. First Lien Equipment Bonds purchased and retired (including accrued interest)	312,170.64	
Securities and Cash in hands of Trustees	1,441,303.05	
Total		$3,361,967.68

In accordance with the ordinance passed May 10, 1899, and amended at the annual meeting of stockholders held on May 10, 1910, there was accumulated in the Coal Department Sinking Fund $285,486.35. Of this amount $1,780.04 was applied toward the cost of coal lands purchased in the Wyoming section of Pennsylvania, and the balance was applied to the advances to The Schuylkill Coal & Iron Co. and the Shamokin Coal Co. for the acquisition of anthracite coal lands in Schuylkill County, Pennsylvania.

DIVIDENDS.

On December 18, 1912, a dividend for the year 1913, upon the outstanding $42,500,000 of Capital Stock of the Company, at the rate of nine (9) per cent. upon the par value thereof, and amounting in the aggregate to $3,825,270, was declared out of the earnings for the current and preceding years, payable as follows:

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon February 25, 1913, and payable March 20, 1913.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon May 28, 1913, and payable June 20, 1913.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon August 28, 1913, and payable September 20, 1913.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon November 27, 1913, and payable December 20, 1913.

COAL MINING DEPARTMENT OPERATIONS.

During the year 1912 there were mined 6,438,555 gross tons of anthracite coal out of a total of 63,610,578 tons, including product of washeries, produced in the region. The output produced by this Company was 6,427,864 gross tons less than for the year 1911, due to the suspension of work at the collieries from April 1st to April 30th, upon account of strike of employes.

As a result of the suspension above referred to, a joint sub-committee was appointed representing the Mine Workers on the one hand and the Anthracite Coal Operators on the other, which negotiated an agreement governing the relations of employer and employes in the Anthracite Region. This agreement provides that the terms and conditions awarded by the Anthracite Coal Strike Commission and supplemented by the agreements subsequent thereto shall be continued for a further period of four (4) years, ending March 31, 1916, except in the following particulars, to wit:

(a) The contract rates and wage scales for all employes shall be increased ten per cent. over and above the contract rates and wage scales established by the Anthracite Coal Strike Commission as effective April 1, 1902. The provisions of the Miners' Certificate by mutual consent abolished.

(b) All contract miners and laborers when working on consideration shall be paid not less than the rate paid the Company miners and laborers at the mine where the work is being performed.

(c) There shall be an equitable division of mine cars as set forth in the award of the Anthracite Coal Strike Commission, and the decisions of the Conciliation Board; and further, the rates paid by any contract miner to his employes shall not be less than the rates for similar work paid the regular class of work.

(d) At each mine there shall be a grievance committee consisting of not more than three employes, and such committee shall under the terms of this agreement take up for adjustment with the proper officials of the Company, all grievances referred to them by employes who have first taken up and said grievance with the foreman and failed to effect proper settlement of the same. It is also understood that members of the Board of Conciliation elected by the Mine Workers organization or his representatives may meet with the Mine Committee and Company officials in adjusting disputes. In the event of the Mine Committee failing to adjust with the Company officials any grievance referred to them they may refer the grievance to the members of the Board of Conciliation in their district for adjustment, and in case of their failure to adjust the same, they shall refer the grievance to the Board of Conciliation for final settlement, as provided in the Award of the Anthracite Coal Strike Commission and the agreements subsequent thereto, and whatever settlement is made shall date from the time the grievance is raised.

(e) Contract miners shall have the right to employ check weighmen and check docking bosses, as provided by the award of the Anthracite Coal Strike Commission and the decisions of the Board of Conciliation, and when so employed their check weighmen and check docking bosses shall not be interfered with in the proper performance of their work; provided they do not interfere with the proper operation of the colliery. Check weighmen and check docking bosses shall be elected by contract miners in meeting assembled specifically for that purpose, and for such term as said miners may determine, and the chairman or secretary of said meeting shall certify such election to the mine foreman.

(f) For the purpose of facilitating the adjustment of grievances Company officials at each mine shall meet with the Grievance Committee of employes and prepare a statement showing the rates of compensation paid for each item of work under the provisions of this agreement, and certify the same to the Board of Conciliation within sixty days after the date of this agreement.

There are items other than changes in the wage schedule which tend to cause the cost of producing coal to increase from year to year—shafts and slopes are sunk deeper, tunnels are extended, and the mined-out area increases; all of which lengthen the haul of coal in mine cars, requiring increased transportation facilities; increase the area to be drained of water, thus calling for more pumping facilities; increase the area to be ventilated, thus requiring enlarged ventilating appliances; and with it all requires more employes.

The thicker veins are gradually being worked out, so that an increased proportion of coal is coming from thin veins, and, in mining these, sufficient headroom must be provided to enable the miners to take out the coal, so that often an amount of rock greater than the body of the coal must be taken out.

There has been a steady increase in the percentage of steam sizes to the total production—increasing from 27.1 per cent. in 1901 to 38.6 per cent. in 1911. This has not resulted from decreased efficiency in mining, but on the contrary is due to improved cleaning appliances which enable the producer to prepare for the market small sizes which formerly went into the culm banks. It is also due, in part, to a conservation of the natural resources, in that the producer is now mining from the thinner veins, while formerly the mines were abandoned after the coal was taken out of the thicker veins, and by reason of cave-ins, which occurred after the coal from the thicker veins was mined, and which prevented the securing of a safe roofing, it became impracticable to subsequently mine the coal in these thinner veins.

The cost of production per ton of fresh-mined coal applies equally to all sizes, whether it be chestnut or smaller sizes, and represents the same loss valuable. In arriving at the cost per ton, a ton of buildseye coal is as much above as a ton of chestnut coal. Inasmuch as the greater proportion of the increase in coal production has been in the smaller or less valuable sizes, such increased tonnage has contributed to keeping the average cost per ton of all sizes less than it otherwise would have been, but at the same time the increased resulting product is one of which the greater proportion is less valuable than the cost to produce it.

Taxes have been increased, so that they are about four times in excess of the amount paid in the year 1901, and this notwithstanding the constant decrease in the unmined coal remaining in the ground. This increase is equivalent to three and thirty-eight hundredths cents per ton on the normal output.

Thus since the adjustment of the wage schedules and the sales prices of coal following the strike of 1902, there has been a constant increase in the cost of producing coal from year to year, due to the causes mentioned which were not counterbalanced by any changes in prices which were made during that period, so that the operating costs of producing coal of this and subsidiary companies, including taxes but excluding sinking fund for depletion of the coal lands, were higher in 1911 than in 1901 by $0.3573 per ton; while, on the other hand, if all of this product had been sold at the average sales prices prevailing there being a few exceptions to the fluctuations in prices which might take place in any other market), the increased gross return of 1911 over 1901 would have been $0.0808 per ton. That is, the increased cost of production exceeded the increased price return by $0.1257 per ton and made it impossible to earn a fair return on the investment. Therefore, some increase in the market price of coal was necessary even though no increase in wages had occurred.

Assuming that in the year 1913 the mines had been operated under normal conditions, but with the increase of $0.0808 per ton in the cost of mining under the new wage scale, with an increase of $0.0243 per ton in taxes, and with the increase of $0.25 per ton in the market price of pea coal and larger sizes, and with no change in the market price of the smaller sizes (thus making an increase in the average market price per ton of all sizes of $0.1913), it would have resulted in an increase over the year 1901 of $0.1257 per ton in the cost of production and an increase of $0.1913 per ton in the market price—indicating a decreased return to the producer of $0.0243 per ton, or two-tenths hundredths cents per ton.

Construction was continued during the year on the new colliery at Archbald, Pa., which, it is expected, will be completed and placed in operation in the Spring of 1913.

During the year the facilities were increased to correspond with the requirements of the mine working and development work continued in order to maintain the output.

The charges therefor to Extraordinary Expenses of the Coal Mining Department amounted to $857,975.42, as against $823,654.71 in 1911, as follows:

New Colliery at Archbald, Pa.	$280,321.97
Sinking Shafts and Shaft Improvements	107,884.91
Tunnels and New Openings	83,892.24
New Engines, New Boilers, Boiler Houses and Fittings	63,965.30
Rope Haulage, Slopes, Planes and Ropes	59,892.04
Concrete Barns, etc.	58,220.19
New Pumps and New Pump Rooms	44,216.49
Electric Plants and Machinery	43,122.89
Tanks, Standpipes and Trestles	41,359.36
Other New Buildings	14,753.63
Improvements to Breakers and Washeries	7,196.78
Conveyors	1,028.46
Miscellaneous	46,121.16
Total	$857,975.42

RAILROAD DEPARTMENT.

OPERATING REVENUES.

The total increase in Revenue from operations was $1,058,286.12.

The Revenue from Coal Freight traffic increased $498,901.29, of which approximately one-eighth per cent. was from bituminous coal. Notwithstanding the suspension of coal mining operations in the early part of the year and a decrease of 1,285,711 net tons of anthracite coal carried, there was an increase of 1,545,163 in the total anthracite tonnage.

The Revenue from Merchandise traffic increased $423,062.90, the Revenue from Passenger traffic increased $127,027.54, and the Revenue from Miscellaneous sources increased $79,044.39.

OPERATING EXPENSES.

The total increase in Operating Expenses was $1,308,619.26. Maintenance of Way and Structures increased $451,595.50; Maintenance of Equipment increased $170,003.13; Traffic Expenses increased $39,468.78; Transportation Expenses increased $564,690.82, and General Expenses increased $82,581.97.

The ratio of Operating Expenses to Operating Revenues in 1912 was 62.57 per cent., as compared with 59.56 per cent. in 1911. The increase was partly due to the complete shut-down of all of the anthracite mines from April 1 to May 21, 1912, pending a settlement of the wage dispute, which caused a substantial reduction in the Company's revenues for those months, while it was impossible to decrease the operating expenses with the loss of traffic.

In January and February, 1912, the weather conditions were unusually severe and resulted in increased operating costs.

The increase in the Maintenance of Way and Structures Expenses was chiefly due to an increase of $181,904.06 in Rails, Ties and Other Track Material; also, to an increase of $187,941.28 in Bridges, Trestles and Culverts which was made necessary by addition and betterment work inaugurated to provide for use of heavier power.

The increase in the Maintenance of Equipment Expenses was due to an increase of $130,468.00 in Locomotive Repairs and an increase of $60,169.42 in Freight Train Car Repairs—the Locomotive Repairs resulted from 575,558, or 4.44 per cent., more miles run by Locomotives, and an increase of 5 per cent. in the tractive power of locomotives repaired—the Freight Train Car Repairs resulted from an increased cost of material for repairs and 4,081,505, or 7.58 per cent., more miles run by freight train cars.

The increase in the Transportation Expenses resulted largely from

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increase in business handled. The increased price of fuel resulted in an additional cost of $129,803.65; the increased wages paid to engineers amounted to about $18,000, for the last eight months of the year, under the arbitration award; the increase in Personal Injury Claims paid amounted to $39,695.17, although the number of settlements was less, thus showing the effect of legislation and agitation respecting employers' liability.

Early in the year 1912, the Brotherhood of Locomotive Engineers in behalf of the engineers employed on fifty-two railroads in the eastern section of the United States presented a concerted request to the managements of these railroads for a general increase in wages and for certain modifications in the rules governing their employment.

The matters in dispute were finally submitted to a Board of Arbitration of seven members, one selected by the railroads, one by the Brotherhood of Locomotive Engineers, and one other five were selected by a committee consisting of the Chief Justice of the United States, the Presiding Judge of the Commerce Court, and the United States Commissioner of Labor.

The Arbitration Board fixed the minimum rate for engineers in passenger service at $4.25 for 100 miles or less; miles made in excess of 100, pro rata. Overtime to be computed at 40 cents per hour; paid for at the rate of 50c. per hour. Overtime computed on the minute basis.

The minimum rate for engineers in freight service was fixed at $4.75 for 10 hours or less, or 100 miles or less; miles made in excess of 100, pro rata. Overtime in freight service computed on the basis of 10 miles per hour, and paid pro rata on the minute basis. 25c. per 100 miles or less to be added for local freight service, to through freight rates, according to the class of engines. Mixed service men will be paid pro rata.

The minimum rate for engineers in switching service was fixed at $4.10 per day, 10 hours or less to constitute a day's work; all time over 10 hours to be paid pro rata; overtime computed on minute basis.

The Arbitration Board also established a rule governing Electric Service, Belt Line or Transfer Service, time Engineers are held away from Home Terminal, time of beginning and ending of a day, Initial Terminal Delay, and Final Terminal Delay.

The awards were made effective as of May 1, 1912, except the award covering "Final Away Home Terminal Delay," and the award covering "Final Terminal Delay" which took effect November 1, 1912. The awards will terminate on May 1, 1916.

The Brotherhood of Locomotive Firemen, the Order of Railway Conductors, and the Brotherhood of Railroad Trainmen, on behalf of all the men engaged in engine and train service, other than the locomotive engineers, have presented a concerted request to the managements of the railroads in the eastern section of the United States for a general increase in wages and for certain modifications in the rules governing their employment. The demands of the firemen and trainmen call for about thirty per cent., and those of the conductors and trainmen to ten per cent., of the present rates of pay.

An Arbitration Board has been selected under the provisions of the Erdman Act, for the consideration of questions involved in the demands of the Brotherhood of Locomotive Firemen. The demands of the Order of Railway Conductors and of the Brotherhood of Railroad Trainmen will be taken up for discussion by the Conference Managers' Association of New York, immediately after the Firemen's wage schedule has been disposed of.

ADDITIONS AND BETTERMENTS—ROAD.

A program has been inaugurated covering extensive bridge renewals and betterments in order to make it possible to use the capacity of carrying E-5 engines, the heaviest of the consolidation type. Part of this work was completed in 1912, resulting in the expenditure of charges amounting to $29,564.17 and to Operating Expenses of $123,363.07. The program calls for a total estimated expenditure of $214,300, charges and $9,640 in order available to Additions and Betterments. The work will continue throughout the years 1913 and 1914.

During the year there were completed and put in operation the shops and terminals at Waterviiet, N. Y., the coal storage plant at Glenville, N. Y., the round house and coaling facilities at Rotterdam Junction, N. Y., the location and charge of line Oneonta to Nineveh, N. Y., and the mile of double track north of Binghamton, N. Y., as reported in the annual reports.

New Passenger Stations at Lake George and Dannemora, N. Y., have been constructed and the freight house facilities at the latter place improved.

There is being constructed at the present time an under-crossing, including solid floor three feet in width, at Bridgewater, N. Y.; at Slingerlands, N. Y.; a concrete overhead bridge, concrete cattle pass and approaches, at Bainbridge, N. Y.; and an over-crossing at Robinson Street, Binghamton, N. Y.; all of which are being done in accordance with the orders of the Public Service Commission of the Second District, State of New York.

Substantial improvements in the station and yard layout at Sidney, N. Y., have been undertaken. When completed the improved facilities will be used jointly by this Company and the New York, Ontario & Western Railway Company.

The freight house at Green Island, N. Y., is being enlarged and additional tracks constructed, to care for the increasing traffic at that point.

ADDITIONS AND BETTERMENTS—EQUIPMENT.

As mentioned in the 1911 report, there is under way the work of equipping freight cars with steel underframes. There was expended on this work in 1912 $334,594.70. The program for 1913 contemplates the applying of steel underframes to 200 box cars of 60,000 lbs. capacity; 400 coal cars of 80,000 lbs. capacity, and 200 coal cars of 60,000 lbs. capacity, at an estimated cost of $1,000,000.

There were received during the year the three Mallet Articulated Compound Locomotives, the twelve Class E-5 Consolidated Locomotives, the five new Standard Steel Underframe Milk Cars, the one Passenger and Baggage Car, the Electric Car, and the four wheel Caboose Cars which were ordered in 1911; and, in addition there were acquired one Snow Plow, two Gasoline Tank Cars, and one Pintsch Gas Transport Car; all of which were paid for from funds accumulated under the First Lien Equipment Trust Indenture.

During the year 1912, the Board of Managers authorized the acquisition of fifteen Class E-5 Consolidated Freight Locomotives, and one 100-Ton Wrecking Derrick; one Dining Service Car and Trailer with the necessary equipment, for 1913 delivery; all of which will be paid for from funds accumulated under the First Lien Equipment Trust Indenture.

The total expenditures for the year for account of Additions and Betterments to the Company's Railroad (and including expenditures on account of the items mentioned above) amounted to $2,927,057.72, details of which are as follows:

Road:	
Right of Way and Station Grounds	$44,660.86
Widening Cuts and Fills	9.26
Protection of Banks and Draining Car and Trailer	3,875.31
Bridges, Trestles and Culverts	72,457.64
Increased Weight of Rail	47,990.51
Improved Ballast and Surfacing	202.00
Track Fastenings and Appurtenances	10,661.91
Additional Main Tracks	4,268.50
Sidings and Spur Tracks	434,255.36
Terminal Yards	8,525.65
Fencing Right of Way	2,393.17
Elimination of Grade Crossings	7,089.16
Block and Other Signal Apparatus	16,880.18
Telegraph and Telephone Lines	3,324.55
Station Buildings and Fixtures	69,639.84
Shops, Engine Houses and Turntables	581,236.50
Shop Machinery and Tools	366,511.54
Water and Fuel Stations	75,796.87
Other Additions and Betterments	6,303.40
Work in Progress	613,173.12
Total for Year	$2,318,757.13
EQUIPMENT:	
Steam Locomotives	$328,698.52
Passenger Train Cars	7,538.35
Freight Train Cars	89,139.86
Work Equipment	12,370.37
Work in Progress	348,833.21
Total for Year	608,300.59
Grand Total 1912	$2,927,057.72

The Wilkes-Barre Connecting Railroad Company has been organized to construct a line of railroad which will effect a connection between the Pennsylvania Railroad and the lines of this Company near Wilkes-Barre, Pa. The capital stock of the new Company is owned jointly by the Pennsylvania Railroad Company and the Delaware and Hudson Company.

ALLIED STEAM RAILWAYS.

The Greenwich and Johnsonville Railway Company shows an increase in Operating Revenues for the year 1912 of $8,333.42 as compared with the previous year. The Operating Expenses show an increase of $1,643.80. The Net Income for the year was $25,824.12, an increase of $8,756.30 over 1911.

The Quebec, Montreal and Southern Railway Company shows an increase in Operating Revenues of $25,464.66 for the year 1912 as compared with the previous year. The Operating Expenses increased $16,109.96. The Net Income, independent of interest charges due The Delaware and Hudson Company, amounted to $150,378.40, an increase of $19,539.18.

The Napierville Junction Railway Company shows an increase in Operating Revenues for the year 1912 of $12,400.11 as compared with the previous year. The operating Expenses show an increase of $11,089.12. The Net Income amounted to $19,416.44 or 3.23 per cent. on the Capital Stock outstanding. The Operating Expenses increased by reason of the severe weather conditions in the early part of the year; also by extensive repairs to locomotives. Personal injury claims also increased $5,000.

ALLIED ELECTRIC RAILWAYS.

Increases in Net Operating Revenues were as follows: United Traction Company, $11,721.66; Hudson Valley Railway Company, $11,213.41; Schenectady Railway Company, $35,321.44. The Net Operating Revenues of the Troy and New England Railway Company and the Plattsburgh Traction Company decreased $2,578.61 and $2,398.37, respectively.

Dividends of 4 per cent. for the year 1912 were declared on the Capital Stock of the United Traction Company; 6 per cent. on that of the Schenectady Railway Company; 3 per cent. on that of the Troy & New England Railway Company, and 5 per cent. on that of the Plattsburgh Traction Company.

The United Traction Company has completed the work inaugurated in 1911 of placing feeder wires under ground. A high tension transmission line from Mechanicville Power Plant to North Albany, a distance of 17½ miles, has been constructed, affording a two-way direct transmission of current from the Mechanicville Power Plant to its various transformer stations at Albany and Troy, N. Y. The tracks have been extended on Ten Broeck Street, Albany, N. Y., Mill Street and Pawling Avenue, Troy, N. Y., for a distance of 4,054 feet and 2,692 feet respectively. During the year seventeen 16-ft. cars were lengthened to 21 feet, increasing the seating capacity from 22 to 28 passengers, or 27.3 per cent.; and three 18-ft. cars were rebuilt and lengthened to 21 feet, increasing the seating capacity from 24 to 28 passengers, or 16.7 per cent.

The Hudson Valley Railway Company has purchased three new passenger cars for use in interurbin service between Albany and Warrensburg, N. Y., each with a seating capacity of 52 passengers, and has completed the work of paving Broad Street, Schuylerville, N. Y. The work of paving Lawrence Street, Glen Falls, N. Y., with asphaltic concrete pavement will be completed early in 1913.

ALLIED BOAT LINES.

The Operating Revenues of The Champlain Transportation Company show an increase of $5,359.85 and the Operating Expenses show an increase of $4,372.80 as compared with the year 1911, making an increase in Net Operating Revenue of $986.05 for the year.

The Operating Revenues of The Lake George Steamboat Company show an increase of $5,254.98 and the Operating Expenses show an increase of $16,917.36 as compared with the year 1911, making a decrease in Net Operating Revenues of $11,662.38 for the year.

The Operating Expenses increased by reason of the increased cost of fuel and food supplies and extraordinary repairs to boats of The Lake George Steamboat Company.

The new motor boat "Mountaineer" was completed during the year at a cost of $13,565.21.

Work is in progress on the new shops at Shelburne Harbor, Vt. There was expended on same $15,874.73 during the year.

HOTELS.

Extensive improvements have been made to the Fort William Henry Hotel, consisting of fitting up the Pergola and Bridge for shops and stores, making an addition to the Annex, building a toboggan slide and hockey rink, and constructing a sewage system.

The Fort William Henry Hotel was open in 1912 from January 1st until October 20th and again opened for the winter season on December 20, 1912.

The Hotel Champlain was opened June 14th and closed September 29, 1912.

Both hotels experienced a successful summer season and notwithstanding the moderate winter weather the Fort William Henry Hotel is showing an improvement in business this winter as compared with the winter 1911-1912.

LITIGATION.

In the suit instituted by The Ticonderoga Railroad Company against this Company, mentioned in the annual reports of 1909 and 1910, the New York Court of Appeals has decided that this Company owes no present duty to The Ticonderoga Railroad Company, except to report the results of this Company's operation of the Ticonderoga Railroad, and to continue the annual payments heretofore made.

In other respects the situation of the litigated matters mentioned in the recent annual reports of the Company remains unchanged.

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GENERAL REMARKS.

The Interstate Commerce Commission has proposed rates to be assessed by Express Companies on interstate merchandise express traffic, which would cause losses estimated at 25.2 per cent. of the gross revenues therefrom, and which would correspondingly reduce the express revenues of the Railroads. A hearing before the Commission on the proposed rates will be held during the year 1913, and data is now being prepared which it is believed will clearly indicate the injustice of making any general reduction, and that, at most, changes should be made only in such individual rates as may be necessary to bring them into harmony with the general schedule.

By an Act of Congress a Parcels Post was established on January 1, 1913, whereby packages not exceeding seven pounds in weight may be forwarded as United States Mail. A large percentage of small packages formerly carried by express will probably be forwarded by mail.

The Post Office appropriation bill which became a law March 4, 1913, provides, that on account of the increased weight of mail resulting from the establishment of the Parcels Post, the Postmaster General is authorized and directed to weigh the mails, beginning September 1, 1913, and to readjust compensation from the date of the commencement of such weighing. It provides, also, for the discontinuance of the transportation of second class matter in freight trains. No provision has been made for compensation to the Railroads for the additional mail carried by reason of the Parcels Post between the date of its establishment and the date of the weighing.

While the increased mail pay resulting from the re-weighing of the mails will largely offset the loss in express revenues of the Railroads, it will not compensate them for the increased labor in handling the mails—the Railroads being obligated to handle, without compensation, all mail at transfer points, and also between the depots and post offices in all cities and towns where the distance does not exceed 80 rods.

Shortly before the close of the year the Interstate Commerce Commission announced its intention to make an investigation of all rates, rules, regulations and practices governing the transportation of anthracite coal. Investigations and practices governing the transportation of anthracite coal. Investigations and practices governing the transportation of anthracite coal constitutes over forty per cent. of the total tonnage handled by this Company, it is deeply concerned in the outcome of the proposed investigation.

In view of the constantly growing expense of operation, due to the demands of labor, to the increased cost of material, and to the new Federal State laws, which to a large degree needlessly and unreasonably increase the number of employees and with no corresponding increase in the freight rates—the following table showing the investment which all of the carriers reporting to the Interstate Commerce Commission have made in property devoted to public use and their return on the total investment and on the new money going into the property since June 30, 1907 (the date the new Operating Expense accounts of the Interstate Commerce Commission became effective), is of especial interest:

	†1911.	1910.	1909.	1908.	1907.
Cost of Road and Equipment	$14,984,796,837	$14,387,816,099	$13,609,183,515	$13,213,766,540	$12,940,379,220
Revenues	$2,852,854,221	$2,812,141,575	$2,473,205,301	$2,440,638,832	$2,570,795,058
Expenses	1,976,331,864	1,881,879,118	1,650,034,204	1,710,401,791	1,737,698,201
Net	$876,522,857	$930,262,457	$823,171,097	$730,237,041	$833,096,857
Taxes	102,657,157	98,034,593	85,139,554	78,673,794	79,640,013
Operating Income	$773,865,700	$832,227,864	$738,031,543	$651,563,247	$753,456,844
Other Deductions:					
Hire of Equipment—Cr.	13,616,738	11,802,699	8,118,416	14,140,351	.....
Joint Facilities—Cr.	18,983,462	17,531,307	15,215,611	13,890,179	.....
Total	$32,520,200	$29,334,006	$23,334,027	$28,030,530	.....
Total Income	$806,385,900	$861,561,870	$761,365,570	$679,593,777	$753,456,844
Income Deductions:					
Hire of Equipment—Dr.	$31,345,508	$27,647,038	$24,794,781	$21,660,850	.....
Joint Facilities—Dr.	30,371,290	28,819,675	26,111,803	23,136,943	.....
Total	$61,716,798	$56,466,713	$50,905,584	$44,797,833	.....
Net Operating Income	$744,669,102	$805,095,157	$710,458,986	$634,795,944	$753,456,844
Per Cent on Cost of Road	5.59%	5.25%	4.80%	4.80%	5.82%
Increased Cost of Road over 1907	$2,044,417,617	$1,447,436,879	$668,804,295	$273,387,320	.....
Increased Return over 1907	$†8,787,742	$†51,638,313	$†42,997,858	$†119,660,900	.....
Per Cent. Increased Return on Increased Cost of Road.	*0.43%	*3.56%	*6.43%	*43.40%	.....

†Although the 1911 Report has not been published, we were able to get the information by sending a representative to the Commission. The 1912 figures, although in the hands of the Commission, have not been compiled, so that 1911 is the latest information available.
*Decrease.

NOTE.—The following amounts were deducted from the 1907 figures shown in the Interstate Commerce Statistics, as they represent the figures for switching and terminal roads; while subsequent reports of the Commission excluded such roads and the data is unobtainable: Road and Equipment, $90,065,108; Earnings from Operation, $18,310,520; Operating Expenses, $11,117,613; Taxes, $672,362.

It will be noted that the investment in Road and Equipment increased approximately $273,000,000 in 1908, $395,000,000 in 1909, $729,000,000 in 1910, and $597,000,000 in 1911, so that on June 30, 1911, the investment in the property devoted to public use was, $2,044,417,617 in excess of the investment on June 30, 1907.

Compared with 1907, there was available for interest and dividends approximately $119,000,000 less in 1908, $43,000,000 less in 1909, $52,000,000 more in 1910, and $9,000,000 less in 1911.

In other words, the year 1910 was the only year in which the railroads received any return on the new money going into their property devoted to public use, and in that year they received only 3.56 per cent. on the increase of $1,447,436,879 in the cost of Road and Equipment on June 30, 1910, as compared with the rate of 5.82 per cent. earned on the rate of return on the total investment equal the 5.82 per cent. earned in the year 1907.

It will be noted that the taxes for the year 1911 increased approximately $23,000,000, or 29 per cent. over the year 1907.

The necessary annual increases of capital investments by railroad enterprises of the character above indicated must be largely made through new issues of long term securities. Such securities will hereafter be placed with some difficulty at such rates of interest as the companies can afford to pay, unless there can be secured to the carriers a fair rate of return upon the cost of the improvements to their properties.

By order of the Board of Managers.

L. F. LOREE,
President.

BALANCE SHEET.

Items.	1912.	1911.	Increase or Decrease.
Assets.			
Unmined Coal Owned and Controlled	$16,397,240.93	$16,667,697.24	—$270,456.31
Advances on Unmined Coal	354,033.35	361,129.71	—7,096.36
Real Estate	805,850.47	4,846,119.40	—4,040,268.93
Road and Equipment—The D. & H. Co.	65,814,079.28	58,858,151.17	16,955,928.11
Road and Equipment—Canadian Lines	6,331,867.72	6,308,139.71	23,728.01
Floating Equipment	6,726.00	31.00	6,695.00
Coal Mining Department Equipment, Cars, Motors, Mules, Horses, etc.	1,303,362.30	1,263,292.17	40,070.13
Coal Handling and Storage Plants	61,134.46	95,877.17	—34,742.71
Stocks and Bonds	27,088,093.56	27,014,189.46	73,904.10
Cash	1,182,559.75	1,921,783.81	—739,224.06
Fire Insurance Fund	373,904.51	336,723.56	37,180.95
Cash and Securities in Special Renewal Funds	9,738.00	9,393.00	345.00
Equipment Trust Fund	1,441,303.05	1,196,135.31	245,167.74
Special Deposits	.....	596,678.42	—596,678.43
Supplies on Hand	2,781,672.78	2,885,682.49	—104,009.71
Bills and Accounts Receivable	4,118,196.86	2,790,468.68	1,327,728.18
Advances for Construction and Acquisition of New Lines	3,427,607.68	2,047,128.62	1,380,479.06
TOTAL	$131,497,370.70	$127,198,620.93	$4,298,749.77
Liabilities.			
Items.	1912.	1911.	Increase or Decrease.
Capital Stock	$42,503,000.00	$42,503,000.00	.....
Bonds as follows:			
1st and Refunding Mortgage Gold Bonds, 1943, 4%.....	$27,704,000		
1st Mtge. Bonds, 1917, 7%.....	5,000,000		
The Adirondack Ry. Co. 1st Mtge. Bonds, 1942, 4½%...	1,000,000		
Schenectady & Duanesburgh R. R. 1st Mtge. Bonds, 1924, 6%	500,000		
	1911.	1910.	1909.	1908.	1907.
Cost of Road and Equipment	$14,984,796,837	$14,387,816,099	$13,609,183,515	$13,213,766,540	$12,940,379,220
Revenues	$2,852,854,221	$2,812,141,575	$2,473,205,301	$2,440,638,832	$2,570,795,058
Expenses	1,976,331,864	1,881,879,118	1,650,034,204	1,710,401,791	1,737,698,201
Net	$876,522,857	$930,262,457	$823,171,097	$730,237,041	$833,096,857
Taxes	102,657,157	98,034,593	85,139,554	78,673,794	79,640,013
Operating Income	$773,865,700	$832,227,864	$738,031,543	$651,563,247	$753,456,844
Other Deductions:					
Hire of Equipment—Cr.	13,616,738	11,802,699	8,118,416	14,140,351	.....
Joint Facilities—Cr.	18,983,462	17,531,307	15,215,611	13,890,179	.....
Total	$32,520,200	$29,334,006	$23,334,027	$28,030,530	.....
Total Income	$806,385,900	$861,561,870	$761,365,570	$679,593,777	$753,456,844
Income Deductions:					
Hire of Equipment—Dr.	$31,345,508	$27,647,038	$24,794,781	$21,660,850	.....
Joint Facilities—Dr.	30,371,290	28,819,675	26,111,803	23,136,943	.....
Total	$61,716,798	$56,466,713	$50,905,584	$44,797,833	.....
Net Operating Income	$744,669,102	$805,095,157	$710,458,986	$634,795,944	$753,456,844
Per Cent on Cost of Road	5.59%	5.25%	4.80%	4.80%	5.82%
Increased Cost of Road over 1907	$2,044,417,617	$1,447,436,879	$668,804,295	$273,387,320	.....
Increased Return over 1907	$†8,787,742	$†51,638,313	$†42,997,858	$†119,660,900	.....
Per Cent. Increased Return on Increased Cost of Road.	*0.43%	*3.56%	*6.43%	*43.40%	.....

Debentures, 1916, 4%	13,973,000		
1st Lien Equipment Bonds, 1922, 4½%	9,694,000		
Debentures, 1914, 4%	300,000		
	$58,171,000.00	$58,375,000.00	—$204,000.00
Loans Payable	3,500,000.00	900,000.00	2,600,000.00
Interest, Dividends, etc., Accrued	1,405,209.12	1,371,743.86	33,465.26
Interest, Dividends and Bonds due and not yet collected	195,086.81	210,796.31	—15,709.50
Taxes Accrued	157,041.56	109,644.37	47,396.99
Special Reserve Fund Accounts	9,738.00	9,393.00	345.00
Audited Vouchers and Pay Rolls	3,052,053.77	2,773,300.85	278,552.92
Other Accounts Payable	552,479.93	707,107.15	—154,627.22
Appropriated Surplus—Additions to Property prior to June 30, 1907, through Income	6,751,837.48	6,751,837.48	
TOTAL LIABILITIES	$116,297,446.67	$113,712,023.22	$2,585,423.45
General Profit and Loss, being excess of Assets over Liabilities	15,199,924.03	13,486,597.71	1,713,326.32
TOTAL	$131,497,370.70	$127,198,620.93	$4,298,749.77

*Unexpended balance from proceeds of Bonds deposited with Trustee to defray cost of authorized Additions and Betterments.
†Decrease in Real Estate caused by Railroad Real Estate transferred to Road and Equipment—The D. & H. Co. This transfer also accounts for the large increase in Road and Equipment—The D. & H. Co.

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Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,100 copies were printed; that of these 8,100 copies, 6,651 were mailed to regular paid subscribers and 948 were provided for counter and news companies' sales; that the total copies printed this year to date were 167,909—an average of 8,701 copies a week.

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WHILE day work and piece-work systems of payment for shop and engine house employees have been used almost exclusively by American railways, a few roads have experimented with and, in one or two cases, have used more or less extensively different types of premium or bonus systems. That piece-work or special methods of wage payment have proved more productive and efficient than the day work system is largely because of the fact that to successfully introduce and maintain them it has been necessary for the management to study and plan the work more carefully to eliminate useless moves and lost motion, and to closely check the output of each individual, both as to quantity and quality. As the earnings of the men under these systems are dependent on having good facilities and a convenient and plentiful supply of material, abuses of this sort, which have been overlooked under the day work system, have been forcibly brought to the attention of the officers in charge by the workmen. Assuming that an equal amount of attention is given to these matters under the day work system, and that care is taken to study the characteristics of each man so that he can be assigned to that class of work for which he is best suited, it is doubtful if any of the systems are more efficient than day work; in fact, the results obtained on at least two roads of which we have a knowledge would seem to prove this to be true. The rather unique method of developing this truth, as outlined by B. B. Milner in the article on "Fundamentals of Wage Payment," which appears in another part of this issue, is worthy of most careful study by those interested in the problem of the payment for labor, and this is particularly true of the suggestion as to the advisability of basing the compensation on a time element only, rather than on a combination of time and rate elements, as in piece-work.

GOVERNOR MAJOR, of Missouri, in signing the train crew law in that state, not only put into effect a measure which railway officers declared would increase railway operating expenses without increasing the safety of transportation, but he gave out a statement in which he took the cheerful view that the measure would increase safety and reduce operating expenses! The railways really need more employees, the governor said, in order to operate more economically. The implication, of course, is that the governor knows more than the officers of the railways, not only about how to deal with accidents, but also about how to deal with expenses. Mr. Major is a country lawyer, who during most of his career has practised politics as much as law. He has served in the state senate, and been attorney-general of Missouri. Neither in his private practice nor in his public career has he given tokens of surpassing ability; he has had no experience in railway affairs; yet according to his statement he must have a most intimate, thorough and profound knowledge of railway operation. "The trouble in Oklahoma," said Governor Cruce in vetoing the train crew bill in that state, "is and has ever been that in dealing with public service corporations we have assumed to know more about how to operate them than those who have given the matter careful study." Governor Cruce could learn from Governor Major that in a few minutes' consultation with the legislative representative of the organized voting power of a labor brotherhood a truly great statesman can learn more about how to run a railroad than has been learned in all their years of study and experience by all the operating officers of all the railroads in the United States.

AT the meeting of the Central & Western Association of Car Service Officers in Chicago last week, a recommendation was adopted and referred to the Association of Transportation & Car Accounting Officers, that cars found to be unserviceable beyond repair shall be destroyed by the road in whose possession they are at the time, credit being given to the owner for the salvage, instead of being sent home to be scrapped. A similar proposition has been under consideration by the Master Car Builders' Association. The discussion at the meeting of the Car Service Officers left no doubt in the minds of those present that such a rule is in the interest of better railroading. W. E. Beecham, car accountant of the Chicago, Milwaukee & St. Paul, told of a St. Paul car which left that road on October 4, 1909, and arrived home on February 13, 1913, seventeen months after it had been reported in an unserviceable condition by the Central of Georgia, although a home route card had been promptly issued. When the car reached the rails of the St. Paul it was at once sent to the Milwaukee shops to be scrapped. The Central of Georgia's connection refused to accept it, and after various delays it drifted from one road to another until it finally wound its weary way to the scrap pile over more than a score of roads without hav-

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ing performed any service of value to any of them. Others at the meeting related instances of "cripples" that had caused accidents not only serious in themselves, but resulting in serious delays to traffic. Last year the Master Car Builders' Association adopted a rule increasing the repair allowances, which was intended to reduce the number of bad order cars in service by making it more attractive for railways to repair foreign cars. This having been done it would seem to be a wise move to go a step farther, and provide that when cars finally get into a condition beyond repair they shall no longer be allowed to cumber the tracks and trains during the long period which is likely to be required to get them home.

WHILE the construction of the new line of the Lackawanna north of Scranton, Pa., is of much interest from the engineering standpoint, because of the very heavy construction work and the large structures involved, it is of even greater interest as illustrating the expenditures which a road with a heavy traffic and ample financial resources will make to decrease the cost of operation. The Tuckhannock viaduct is of great interest to engineers, particularly because it will be the largest structure of its type ever built, but it is of even greater interest as forming part of a plan to secure an improved line. As indicated in another column, this new line was very carefully located, the rate of increase of both freight and passenger traffic being studied and the cost of handling the present and future traffic over the present and proposed lines being very carefully compared. That this study showed that the interest on the cost of construction would be more than offset by the decrease in operating costs is evident from the authorization of the construction. The large decreases in distance, ruling grades, rise and fall, and degrees of curvature, are not an indication of poor location of the old line, but rather of the character of the country through which the line passes and of the money which is being spent to secure these improvements. It is interesting to note that these savings in distance are being made in spite of the fact that the Lackawanna is already the shortest line between Buffalo and New York. While the Lackawanna's financial position makes it more practicable for it to do work of this kind than for most roads, the expenditure of such sums as are required on the recently completed Hopatcong-Slateford cut-off, and on this more recent one, enables it to increase its already large net earnings. The work is a good example of the intensive development of railway facilities and the improvement in operating conditions which has become more marked within recent years. Improvements of this nature, the example of making which is first set by the roads which are the strongest financially, are gradually undertaken also by other roads which are not so strong, but which must meet the competition of the strong roads.

THE members of the South Dakota Railroad Commission are curious about the salaries paid to railway officers. Curiosity about other people's incomes is not confined to them. It is very common. Few of us can deny having some of it. The South Dakota commissioners are contriving means for gratifying theirs. They have ordered the railways in that state to furnish statements of the salaries of all their officers. Doubtless the South Dakota commissioners expect to find that the salaries paid are so extravagant that some judicious reductions of them would make possible large reductions in freight and passenger rates. The impression that the railways pay out a large part of their earnings in "fancy" salaries is not confined to South Dakota. If the statesmen of that and other commonwealths will turn to the statistics of the Interstate Commerce Commission for 1910, page 44, their interest in the subject will be much moderated. They will find there that the total salaries of all the officers of the railways of the United States are but 3.4 per cent. as much as the total wages paid to railway employees. If they will look farther in the same statistics they will find that all official salaries in 1910 were but 2 per cent. of total operating expenses, and but 1.3 per cent. of total earnings. If, therefore, all official salaries were abolished, and other things remained equal, freight and passenger rates might be reduced by the large amount of 1.3 per cent. If the commissioners really want to reduce expenses let them tackle the wages of employees. The wages paid to train employees—engineers, firemen, conductors and other trainmen—in 1910 were eight and a half times as great as the salaries paid to all officers. The wages of shop employees—machinists, carpenters and other shopmen—were over six times as great as the aggregate salaries of all officers. Therefore, a 6 per cent. reduction in the wages of train employees, or a 7½ per cent. reduction in the wages of shop employees, would be equal to a 50 per cent. reduction in the salaries of all officers; and surely the commissioners would not curtail official salaries more than 50 per cent., for the average salary of general officers in 1910 was only $3,277 a year, and of other officers only $2,076 a year. Each of the foregoing somewhat surprising statements the South Dakota commissioners and others interested can verify by consulting the aforementioned statistics of the Interstate Commerce Commission. Obviously, if the commissioners desire to make attacks on railway expenditures that will have some perceptible tendency to reduce rates they should direct their efforts against the wages of employees, which are over 60 per cent. of railway operating expenses, as compared with but 2 per cent. for the salaries of officers. And it is confidently predicted that this is exactly what the commissioners will not do.

GOOD LOOKS AND GOOD CONDUCT; THEY SHOULD GO TOGETHER.

"JACKING UP" train and station employees is a means of discipline which is still practiced to a considerable extent. The true theory is that high standards should be prescribed and then the employees be so regularly and constantly required to square their conduct with the rules that anything like a big change in conduct, such as the jacking-up process implies, would be unnecessary and unheard of. But for various reasons the maintenance of high standards often becomes impossible, at least for a time. In real life, our theories are all the time getting buried out of sight, and we work along on what is really a low standard.

These reflections are suggested by the fact that a certain general superintendent has issued a circular calling on his trainmen to carry out the rules of courtesy, efficiency and neat appearance. The emphasis is placed on the last of the three items. It is often said that the way to have trainmen who will maintain a neat appearance is to hire men who appreciate neatness without being told. Men who like to keep their shoes clean and black, and their faces properly shaved; who wear modest neckties and do not chew either tobacco or gum, do not come to the trainmaster in droves. And if the trainmaster takes his passenger men from the freight force he has never-ending perplexities.

The standards of the superintendent, whose efforts to put his trainmen in Class A 1 are of the periodical kind, manifesting themselves only once or twice a year, hardly merit approval. Nevertheless, it is to be admitted that the time when a brakeman puts on a new uniform is a good time to get him to improve himself in other respects, and we shall therefore make no apology for preaching politeness at the time when spring suits and the spring timetables are in preparation. The essential thing is to attain to a proper standard; the time is not so important. The time to make any improvement is *now*, unless there are good reasons for delay.

The circular, however, is an ineffective means for the purpose under consideration. Assuming, at the outset, that the trainmaster loves neatness and knows the methods of securing obedience, the simple and obvious way to make a hundred trainmen neat is for him to go out among them so frequently

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that disregard of his orders, because of his apparent indifference, shall be out of the question. The superintendent must face the fact that this may mean more trainmasters. Not only must the man who disciplines the brakemen (and conductors, station agents, baggage agents and porters) have time to see and talk with the men; he must have time to talk with some of them an hour at a time, privately. Many a good conductor whose uniform is discreditable could be made permanently passable, and perhaps satisfactory, by a confidential interview—and in no other way. Moreover, the trainmaster who has to take up this question after a long period of neglect of the matter must for a time give it his chief attention. An important task seldom gets done unless a competent man gives his main energies to the job. In this case the personal attention of the officer is particularly necessary because so much of the work to be done is not susceptible either of being reduced to writing or of being delegated or managed at second hand. The newness of a necktie or the age of a pair of trousers in many cases cannot be approved or disapproved except by personal inspection.

And in putting out money to pay an assistant, while the trainmaster thus neglects his other duties, the superintendent must consider the pay of the trainmaster himself. In many cases he ought to have an increase of 25 to 50 per cent.—if he fills the bill. If he is not worth that much more than the best-paid conductor or engineman, it is to be questioned whether the place is well filled.

Neatness of appearance should be dealt with, not as a thing by itself, but along with politeness and efficiency. There is a decided advantage in having a subject which is big enough to justify a serious talk, discussion or lecture. Putting these three features together accomplishes that object. As an illustration, take the case of a brakeman dealing with an ill-tempered passenger who asks an unreasonable question. To be efficient, the brakeman must be able to give a fair reason for being unable to answer the question. To be polite when the passenger is not polite will test his ability as a competent passenger trainman. To be neat in his appearance is particularly necessary in this case, because when a passenger is unreasonable in his demands it is important, as a matter of simple business policy, to leave him no justification at all for his unreasonableness. A trainmaster who has occasion to instruct a trainman in a case of this kind quite likely may find it worth while to spend a half hour on it; and as soon as the trainman has gone out he will do well to put his lecture or interview in writing, to be promulgated for the benefit of other trainmen. Why should not information of this kind be given out by means of the stereopticon? One of the most useful things done by the Safety Committee on the New York division of the Pennsylvania is the display of printed rules on the screen at evening meetings. The same process is available for any topic.

Another road recently has taken action on this subject. It is one terminating in New York, and its announcement says that "in order that the general appearance of the men on its trains shall be in keeping with the conduct required of them, provision has been made for regular inspection of their uniforms and general appearance, the aim being to make the road the best in the country in this respect." This statement, in its language, is so very like one which was made by the Pennsylvania about 35 or 40 years ago that one is tempted to observe that in the race to become "the best road in the country" this latest entrant has a severe handicap. However, there is no need of taking a very long time in the process. Great things have been done in two years, where superintendents and all concerned put their energies into the job. The word "inspection," in this announcement, serves as a reminder that on a large road an inspector not subordinate to the division superintendent can do useful work. Few trainmasters are so efficient that a spur of this kind will not benefit them. The competent trainmaster should not object to such "surprise checking" any more than an honest conductor should object to the means taken to detect the dishonest. Moreover, the general superintendent needs the report of one man who knows the conditions on all divisions. Many things in discipline can be dealt with properly only by a man who is entirely removed from the field of possible sympathy.

Is all this worth while? Railroad managers seem, in many cases, to deem it worth while only occasionally. But every road aims to give the best service—in all that that term implies—at a few places; at least at the larger terminals. The public, however, asks for good service everywhere; and every superintendent who persistently aims to give it everywhere finds a marked satisfaction in doing so.

THE PRUSSIAN-HESSIAN STATE RAILWAYS.

THE Prussian-Hessian railway system is the largest government owned and operated system in the world. Therefore, its organization, physical structures and operation, service, rates and financial results are of unusual interest. The paper presented to the New York Railroad Club last week by Professor W. J. Cunningham, of Harvard University, an abstract of which is published elsewhere, is a very complete and satisfactory description and discussion of the Prussian-Hessian system. Professor Cunningham concludes that "state ownership of railways in Prussia is successful and that the railways are operated with reasonable efficiency." Most well informed people will agree with him. He adds, "it does not at all follow that government ownership in this country would be equally successful." Most well informed people will agree with him on that, too. As Charles Francis Adams said 30 years ago, "In applying results drawn from the experience of one country to the problems which present themselves in another, the difference of social and political habit and education should ever be borne in mind. . . . A country with a weak or unstable executive or a crude and imperfect civil service should accept with caution results achieved under a government of bureaus."

The bane of public management in democratic countries is the use of political influence to promote the interests of sections or classes whose interests are opposed to those of the public. The electoral arrangements in Prussia, as well as the railway organization, are such as to keep political influence at a minimum. The Prussian parliament has a House of Lords, which is entirely non-elective and chiefly hereditary, and a House of Representatives. In each representative district the people are divided into classes according to their wealth; an arrangement under which 15 per cent. of the people in numbers have two-thirds of the political power. The railway employees belong to that 85 per cent. of the people who have only one-third of the effective voting power. Besides, they are not allowed to organize, and it is only by organization that they could make themselves felt. The minister of public works, the head of the railway administration, is appointed by the kaiser for life, and, therefore, parliament could not turn him out of office if it wanted to. Also, the railway employees are recruited from the army, where they have learned to submit to discipline, and are subject to a discipline on the railways hardly less rigorous than that in the army. Another important point is that the Prussian state mileage is not one-tenth that of the railways of the United States, and is spread over a territory only half the size of Texas.

The Prussian freight service, all things considered, probably is not so good as that of either England, France or the United States. The movement of goods is relatively slow, the regulations to prevent claims stringent, the demurrage rules very strict and often made more so in periods of car shortage; and car shortages are large and not infrequent. While the railways of England and the United States give shippers 48 hours free time in which to unload cars, those of Prussia never give more than 24 hours, usually not more than 12, and often reduce the

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time below this. The demurrage rates, allowing for the differences in the capacities of cars, are substantially higher than in England, and from three to five times as high as in the United States.

The Prussian passenger service will compare with any in the world. The trains are not so fast as in England, France or the eastern part of the United States, but are more regularly on time. In frequency of passenger train service the British roads are first and the Prussian roads second. The Prussian trains, and especially their fourth class compartments, are more likely to be crowded than those of any other leading railways.

Professor Cunningham refers to the remarkably good record of the Prussian lines for accidents. They are superior in this respect to the railways of the United States. But this cannot be attributed to government management, nor indeed to the Prussian scheme of operation, for the record of the English roads and of the five large French private roads, are fully as good as that of the Prussian roads, while the record of the French state railways is very bad. In the year ended June 30, 1910, the Prussian-Hessian roads made the remarkable record of killing only two passengers in collisions and derailments, but in the calendar year 1909, the British roads, with a larger mileage and more trains, made the still more remarkable record of killing only one passenger in a train accident. The accident records of the British, French and German roads are so much better than that of the railways of the United States for the following reasons: First, their physical properties are in safer condition chiefly because a great deal more money has been invested in them. Second, the railway employees in both countries are more careful, discipline being rigorously enforced by the management and governments. As Professor Cunningham points out, in Prussia in 1910 132 employees were prosecuted criminally for infractions of the rules, 81 being given court sentences. Third, in Europe there are stringent laws against trespassing on railway property, which are enforced. The possible trespassers on the railways of a country include its entire population. The population of the United States is somewhat over twice that of Prussia-Hesse, while the number of trespassers killed on our railways is about 28 times as great as on the railways of Prussia-Hesse.

The average passenger rate of the Prussian-Hessian railways is only 46 per cent. of that in the United States and is less than that of any other railways in the world except the state railways of Belgium. The average rate is not so low, as Professor Cunningham shows, because the absolute rates are so low, but because 89 per cent. of the passengers carried travel on the extremely low third and fourth class rates, the service for which is inferior, while only 10 per cent. travel second class and only a trifling number first class. Furthermore, the density of passenger traffic in Prussia is over five times as great as in the United States, and three and a half times as great as in Interstate Commerce Commission Group 2. On the five large French private lines, whose density of passenger traffic is about two-thirds that of the Prussian roads, the average passenger revenue per mile is from 1.11 cents to 1.25 cents. The average rate per ton per mile in Prussia is much higher than in the United States, and after full allowances for differences in conditions, it is relatively higher. The density of freight traffic in Prussia in 1910 was 1,150,460 ton miles per mile, and on the five French private roads only 819,055 ton miles per mile; and the average rate per ton per mile in Prussia was 1.248 cents, and on the French private roads from 1.18 to 1.46 cents.

It is generally considered that the Prussian roads are the most economically operated railways in Europe. It is very questionable if they are as economically operated as the five large French privately owned roads, with which they may most fairly be compared. The average passenger journey in Prussia in 1910 was 14 miles and on the French private roads 22 miles. The average passenger density of the Prussian-Hessian roads was 693,921 passenger miles, and that of the French private roads 436,000 passenger miles. The average haul per ton on the Prussian roads was 68 miles, and on the French private roads 96 miles. Both the passenger and the freight hauls in Prussia are shorter, but this disadvantage is offset by the greater densities of both freight and passenger traffic. While the total units of freight and passenger traffic per mile on the French private roads were 68 per cent. as great as on the Prussian roads, their operating expenses per mile were only 60 per cent. as great, the operating expenses per mile of the Prussian roads being $14,866 and those of the French private roads $8,889. The operating ratio of the French private roads was 55½ per cent., while that of the Prussian-Hessian state roads was 67.27.

As Professor Cunningham points out, the financial results on the Prussian-Hessian roads are very good, and they were able in 1910 to turn about $50,000,000 into the public treasury. This is about 9½ per cent. of their gross earnings—in other words, of what they collected from the public in rates. The taxes paid by the railways of the United States in the same year amounted to $99,423,112, or 3.7 per cent of their gross earnings. The Prussian railways are the only government railways that regularly have net earnings in excess of the interest on their indebtedness.

While, as Professor Cunningham says, the experience of Prussia is not an argument for government ownership in the United States, it does teach one important lesson. Government railway management in Prussia is efficient because it is backed by an efficient government, is not subject to political influence and usually puts national above class or sectional considerations. Any government that is to be successful in the operation of railways must follow the example set by Prussia in these respects. No democratic government ever has done this, and it is questionable if any ever will or can do so.

NEW BOOKS.

The Earning Power of Railroads. By Floyd W. Mundy. 528 pages. The Guenther Publishing Company, 18 Broadway, New York. Price, $2.

The 1913 edition of this manual, like the previous editions, gives a large range of statistics showing mileage, capitalization, tonnage, earnings, etc., of the American railroads in comparative tables covering 10 year periods. The value of the book lies quite largely in the wide scope of the figures given. In addition to the figures for certain physical characteristics of the roads and earnings there are tables showing dividend records, bonds outstanding and in addition a short history of each property. The author is a member of James H. Oliphant & Co., New York.

In making use of the comparative tables for the ten year period, it should be borne in mind that since 1907 the railroads have followed the methods of accounting prescribed by the Interstate Commerce Commission, which was quite different in many instances from the methods in use previous to that time. Comparisons, therefore, between 1912 figures and 1902 are not always accurate. If this fact is not lost sight of then, the ten year tables are very handy and serve a useful purpose.

Engineer's Handbook on Patents. By William Macomber. Bound in flexible leather, 288 pages, 4½ in. x 7 in. Published by Little, Brown & Company, 34 Beacon street, Boston, Mass. Price, $2.50.

The author is a lecturer on the law of patents in the Cornell University law school, and the book is intended as a text book rather than a treatise on the subject. It includes chapters on: What is a patent, the nature of an invention, what is patentable, patentable novelty, the obtaining of patents, claim construction, infringement, patent litigation, and property rights. The book is written in clear and concise language, with a minimum of legal phraseology, and is accompanied by an extensive index for ready reference. Intended especially for engineers, it is equally valuable for inventors and manufacturers.

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THE PRUSSIAN-HESSIAN STATE RAILWAYS.*

An Instructive Description and Discussion of Their Management, Service, Rates and Financial Results.

By W. J. Cunningham,
Assistant Professor of Transportation, Harvard University.

Altogether there are about 34,500 miles of state-owned railways, and 2,200 miles of private-owned railways, in Germany. Of the state-owned mileage Prussia has 23,335, or slightly more than two-thirds. Bavaria comes next with 14.1 per cent. Then comes Saxony with 5.1 per cent.; then respectively Alsace-Lorraine with 3.6 per cent.; Baden with 3.1 per cent.; Mecklenburg with 2.0 per cent.; and Oldenburg with 1.2 per cent. In Prussia-Hesse, the private-owned mileage is 6 per cent. of total. The private railways, however, are comparatively unimportant and are controlled by the government almost as completely as the railways of the states. They are obliged not only to conform to the state traffic regulations but as well to adopt the rules and standards set by the government for the same class of state-owned railways.

STATE OWNERSHIP.

If we may accept as true the statements of the early advocates of state ownership for all of the railways, the greed, selfishness and arbitrariness of the private railway companies were the causes which led to their ultimate absorption by the states. The results, however, were not unprofitable to the shareholders.† Widespread complaints crystalized into a common demand for government ownership, and the movement had a peerless leader in Bismarck. The causes of dissatisfaction then remind us of those now advanced so hysterically by those in New England who wish to bring about state ownership of the Boston & Maine.

In order to summarize the reasons which impelled Germany to give up private ownership, we can hardly do better than to quote from Bismarck's speeches in Parliament.‡ He protested that the railways must not be allowed to act the part of Providence and alter the natural laws of supply and demand; they must not be allowed to dominate trade and industry; they must not be allowed to grant preferential treatment and discriminate in favor of the large shipper at the expense of the small trader; they must not be allowed to overcharge on non-competitive traffic in order to recoup themselves for losses on competitive business; they must not be allowed to grant passes and rebates to the favored few. In brief, the arbitrariness, the egotism, and the discrimination of individuals must be checked. Instead, a policy must be substituted which under state ownership should bring about uniformity of charges, equality of service, protection of public interests, and the establishment of a just, diligent and able railway administration actuated solely by considerations of the general good of the country.

Many reasons other than those quoted from Bismarck's speeches are given as the real object of government ownership. It is commonly believed that military reasons were dominant, that the government in its consistent policy of preparedness for war desired absolute control of all transportation facilities. Taking the view of economists of high standing in Germany, it appears that the real and controlling reason was economic. The object was not to make the railways a means of state power, nor of revenue, but to make them a means of traffic subservient to the economic interests of the nation; to substitute the state for private enterprise as the guardian of the commercial interests of the community.**

It is proper to add that when the nationalization project was before Parliament, Bismarck promised substantial reductions in rates. These promises, no doubt, were made in good faith, but subsequent political exigencies have caused their repudiation. The railways of Prussia as now administered, make large profits, and they apparently could afford to place freight rates on a lower basis and still continue to take care of renewals and betterments. They continue to earn a large surplus and every year they turn over a substantial part of it to the state to be used for the general budget. In the year 1910, the net earnings in Prussia were 6.48 per cent. on the capital investment of $114,000 per mile of line (nearly double our average capitalization) and out of $170,000,000 net revenue, $50,000,000 was devoted to other than railway purposes. The patrons of the railways, therefore, particularly the freight shippers, have reason to complain that they are taxed for the benefit of the community at large.

ORGANIZATION.

At the head of the railway administration of Prussia, is the minister of public works, who is appointed by and may be removed only by the king. Changes in this office are very infrequent. The minister and his councillors correspond roughly to our board of directors or executive committee and chairman; but the several councillors are railway experts, and each devotes his attention to the department in which he has specialized.

The ministry deals only with general matters of policy and standards. The active administration is left to the local directorates, of which there are 21. The average mileage per directorate is 1,116. At the head of each directorate is a president, who reports to the minister of public works. The president of a directorate corresponds in a general way to our general manager, but he has control over every department on his division, including not only maintenance and operation, but also traffic, accounting, finance and construction. It will be seen, therefore, that the Prussian operating unit—the directorate—is the highest type of the divisional system of organization. Below the president the organization becomes departmental, and the lines of authority and responsibility are tightly drawn.

While the principle of local autonomy in the operating of each directorate is carefully guarded, it has been found advantageous to concentrate a few functions exclusively in one of the several directorates, the one so selected to act in that particular matter for all other directorates. Besides, there is a central office in Berlin, which is rated as a directorate (making 22 in all) and attends to certain specified activities for the system as a whole. In some respects the president of the central office resembles our superintendent of transportation, but the former has wider jurisdiction, including that of our purchasing agent.

Associated with the administration are two kinds of advisory or consulting bodies: (1) advisory councils, local and central, established by law; and (2) voluntary traffic and operating unions. The advisory councils are composed of representatives of the government, and delegates from boards of trade, industry and agriculture, as well as representatives of the railway administration. The administration is obliged to consult with

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*An abstract of a paper presented before the New York Railroad Club, April 18, 1913. Prof. Cunningham spent three months in the summer of 1912 in Germany, and his discussion is based on personal observations and a study of official publications.

†In nearly every case the states paid more for the railways than the sums for which they were capitalized. In Prussia this excess averaged about 8 per cent. over the capitalization. Payments were made in 3 per cent., 3½ per cent. and 4 per cent. government bonds.

‡Contemporary Review, February, 1907, pp. 174-192.

**Professor Hermann Schumacher before Royal Economic Society, London, January, 1912.

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these advisory councils on all matters affecting rates or public service. They have no actual power to compel the railway administration to accept their recommendations, but, like the findings of the Massachusetts Railroad Commission, their recommendations are equivalent to commands. The jealousies of sections usually prevent any tinkering with tariffs, even when the administration might be willing to make a reduction which would benefit certain communities. To illustrate, the German policy would not permit California to compete on equal terms with Florida for the New York fruit market. Florida's natural advantage in being nearer the New York market would be guarded.

The advisory councils, on the whole, are to be commended, both in their negative and positive results. Through them the industrial, agricultural, and trade bodies are the arbiters of their own interests in transportation, and all persons affected by railway rates and rules of service have an opportunity to be heard before any change can be made in existing tariffs or regulations.

The American railroad man who visits behind the scenes on the Prussian railways is struck by the absolute impersonality of the organization. Authority flows from the office, and respect is accorded to the office, rather than to the man who happens to fill it. The personality of an official, which is so important here, has practically no play under the Prussian organization. Letters or instructions emanate from the directorate, and may bear the signature of any one of the officials, but in the name of the directorate.

DISCIPLINE.

It is well known that practically all of the railway employees of Prussia have served in the army. When they enter the railway ranks from the army, certain credits are allowed for their military service, and certain positions are reserved for army men. This military experience shows its influence on their deportment and discipline in railway service. There is a noticeable orderliness and precision about everything connected with German railways. In respect for authority and strict observance of the rules, the German railway employee has no superior. The traveler will not fail to notice the red-capped station master standing at attention on the station platform as the train passes through each station. He will also find the senior signalman, gatemen, and other employees connected with train service always in evidence, standing like sentries as the train passes. The operating official, while riding over the line, can thus take a census of all employees in positions of responsibility. When he alights at a station his rank is at once recognized. The station master immediately salutes and gives a verbal report of the situation at his station. If the official goes into a signal tower, the signalman in charge salutes and reports. If he goes into an engine house, the foreman salutes and gives a brief report of the work in progress.

The formation of railway labor unions in Prussia is forbidden by the railway administration. The employees have associations, but inasmuch as the railway officers are *ex officio* members, and take a fairly active part in the proceedings, these associations bear little resemblance to our railway brotherhoods.

The high order of discipline and rigid observance of rules which follows their system of ample and constant supervision bears fruit in their remarkable immunity from train accident, and in the small number of passengers and employees killed or injured. Differences in the manner of compiling accident statistics make comparisons with this country difficult. It is possible, however, to make a comparison of injuries in train *collisions and derailments*, since the classification is the same in both countries and the statistics are made up on the same basis. In 1910, only 2 passengers lost their lives in collisions and derailments on Prussian railways. In that year they handled 1,083,882,279 passengers. In the same year the United States, with ten times the railway mileage, transported 971,683,199 passengers (112 million less than Prussia). But it must be borne in mind that our passengers traveled farther. In Prussia the average passenger journey is 14 miles; here it is 33 miles. Consequently our railways produced more passenger miles, although they handled a smaller number of passengers. Looking at it one way, it is fair to the United States to compare injuries to passengers on a basis of passenger miles. Viewing it from another angle, it may be said that collisions and derailments will tend to vary with the train miles rather than with the number of passengers. We will make the comparison on the two bases:

PASSENGERS AND EMPLOYEES KILLED AND INJURED IN COLLISIONS AND DERAILMENTS, 1910.

Item.	Prussia-Hesse.	United States.
Passengers carried one mile (millions)	15,688	32,338
Total revenue and non-revenue train miles (thousands)	298,584	1,276,025
Passengers killed in collisions and derailments	2	127
Passengers injured in collisions and derailments	349	6,499
Employees killed in collisions and derailments	13	608
Employees injured in collisions and derailments	162	5,201
Passenger miles per passenger killed (millions)	7,844	255
Passenger miles per passenger injured (millions)	45	5
Total train miles per passenger killed (thousands)	149,292	10,048
Total train miles per passenger injured (thousands)	856	196
Total train miles per employee killed (thousands)	22,968	2,099
Total train miles per employee injured (thousands)	1,843	245

Attention is again drawn to the fact that the foregoing tabulation includes only the injuries in *collision and derailments*. Injuries in other train accidents, falling from moving cars, highway crossing collisions, trespassing fatalities, suicides, etc., are not included in the figures for either country. Those for this country are sufficiently familiar to us. The small number of accidents to trespassers is noticeable.* In Prussia the laws prohibiting trespassing are strictly enforced and the railway right of way is carefully guarded. Those who trespass assume a high risk of arrest, since the tracks are well patroled. All persons detected are arrested, fined or imprisoned. The fact that 14 trespassers are killed daily on the railways of the United States,† although given wide publicity, has thus far made little impression on our city and county authorities.

The poor accident showing in this country is largely due to the inherent tendency of the American railroad man to take chances. In Prussia, the railway employee is more deliberate in action, and his military training gives him greater respect for the rules. It may be, too, that the methods there employed to investigate accidents and mete out punishment to the careless, have a direct bearing on their remarkable immunity from casualty. Discipline for infraction of the rules is severe. Guilty employees are not only reprimanded, suspended, fined, or dismissed, but in flagrant cases they are imprisoned. In 1910, there were 132 cases of criminal prosecution, and 81 employees were given court sentences.

COMPENSATION OF EMPLOYEES.

Turning now to the question of salaries and wages, it is interesting to note that in 1910 the average yearly wages of the Prussian railway forces, including all officials as well as workmen, was only $380 per employee. The official statistics show that the average number of "rest days" per month was 3.44 for all employees whose duties require any Sunday work. This gives an average of 324 working days, and an average daily compensation of $1.17. The writer has not sufficient information to hazard a guess as to how much more should be added to that average to allow for the supplementary allowances. He believes, however, that it is within the bounds of reasonable accuracy to say that the gross income of the Prussian employee is just about one-half the average wages of the American railway man. The general average for this country in 1910 is given by the Interstate Commerce Commission as $2.14 per day, excluding officials, but the accuracy of the figure is open to question because of differences in methods employed by different railways in compiling the basic figures. It must be remembered, however, in making comparisons between the two countries, that the cost

*Killed 180; injured 145.

†In Prussia, one trespasser was killed every second day.

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of living is considerably lower in Prussia, and the purchasing power of the dollar is correspondingly greater.

An examination of the list of salaries, etc., shows that the financial reward for the officials is striking in its moderation. The presidents of the various directorates receive but $2,900 per year and a free dwelling. The honor and prestige which go with the position are rated high and evidently compensate for the lack of salary. His assistants, in addition to free dwellings, are paid $1,000 for the first three years, and a small amount is added every three years until they reach the maximum of $1,720, after 18 years of service.

On a road mileage basis Prussia has 21 employees per mile. The average in group 2 of this country is 16 per mile, and in the whole United States 7 per mile.

PHYSICAL CHARACTERISTICS.

Turning now to a consideration of the physical characteristics of the Prussian railway system as it is today, we will first examine its trackage facilities. Serving as it does such a thickly populated district (about 300 per square mile) and having such dense traffic (as will be apparent from the figures to be presented later) we naturally expect to find the lines well equipped with multiple running tracks. Nearly one-half of the system has two or more tracks. In group 2 of the United States (comprising the railways of New York, New Jersey, Pennsylvania, Maryland and Delaware) the territory in this country which comes nearest to resembling Prussia in population and railway development, the percentage of two or more running tracks is practically the same as in Prussia, but in the United States as a whole, only 10.5 per cent. of the railways have two or more tracks. The comparative figures which follow may be of interest:

TRACK DENSITY IN PRUSSIA-HESSE AND UNITED STATES, 1910.

	Prussia-Hesse.		Group 2; U. S. A.		United States.	
Trackage—	Track miles.	Per Ct. of road miles.	Track miles.	Per Ct. of road miles.	Track miles.	Per Ct. of road miles.
Single track	23,364	100.0	23,815	100.0	240,831	100.0
Second track	9,807	42.1	7,609	32.0	21,659	9.0
Third track	44	0.2	1,284	5.4	2,206	0.9
4 or more tracks	119	0.5	941	4.0	1,489	0.6
Yards and sidings	15,287	65.4	16,101	67.6	83,582	35.5
Total trackage	48,621	208.2	49,750	209.0	351,767	146.0

The Prussian roadbed, particularly on the main lines, is well built and well maintained. Steel rail, of design similar to ours, and weighing 91 lbs. per yard is now standard, but the greater part of the mileage still has the lighter rail, averaging between 70 and 75 lbs. per yard. Crushed stone and gravel predominate as ballast, the former being generally used on the important lines. Their standard roadway section for single track main lines calls for a width of 19 ft. across the top of the subgrade, 9 in. of ballast, and 13 ft. across the top of the ballast. Multiple tracks are spaced 11½ ft. on centers.** Tie plates are used on all lines of heavy traffic and screw spikes are standard everywhere. About 31 per cent. of the mileage is laid with metal ties of the inverted trough type, and practically all wood ties are creosoted. The average spacing of ties is 28 in. from center to center, and their length runs from 9 ft. on main lines to 7½ and 8 ft. on branch lines. The use of the metal tie has not become a settled policy and there is much discussion in Germany as to whether it is really superior to the treated wood tie when all factors are considered.

Station, siding and yard facilities at many points, particularly near the frontiers, seem entirely too generous for the regular freight and passenger traffic. The explanation lies in the possible need of these facilities for the handling of troops and military supplies. All freight cars are stenciled to show capacity not only for freight but also for men and horses. A timetable for military operation is ready for use on short notice, and in the event of war, the trains for troops, horses, guns and supplies would take precedence over all other traffic.

The passenger stations in the cities, particularly the stations built within the last 15 years, are imposing in design, generous in size and trackage facilities, and well equipped to take care of the needs and comfort of the maximum traffic. The Hamburg main station is a good example. Those at Cologne, Frankfort, Darmstadt and Halle are notable. The latest and most magnificent, as well as the largest station in Europe, has just been completed in Leipsic at a total cost of upwards of $40,000,000. It has 22 tracks under one train shed. In Berlin there are several large stations to serve the different lines radiating therefrom, but there is no central or union station. All the Berlin passenger stations are connected by the north and south rings—belt lines which carry an enormous passenger traffic. Conditions on these belt lines, which intersect both the business and residential sections, seem ideal for electric operation, but the service is still steam operated, although electrification has been under consideration for several years.

In the freight classification yards we find occasional use of the "hump" in switching. A good example is seen at Wustermark, near Berlin. There are separate humps for each direction, and besides the well laid out yards, there is an admirably designed freight transfer station of concrete construction. The light cars are very easily handled over the hump. The writer observed a 48 car train classified in 12 minutes, each cut averaging about two cars.

The frequency of fixed signals and signal cabins is noticeable. All are of the manual or manual control type. The Germans do not take kindly to automatic signals. They prefer to rely upon the signalman. When asked why they do not consider the adoption of the automatic signal, which has been developed here to such a high degree of perfection, they usually turn the conversation to train accidents and inquire why it is that America has such an unenviable record in that respect.

The official statistics show that Prussia has 40,916 home signals (1.7 per mile of line) and nearly 15,000 distant signals. There is one interlocking cabin for every 5¾ miles. Grouping together all signal towers, cabins, and block stations, there is one for every one-half mile of line. On 2,800 miles of line where speed restrictions apply, automatic speed recording devices are installed alongside the track, and the records are carefully checked to insure strict adherence to the rules.

LOCOMOTIVES.

The Prussian passenger locomotive on through trains is considerably lighter than ours, but there is not as much difference as is generally supposed. In that class of service the Atlantic and 10-wheel type predominate. A large proportion of all locomotives is of the compound type. Germany is the home of the superheater and nearly all engines are equipped with the device, as well as feedwater heaters, draft regulators, screw reversing gear, and other appliances which are not common here. The interior of the cab, especially in those equipped also with cab signals, seems somewhat complicated to the American observer.

The tank locomotive, which is comparatively light, appears to be the favorite in local passenger service. Freight locomotives vary in size, but most of them are little more than half the size of our freight locomotive. With the small freight cars and light grades of the main lines, the length rather than the weight of the train is the controlling feature, and heavy engines are not needed. In southern Germany, however, where the grades are heavier, there are many locomotives which in weight and power compare favorably with those of the American consolidation type.

In 1910, Prussia had 19,670 locomotives of all kinds. This is an average of 84 locomotives per 100 miles of line. The average for the United States in the same year was 25, but in group 2 it was 57. The average weight of all Prussian locomotives, including tender, was 59 tons. For the United States, the average weight was 73 tons, exclusive of tender. Without knowledge of the weight of the tender, and the proportion of tank locomotives in each country, it is impossible to make an

**The Prussian car is narrower than the American car.

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exact comparison, but in the judgment of the writer, it is close to the mark to say that the Prussian passenger locomotive is about two-thirds the size of the American passenger locomotive, and the Prussian freight locomotive about one-half the size of ours.

The cost of maintaining locomotives in Prussia in 1910 averaged 4.8 cents per mile, which indicates commendable efficiency even when due allowance is made for their small size. Failures are infrequent and the locomotives generally have the appearance of being well maintained. The Prussian policy differs from ours in that they expect and obtain a comparatively long life from their locomotives. The average life of all locomotives in 1910 was 10.2 years. One was 40 years old; 10 were 37 years old; 9 were 35 years old; 10 were 33 years old. One-quarter of the entire equipment ranged from 10 to 20 years in service; 45 per cent. ran from 5 to 10 years; and 22 per cent. had an average age of less than 5 years. The average mileage per locomotive in 1910 was 25,600. The same average for this country was approximately 29,100.

The Prussian statistics showing the performance of locomotives (and in fact all of their statistics) are remarkably complete. Among other things they give the number of days all locomotives were in service, the per cent. of time in actual use, and the per cent. of time they were in the shops for repairs. They were actually used in train service 32.79 per cent. of their time; 18.91 per cent. of their time was spent in the shops for repairs; leaving 48.3 per cent. of the time when they were idle in or near the engine house. The high proportion of time idle is accounted for by their policy of single crewing. When not single-crewed, it is the general practice to assign one engine to two crews. Enginemen are required to do much of the light running repairs themselves, and on single-crewed engines the fireman is required to report at the engine house two hours in advance of leaving time, in which to kindle the fire and get up steam. At the end of the trip it is his duty to clean the fire and do other work which here is done by the engine house forces.

Careful attention is paid to fuel economy, and premiums are paid to engine crews for economic results. The writer did not personally secure any detailed statistics on this feature of operation, but the figures given recently in the *Railway Age Gazette* (January 3, 1913) by H. W. Jacobs, throw light on the subject. Mr. Jacobs compares the performance on a division in Prussia with a division of an American railway with somewhat similar service.

PASSENGER CARS.

The passenger cars of Prussia conform to the usual European design of separate compartments. The older type, used exclusively in suburban and local service, has doors on each side of each compartment, and when the train is in motion the only means of communication between cars or between compartments of different classes is by the running board on the outside of the car. This, of course, is used only by the trainmen and by them rarely.

Altogether there are 51,703 passenger, baggage and mail cars in Prussia, or 2.22 per 100 miles of line. In group 2 of the United States the passenger train car density is 5.2; in the United States as a whole, 2.0. Of the Prussian equipment 68 per cent. have side entrances and 32 per cent. have end doors and vestibules. The latter are used almost exclusively in through trains. More than half of the passenger cars have 3 axles, one under each end of the car and one under the center; 33 per cent have but two axles; and the remaining 13 per cent. are of the modern type for the best trains and have four or six axles. Averaging all passenger train cars, the number of axles per car is 2.72. The older type of two or three axle car with side doors is very small and weighs about 20 tons. The modern corridor car, with four or six axles, is 60 ft. long, 9'5 ft. wide, and weighs from 45 to 55 tons. The capacity of the car depends upon the classification of the compartments. There are four classes. First-class compartments seat four passengers (two per seat); second-class, six passengers; third-class, eight passengers. Fourth-class compartments are much larger, but only a limited number of seats are provided for the first comers —the other passengers stand. As a rule, those who stand in fourth-class compartments far outnumber the fortunate few with seats.

First-class compartments correspond with our parlor cars; second-class cars are as comfortable as our best modern coaches; third-class accommodations are considerably worse than our poorest and oldest day coach, or perhaps a shade better than our colonist car. The seats in third-class cars are not upholstered. With four passengers per seat all occupants are crowded. We have nothing that compares with fourth-class. Very few passengers use first-class compartments. Most of the well-to-do and tourists travel second-class. A traveler who wishes to economize may ride third-class for short distances without much discomfort, if the train is not crowded, but he must be in hard straits indeed to economize by riding in fourth-class cars. Nevertheless, as will be pointed out later, 46 out of every 100 passengers use fourth-class accommodations.

FREIGHT CARS.

The average capacity of all Prussian freight cars in 1910 was 15.7 tons. Practically all of them have but two axles. Only one-third are fitted with brakes of any kind and only a very few of these with air brakes.* Automatic couplers have not been adopted, although used experimentally. The standard box car of Prussia is 26 ft. long and has a capacity of 16.6 tons. Coal cars run in capacity from 22 to 40 tons, but those of the higher capacity are relatively few. The dead weight of the standard box car is 10.7 tons, or 65 per cent. of its capacity.

It is not to be assumed that Prussia is to be charged with shutting its eyes to the apparent economies in the use of the large capacity car. As a matter of fact, the peculiar conditions of the traffic there (as in England) seriously minimize the advantageous use of cars of the American type. The distinctively retail character of the freight shipments makes it difficult under present conditions for shippers to avail themselves of the special rates applying to the carload minima of 5 and 10 tons, and they are obliged to enlist the services of *spediteurs* (forwarding agents) who undertake to consolidate the freight of various shippers so as to obtain the carload rates. Small lot shipments predominate, and the immense quantities of bulk freight offered to the railroads of this country are not seen in Prussia. Much of the low-grade freight moves there by river or canal.

Another factor which influences freight car design, and which affords an example of the penalties of standardization, is the axle load limit, which is set at 31,000 lbs. Prussia is party to the rolling stock agreement between the several European nations which use the freight cars of all subscribers in common, much as the railways of the United States make common use of their freight cars. The design of cars for such joint use must necessarily conform to the clearances and track limitations of the weakest link in the chain. Italy happens to be that link, and sets the maximum axle load for the other systems which are parties to the agreement. The maximum axle load in the United States is approximately double that of the European railways. This feature, however, does not prevent the use of heavier equipment when confined exclusively to the Prussian rails. They are adding to their heavier equipment each year and are experimenting with cars of the American type. For transporting machinery and heavy guns from the Krupp works at Essen, flat cars of very high capacity are utilized. The largest has 16 axles and has a capacity of 85 tons.

The total number of freight cars of all kinds in Prussia in 1910 was 415,797, or 1,782 per 100 miles of line. The freight car density of group 2 in the same year was 2,168; and for the entire United States, 887. The number of cars, however, is not the true index. Their capacity must be considered. Ex-

*About 86 per cent. of passenger cars are fitted with air brake.

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pressed in terms of capacity per 100 miles of line, Prussia had 28,000; group 2 had 78,048; and the United States had 31,932.

TRAIN SERVICE.

In speed of passenger trains Prussia is somewhat behind England and France. The fastest train in Prussia makes the run of 178 miles between Berlin and Hamburg at an average speed of 55.2 miles per hour. The next fastest train is between Berlin and Halle, 100 miles, at a speed of 54.9 m. p. h. There are several other through trains which average over 50 m. p. h., and the average schedule speed of all through trains is given in the official statistics as 40 m. p. h. With the exception of a few of our limited trains, and the Camden-Atlantic City trains, the Prussian speeds are equal to those of this country. There are several trains, for instance, which for similar distances and a similar number of stops, make somewhat better time than the 5-hour limited trains between New York and Boston. The Prussian trains, too, are almost invariably on time.

We will now undertake a consideration of the traffic characteristics and first examine the statistics of train mileage, and passengers and tonnage handled. As already stated, the number of passengers handled in Prussia exceeds the total number handled in the United States. We are therefore prepared to find a very dense passenger train mileage per mile of road. Freight traffic is also dense in the industrial regions of western Prussia, but when averaged for all of Prussia the figures are not so impressive. A comparison of traffic and train mile density is shown in the following table:

PASSENGER MILES, TON MILES, TRAIN MILES AND OPERATING REVENUE PER MILE OF LINE, 1910.

Item—	Prussia-Hesse.	Group 2.	United States.
Passenger miles per mile of line	693,921	314,187	138,159
Ton miles per mile of line	1,150,490	2,797,011	1,071,086
Operating revenue per mile of line	$22,144	$24,619	$11,553
Passenger train miles per mile of line	7,741	*5,315	*2,787
Freight train miles per mile of line	4,824	*4,832	*2,486
Total revenue train miles per mile of line	12,565	10,347	5,073
Average passengers per train mile	87	63	56
Average revenue tons per train mile	236	503	380

*Special train miles included in passenger; mixed train miles in freight.

The significant facts in the above comparison are that in revenue passenger mile density the United States as a whole has only 21 per cent. of the Prussian density. Group 2, which has the greatest passenger traffic of any group in the United States, has 45 per cent. of the Prussian density. In ton mile density, however, the United States is almost as much as Prussia, and group 2 exceeds Prussia in that respect by 140 per cent. The Prussian passenger trainload is considerably heavier than ours, but the majority of the passengers ride in the third and fourth-class cars, already described. In freight-trainload, however, Prussia is conspicuously low. Its average is less than half the trainload of group 2, and about two-thirds that of the whole United States.

PASSENGER TRAFFIC AND RATES.

The German statistics of traffic are available in great detail, and we are able to analyze the receipts and averages for each class of passenger and freight. To show the results for the passenger service, the following summary is inserted:

DIVISION OF PASSENGER TRAFFIC, PRUSSIA-HESSE, 1910.

Class—	Per Ct. of passengers carried	Per Ct. of passenger service	Per Ct. of passenger revenue	Average revenue per passenger	Average revenue per passenger per mile	Average miles per passenger
First class	.14	.89	2.94	$2.65	2.89c	92
Second class	3.11	11.00	15.56	.25	1.49	16
Third class	43.66	39.51	41.65	.12	.93	13
Fourth class	45.51	44.59	35.09	.10	.69	14
Military	1.03	4.01	1.76	.22	.39	56
Total	100.0	100.0	100.0	.13	.88	14
Tickets sold at reduced rates —season tickets, workmen's, school tickets, etc. (included in above)	55.46	26.75	14.53	.03	.38	7

The preponderance of the third and fourth-class traffic, and the exceedingly small number of first-class passengers, are noticeable. The astonishingly low average passenger mile rate (8.8 mills) loses much of its value for purposes of comparison with this country because it includes such a relatively large number of passengers who travel in the inferior class compartments. The returns include also the traffic on passenger belt lines in Berlin and the electric railway between Hamburg and Altona. Both of these lines carry a heavy traffic, which is essentially the same as is handled by the subways and elevated railways of New York, Chicago or Boston.

In second-class compartments, which come nearest to our day coaches, the Prussian average revenue was 1.49 cents per mile. Our average in the same year for all passenger traffic was 1.938 cent. The Prussian first-class corresponds to our parlor cars. Their average receipts for that class were 2.89 cents per mile, which is substantially above our average, even when the Pullman car fare is added. For instance, the regular fare from New York to Boston is $4.75. Add $1.00 for parlor car seat and we have an average rate of 2.47 cents per mile.

In passing, attention should be called to the fact that there is no free baggage allowance in Germany. Passengers may take a generous amount of hand baggage with them in the compartments, but trunks and other similar baggage must be registered and transported in the baggage car. The baggage tariff is on the zone principle. For example, the charge for the first zone (1 to 15.5 miles) runs from 5 cents for 44 lbs., to 14 cents for 165 lbs. For the fourth zone (95 to 124 miles) the charges are 12 cents and 71 cents respectively. For the sixth zone (158 to 186 miles) the charges are 12 cents and $1.07. To illustrate further, by again using the New York and Boston journey, the additional cost of a trunk weighing 150 lbs. would, under the Prussian tariff, be $1.43, which is equivalent to adding 0.61 cent. per mile to the price of the ticket.

The Prussian statistics show, however, that relatively few passengers carry other than hand baggage. Altogether in 1910, the railways transported 820,000 tons of baggage. This is an average of 1½ lbs. per passenger. The revenue from baggage was $4,370,000, or 27 cents per 100 lbs. The average distance carried was 65 miles. Each 100 lbs. of baggage, therefore, cost the traveler 41 cents for each 100 miles transported. Baggage charges made up 3 per cent. of the total passenger revenue.

Before leaving the passenger service, mention should be made of the practice of selling "*bahnsteig*" (platform) tickets which permit the friends of incoming and outgoing passengers to meet or part with them on the station platform at the car door. These tickets, which cost 10 pfennig (2.4 cents) are procured through slot machines. They are punched by the gateman when the holders pass through the gate to the platform, and are collected when they leave the platform. In 1910, 31,000,000 of such tickets were sold (85,000 per day) and they yielded a revenue of $735,000. This, of course, is clear profit.

FREIGHT RATES.

It is much more difficult, if not hopeless, to make any intelligent comparison of freight rates, because of the fundamentally different conditions. In the first place, we must recognize in the case of freight rates, as well as in passenger rates, wages, and cost of operation, that the purchasing power of money is greater in Prussia. How much greater, it is impossible to state with accuracy. In discussing comparative wages, the writer gave as his estimate that the cost of living in Berlin is from 60 per cent. to 66 per cent. of the cost in Boston.

In the second place, the policy of the government is to develop the traffic on the rivers and canals, and to prevent the railways from competing with the waterways. Thus, the lower grade commodities and other freight which will stand the slower movement go by water, under a subsidy, since most canals and improved waterways do not yield enough in tolls to pay for interest and maintenance. The proportion of water-borne tonnage at low rates is, therefore, much higher in Prussia than in the United States, and the Prussian ton mile rate is based on a much higher proportion of high grade commodities moving under the higher rates.

In the third place, there are no express companies in Ger-

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many, and with the exception of the smaller packages, which may go by parcel post, this class of goods moves under the high class rates in freight cars.

In the fourth place, the average distance per shipment is just about half that of this country, consequently the element of terminal expense for each ton-mile is greater. The terminal expense, which is a large part of the total expense of moving traffic, is not affected by the length of the haul. It is just the same for a haul of 68 miles (the average Prussian haul) as for 138 miles (the average for the United States). The importance of this factor may be appreciated when it is realized that each ton of freight is handled through a terminal twice in Prussia to once in this country, since the average haul in this country is twice that of Prussia.

In the fifth place, the Prussian freight shipments are distinctly retail in character.

On the other side of the comparison, it should be noted that the conditions surrounding the process of shipping are more burdensome to the shipper. It is difficult to collect claims. Their movement is slower than ours. There are many complications in regard to classifications and tariffs, and the demurrage regulations are severe. In time of car shortage*** the free limit is reduced from the normal period of one day, to 12 hours, 8 hours, and even to 6 hours. The normal charge per day is 48 cents for the first day over the free period, 72 cents for the second day, and 95 cents for every additional day. The low capacity of the cars is to be borne in mind when comparing these demurrage conditions with ours. Besides this, there is a slight charge for the necessary printed forms. For instance, bills of lading cost $2 per 1,000. Again, when open cars are used, and covering is necessary, a charge is made for the use of the tarpaulin sheets which protect the freight. For distances of 63 to 125 miles, the minimum charge for two sheets is 72 cents.

No two persons, equally qualified to express opinions on the subject, will agree upon the weight to be given to the various factors, and any attempt here to devise a unit of comparison would only lead to profitless discussion. The writer will, therefore, leave the subject for each to form his own conclusion from an interpretation of the following statistics showing the freight traffic in Prussia in 1910; but will venture as his opinion in passing that freight rates are on the whole somewhat too high. The large surplus which is turned over to the state each year certainly is not made from the transportation of passengers. Freight shippers by rail are being indirectly taxed for the benefit of the state at large; while shippers by water have the benefit of state subsidies which come from the public at large—a conflicting situation.

It is commonly believed by those who advocate government ownership of railways that the Prussian freight tariff is the essence of simplicity, and if adopted here, would afford the solution to all of our freight rate problems. They are told that the Prussian rate is divided into two elements: (1) the terminal charge, and (2) the movement charge; the former graded for zones of 10 km. up to 100 km. (62.1 miles) and the latter graded for zones of 50 and 100 km. up to 500 km. (310 miles). This is correct so far as it goes, but there are so many exceptions to the zone tariffs that most of the seeming simplicity disappears. It is a common complaint among German shippers that the tariffs and shipping regulations are so complicated that they require experts to unravel them, and in the main they depend upon forwarding agents (*spediteurs*) to attend to all details of shipping for them. The exceptional tariffs which correspond to our commodity tariffs cover 61 per cent of the ton mileage, and have the lowest ton mile rate of 0.9 cent. Express freight takes the highest ton mile rate of 5.41 cents, and the average for all classes of freight is 1.248 cent per ton mile. The average for this country is 0.76 cent per ton mile, or 61 per cent. of the Prussian average. We have a few railroads, however, with a ton-mile rate which equals or exceeds that of Prussia. Usually, where that conditions obtains, it will be found that the freight traffic is largely local, or contains a relatively large amount of merchandise or other high-grade freight to which high-class rates apply, and also that the proportion of coal, iron, grain and other bulk freight moving under low commodity rates is relatively small. Such is the case on the New York, New Haven & Hartford.

***The car shortage becomes acute every fall and seriously affects the mining and manufacturing districts of Westphalia. In last December the shortage was 12,000 cars in the Essen Ruhr district.

CONCLUSION.

The writer's conclusion is that it is futile to attempt any exact comparison either of freight rates, passenger rates, expenses, or net returns in terms of percentages or of ratios of one country to those of the other country. When social and economic conditions are so essentially dissimilar, it is impossible to find a measuring stick which will permit us to gage the relative reasonableness of rates or the relative efficiency of operation. The real question is, "How well does the transportation system of each country measure up to the requirements of that country?" The answer must necessarily be based on opinion rather than on fact. In both countries we find those who praise and those who criticize the railways. But considering the Prussian situation alone, it seemed to the writer, from personal observation and study on the ground, that state ownership of railways in Prussia is successful and that the railways are operated with reasonable efficiency.

If it is granted that Prussia has met with substantial success in owning and operating its railways, it does not at all follow that government ownership in this country would be equally successful. That subject justifies a complete paper in itself, and we can do no more than touch upon it here in closing. Suffice it to say that nowhere are conditions more ideal for government ownership than in Prussia. It has a strongly centralized government. The administrative head of the railways—the Minister of Public Works—is appointed by and responsible to the king personally. Changes in that office, or in fact in any of the high offices, are infrequent. Civil service principles apply in the promotion of officials as well as of workmen. Military discipline obtains throughout the entire army of employees. It permeates the whole social organization of the country. The administration appears to be entirely free from graft. Little is heard of political patronage. In fact, government service there is regarded as highly honorable service.

Can we say as much for this country? Is our public service elevated to such a plane that we can safely trust it with the great enlargement of power which would come with government ownership of railways? Are we sufficiently insured against "pork barrel" methods of making and disbursing the budget? Are we sure that the quality and efficiency of service would not be lowered rather than improved?

He who would answer these questions in the affirmative is indeed an optimist!

BRAZIL RAILWAY IMPROVEMENTS.—A report on a journey to Southern Brazil in October, 1912, by Sir W. Haggard, says that the main improvement to which the Brazil Railway Company is directing serious consideration, is the straightening of numerous winding curves—which is particularly needed between Itararé and Ponta Grossa—and the process has already been completed on the Paraná line. "Of three such lines constructed prior to their being taken over by the Brazil Railway Company, the Sorocabana and Paraná are undoubtedly," says the report, "the more prosperous, and the section of the Sao Paulo-Rio Grande over which we traveled must for the present come in a bad third. The paucity of population all along this line was obvious. We traversed great distances without seeing more than small isolated huts. Whenever we were in the proximity of a town the settlements visibly increased, and some serious attempt had been made at cultivating the soil, but the main problem which the company have to solve, and which they have already attacked, is the remedying of this want of labor."

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NEW D. L & W. LINE NORTH OF SCRANTON, PA.

Radical Improvement Being Made in Grade and Alinement from Clark's Summit to Hallstead. Several Unusual Structures.

The Lackawanna now has under construction a new line between Clark's Summit, Pa., and Hallstead, 41 miles, which involves some very heavy work and several structures of unusual size.

The accompanying profile shows the present and proposed grades on the main line between Scranton, Pa., and Elmira, N. Y. This part of the road is a portion of the main line between New York and Buffalo, and freight trains operate between the above two points as terminals. Prior to 1910, all coal and dead freight was switched at Hallstead, Pa., 48 miles north of Scranton. Turn-around runs operated between the Kingston, Taylor and Scranton coal districts and Hallstead, thus providing tonnage at the latter point for filling out west bound trains, and the extra power necessary to handle trains over the heavy grades east from Hallstead. Crews also operated between Hallstead and Syracuse, and Hallstead and Utica. This operation required a yard and terminal facilities at Hallstead, including engine house, coaling station, ash pits, etc., and necessitated a considerable delay to all through trains.

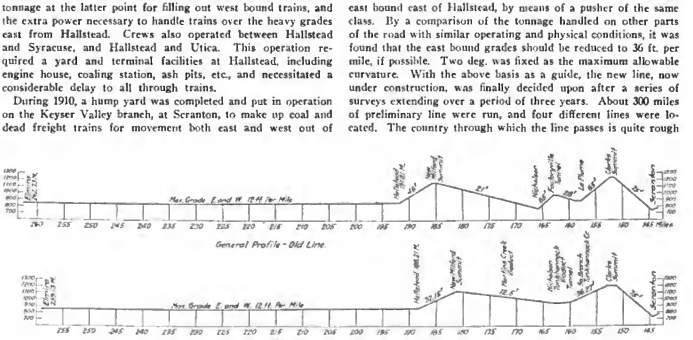
During 1910, a hump yard was completed and put in operation on the Keyser Valley branch, at Scranton, to make up coal and dead freight trains for movement both east and west out of Scranton. A large engine house, coaling station, ash handling plant, equipment for minor repairs, etc., were built in connection with the hump yard. The coal from the various mining districts is handled by special crews to the receiving yard above the hump. Trains are now run through between this yard and Elmira, Syracuse and Utica, with no long delays other than that required to clean ashes and take coal at a new plant built for this purpose at Binghamton, and eliminating the delay to road crews at Hallstead.

After ascending from Scranton to Clark's Summit, a distance of seven miles, on grade of 75 ft. to the mile, the present line descends to the south branch of the Tunkhannock creek at La-Plume on a grade of 65 ft. to the mile, then ascends on a 28 ft. grade to the Factoryville tunnel. This tunnel is 2,200 ft. long and passes through the ridge between the south and main branches of Tunkhannock creek. West of the tunnel, the line again descends on a 65 ft. grade to the Tunkhannock creek, at Nicholson, then ascends along the east bank of Martins creek to New Milford Summit on a 21 ft. grade. From New Milford Summit to Hallstead, the line descends along Salt creek to the Susquehanna river on a grade varying from 30 to 47 ft. to the mile.

Practically 50 per cent. of the line between Clark's Summit and Hallstead is curved, and many of the curves are between four and six deg. The total curvature in this distance of 43 miles is 3,940 deg. None of the grades above mentioned are compensated for curvature. From Hallstead west to Elmira the controlling grade is approximately 12 ft. per mile, in either direction.

A glance at the profile will readily show that a great amount of pusher service is necessary, both east and west, between Hallstead and Scranton in order to handle the tonnage in one train which can be handled by one engine between Hallstead and Elmira.

It was desirable to relocate, if possible, so as to eliminate all west bound pusher grades west of Clark's Summit and to reduce the east bound grades so that any class of engine in this service can handle its regular tonnage for the line west of Hallstead, east bound east of Hallstead, by means of a pusher of the same class. By a comparison of the tonnage handled on other parts of the road with similar operating and physical conditions, it was found that the east bound grades should be reduced to 36 ft. per mile, if possible. Two deg. was fixed as the maximum allowable curvature. With the above basis as a guide, the new line, now under construction, was finally decided upon after a series of surveys extending over a period of three years. About 300 miles of preliminary line were run, and four different lines were located. The country through which the line passes is quite rough and the general direction of the streams is at right angles to that of the line. Their beds are from 300 to 700 ft. below the surrounding hills. As no government contour maps have been made of this territory, the work of locating was extremely tedious.



Profile of the D. L. & W. Old and New Line Between Elmira and Scranton.

On the new line, the main branch of Tunkhannock creek is crossed about 240 ft. above the bed of the stream; the south branch of Tunkhannock creek and also Martins creek are crossed at a height of about 150 ft. The south branch crossing will be made by a fill, containing about 1,600,000 cu. yds. At the Martins creek crossing the new line passes over the present line 88 ft. above on a three-track concrete viaduct, 1,600 ft. long, composed of two 50-ft., two 100-ft. semi-circular arches, and seven 150-ft. three centered arches with a rise of 59 ft.

The Tunkhannock creek viaduct is to be a double track structure, 2,375 ft. long over-all, and, as above stated, will have a maximum height of 240 ft. above the bed of the creek. There will be two 100-ft. semi-circular abutment arch spans and ten 180-ft. semi-circular arch spans. All piers are to be carried to bed rock, which varies in depth up to 95 ft. below the surface of the ground.

It was only decided to use concrete structures for these two viaducts after a very careful and extended study of the problem. Bids were secured on several styles of steel structures and, while those acceptable in design were somewhat less expensive

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when first cost only was considered, they were less desirable when maintenance and other important items were taken into consideration.

The tracks will be carried through the divide between the south and main branches of Tunkhannock creek by a tunnel, 3,600 ft. long. This tunnel will have 50 ft. air shafts for ventilation.

The accompanying table gives a brief comparison of the physical characteristics of the old and new line.

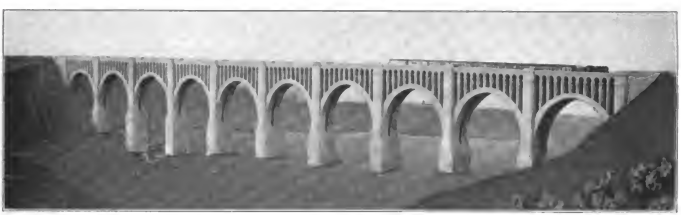
	Old Line	New Line	Saving
Length of line	43.2 miles	39.6 miles	3.6 miles
Maximum grade eastbound (uncompensated)	1.23%	.68%	.55%
Maximum grade westbound (uncompensated)	.52%	.237%	.283%
Rise and fall	553	226	327
Maximum degree curvature	6° 22'	*5° 00'	1° 22'
Total degree curvature	3,940	1,500	2,440
Degrees per mile	96	36	50

*Very few curves exceed 2 deg. on the new line.

Space will not permit an elaboration on the method used in calculating the amount of money which could be spent in reconstructing this line so that the decreased cost of operation and maintenance, due to reduction of distance, elimination of curvature, rise and fall and reduction of gradient would meet the interest charge. However, among the items taken into consideration in this computation were the total cost of operation and maintenance for the year 1910; the total train miles, exclusive of work train mileage, for 1910; the cost of operation and maintenance per train mile; the average yearly increased cost of operation and maintenance per train mile from 1900 to 1910 = 4.4 per cent.; the average yearly increase in net tons of freight handled 1900 to 1910 = 7.425 per cent.; the average yearly increase in passengers carried 1900 to 1910 = 8.2 per cent.; the total net tons of manifest freight moved over the territory in question for 1910 (east, 1,324,907; west, 592,713); the total net tons of all classes of freight moved over the territory in question for 1910 (east, 3,134,688; west, 6,967,269); the total number of freight cars moved over the territory in question in 1910 (east, 188,237 loads, 122,919 empties; west, 143,279 loads, 123,146 empties); total tons east, 8,306,003; total tons west, 12,006,973; passenger and milk trains, east and west bound (= 26); total reduction of distance; elimination of curvature (total degrees); elimination of rise and fall, and reduction of gradient.

In further considering the advisability of relocating the line, consideration was given to the fact that an additional third track would soon have to be constructed along the present alinement, especially on the heavy grades. Furthermore, there are on the present line 22 public highway crossings at grade, all of which would have to be eliminated in the near future, some of them at a very considerable expense.

The contracts for the entire work were let about a year ago. The roadbed is being constructed for three tracks between Clark's Summit and New Milford, excepting at the tunnel and on the Tunkhannock viaduct. From New Milford to Hallstead, two new tracks are to be built for east bound movement. The present two tracks, with some slight revision in alinement, will remain for westbound movement. The entire line will be constructed without any highway crossing at grade.



Model of Tunkhannock Creek Viaduct.

THE DEMANDS OF THE TRAINMEN.

The joint committee of one hundred, representing the trainmen and conductors on the eastern railroads, began conferences on April 22 with the committee of the managers. Elisha Lee, chairman of the managers' committee, presided, and the spokesmen for the trainmen and conductors were William G. Lee, president of the Brotherhood of Railroad Trainmen, and A. B. Garretson, president of the Order of Railroad Conductors.

The demands of the trainmen are as follows:

Article A. On runs of 155 miles per day or over the pay of passenger conductors on steam or electric trains to be 2.90 cents per mile; baggagemen 1.87 per mile; flagmen or rear brakemen 1.80 per mile; brakemen 1.74 per mile.

Article B. On runs of less than 155 miles per day the pay of passenger conductors to be $4.50 per day; baggagemen $2.90 per day; flagmen or rear brakemen $2.80 per day; brakemen $2.70 per day.

Article C. Passenger trainmen on short turn around runs, no single trip of which exceeds 80 miles, including suburban and branch line service, shall be paid overtime for all time actually on duty or held for duty in excess of eight hours (computed on each run from the time required to report for duty to end of the run) within ten consecutive hours, and also for all time in excess of ten consecutive hours, computed continuously from time first required to report until final release at end of last run; and such will be computed for each employee on the basis of overtime worked or held for duty at the following rates:

Conductors	45 cents per hour
Baggagemen	29 cents per hour
Flagmen or rear brakemen	28 cents per hour
Brakemen	27 cents per hour

(a) All other passenger trainmen shall be paid for overtime on the speed basis of twenty-five miles per hour, computed from the time required to report for duty until released at end of last run. Overtime will be computed on the basis of actual overtime worked, or held for duty, at the pro rata rate.

(b) Regularly assigned passenger trainmen who are ready for service the entire month and who do not lay off on their own accord shall receive the following minimum sums, exclusive of overtime or extra service, for the calendar months:

Conductors	$135.00
Baggagemen	87.00
Flagmen or rear brakemen	84.00
Brakemen	81.00

(c) When regular passenger men lay off of their own accord or are held out of service extra men will receive the same com-

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pensation regular men would have received and the amount to be paid the extra man shall be taken from the amount the regular man would have received had he remained in service; the sum of the payment to men who may be used on the run equalling the monthly guarantee.

Article D. Reductions in crews or increases in mileage in passenger service from assignments in effect November 1, 1912, will not be made for the purpose of offsetting (or having the effect of offsetting) these increases in wages.

Article E. The increases herein requested to apply to all rates for special or incidental service or for classes of service not named herein as specified in the individual schedules.

Article F. Through and irregular freight service to be paid as follows: Conductors, 4.18 cents a mile; flagmen, 2.88 cents a mile; brakemen, 2.78 cents a mile; runs of 100 miles or less either straightaway or turn around to be paid for as 100 miles.

Article G. Way freight, pickup or drop, mine and roustabout service shall be paid as follows: Conductors, 4.84 cents a mile; flagmen, 3.31 cents a mile; brakemen, 3.21 cents a mile; runs of 100 miles or less either straightaway or turn around to be paid as 100 miles.

Article H. Work, construction, snowplough, circus or wreck train crews shall be paid as follows: Conductors, $4.50 a day; flagmen, $3.10 a day; brakemen, $3 a day; 100 miles or less, ten hours or less, shall constitute a day's work, overtime to be paid as time and one-half.

Article I. In all freight, mixed and mine service, including pusher or helper service, 100 miles or less, ten hours or less shall constitute a day's work; on all runs of 100 miles or less overtime shall be paid for all time in excess of ten hours, and on runs of over 100 miles overtime shall be paid for the time used in excess of the time necessary to complete the trip at an average speed of ten miles an hour. The working time of trainmen shall begin at the time they are required to report for duty and do report; and shall continue until they are relieved from duty at end of run. Overtime shall be computed for each employee on the basis of actual overtime worked or held for duty and be paid for at the rate of fifteen miles an hour for the class of service performed.

Article J. The same percentage of increases as herein given in through freight service to be given also in milk, helper and all other classes of service, whether special or incidental, as specified in the individual schedules.

Article K. Regularly assigned way freight, wreck, work and construction crews who are ready for service the entire month and do not lay off of their own accord will be guaranteed not less than 100 miles or ten hours for each calendar working day, exclusive of overtime. (This to include legal holidays.)

Article L. Deadheading in freight or passenger service to be paid for at full rate for the class of service in which regularly engaged. Trainmen running with light engine or engine and caboose will be paid through freight rates.

Article M. Unassigned freight crews held at other than their home terminals longer than twelve hours will be paid at the rate of ten miles per hour at the through freight rates for time so held, time to be computed from the time crews go off duty until one hour before the departure of the train on which they resume duty.

Article N. Time and one-half will be paid to crews handling double headed trains of two engines; if more than two engines are used, or if either or both of the engines used in double headed trains are of the Mallet type, double time will be paid.

Article O. The Chicago standard rates of pay to govern all yards; ten hours or less to constitute a day's work. Overtime to be paid as time and one-half, and be computed for each employee on the basis of actual overtime worked or held for duty, actual minutes to be counted. (The above rule does not apply to roads having a shorter workday.)

Article P. Upon roads having a better basis for a day's work or for payment of overtime or other rates or allowances in passenger, freight, yard, mixed, work train service or other service the adoption of the foregoing rates and rules shall not operate as a reduction thereof.

CENTRAL & WESTERN ASSOCIATION OF CAR SERVICE OFFICERS.

The Central & Western Association of Car Service Officers held its annual meeting at the Grand Pacific hotel, Chicago, on April 17, with President E. E. Betts, superintendent of transportation of the Chicago & North Western, in the chair. A recommendation of the committee on office methods and accounting, providing that when a car is reported in an unserviceable condition and beyond repair the road in whose possession it is shall be required, with the consent of the owner, to destroy it and credit the owner with the salvage, was adopted and referred to the Association of Transportation & Car Accounting Officers, as were several other recommendations providing for minor changes in rules.

There was a long informal discussion of the proposed abolition of the per diem reclaim rule by the American Railway Association of July 1, which has been postponed for six months. Representatives of switching roads present were strongly opposed to the abolition of reclaim for the reason that no substitute is offered, and that the amounts paid for per diem would be a direct loss. Several important switching roads, including the Terminal Railroad Association of St. Louis and the Belt Railway of Chicago, had decided to withdraw from the per diem rules agreement before it was decided to postpone the change. Considerable discussion ensued as to whether the present rules should be retained, providing for a reclaim of per diem for an arbitrary number of days to be determined for each local territory, or whether it should be based on the number of days actually required by each road. It was asserted that the principal purpose in the abolition of the rule was to prevent the payment of virtual rebates to short industrial roads by allowing them a reclaim for a larger number of days than they usually pay per diem for, and that this abuse could be eliminated if the reclaim were based on the actual average requirements of individual roads, instead of an average for each territory. It was decided to appoint a committee of three to consider the subject and report at the next meeting in Chicago on November 13. Officers were elected as follows:

President, D. C. Fredericks, car service agent, Chicago, Peoria & St. Louis.

Vice-president, E. T. Kennan, auditor and car accountant, Indianapolis Union.

Secretary, W. E. Beecham, car accountant, Chicago, Milwaukee & St. Paul.

Treasurer, F. M. Luce, superintendent of car service, Chicago & North Western.

Mr. Beecham and Mr. Luce were re-elected. J. R. Pickering, superintendent of car service of the Chicago, Rock Island & Pacific, was elected a member of the executive committee for three years.

PASSENGER TRAFFIC ON THE BUENOS AYRES GREAT SOUTHERN, ARGENTINA.—The number of passengers carried during the last half of 1912 by the Buenos Ayres Great Southern were 13,313,689, compared with 12,000,440 for the corresponding period of 1911, an increase of 1,313,249, or 10.94 per cent.

NEW MILEAGE IN ARGENTINA.—During the last half of the calendar year of 1912, 89 miles of extensions were opened to traffic by the Buenos Ayres Great Southern. These extensions comprise one from Juancho to Vivorata, 49 miles; Barrow to Juan E. Barra, 37 miles, and an extension of the quarry line at Tandil, 3 miles. The total length of the system on December 31, 1912, was 3,574 miles.

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NEW DELAWARE RIVER BRIDGE OF THE P. & R.

Double Track Concrete Arch Structure Now Being Completed at Yardley, Pa.—Construction Plant Installed by Contractor.

By Edwin Chamberlain,
Assistant Engineer, Philadelphia & Reading.

The Philadelphia & Reading has almost completed the construction of a double track concrete arch bridge on the New York division across the Delaware river near Yardley, Pa. The new bridge is parallel to and 35 ft. down stream from the old structure which it will replace and which will be dismantled after the new bridge is put into service. The old double track bridge which is made up of seven pin connected and two deck plate girder spans, carrying two tracks, was built jointly by the North Pennsylvania Railroad and the Delaware & Bound Brook Railroad. It was erected in 1875 and opened for traffic in May,

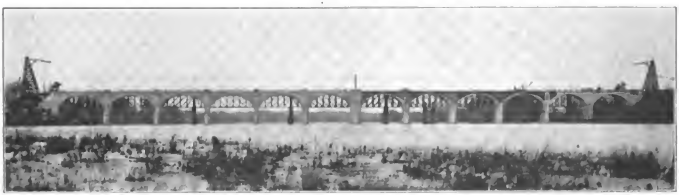

Fig. 1—Yardley Bridge Looking from the Downstream Side.

1876, since which date it has been in continuous service. It was, however, strengthened in 1883 by an addition of 50 per cent. to the trusses and 100 per cent. to the floor system by the introduction of a middle truss.

The new bridge consists of 14 arches, 11 of which have a span of 90 ft. 9 in. and three 85 ft. 11 in. The total length between ends of abutments is 1,445.5 ft. The bridge is built on a rising grade to the eastward of 0.22 per cent., and is 33 ft. wide from out to out of coping, with tracks 13 ft. center to center. The base of rail is about 70 ft. above low water in the river and about 80 ft. above bed rock. The intrados of the arch ring is five centered, having a rise of 35 ft., a crown thickness of 3 ft. 6 in. and a radial width at the junction of each arch, over the piers, of about 13 ft. 6 in. Two lines of reinforcing rods are embedded in the arch rings, one line at the intrados and the other at the extrados, each being ¾ in. square twisted and spaced 7 in. center to center. These were tied in with transverse rods ½ in. square and spaced 3 ft. apart.

The piers are of the type shown, the center or abutment pier having a width of 20 ft. and the intermediate piers a width of 10 ft. at the springing line. The ends are symmetrical in shape, having cut-water extensions, the up-stream noses of piers of the arches, providing refuge bays at the track level. With the intermediate concrete posts and two lines of 4-in. galvanized iron pipes they form a very substantial and effective railing. Embedded in each of the spandrel walls is a four-way vitrified clay conduit with manholes placed at frequent intervals to carry the telephone and telegraph wires, instead of attaching them to the outside of the bridge.

The drainage is taken care of by means of an 8-in. cast-iron pipe, extending from the valleys over the piers to the soffit of the arch. The spandrel filling is composed entirely of one

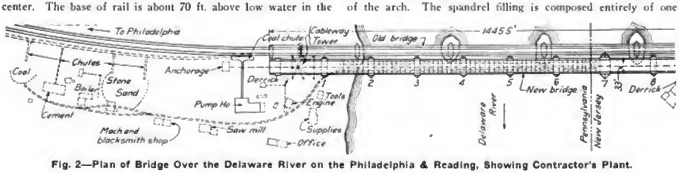

Fig. 2—Plan of Bridge Over the Delaware River on the Philadelphia & Reading, Showing Contractor's Plant.

and two man size stone carried to the sub-grade of the roadbed. The water-proofing of the arches is composed of five layers of felt protected by a layer of hard bricks thoroughly mopped, applied to the tops of the arches between the spandrel walls, flashed up about 12 in. along the inner faces of the spandrels except directly over the piers where the flashing extends four ft. above the tops of the arches. All vertical expansion and horizontal construction joints are protected by a single layer of prepared burlap 12 in. wide thoroughly mopped with asphalt compound. This burlap is carried under the coping at all expansion joints.

The contract for the work was let to the Talbot Construction

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Co., of New York, in April, 1911. Included with the river bridge contract was the extension of the masonry at the bridge crossing the tracks of the Pennsylvania and the feeder of the Delaware and Raritan canal, made necessary by the change in alinement across the river. On May 15 the contractors began to assemble their plant in preparation for starting the work, but it was nearly two months before they were prepared to make a start on the foundations in the river and on July 21 the first concrete was deposited on bed rock for the foundation of pier No. 2.

PLANT.

The contractors decided to conduct the work from both sides of the river and for this purpose duplicate plants were installed near each end of the bridge as shown upon the accompanying plan. The materials used in the Pennsylvania half of the bridge were shipped over the Reading to a siding at the elevation of the main tracks and dumped from the cars into chutes, by which the sand and pebbles were conveyed to storage piles, and the cement to storehouses at the base of the main track embankment. The height of this embankment, about 45 ft., afforded almost unlimited capacity for the storage of materials at practically no additional cost for rehandling. The cement house, with a capacity of 14 cars, had a narrow gage track laid on the floor, upon which a car containing a skip holding 50 bags was operated to serve the mixer which was about 100 ft. distant. This skip was hoisted from the car to the charging platform by the supply derrick which delivered the pebbles and sand to the mixer bins.

The mixing plant on the New Jersey side of the river was located along the Pennsylvania, over which all the materials for this half of the bridge were shipped and delivered to a siding leading to the mixing plant and storage piles. A derrick operating a clam-shell bucket unloaded the cars and delivered the concrete materials either to the mixer bins or to storage piles. The mixing plants were similar in construction and of the enclosed cube type sufficiently elevated on a timber framework to dump the mixture into cars or into buckets on flat cars. The mixers were belt connected to horizontal steam engines. Above the mixers were the measuring and supply bins, the latter having two hours, the average for the day would fall to about 15 or 16 batches per hour. The distance from the mixers to the work hindered more rapid progress.

The construction work on the Pennsylvania side of the river was carried on from a temporary pile trestle, built on the center line of the new bridge and reaching to the middle of the river at pier 7, the piers being numbered from the Pennsylvania side. This trestle was composed of five-pile bents spaced about 10 ft. between centers and capped with 12-in. by 12-in. timbers, with 3-in. by 12-in. cross bracing. The stringers generally were of 12-in. by 16-in. timbers upon which were placed 3-in. by 12-in. planks to which the rails were spiked. This trestle supported a 20-ft. gage track for the operation of a steel traveling crane, which was used in placing the coffer dams, in excavating the pier foundations and in placing the concrete from the flat cars into the foundations or forms. It also supported a narrow gage track used in transporting concrete, etc., by small locomotives from the mixing plant, located about 500 ft. back from the shore.

On the New Jersey side construction was handled by a series of stiff leg derricks, placed south of the bridge and midway of the piers, so that each derrick served two piers. These derricks were used in handling the excavation and in placing the materials in the piers. A temporary trestle, about 1,200 ft. long, carrying a narrow gage track, extended from the mixing plant into the river to a point between piers 8 and 9. The piers were completed to the springing line of the arches from the river trestle and stiff leg derricks.

On the Pennsylvania side the work of completing the piers began with pier 7, and as each succeeding pier was completed it was necessary to abandon the river trestle between the completed piers. While this part of the work was progressing a cableway was being installed on the center line of the bridge with towers 125 ft. high. The Pennsylvania tower was located between the west abutment and pier 1 and the New Jersey tower between pier 13 and the east abutment, making a clear span of 1,330 ft. The towers were built of long leaf yellow pine lumber and were supported on concrete foundations. They were composed of eight 12-in. by 12-in. posts to a height of 78 ft., and four posts for the remainder of the distance to the top. The bracing was of 3-in. by 12-in. material throughout. A saddle

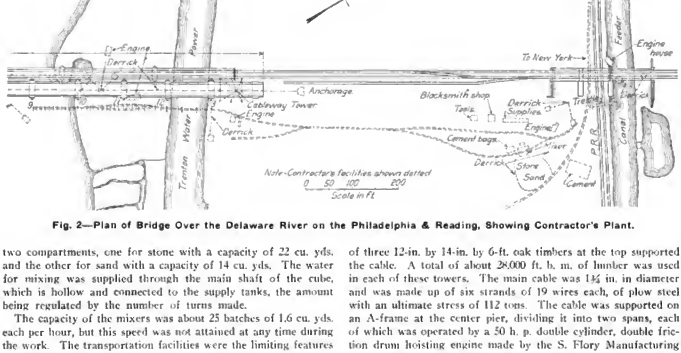

Fig. 2—Plan of Bridge Over the Delaware River on the Philadelphia & Reading, Showing Contractor's Plant.

two compartments, one for stone with a capacity of 22 cu. yds. and the other for sand with a capacity of 14 cu. yds. The water for mixing was supplied through the main shaft of the cube, which is hollow and connected to the supply tanks, the amount being regulated by the number of turns made.

The capacity of the mixers was about 25 batches of 1.6 cu. yds. each per hour, but this speed was not attained at any time during the work. The transportation facilities were the limiting features and while they handled 20 or 22 batches per hour for one or of three 12-in. by 14-in. by 6-ft. oak timbers at the top supported the cable. A total of about 28,000 ft. b. m. of lumber was used in each of these towers. The main cable was 1¼ in. in diameter and was made up of six strands of 19 wires each, of plow steel with an ultimate stress of 112 tons. The cable was supported on an A-frame at the center pier, dividing it into two spans, each of which was operated by a 50 h. p. double cylinder, double friction drum hoisting engine made by the S. Flory Manufacturing Company, Bangor, Pa. The cableway was used for the re-

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mainder of the concrete work above the springing line of arches and in placing the forms and centers.

In building the spandrel walls the steel traveling crane was used in connection with the cableway, operating from a track built on the completed arch rings; drop bottom buckets of 1¾ cu. yd. capacity were used throughout the work. A portable steam saw mill manufactured by the American Saw Mill Company, of Hackettstown, N. J., carrying a 44-in. circular saw, was installed by the contractors, and proved of great economy in resawing the heavy lumber required in the early part of the work into smaller sizes for use in the pilaster and spandrel wall forms.

FOUNDATIONS.

The foundations for the abutments and piers were all carried to bed rock, although the abutments were originally designed to be built on concrete piles driven to rock. This construction was

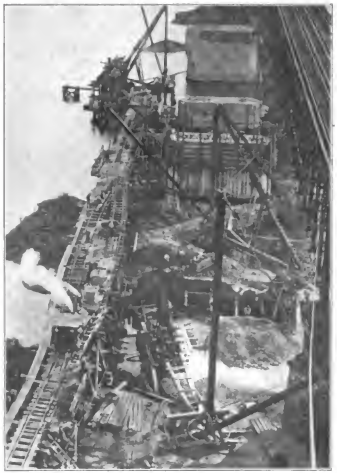

Fig. 3—General View of Work on the New Jersey Side.

adopted on account of the proximity of the new abutments to those of the old structure and the fact that the west abutment was founded about 30 ft. and the east abutment about 20 ft. above the rock. About 30 piles were driven to the gravel under the west abutment and in each case it was impossible to penetrate further. The piles were badly broomed at the ends and several were broken and sheared off below the surface. It was therefore deemed unwise to proceed with this construction and arrangements were made to excavate to rock. For this purpose 40 ft. lengths of Lackawanna steel sheet piling, with ½-in. webs, were successfully driven to rock on the outside lines of the abutment. The south half of the abutment was first completed to provide means for bracing the old masonry during the construction of the north half. This method of carrying on the work is shown in the accompanying drawing. Before making the excavation trestle bents were placed under the present tracks in order to relieve the old masonry as much as possible.

A slight settlement of about four inches was noticed in one end of the old abutment, but nothing more serious resulted. A great deal of water was encountered in the excavation and much

Fig. 4—General View of Work on the Pennsylvania Side.

of it had to be raised about 42 ft. One 10-in. and one 6-in. centrifugal pump were used in unwatering the excavation. These were set about 18 ft. above the bottom and the discharge was piped about 24 ft. to the top of the excavation.

No attempt was made to drive concrete piles at the east abut-

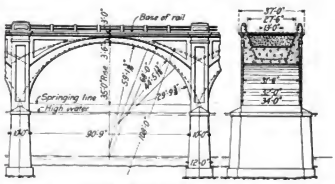

Fig. 5—Elevation and Section of 90 ft. 9 in. Arch of Bridge.

ment and the same method of construction was used as at the west abutment to carry the foundation to bed rock. Steel sheet piling of the Lackawanna pattern 12½ in. wide with ⅜-in. web

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and 18 ft. long was used for all the coffer dams in the river.

The wooden piles for the construction trestle were driven so as to provide anchorage for the 12-in. by 12-in. timber templates, placed near the water level, around which the steel piling was driven. These templates corresponded to the outside lines of the masonry, the ends being made semi-circular, to form a continuous line of locked sheet piling. The piling was set up against the

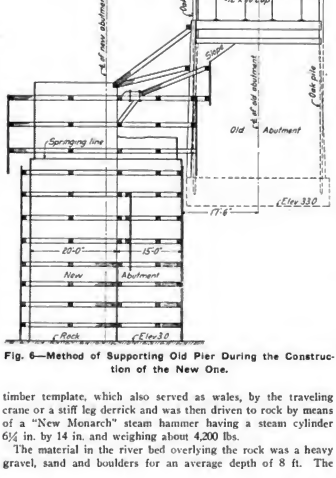

Fig. 6—Method of Supporting Old Pier During the Construction of the New One.

timber template, which also served as wales, by the traveling crane or a stiff leg derrick and was then driven to rock by means of a "New Monarch" steam hammer having a steam cylinder 6½ in. by 14 in. and weighing about 4,200 lbs.

The material in the river bed overlying the rock was a heavy gravel, sand and boulders for an average depth of 8 ft. The depth of water at the summer stage ran from zero to 6 ft. Most of the unwatering of the coffer dams was done with two 6-in. pumps. Some difficulty was experienced at first in lowering the water, as a depth of several feet of water was in direct contact with the outside of the piling, causing considerable leakage into the dam. This was checked by placing burlap bags filled with earth against the outside of the piling, which proved very effective. Long wire rods were also used to puddle the gravel and silt along the outside of the joints, which assisted very materially in closing up any leaks through them.

The excavated material was placed on the outside of the dams, which also aided in reducing the leakage. As the excavation progressed additional timbering and bracing were placed to support the sides of the dam. Although the piles in many instances penetrated the top strata of the shale rock 12 to 18 in. a great deal of water came into the dams at the bottom of the piling and interfered with the placing of the foundation concrete. The dams were about 24 in. wider than the neat foundation lines of the piers and this space was taken advantage of in leading the water around the outside of the concrete to the pumps at the end of the dam. This was accomplished by leaning a form of two planks in height against the steel sheet piling leaving a space of about 12 in. at the bottom for the excess water.

Sufficient 18 ft. steel piling was purchased to cover five dams, or about 11,466 lineal ft. The first driving of five coffer dams, required about 11,160 lineal ft. The second driving of five dams required 10,980 lineal ft. and the third driving 11,460 lineal ft., or a total for the work of 33,600 lineal ft., showing that most of the piling received was used three times. With the exception of a section of the dam at pier 13 which was allowed to remain to protect the bank of the Trenton Water Power canal, all the 18-ft. lengths of piling were recovered. The loss to the contractor by reason of the steel splitting open, bending or otherwise becoming damaged so as to be worthless for further use, did not exceed five per cent. of the total, so that of the 637 pieces brought on the work 600 were recovered and were available for use on other work.

FORMS.

Great care was exercised in the construction and bracing of the forms and no materials were spared in their design, the justification for which is shown by the very small percentage of failures during the work. These were very slight and of minor importance, although a failure in any of the umbrella forms might have been disastrous. As it was, no movement has been noticed during construction.

The forms for the piers were made up in sections measuring about 12 ft. x 16 ft. They were composed of 8-in. x 10-in. horizontal timbers, spaced about 2 ft. center to center, well bridged, with two thicknesses of 1-in. by 8-in. boards, placed diagonally, for the lagging. Upon the face of the lagging was tacked No. 22 galvanized sheet iron. These forms were assembled on the shore and placed in position with the derricks. They were held in position with ¾-in. rods and 4-in. by 6-in. spreaders across the pier. Attached to the ends of the rods were wrought iron swivels, receiving the square nuts of stub bolts, which passed through the forms to outside waling pieces. The stub bolts extended several inches into the concrete and were removed to release the forms, leaving the bolt holes in the concrete to be closed with mortar. This avoided the necessity of cutting bolts and kept all iron well back from the face. The forms were adjusted to line at the top by turnbuckles at-

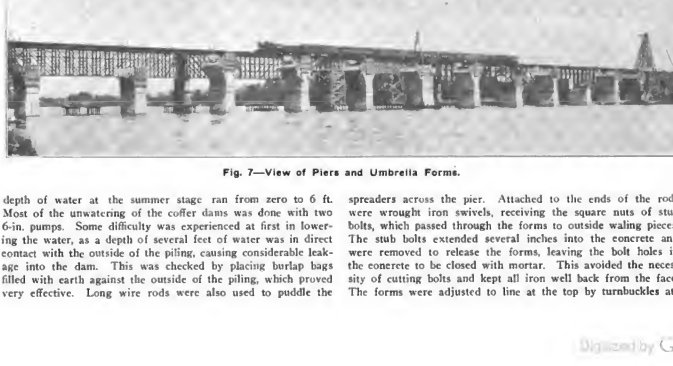

Fig. 7—View of Piers and Umbrella Forms.

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tached to the 2-in. by 2-in. by ¾-in. angle iron cross braces which were anchored into the lower section of concrete previously placed.

The ribs for the umbrella forms were composed of two pieces, 2 in. by 8 in., spaced about 2 ft. center to center, with 8-in. by 10-in. wales, spaced about 4 ft. center to center and secured to the concrete to the back of the arch. The coping of the piers was reinforced with T rails to take the thrust of the loaded centers. At the middle the centers were supported by timber towers measuring 21 ft. by 33 ft. at the base and founded upon 14 timber piles. Four sets of oak wedges were used under each rib, the ribs being built in half sections for ease in erection. All

Fig. 8—Looking Upstream, Showing Arch Centering and Forms.

the ribs with ¾-in. iron stirrups. The lagging was of 2-in. by 6-in. timbers. Practically the same method of inside bracing was used as for the main pier forms, except that it was heavier and closer together.

The main centers had a clear span of about 70 ft. and were

Fig. 9—Arch Centers and Falsework.

made up of seven ribs supported at the ends on inclined timber bents resting on the coping of the piers and suspended from the umbrella section by means of seven 1½-in. rods passing through the forms and arch centers were of short leaf yellow pine and were designed by the contractors. The concrete in the bridge was of two classes, 1:2:4 and 1:3:6 mixtures. A 1:2:4 mixture was used in the first 4 ft. of the foundations. From this point to the springing line of the arches the mixture was 1:3:6. The arches and spandrel walls were of 1:2:4 mixture. Embedded stones were allowed in the foundations and piers, but not in the arch rings or spandrel walls. One or two man size stones were used

Fig. 10—Spandrel Wall Forms.

for this purpose, procured from a local quarry for the New Jersey side of the bridge and limestone for the Pennsylvania side. The quantity of stone used varied in different portions of the work, depending upon the convenience to the stone piles and the ability of the derricks to handle the concrete and place it in the forms as fast as it reached them from the mixer. As it was necessary to use the same derrick for both concrete and

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stone, the stone was placed when convenient, the concrete having the preference. The coping was composed of a 1:3:6 mixture and the railing posts of a 1:2:4 granolithic mixture. The stone for the posts was of ¾-in. size trap rock, cleaned of dust.

Dragon cement was used throughout the structure and every car received at the work was sampled and the sample forwarded to the company's laboratories at Reading, Pa., for testing. The following table shows the average result of 40 tests:

Residue, No. 100 Sieve. Per Cent.	Residue, No. 200 Sieve. Per Cent.	MgO. Per Cent.	SO_3 Per Cent.	Specific Gravity.	Initial Set. (Hours)	Hard Set. (Hours)	Steam and Hot Water Test.	Tensile Strength—Neat Test— One Day. (Lbs.)	Tensile Strength—Neat Test— One Week. (Lbs.)	1-3 Sand. One Week. (Lbs.)
4.74	21.48	2.42	1.846	2.15	2.6	6.43	O. K.	472	698	357

The sand used for the concrete in the Pennsylvania side of the bridge was a well graded bar sand dredged from the Delaware river near Burlington, N. J. That used for the New Jersey side was a bank sand from Birmingham, N. J. Freight rates influenced the contractors in using the two different sands. The following tables show analyses of the sands:

Tensile Strength (1-3 Mortar)

	Ottawa Sand. 7 days. (Lbs.)	Sample. 7 days. (Lbs.)	Per Cent. Ottawa Sand. 7 days.	Voids.	Weight per cu. ft. (Lbs.)	Per Cent. Silt.
Delaware river bar...	399	279	70	44	94 11/16	1.5
Birmingham bank	419	310	74	40.1	92 8/16	2.8

Granulometric Analyses.

	Per Cent. Passing Sieves.							Retained on	
	No. 200	No. 100	No. 80	No. 50	No. 40	No. 30	No. 20	No. 10	No. 10
Delaware river bar...	0.9	1.3	1.4	21.8	18.1	23.5	16.7	16.3	19.9
Birmingham bank....	1.4	8.9	9.2	23.8	10.5	12.5	15.7	18.0	0.5

While the specifications called for crushed stone to be used in all concrete, the contractors were allowed to use river pebbles

Fig. 11—Waterproofing Over Arches and Brick Covering.

for the Pennsylvania side of the structure. These were well graded in size from ¼ in. to 1¼ in. Crushed stone was used for the New Jersey side ranging in size from 1¼ in. to a small percentage of dust, being the run of the crusher.

CONCRETE SURFACE AND CONSTRUCTION.

In constructing the piers and the umbrella sections the work was so arranged as always to stop the day's work at the inner edge of a triangular wooden fillet or scoring, 1½ in. wide, in order to hide as far as possible any irregularity on the surface. The sections between scorings were so designed as not to be more than the day's capacity of the mixing plant and also with a view of avoiding night work.

On the face of the pilasters and umbrella sections, the scoring was closer together than on the piers and coincided with the scoring of the arch rings. There were 18 of these in the umbrella section, and the arch ring between the umbrella sections was divided into 35 voussoirs by the scoring. Fillets were used at the exposed corners of all contraction joints and on all salient corners.

The exposed faces of the concrete throughout the structure were spaded, with the exception of the railing posts, which were bush-hammered. The spading against the metal lining of the forms produced a very smooth and uniform surface. The specifications called for a granolithic finish throughout, to be scrubbed and washed, exposing the grit, or to be bush-hammered if the contractor so desired. The change in the specifications to a spaded face was granted at the solicitation of the contractor, who agreed to give a finish equal to the granolithic finish in appearance and uniformity of color and surface.

In building the umbrella sections they were carried up in sections corresponding to one or more of the face scorings. The arch ring was divided into six large sections or voussoirs, three on either side of the key and the key section, which was about two ft. wide. Two opposite sections amounted in contents to about 10 hours run of the mixing plant. Corresponding with the joints between the ring sections, were vertical joints through the spandrel walls extending through the coping, providing weak joints in case of any tendency to open up on account of shrinkage or temperature changes. Tongued and grooved joints were used in every case. In order to prevent the bonding of one section with another and to form a cushion between them, corrugated asbestos boards were placed on the faces of the joints. In the joint at the junction of the spandrels and pilasters a double thickness of boards was used.

As the main centers were designed for a loading equivalent to a thickness of the showing ring, the entire ring for this thickness was first completed and keyed up, after which the haunching was placed. This was kept 2½ ft. back from the showing face, thus bringing the extradosal joint between the spandrels and arch ring at the top of the projection of the rings.

The skewback for the main arch ring was formed by the radial line passing through a point on the intrados, 15 ft. measured horizontally from the center of the piers. The portion of the arch below this skewback—called the umbrella—was constructed as a part of the pier. The sections of the ring were built in pairs one on each side of the crown, in order to balance the horizontal thrust on the centers. They were constructed continuously from start to finish, so as to avoid any intermediate joints. Fortunately nothing occurred to prevent the carrying out of this method.

The turning of the arches began with the arch adjacent to the center pier after the centers for four arches had been placed in position. The first two voussoirs cast were those at the crown of arch 7. The next pair placed were those at the crown of arch 6. This was done to weight down the centers at the middle and also to obtain the maximum settlement in the centers at this time. In arch 6 it was done to add weight to its center that it might better take any horizontal thrust while the sections at the skewback of arch 7 were being placed. This rotation was carried through the construction of all the rings. The haunching was not placed until the key section had received a hard set. The centering was required to be maintained under the completed arch ring for at least 30 days.

In framing the centers they were given an additional height

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at the crown of about 1¼ in. above the plan height to allow for any compression in the centers and in anticipation of some settlement after they were struck. Levels were taken on the centers before and after completing the crown sections; on completion of the haunch blocks; on completion of the key; and before and after striking the centers. The greatest deflection was at the time of completing the crown sections, which ran from .05 to .13 ft. In the first centers that were built an attempt was made to obtain the additional height at the crown by manipulating the wedges, but this proved unsatisfactory. The remaining centers were then framed so as to give the required 1¼ in. additional height at the crown. Most of the arches deflected so as to be about ¼ in. below the plan elevation at the crown after striking the centers and four were ½ in. higher.

The spandrel walls were completed after the centers were dropped. On account of the liability of a side movement in the spandrel walls during construction the coping was not constructed until after the spandrels for each arch had been entirely completed and the concrete had received a set. The posts for the railing were all cast in place. The total quantity of concrete of all kinds in the bridge is 34,670 cu. yd., made up of the following materials, viz.:

Cement	42,363 bbls.
Crushed stone and pebbles	37,172 tons
Sand	21,954 tons
Imbedded stone	2,558 tons
Steel reinforcement	262.5 tons

The total area of surface to be waterproofed will amount to about 42,000 sq. ft. and the stone spandrel filling will amount to about 7,500 tons. There were used for construction purposes about 1,400,000 ft. b. m. of lumber, 800,000 ft. of which was required for the centering of the arches.

The construction work was carried on under the direction of the Philadelphia & Reading, William Hunter, chief engineer, the writer being in direct charge.

CONDITION OF SAFETY APPLIANCES.

The following data as to the condition of safety appliances is taken from a report to the Interstate Commerce Commission made by H. W. Belnap, chief inspector of safety appliances. It was accompanied by several tables which are not reproduced. One of them showed in detail a statement of all penalties, exclusive of costs, which have been collected under the safety appliance, hours of service and ash pan acts, as of November 1, 1912. It shows that a total of $259,900 has been collected from 204 roads for violations of the safety appliance law, an average of $1,274 per road. For violation of the hours of service law $40,921 has been collected on account of trainmen, $11,715 on account of telegraphers, and $500 because of failure to file reports. For violations of the ash pan law $3,400 has been collected.

The following extracts are quoted from Mr. Belnap's report: In submitting the data showing the condition of safety appliances in general for the past fiscal year, I have the honor to report an apparent increase in the number of defects noted as to freight equipment and locomotives and a decrease as to such defects in passenger equipment. This increase, however, with respect to freight cars and locomotives is due to the fact that the report for the fiscal year ending June 30, 1911, comprehended only 83 classes of defects, whereas this report covers inspections made pursuant to the commission's order of March 13, 1911, and includes an aggregate classification of 230, or an increase of 147 different kinds of defects. The decrease in the number of defects reported as to passenger cars shows a high degree of efficiency in the maintenance of safety appliances on this character of equipment.

The number of defects reported on freight and passenger cars and locomotives is 73.45 per thousand inspected, while the number of such cars and locomotives found to be defective is 61.45 per thousand inspected. Defective lock blocks represent the majority of defects under the heading "couplers and parts," there being 1,993 such defects out of a total of 3,000 coupler defects reported. The uncoupling chain is the most prolific cause of defects to uncoupling mechanisms, as out of a total of 4,071 defects of this character 2,324 cover defective chains. As to the 16,442 defects to air brakes, 9,774 such defects were due to air brakes being "cut out" and inoperative, or to the fact that there was no stenciled date to indicate that the cylinders and triple valves had been cleaned within a year. Under the heading "handholds" a total of 3,917 defects were reported, of which 2,409 were missing handholds. The most numerous of the defects to running boards consist in the insecurity of the running board brace, 1,209 out of a total of 2,174 defects to running boards being of this character.

It is to be particularly noted that out of a total of 4,965 defective hand brakes reported, 2,630 were caused by the cotter key or ring at the bottom of the brake shaft being missing. The foregoing instances are enumerated for the purpose of showing that the great majority of the defects reported comprehend a comparatively small number of appliances, and it is believed that if the railroad repair men would familiarize themselves with the defects, especially those just indicated, and would make a special effort to reduce the number of such defects, a very short period of time would suffice to bring about a much improved condition.

The committee appointed by the Master Car Builders' Association, for the purpose of adopting a standard coupler, is conducting an investigation with a view to securing a coupler which will combine the maximum of efficiency with a minimum number of parts, of simple construction and easily repaired. When this committee shall have designated a coupler, if the carriers will adopt it as the standard coupler, the number of defects to couplers will be reduced to a minimum. The Master Car Builders' Association is to be commended for its action in this matter, as the adoption of a standard coupler will tend not only to reduce the number of accidents resulting from defective couplers, but should ultimately redound to the material advantage of the carriers themselves from the standpoint of economical maintenance.

It is recommended that the commission take such action as will require the carriers to report semiannually the progress made in the equipment of freight and passenger cars with the new standards. From information thus far received it is apparent that unless this work is greatly expedited it will not be completed within the time required by the commission's order.

In many instances our inspectors have found that the only test made of the efficiency of the train brakes is one intended to show that the air is working throughout the train line. Under such a system of inspection the train crew has no means of knowing the actual condition of the air brakes. Such practices cannot be too severely condemned, as the several trains on any railroad are not independent in point of movement and safety, but are interdependent, and whatever brings delay or disaster to one train, or results in disabling one of its operatives, impedes the progress and imperils the safety of other trains. Our inspectors have frequently made terminal tests which disclosed the fact that the proportion of operative air brakes on trains about to leave their terminals was less than the percentage required by law. Had these trains, in fact, left their terminals in that condition, our inspectors, in the performance of their duty, would have been compelled to file evidence of such violations of the law for prosecution. However, the train crews being present at the time such inspections were made, and realizing the imminent danger to themselves and to opposing trains, the matter was promptly reported to the officials in charge, by whom the necessary repairs were ordered. In such instances inspectors have occasionally been charged with holding the train and causing delays. In this connection it should be understood that inspectors always make their terminal tests in conjunction with the train crews and at the same time, thereby causing no direct delays, and they have in no instance held a train longer than was necessary to make the test, which ordinarily consumes only 5 or 10 minutes. A terminal or standing test of power brakes should be made on all trains before permitting them to leave their terminals. This method of inspection cannot be too highly

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recommended as a means of ascertaining the true condition of air brakes.

The question as to the right of a railroad to handle equipment defective in the matter of safety appliances has occasioned more controversy than any other part of the act of April 14, 1910. This portion of the law, however, will receive judicial interpretation within the next few months, as a number of cases involving the handling of chained-up cars, and cars with defective safety appliances hauled out of repair points for the purpose of repairs have been filed for prosecution in the several judicial districts.

The impression seems to obtain very generally that inspectors have the authority to shop cars if they should find that any of their safety appliances are defective. This is an error, and is without foundation, as none of our inspectors has ever ordered a car to be taken out of service, regardless of the number or the serious nature of its defects. The law merely authorizes inspectors to make inspections and to file evidence with the commission of any violations of the law with come within their personal knowledge.

In conclusion, it may be observed that in view of the large number of appliances covered by our present system of inspection, the splendid showing made by the majority of the railroads in the maintenance of those valuable safeguards is truly gratifying.

DEPUTY INTERSTATE COMMERCE COMMISSIONERS PROPOSED.

T. J. Norton, general attorney of the Atchison, Topeka & Santa Fe, in a letter to the *Traffic World*, advocates the creation of deputy Interstate Commerce Commissioners to hold hearings in various places throughout the country, to relieve the Interstate Commerce Commission of many of the details for which it is now responsible, and to hear minor cases subject to appeal to the commission. Mr. Norton's letter is as follows:

"While so many others are expressing their views as to how the burden upon the Interstate Commerce Commission may be lightened, I should like to offer an opinion based upon many years of practice before that body. I do this because I think some of the plans suggested would needlessly unsettle conditions which have grown stable and which should not be disturbed. When a practice has become settled and well understood by all concerned it is not wise, just because some little alteration may be necessary, to change it fundamentally, any more than we should pull a house to pieces when we find it necessary to cut a new window or to make some other change suggested by trial.

"My idea is that by one short paragraph of amendment to the interstate commerce law all that is now lacking in a well-ordered and well-tried system can be provided.

"No one acquainted with the work of the Interstate Commerce Commission can doubt for a moment the pressing need of giving relief to that body. It has to look after the details of many informal cases in which important contentions are disposed of without formal trial. It makes rulings in response to almost countless inquiries by mail. It has passed up to it for examination the enormous trial records of a multitude of cases. In addition to its work in looking after litigated business, it is required by Congress to give effect to the safety appliance laws, to investigate and keep a record of all accidents, to effectuate the medals of honor act for the recognition of those who endanger their lives in saving others in time of wreck or disaster, to enforce the hours of service law and the ash pan law, to regulate and supervise the transportation of explosives, to effectuate the boiler inspection act, to supervise the charges and practices of the Lake Erie and Ohio river ship canal, to carry out the purposes of Congress in the supervision of traffic through the Panama canal, and finally, to supervise the classifications and rates under the act establishing a parcel post.

"Clearly that is as much as one body should be called upon to do, if not more than it can handle.

"Those administrative matters render it impossible for the commission to give the time and reflection to important litigated cases which it would give to them in other circumstances and which they certainly should have. In addition to this the commissioners would like to try more cases than they do instead of assigning them to examiners. Assuredly the litigants would be greatly pleased to have more of the larger cases tried by the commissioners themselves.

"Another thing taking the time of the commission is the oral arguments of cases, which now occupy something like one-half of each month. Formerly oral arguments were few; but it is now believed by both the commissioners and the parties that, in view of the congestion described, the best presentation of the subject calls for oral argument, for otherwise some of the commissioners might not become fully acquainted with the case. There are general conferences several days each month, and there are also numerous special conferences. How give relief?

"Let Congress create deputy commissioners to sit throughout the country somewhat as district judges hold court, with authority to try cases and decide them and with the right of the losing party, if he believes that he has not received his due, to appeal to the central commission at Washington, that appeal to be based on exceptions to the findings of the deputy commissioner as not being supported by the evidence, thus giving a trial *de novo* on the facts. The central body would go over the record as criticized by the appellant, and would either affirm the order of the deputy commissioner or else enter such order as it might deem appropriate. My observation has been that the dissatisfaction of both the shippers and the carriers has been with respect to the inability of the parties to get further hearing on the facts. Under late decisions the shipper cannot go up from the commission even on the law. Bills have been introduced in Congress to alter this condition. But there will not be any law to speak of in these cases after there has been a thoroughgoing trial on controverted facts. An important case tried by a competent deputy commissioner and then reviewed by the central commission would be decided as nearly right as men could expect to have a case of disputed facts determined. Of course only the heaviest cases would ever go above the deputy commissioner. The findings of the deputy commissioner who heard the witnesses would be very suggestive and serviceable to the central commission, and the commission would in all probability smooth out many irregularities passed up by the deputy commissioner, so that finally we should have the best conclusion that could be expected.

"Such a plan would not only remove from the back of the commission as it exists now a great part of the enormous work attendant upon litigation, but it would also conduce to more thorough trials, which means more satisfactory work to all concerned, to the commission as well as to the litigants.

"The deputy commissioners should be well paid. The salaries should be such as to invite thoroughly competent men to seek the places. They should either know the leading rules of evidence or else the commission should formulate a code for their guidance, for the laxity in this regard has become intolerable and grossly expensive to the parties. Besides, the late decisions governing the review of evidence by the courts makes necessary a reasonably close adherence to the law of evidence. In some traffic centers more than one deputy commissioner would be required. Chicago might need two or three. Just how many would be necessary and where they should best be stationed would be determined shortly by experience.

"This improvement could be provided for by a single short paragraph and without any change in the substantive law as it stands today. Let the president or the commission appoint the deputy commissioners for a statutory term and let them be assigned by the chairman of the commission to duty in the parts of the country where they may be needed. We shall then have better trials, an opportunity for review, which is now practically denied to both shippers and carriers, the benefit in the more important cases of the more thorough consideration of the central body, and altogether a disposition of this business with a care more nearly commensurate with its importance to the litigants and to the country."

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FUNDAMENTALS OF WAGE PAYMENT.

**All Systems, Properly Administered, Are Equally Effective—
The Time Element Is All-Important Under Any System.**

By B. B. Milner.

Frequent argument that there exists such a great difference in the efficacy of various wage payment systems as factors in efficient management, warrants the following, which has been written with the idea that a more definite understanding of the very simple relations which exist between the basic elements concerned in the various systems of labor payment and which can so readily be obtained, will show: (1) that the selection of the type of wage system is not so vital as very popularly supposed and argued; (2) that under uniformly efficient administration the differences between them are more largely imaginary than real; (3) that, under any system of labor payment, efficient management and administration involves constant attention to important elements common to any of the many systems

In the consideration of labor costs three elements are fundamental and inter-dependent; namely, the labor cost of production per operation (identical with the workman's earnings per operation); the rate of the workman's earnings per hour, and the time consumed per operation. These will hereafter be referred to as "Cost," "Rate" and "Time," respectively. The time consumed per operation should be understood as that of, not the unusually skillful and rapid workman, nor the one lowest in the scale of skill and speed who is qualified to satisfactorily perform the work, but of an average workman who occupies a position

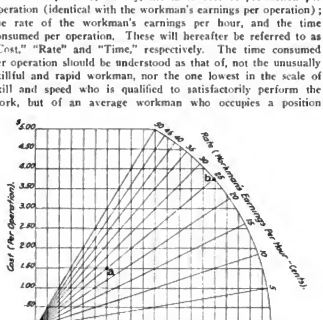


Chart 1.

between these two extremes. The relations existing between the elements, cost, rate and time, are expressed algebraically by the following equation:

$$\text{Cost} = \text{Time} \times \text{Rate}$$

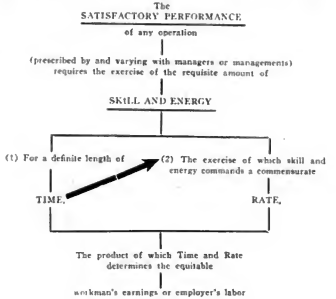
so simple in application that, having given any two, few workmen are unable to determine the desired third. The same relations may be represented advantageously by Chart 1, which geometrically interprets the equation:

$$\text{Rate} = \frac{\text{Cost}}{\text{Time}}$$

obtained from the first equation by transposition and division of both its members by "Time."

Within the range of values exhibited by the three scales, having given any two of the elements (Cost, Time and Rate), the third may be immediately found therefrom. For example, a workman's rate of earnings per hour may be immediately determined as 25 cents, when he has earned $1.50 in six hours, by locating the point of intersection *a* of the lines representing the given cost and time and following the rate line from this common point of intersection to the rate scale at *b* where the desired rate will be indicated as 25 cents per hour. Similar charts for any range of cost, time and rate values may, of course, be easily constructed.

In order to be more specific, throughout the following discussion, we will assume an operation, the "satisfactory performance" of which requires ten hours of time, and for which the "commensurate rate" is 30 cents per hour as shown by Chart 2. The following graphical statement defines the relative meanings attached to the terms satisfactory performance, skill and energy, etc.:



The day work wage line of Chart 3 is the locus of all points on the chart representing the relations existing between time, cost and rate, under the day work system. Note that the cost (per operation to the employer) rises and falls with increases and decreases in time (consumed per operation) and that the (employees) rate (of earnings per hour) remains constant at 30 cents an hour for all values of cost and time.

The employer was opposed in stimulating his employees to the point of satisfactory performance by the ordinary worker's tendency to do no more than actually required of him. This tendency was aggravated under the day work system by the fact that the employee does not participate in the profits accruing from increased output as evidenced by the uniformity in the employee's rate of earnings per hour. The employer therefore conceived the idea of paying for labor by the piece, expecting therefrom a considerable reduction in his labor costs, which he may have thought or known were high and, at the same time, relief from having to so closely supervise his workmen in order to obtain a satisfactory performance

The piece-work wage line of Chart 4 is the locus of all points in the chart representing the relations existing between time, cost and rate under the piece-work system. Note that the cost per operation to the employer remains constant at all values of the employee's rate of earnings per hour and time consumed per operation, and that the employee's rate rises and falls with decreases and increases with the time consumed per operation.

The labor cost per operation to the employer is uniform, and all profits accruing from increased output revert to the employee,

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being reflected by variations in his rate of earnings which follow directly the increases or decreases in output. The employer was not disappointed in what piece-work actually did for him, and was largely relieved of the necessity of crowding workmen because of their being now personally interested in their own output. We would actually expect that the output of the workmen should now have been limited only by their capacity, but conditions soon developed which materially affected the actual output of piece-workers and necessitate qualification of the statement that the piece-work system has been satisfactory. These apparently unforeseen factors affecting the output have been two, namely, (1) the decreasing amount of effort which workmen will exercise as their rate of earnings increase (in accordance with the economic law of decreasing returns under which, after a certain amount of energy has been expended and a corresponding compensation earned, the workman's desire to earn decreases at a rate varying with the personal characteristics and the needs of the individual); and (2) the possibility of readjustment or cut in the piece-work price as the result of high earnings. The workmen soon learn by experience or are taught by their fellows that this readjustment of a piece-work price is apt to follow any demonstration that a lower price will still permit the earning of wages much above that usually paid similar labor.

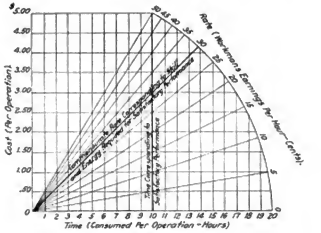

Chart 2.

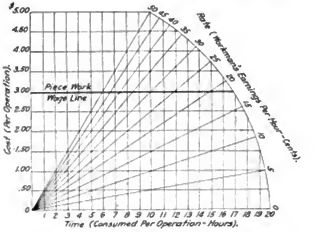

Chart 4.

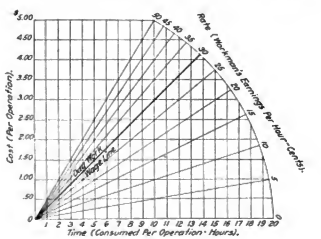

Chart 3.

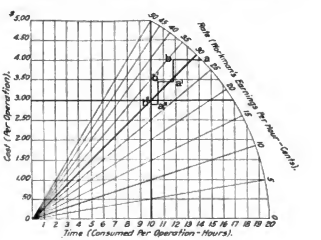

Chart 5.

The zigzag line of Chart 5, *a b a' b' a'' b''* shows graphically the usual history of piece-work operation where the prices originally quoted were too high, and have resulted in earnings higher than those commensurate with the skill and energy required for the satisfactory performance of the operations. Successive demonstration of that fact has resulted in piece-work price adjustments (reductions) at points *b* and *b'* until the final price may be so low that it will not pay a satisfactory wage, that is, commensurate with the skill and energy which must be exercised to satisfactorily perform the operation. However, very early in his piece-work experience the workman learns that, by exceeding a certain rate of earnings, i. e., the "commensurate rate," he exposes and demonstrates the equity of a lower piece-work price and that it is therefore to his personal interest, in the effort to obtain as high a wage as possible with the minimum amount of exertion, to guard and protect his piece-work price from any cutting readjustments, by limiting his output to that which will, at the prices quoted, pay him a rate commensurate with the skill and energy which he is expected to exercise.

The difference between Charts 5 and 6 is that the zigzag line *a b a' b' a'' b''* of Chart 6, interprets the performance of experienced piece-workers who so limit their output that their earnings at no time exceed the commensurate rate.

The difficulties outlined as having been experienced with piece-work operation and having made of it "high priced day work," are ultimately most largely dependent upon inability or failure to locate accurately the time actually required for satisfactory performance and to use it and the commensurate rate as the basis of the piece-work price originally quoted.

Any system of labor payment should be based upon the payment of an honest wage for honest performance, and a definite understanding should exist between employee and employer that the employer expects the skill and energy required for the satisfactory performance to be honestly exercised. For this he expects to pay a commensurate rate of earnings. On the other hand, the employee will certainly expect to receive the commensurate rate for satisfactory performance regardless of the

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system of labor payment under which the work may happen to be performed. Consistent with this a satisfactory piece-work price (Cost) must equal the product of Time (actually required for satisfactory performance) and Rate (commensurate with the degree of skill and energy required for satisfactory performance), and it should be definitely understood that changes in piece-work prices can only be justified by, and must be expected to follow, changes in either or both of the co-ordinate component elements, i. e., time (a function of methods and conditions under which the operations are performed) and rate.

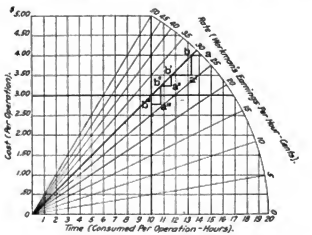

Chart 6.

Such understandings and methods of procedure consistent therewith should more nearly bring for the piece-work system that which was expected of it, viz.: (1) a lower labor cost, (2) an output limited more nearly entirely by the employee's individual capacity, and for him, (3), a rate of earnings proportional to his output and considerably higher than paid under the day work system as usually administered.

Chart 7 shows clearly the relations existing between the piece and day work systems when the conditions referred to have been fulfilled, the shaded portions of the chart representing the labor

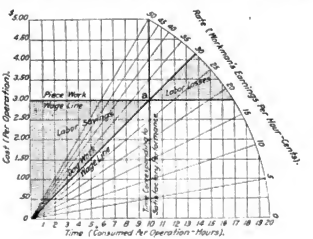

Chart 7.

savings and losses accruing from increasing or decreasing output above or below that represented by satisfactory performance. Note that, for time corresponding to satisfactory performance under either piece-work or day work, cost and rate are identical and that, under the day work system, all labor savings resulting from increased output revert to the employer by whom all labor losses resulting from decreased output are assumed and that the employee's rate remains constant, while under the piece-work system, all labor savings resulting from increased output revert to the employee by whom all labor losses resulting from decreased output are assumed, the employer's cost remaining constant. Under no system of labor payment does cost per unit of output regularly increase with increases in output or decrease with decreases in output; likewise, under no system does rate decrease with increases in output or increase with decreases in output. The piece-work and day work systems represent then extremes of liberality and exactitude toward the employee at his varying rates of output; in other words, no system is more liberal to the employee where output is high, or more exacting where output is low, than piece-work and, on the other hand, no system is

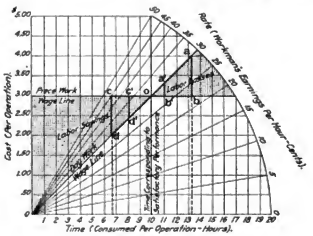

Chart 8.

more liberal to the employee where output is low or more exacting where output is high than day work.

Between the two extremes represented by day and piece-work, there are many systems, premium, bonus, profit sharing, etc., which may be generally classed as "divisional" because of being, in a way, compromises under which the labor savings and losses resulting from increased or decreased output are divided between the employer and employee. They were suggested largely because of unsatisfactory results obtained from piece-work operation, and, though the introduction of the divisional systems

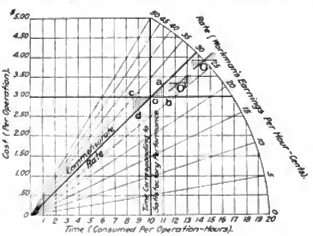

Chart 9.

did not in itself cure the difficulties with piece-work, it did immediately relieve somewhat the "thorn in the side" of the employer by returning to him a portion of the labor savings which were usually large. Their introduction has, however, almost without exception, been accompanied by better management which would have, by itself, removed some of the basic difficulties with previous day or piece-work operation.

Two triangles *a b o c d* are shown on Chart 8, within which the performance of all except the most unusual workman will fall; in fact, if satisfactory performance is well determined and

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defined, we may safely reduce these triangles to *a' b' o c' d'* and say that these two small triangles contain that portion of the chart within which all our operations should fall. Since the workman must be paid the commensurate rate for satisfactory performance, regardless of the system of wage payment under which he may happen to work, the wage lines of all systems must pass through the point *o* and lie wholly within the triangles referred to, which, as previously stated, bound the extremes of liberality and exactitude represented by the piece and day work systems. It now becomes apparent that, under uniform

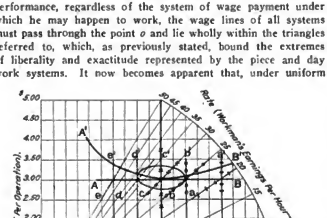

Chart 10.

degrees of management efficiency the actual differences due to variation in wage systems are relatively small and that the large variation in the efficiencies of operation under them must be due to variations in the efficiency of methods and management under which they are administered.

The greatest difficulty with operation under the piece-work and all other systems, including day work, has been inability or failure to locate the time corresponding to or actually required for satisfactory performance, the result being that operation has, instead of being within the field bounded by the

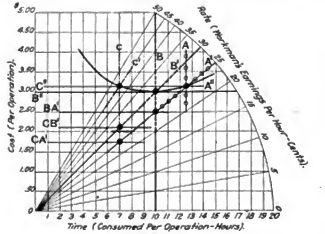

Chart 11.

triangles referred to above and connected at the common point *o*, been within the triangles connected at some other point such as *O* or *O'* of Chart 9, the location of which is based on a time much in excess of that actually required by satisfactory performance. Workmen do not usually co-operate in (and frequently openly oppose) the movement of the respective pairs of triangles and points corresponding to *O* and *O'* to their proper position at *o*, which movement is, of course, made through some such path as *a b a' b' a'' b''*, etc., of Charts 5 and 6.

The equity of operation from the standpoint of both employee and employer is therefore largely based on the proper determination of the time corresponding to satisfactory performance and of the commensurate rate. But satisfactory performance varies with the personnel of the management. Various managers or managements will require varying degrees of output. Yes, but to each definition of satisfactory performance there corresponds a certain degree of skill and energy which must be exercised for a certain amount of time, and the exercise of that degree of skill and energy will command a certain rate. Assume that such a time and rate be that represented upon Chart 10 by time and rate lines *c'* and *c*. A less time represented by *d'* will command a higher rate assumed as *d*, likewise time represented by time line *e'* will command a still higher rate assumed as represented by rate line *e*. Greater amounts of time represented by time lines *b'* and *a'* will command correspondingly lower rates, represented by rate lines *b* and *a*. According to assumptions made, the line *AB*, the locus of points at which time lines and corresponding rate lines intersect, is the horizontal straight cost line definitely located by intersection of any time line and its corresponding rate line.

But by considering conditions represented at the extended extremities of the line *AB*, we will readily see that if the line is to be the locus of points at which time lines and corresponding rate lines intersect, each extremity will be above and farther and farther removed from the straight line *AB*, originally considered, as we reeede from the time corresponding to satisfactory

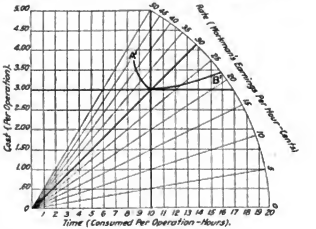

Chart 12.

performance. Considering the right extremity extended, by continuing the lowering of the rate, we will approach at a rate which does not command the exercise of a sufficient amount of skill and energy to ever satisfactorily perform the operation in question. Under such conditions the time and cost both approach infinity. On the other hand, if we continue lowering the time, we approach a time within which it is impossible to satisfactorily perform the operation. If it is possible, however, to satisfactorily perform the operation in the reduced time, an amount of skill and energy will be required, commanding a rate much higher in proportion than the resulting reduction in time.

The extremities of the locus considered are, therefore, removed an infinite distance from the time axis and the locus itself is not the straight line *AB*, but a convex downward curve which may be represented by *A' B'*. That portion of this curve which represents actual operating conditions lies, or should lie, within a comparatively small portion of the chart, as that shown bounded by an ellipse, and very nearly coincident with the straight line *AB* originally considered. We may legitimately assume then that within the field covered by actual operation and practice, a single piece-work price may be determined upon the basis of, and is equitable (that is, will pay a wage commensurate to the skill and energy actually exercised) for any of the various ontputs developed by various workmen who may be engaged upon the operation.

However, it should be remembered that there is an output

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(time) and a corresponding commensurate rate under which cost (equitable piece-work price) will be a minimum; and one of the problems of management is to locate as nearly as possible that time and rate resulting in minimum cost and to so balance the classes of forces used with the operations to be performed, that they may be performed at a minimum cost and at the same time satisfy workmen by reason of their having received, "a fair day's pay for a fair day's work." This means plainly that forty-five cent labor should not be used upon twenty cent work.

Under piece-work operation, the problem as actually presented, is, having given a workman with previously fixed rate (commensurate with his skill, energy, experience and other factors which may have a bearing upon his value to the service) and operating conditions, to establish a piece-work price. The employer must retain a responsibility for the methods and conditions under which the operations are performed and must require the operator (1) to perform the operation according to prescribed methods and (2) to actually exercise an amount of skill and energy commensurate with his rate, upon the basis of which together with the determined time, a piece-work price will be subsequently established.

While the complimentary times and rates actually selected as bases for the piece-work price determination must be consistent and correspond one with the other, it is not necessary that the rates and corresponding times used in establishing piece-work prices for the same operation, be the same in different shops or even in the same shop. It should be remembered, however, that there is a rate and corresponding time at which the cost will be a minimum located by the lowest point of the curve A' B' of Chart 10.

Referring to Chart 11, for example, the higher time A is represented as corresponding to the lower rate A' and locating an equitable cost or piece-work price A''. In like manner a lower time B, and a corresponding higher rate B', locates a cost or piece-work price B'', and a still lower time C, with the corresponding higher rate C', locates also a cost or piece-work price C'' coincident with that located as A''. The difference, however, between either A'' or C'' and B'' appears to be practically negligible. We have here presented in A, B and C and A' B' and C' three of many complementary times and rates determining practically the same cost or piece-work price, and the question of which of these should, or can, with best advantage, be used very naturally arises.

Concretely put, a 30 cent man may perform an operation satisfactorily in ten hours, a 43 cent man should perform the operation in less time or about seven hours, while a 25 cent man will probably consume twelve hours. The cost of the operation, the equitable piece-work price, will in either case be three dollars.

The time consumed in the satisfactory performance of an operation under given conditions, ten, eight or twelve hours, can only be determined from a direct or indirect time-study; a very elastic term covering all degrees of precision and exactitude, from that involved in gathering the information upon which to base a rough estimate of the time required for a day workman to mow a lawn, to that referred to by some as of the "blood-drawing type," involved in the determination of the working schedules in some trades and shops which requires the most minute stop-watch data. Workmen object to the latter, especially until such time as all conditions of shop operation have been reduced to a degree of precision somewhere nearly consistent therewith.

In most piece-work shops there are two actually existent or implied rates, one the regular day rate, used when a workman is working under the day work system, and another a piece-work rate, which it is expected the workman will earn when working on a piece-work basis. The latter is most frequently used as the basis of establishing piece-work prices and is usually 25 per cent to 35 per cent higher than the former. The usual practice under which piece-work prices are established by the use of the latter high rate, necessitates a closer time-study and the use of the lower time corresponding to a performance commensurate with the higher rate. It is thought, however, that, because the more minute and close the time-studies are made, the more objectionable they become to workmen, it is better to use the lower (day) rate and the correspondingly higher time for the basis of prices, with the understanding, that while the operations of workmen are under observation for the collection of data to be used in establishing a piece-work price, they will be expected to exercise an amount of skill and energy commensurate with the lower (day) rates which are to be combined, with the correspondingly high times determined by means of the observations made, in the formation of the piece-work price.

Special objection should be expected when for one reason or another the degree of skill and energy required by the pace set under the time-study exceeds that for which rates (those upon which piece-work prices are based) are commensurate; in other words, by reference to Chart 11 again, the combination of time B and rate A' will result in a piece-work price B A', $2.50, much lower than either A'', C'' or B''; likewise the combination of time C and rate B' or A' will result in a piece-work price C B', $2.10, or C A', $1.75, both of which are much lower than the practically identical piece-work prices A'', C'' or B'', originally referred to. The results of any attempt to get $3.00 worth of work done for $2.50, $2.10 or $1.75 should be apparent.

We have attempted to show that:

(1) The satisfactory operation of piece-work or any reward system of labor payment is most largely dependent upon careful consideration and equitable selection of the co-ordinate basic elements, time and rate.

(2) The selected times and rates must mutually correspond

(3) After such selection the differences in the various reward systems are of minor importance.

(4) Small differences actually existing are most favorable to the desirable employee and least favorable to the slower undesirable employee under the piece-work system.

Day-work, the original system of labor payment, must continue to be used for by far the largest percentage of work done, and the application of reward systems must be restricted to such operations as permit of convenient and accurate measurement of output, which is more or less largely under the control of the workmen.

The non-use of a reward system of payment does not obviate the necessity of giving the time element of wage payment attention; in fact, although not used directly in the determination of wages, some shops, among them a few operated by railroads, keep accurate records of output based upon time elements determined for those operations to which reward wage payment might be applied, which are very instrumental in the maintenance of high shop labor efficiency. It is unquestionably more difficult to maintain shop efficiency under exclusively day-work, without the co-operation of workmen occasioned by reward payment, but it is being done, and with excellent results, with the assistance of individual output records.

We desire, however, to call attention to the fact that the amount of skill and energy which may be profitably exercised upon a given operation is limited and that surplus skill and energy, especially the former, will result in a corresponding increase in output. In other words, instead of assuming the very gradually rising slope shown by the Charts 10 and 11, for the left hand portion of the loci of the intersection of corresponding times and rates, the curve will rise very abruptly from the point of intersecting time and rate corresponding to and commensurate with the maximum amount of skill and energy which can be profitably exercised upon, or is required by operation. The employment of higher skilled labor upon the operation will very rapidly increase the cost, with very slight increase in output as shown by Chart 12. The curve A' B' is that of an operation the satisfactory performance of which requires a degree of skill and energy commanding a rate of about 30 cents an hour, at which rate the cost will be approximately $3.00 per operation. A higher rated workman, say one of 50 cents per hour instead of 30 cents, upon the same work will require a higher

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piece-work price, say of approximately $5.00 instead of $3.00, because his additional skill cannot be profitably employed upon the operation in question. So it is that piece-work prices established are usually those which will pay to the highest rated workman who may be profitably employed upon the operations covered, a wage consistent with their skill and experience. The result is that the higher-priced workmen, employed upon lower-classed work, must receive higher piece-work prices to enable them to make wages commensurate with their skill and at the same time will be over-paid from the standpoint of the labor cost of the work they turn out.

The dissatisfaction, or at least, the confusion which frequently results, under the piece-work system, from workingmen of varying skill and experience upon the same operations for the same piece-work rate, therefore, suggests many advantages in a separation of the time and rate elements, or rather, the discontinuation of their combination in piece-work price, and the quotation of the time element only (invariable as between men) instead of the piece-work price, one element of which is the rate which should measure the workman's value (his skill, length of service, etc.). The rate element (workman's rate) should remain fixed for any workman regardless of work upon which he may be engaged and should be paid him for a fixed amount of time for each satisfactorily completed operation. It is believed that such separation will eventually become generally adopted (though probably not for a number of years).

Summarizing we have attempted to show that:

(1) Time is the all-important element under any and all systems of labor payment.

(2) With proper attention to the time element and otherwise efficient administration, the differences between the various systems of wage payment are of minor importance.

(3) Piece-work, with its advantages over other reward systems, in simplicity, minimum accounting, etc., should be used where a reward system of payment is applicable.

(4) Adjustments of methods, as are necessary to get a purely time basis by quotation of time elements instead of piece-work process, should be considered and furthered as opportunity offers.

CHICAGO & NORTH WESTERN DEMONSTRATES SMOKE ABATEMENT DEVICE.

The Chicago & North Western made a demonstration run Tuesday, April 15, for the benefit of various railway officials and press representatives, from Chicago to Proviso, testing out a device for smoke abatement on locomotives, recommended to the railways about Chicago by the General Managers' Association. Some months ago O. Monnett, smoke inspector for the city of Chicago, called the attention of the General Managers' Association to the fact that there were wide differences of opinion among the railroads as to the most efficient locomotive smoke preventing device—each road maintaining that the devices used by it were the best.

The General Managers' Association accordingly appointed a special committee consisting of representatives of the mechanical departments of the Pennsylvania, Chicago & North Western, Chicago, Burlington & Quincy, Chicago, Milwaukee & St. Paul, and the Chicago & Western Indiana Railways, which committee was asked to make comparative and efficiency tests of the several smoke preventing devices. Extensive tests were made on the Pennsylvania Railroad's testing plant at Altoona, the results of which will be presented before the Master Mechanics' Association at its June convention. In brief, it was found that either the double or multiple tip blower nozzles should be used; that the grate should have not less than 30 per cent. air opening; that sufficient air tubes should be provided above the fire, so that a total of 2,000 cu. ft. of air per minute could be supplied by means of steam jets, the nozzles of which shall be located 8½ in. from the inside ends of the tubes; that the brick arch prevents more smoke while the locomotive is running than when standing, and that such an arch gives the best results when fitted tight up against the flue sheet; that there is advantage in a large quick-opening blower valve.

The test run was made with an 18 in. x 24 in. superheater 6-wheel switch engine equipped in accordance with the above recommendations. The trip out to Proviso was made with a train of about 1,000 tons gross, and the results obtained were considered very satisfactory by all observers, there being practically no smoke thrown from the stack throughout the whole trip. On reaching Proviso some severe tests were made on the device. It was cut out of service and the engine was allowed to smoke as badly as possible, then when being put into service again it was found that the smoke could be eliminated in from five to seven seconds. On the return trip a trainload of over 1,200 tons was hauled, a part of the distance being up a grade of 32 ft. per mile, no objectionable smoke being emitted from the engine at any time. The smoke density to Proviso was 4.6 per cent., and from Proviso 4.3 per cent.

In addition to the above mentioned test committee the General Managers' Association appointed a standing committee consisting of M. K. Barnum (chairman), Illinois Central; H. T Bentley, Chicago & North Western, and E. F. Jones, of the "Belt" Railway. This committee developed the plan for the "Railroad Smoke Inspectors' Association of Chicago," which was organized on January 2, 1913, for the purpose of bringing about the thorough interchange of thoughts and ideas between the smoke inspectors employed by the various Chicago railroads, and to utilize the inspectors for the joint benefit of all lines by requiring them to report cases of emissions of dense smoke, whether made by locomotives of their own company or by those of any other railway coming under their notice, thus bringing about increased efficiency in this line of work.

This association holds a meeting every alternate Friday, and the co-operation secured in this manner has done much in the way of reducing smoke on the part of the railroads in this district. The number of smoke inspectors on Chicago railroads has been increased from 32 to 41, making the number of locomotives in daily operation in Chicago per inspector employed, 40 as against formerly 52. The chairman of this association is J. H. Lewis, Chief Smoke Inspector of the Chicago, Burlington & Quincy, and the chairman of the Executive Committee is C. W. Corning, Chief Smoke Inspector of the C. & N. W. Ry., with C. P. Burnalle, Chief Smoke Inspector of the A. T. & S. F., as the secretary.

The railroad smoke conditions in Chicago today as compared to the smoke densities in other cities and towns where no smoke ordinance is in effect is as follows:

Nashville, Tenn.	30 per cent.
East St. Louis	40 per cent.
Peoria	30 per cent.
LaSalle	30 per cent.
Down Town Chicago	6 per cent.

In 1910 the smoke density of down town Chicago was 23 per cent., which figure represents the density for South Chicago today. Intermediate sections of the city show a density of 12 per cent., showing that the effort of supervision in the down town section has had the effect of reducing the smoke density to a point which was thought absolutely impossible two or three years ago.

ALGECIRAS RAILWAY, SPAIN.—It is said that this line will shortly be taken over by the Andalusian Railways, on terms of purchase which it is believed are very favorable to the former. The line runs from Algeciras, the Spanish port for Gibraltar, to Bobadilla, the junction for Malaga, Granada Seville and Cordoba, and its acquisition by the Andalusian Company will give the latter practically a monopoly of traffic in the southeastern corner of Spain, as well as the exclusive entry into the three important ports of Cadiz, Algeciras and Malaga.

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THE INADEQUACY OF RAILWAY MAIL PAY.

Facts Presented Before Congressional Committee by W. A. Worthington Showing Unfairness of Compensation to Railways.

The accompanying charts illustrating graphically the tendency of railway mail pay in comparison with the other expenditures and receipts of the post office department, and with the receipts from other classes of traffic and the operating expenses of the railways during recent years were presented by W. A. Worthington, vice-president of the Southern Pacific, at a hearing in Washington on March 27, before the Joint Congressional Committee on Postage on Second Class Mail Matter and Compensation for the Transportation of Mails. The charts were submitted incidentally to a presentation of facts regarding railway mail pay which Mr. Worthington made on behalf of the Southern Pacific Company.

Fig. 1 shows the percentage of total postal receipts which the railroads of the United States have received for each year from 1900 to 1911, inclusive, and the percentage of the total

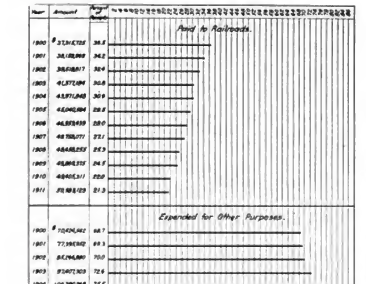

Fig. 1—Percentage of Total Postal Receipts Paid to the Railroads and Expended for Other Purposes.

postal receipts which have been expended for other purposes, as shown by post office department annual reports. In looking over the operations of the post office department it will be observed that in the ten years from 1901 to 1911, the receipts have more than doubled, and the following statement shows what a small percentage of this large increase in receipts went to the railroads:

	1911.	1901.	Increase, 1911 over 1901.	Per Cent.
Postal receipts	$230,879,823	$111,631,193	$126,248,630	113
Postal expenditures:				
To railroads	$50,583,123	$38,158,969	$12,424,154	33
Other purposes	187,063,803	77,395,952	109,669,851	142
Total	$237,648,926	$115,554,921	$122,094,005	106
Surplus	$230,897			
Deficit		$3,923,728		

The figures show that out of the total postal receipts of $112,000,000 in 1901, $38,000,000, or 34 per cent., went to the railroads, while out of the $126,000,000 increase in 1911 over 1901 only $12,000,000, or less than 10 per cent., was paid to the railroads. As the volume of service rendered by the railroads in hauling tonnage increased very much in proportion to the receipts, they received only about one-third as much for the added traffic since 1901, as they received on the total traffic of

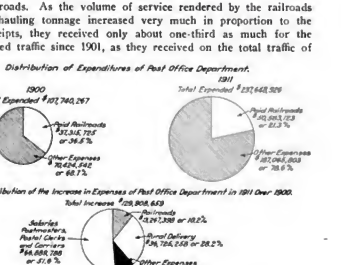

Fig. 2—Post Office Department Statistics.

ten years ago. This saving to the government, however, was more than offset by the increased expenditures of the post office department for other purposes, which, while only $77,000,000 in 1901, were $187,000,000 in 1911. In other words, of the total postal receipts of 1911, 69 per cent. was expended for purposes other than railroad compensation, while of the increase since

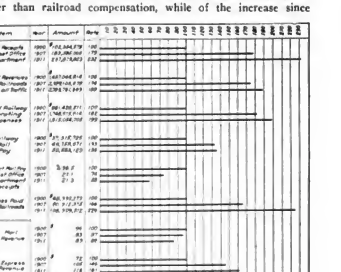

Fig. 3—Statistics of Railway Mail Service and Other Classes of Traffic Covering All Railroads.

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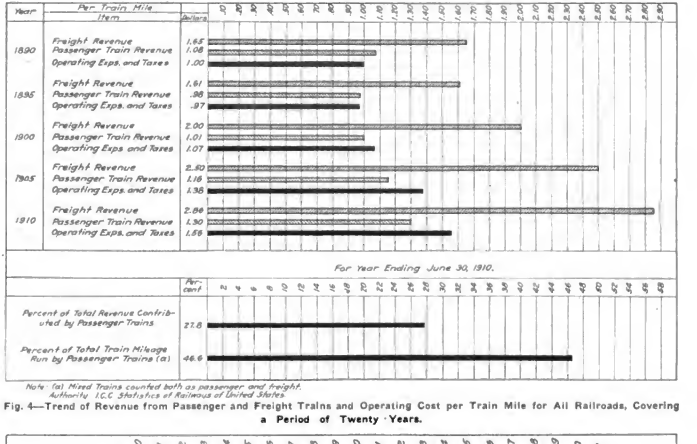
1901, amounting to $126,000,000, 87 per cent. was expended for other than railroad transportation.

Fig. 2 shows a distribution of expenditures of the post office department for the years 1900 and 1911 as between railroad and other expenditures; the relative service rendered by the railroads in these two years was doubled for an increase of only a little more than one-third in compensation.

Fig. 3 illustrates graphically for the years 1900, 1907 and



Note: (a) Mixed Trains counted both as passenger and freight.
Authority: I.C.C. Statistics of Railways of United States.

Fig. 4—Trend of Revenue from Passenger and Freight Trains and Operating Cost per Train Mile for All Railroads, Covering a Period of Twenty Years.

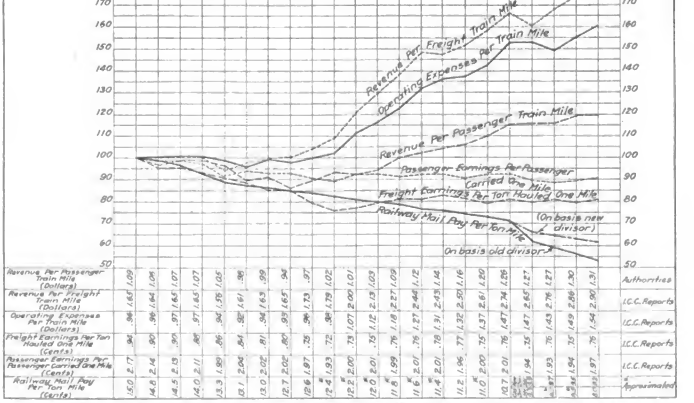


Fig. 5—Relative Revenue per Unit of Traffic from Mails, Passengers and Freight for All Railroads; Year 1890 taken as 100.

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1911 the great increase in receipts of the post office department as compared with the increase in total railroad revenue, in total operating expenses, and in taxes paid by the railroads, and as compared with the relatively small increase in the railways' compensation for carrying the mail. It also shows per 1,000 passenger train miles run on the railways of the United States that from 1900 to 1911 there was a decrease of 14 per cent. in mail revenue, compared with an increase of 31 per cent. in revenue from passengers, 45 per cent. in revenue from freight, and 61 per cent. in revenue from express. During the same time railway operating expenses per 1,000 train miles increased 44 per cent.

This figure strikingly illustrates the slight extent to which the railways have shared in the available greater revenue of the post office department and the actual decrease in payments for carrying mail in proportion to the volume of passenger train service. As is well known, railway wages are very much higher than formerly, prices of material have advanced, the cost of building steel mail cars and operating them is much greater than formerly, yet railway mail pay per unit of traffic has been very greatly reduced during the past 10 or 15 years in the face of changes in industrial conditions that should have increased it.

Fig. 4 illustrates changes that have taken place in railway freight revenue, passenger train revenue, and railway operating expenses and taxes per train mile in 1895, 1900, 1905 and 1910 as compared with 1890. The statistics show there is little for the railways in passenger train service as a whole, and least

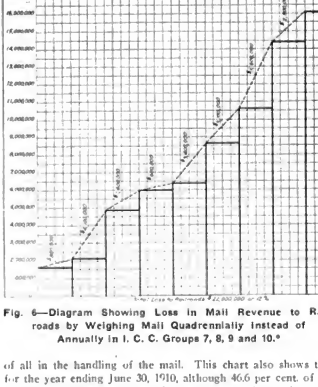

Fig. 6—Diagram Showing Loss in Mail Revenue to Railroads by Weighing Mail Quadrennially Instead of Annually in I. C. C. Groups 7, 8, 9 and 10.*

of all in the handling of the mail. This chart also shows that for the year ending June 30, 1910, although 46.6 per cent. of the total train mileage was run for passenger train service, only 27.8 per cent. of the revenue was contributed by the service rendered by passenger trains.

Fig. 5 shows for the railroads of the United States the relative revenues per unit of traffic from mails, passengers and freight during the past 21 years, the year 1890 being taken as unity or 100. The great increase that has taken place in the last 15 years in railway operating expenses as compared with the pay received for carrying the mails is graphically illustrated. The cost of operating railways per train mile during this period increased over 60 per cent., the railway revenue per passenger train mile increased 20 per cent., the passenger earnings per passenger carried one mile decreased slightly, and the railway mail pay per ton mile of mail was nearly cut in two, using the same divisor throughout the period. The ton mileage rate for mails was obtainable up to and including 1898 from a statement of Prof. Henry C. Adams in 1899 before the commission to investigate the postal service. In order to secure later figures, ton mileage on all the mail routes was compiled for 1905, 1907, 1908 and 1911, figures for other years being approximated, as the decline in railway mail pay under the automatic operation of the law is fairly uniform.

Fig. 6 illustrates graphically the fairness of the railways' re-

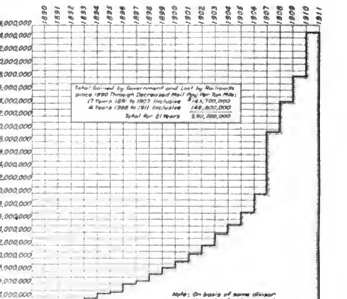

Fig. 7—Annual Gain to Government and Loss to the Railroads Since 1890 Through Decreased Mail Pay per Ton Mile Through Automatic Operation of the Law and Because of Other Reductions by Government Authority Commencing in 1907.

quest for annual instead of quadrennial weighing. It shows for the western states the results of weighing from 1878 to date, the heavy line indicating the actual payments and the dotted line the amounts to which the railways believe they were fairly entitled, the triangles formed between the heavy lines and dotted line representing the losses to the railroads through annual weighing, these losses being expressed in figures on the chart. The growth in the western group of states was no doubt greater in proportion than in the rest of the country, but the chart is presented to illustrate the service rendered by the railroads for which they contend they received no compensation whatever.

Fig. 7 illustrates graphically the gain to the government and loss to the railroads by years since 1890 through decreased mail pay per ton mile on account of the natural or automatic operation of the law and because of other reductions made by governmental authority since the beginning of 1907. This chart shows that the amount of these reductions for the 17 years from 1895 to 1907, inclusive, was $143,700,000, while for the four years from 1908 to 1911, inclusive, it was $146,800,000, or a total for the 21 years of $290,500,000. These figures are obtained by applying the average rate per ton mile effective in 1890 to the traffic handled in subsequent years, the difference between the amount so obtained and the actual compensation representing the amount saved to the government and lost to the railroads through reduction in rates per ton mile. It also demonstrates

*Group 7 includes Montana, Wyoming, North and South Dakota and Nebraska. Group 8 includes Colorado, Kansas, Missouri, Arkansas and Oklahoma. Group 9 includes Louisiana, Texas and Mexico. Group 10 includes Oregon, Washington, Idaho, Utah, Nevada, Arizona and California.

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that the government was sharing quite generously in reduced rates through the automatic operation of the statute without making the additional reductions by governmental authority commencing in 1907, when it is considered that through most of this period the railroads were contending with higher operating cost per traffic unit due to causes beyond their control. It further demonstrates that the present law has been a most favorable one to the government, having secured greater reductions for carrying mail than have been made for any other class of railway traffic.

FIREMEN'S ARBITRATION AWARD.

The award of the arbitrators between the eastern railroads and the Brotherhood of Locomotive Firemen and Enginemen was filed April 23, 1913, and in accordance with the provisions of the Erdman act will take effect ten days later. The first part of the report follows in part, but the award is given in full.

THE ARBITRATOR'S REPORT.

Some time about the middle of 1912, the Brotherhood of Locomotive Firemen and Enginemen, through its duly accredited officers, in support of the demands of the firemen and hostlers presented a request on behalf of all of such employees for an increase in wages, and for sundry improvements of the rules controlling their conditions of service. As early as July 1, a meeting was held between the committee representing the firemen and the conference committee of managers of the railroads in New York, and subsequent to that date a number of other similar meetings were held, and much correspondence engaged in. The firemen were represented in these conferences by W. S. Carter, president, and other officers of the brotherhood, and the railroads were represented by Elisha Lee, chairman of the conference committee of managers, and other gentlemen associated with him on the committee.

After numerous conferences and the exchange of proposals, the parties to the controversy were unable to agree and jointly asked Martin A. Knapp, presiding judge of the United States Commerce Court, and Charles P. Neill, commissioner of labor, to mediate the differences between the firemen and the railroads in pursuance of the provisions of the Erdman act, but they were unable to compose the differences, and the entire correspondence covering the negotiations between the brotherhood and the railroads, together with a historical statement thereof, was published over the signatures of the officers of the brotherhood and the question of a strike was submitted to the firemen employed through the territory covered by the railroads party to the controversy; a strike vote was taken, the total number of votes cast in the strike vote being 33,916, of which 32,918, or 96.5 per cent., were cast for the strike. This created a situation full of serious possibilities, not only to the parties immediately concerned, but in a much wider sense to the general public, and which seemed to be equally appreciated by the representatives of the brotherhood and the railroads.

Immediately following the counting of the strike vote further conferences were held between the conference committee of managers and the brotherhood representatives, but as they were still unable to agree upon a settlement, the president of the Brotherhood of Locomotive Firemen and Enginemen invoked the assistance of Martin A. Knapp, presiding judge of the United States Commerce Court, and G. W. W. Hanger, acting commissioner of labor, to mediate the differences between the firemen and the railroads, in pursuance of the provisions of an Act of Congress concerning carriers engaged in interstate commerce and their employees (commonly known as the Erdman act, approved June 1, 1898). Messrs. Knapp and Hanger promptly responded to this request for mediation. Their efforts at mediation did not accomplish a settlement of the controversies, but resulted in an agreement between the parties to adjust their differences by arbitration, under the provisions of the Erdman act.

The railroads appointed as their arbitrator William W. Atterbury, of the Pennsylvania Railroad, and the brotherhood appointed as its arbitrator, Albert Phillips, of Sacramento, Cal. The two arbitrators thus chosen, having failed within five days after their first meeting for that purpose, requested the presiding judge of the United States Commerce Court and the acting commissioner of labor to appoint a third arbitrator. William L. Chambers, of Washington, D. C., was appointed as such third arbitrator on March 3.

The board of arbitrators appointed as above, held its first meeting at the Waldorf-Astoria hotel, New York, on Monday, March 10, 1913. William L. Chambers was elected chairman and H. S. Milstead was appointed temporary secretary and subsequently his appointment was made permanent. Sessions of public hearings were held daily, with the exception of Sundays, from March 10 to and including the fifth day of April, 1913.

The first session of the board was occupied by a statement of the chairman of the board, followed by an opening statement on behalf of the brotherhood by W. S. Carter, its president, this being followed by the statement of Elisha Lee on behalf of the railroads. Employees from many different lines of railroads throughout the territory covered by them were called on behalf of the firemen, and in connection with their testimony given on the stand, some fifty odd printed exhibits were presented by Mr. Carter.

The railroads called perhaps an equal number of witnesses and filed a large number of exhibits. It is probable that no such elaborate or valuable statistical matter was ever submitted in a similar arbitration before. At the conclusion of the public hearings and after oral arguments covering several days, printed briefs were filed by the respective parties, which have been of great assistance to the board in reaching its conclusion.

The railroads involved in this compulsory arbitration comprise practically all that part of the United States east of the Mississippi and north of the Ohio and Potomac rivers. The trackage of these railroads is approximately 70,000 miles of main line, being something more than one-fourth of the entire trackage of the United States. These railroads represent practically forty per cent. of the total capitalization for all railroads in the United States; they carried about forty-seven per cent. of the ton miles and about forty-three per cent. of the passenger miles of all railroads of the United States.

The firemen employed on these railroads number in the neighborhood of 31,000 for the year 1912, and the wages for the year 1912 was approximately $29,000,000. These figures indicate, with some degree of certainty and emphasis, the magnitude of the problem and the far-reaching character of the controversies submitted for the arbitrament of this board. Reference must be had to the three printed and bound volumes of evidence taken on the stand, comprising more than two thousand pages, the four volumes of printed exhibits, comprising perhaps as many more pages in the aggregate, and the exhaustive briefs of counsel, in order to form a due estimate of the comprehensive and difficult task undertaken, the conclusions of which by the board are now stated.

The award made by the board is as follows:

THE AWARD.

Article 1: Ten hours or less, or one hundred miles or less, shall constitute a day's work in all classes of service, except as otherwise specified. The time for which firemen will be paid shall begin at the time he is required to report for duty, and end when the engine is delivered at the point designated.

Article 2: The following rates of wages per day shall be the minimum rates paid in all classes of service on all railroads, parties to this arbitration:

(a) PASSENGER SERVICE.

Weights of Locomotives in pounds on Drivers.	
Less than 80,000 lbs.	$2.45
80,000 to 100,000 lbs.	2.50
100,000 to 140,000 lbs.	2.60
140,000 to 170,000 lbs.	2.70
170,000 to 200,000 lbs.	2.85
200,000 to 250,000 lbs.	3.00
250,000 to 300,000 lbs.	3.20
300,000 to 350,000 lbs.	3.40
All engines over 350,000 lbs. on drivers	3.60
Mallet engines regardless of weight on drivers	4.00

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Freight Service.	
Less than 80,000 lbs.	$2.75
80,090 to 100,000 lbs.	2.85
100,000 to 140,000 lbs.	3.00
140,000 to 170,000 lbs.	3.10
170,000 to 200,000 lbs.	3.20
200,000 to 250,000 lbs.	3.30
250,000 to 300,000 lbs.	3.35
All engines over 300,000 lbs. on drivers	4.00
Mallet engines regardless of weight on drivers	4.00

Where two firemen are employed on a locomotive as a result of the application of Article 5, hereinafter, the rates of pay to each fireman shall be as follows:

Weight on drivers, 100,000 to 250,000 lbs.	$2.75
Weight on drivers, over 250,000 lbs.	3.00

(b) Switching Service.	
Switch engine firemen on locomotives weighing less than 140,000 lbs. on drivers, per day of ten hours or less	$2.50
Switch engine firemen on engines weighing 140,000 lbs. or over on drivers, per day of ten hours or less (excluding Mallets $4.00)	2.60

(c) Hostlers.	
Hostlers, per day of ten hours or less	$2.40
If hostlers are employed in handling engines between passenger stations and roundhouses or yards, or on main tracks, they will be paid, per day of ten hours or less	3.25
If men are employed to assist hostlers in handling engines between passenger stations and roundhouses or yards, or on main tracks, they will be paid, per day of ten hours or less	2.50

(d) Helper on Electric Locomotive.	
The term "helper" will be understood to mean the second man employed on electric locomotives, and he shall receive in passenger service, per day of ten hours, or less, one hundred miles or less	$2.50
In through freight per day of ten hours or less, one hundred miles or less	2.80
In switching service, per day of ten hours or less	2.50

All working conditions applicable to steam locomotive firemen in steam service will apply to helpers in electric service.

(e) Firemen on locomotives in pusher and helper service, mine runs, work, wreck, belt line and transfer service, and all other unclassified service will be paid through freight rates according to the class of engine.

(f) Firemen in local freight service will be paid fifteen cents in addition to through freight rates according to class of engine.

(g) For the purpose of officially classifying the locomotive, each railroad, party to this arbitration, will keep bulletins posted at all terminals showing accurately the weight on drivers of all engines in its service.

Article 3: (a) Overtime in all classes of service, except passenger, will be paid for pro rata on the minute basis. Except as otherwise specified ten hours, or one hundred miles will be the basis for computing overtime. Miles and hours will not be counted together; when miles exceed hours, miles will be allowed, and when hours exceed miles, hours will be allowed.

(b) Overtime in passenger service (except suburban service) will be paid at the rate of thirty cents per hour on the basis of twenty miles an hour, computed on the minute basis. Five hours or less, one hundred miles or less, to constitute a day's work.

(c) On short turn around runs, no single one of which exceeds eighty miles, including suburban service, overtime shall be paid for all time actually on duty, or held for duty, in excess of eight hours (computed on each run from the time required to report for duty to end of that run) within twelve consecutive hours; and also for all time in excess of twelve consecutive hours, computed continuously from the time first required to report to the final release at the end of the last run. Time shall be counted as continuous service in all cases where the interval of release from duty at any point does not exceed one hour.

Article 4: No initial terminal delay is allowed beyond that involved in the rule that pay shall begin in all cases at the time fireman is required to report for duty, but final terminal delay after the lapse of one hour will be paid for at the end of the trip, at the overtime rate, according to the class of engine, on the minute basis. For freight service final terminal delay shall be computed from the time the engine reaches the designated main track switch connecting with the yard track. For passenger service final terminal delay shall be computed from the time the train reaches the terminal station. If road overtime has commenced terminal overtime shall not apply, and road overtime shall be computed to the point of final release.

Article 5: Firemen in pool freight and in unassigned service held at other than home terminal, will be paid continuous time for all time so held after the expiration of eighteen hours from time relieved from previous duty, at the rate per hour paid him for the last service performed. If held fourteen hours after the expiration of the first twenty-eight hour period, he will be paid continuous time for the next succeeding ten hours, or until the end of the twenty-four hour period, and similarly for each twenty-four hour period thereafter. Should a fireman be called for duty after pay begins, his time will be computed continuously.

Article 6: When a second fireman is deemed necessary on any engine or assistance is deemed necessary on any engine where one fireman is employed, the matter will be taken up with the proper officials by the Firemen's Committee. Failing to reach a settlement the matter shall be referred to an Adjustment Commission, to be composed of five persons, two of whom are to be chosen by the railroad, two by the Firemen's Committee, and one to be selected by the four thus chosen, who shall be the chairman of the commission. Should the four men fail to agree upon the fifth, then three days after the last of the four is selected, the fifth man shall be named by the presiding judge of the United States Commerce Court. If, for any reason, the selection of the fifth man cannot be made by the presiding judge of said court, he shall be named by the United States district judge of the district in which the controversy may have arisen. All expenses incurred in connection with the settlement of such matters shall be borne equally by the two parties to the controversy.

Article 7: Firemen will be relieved of cleaning engines. Lubricators will be filled, headlights, markers and other lamps cared for (including filling but not lighting), and all supplies placed on engines at points where roundhouse or shop force are maintained. The firemen shall not be relieved of responsibility of knowing that engines for which they are called are properly equipped for service.

Article 8: Firemen tied up between terminals on account of the hours of service law, will be paid continuous time from initial point to tie-up point. When they resume duty on a continuous trip they will be paid from tie-up point to terminal on the following basis: For fifty miles or less, or five hours or less, fifty miles pay; for more than fifty miles up to one hundred miles, or over five hours, and up to ten hours, one hundred miles pay; over one hundred miles, or over ten hours, at schedule rates. This provision does not permit the running of firemen through terminal or around other firemen at terminals, unless such practice is permitted under the pay schedule.

Article 9: The earnings of firemen in any class of service shall not be diminished by the provisions of this award; and if the rates that were higher or the conditions that were better antecedent to this award are necessary to guarantee this requirement they shall be maintained. Neither shall the earnings of the firemen, in any class of service, be increased above what the higher rates of pay and the conditions that were better antecedent hereto guaranteed him, by a combination of the rates herein established with the conditions of service antecedent hereto, or vice versa.

It is not intended that any of the terms or provisions of this award shall debar committees from taking up for adjustment with the management of the respective railroads any questions or matters not specifically covered herein.

Article 10: This award shall take effect at the time and in the manner provided by the act of congress entitled "An Act Concerning Carriers Engaged in Interstate Commerce and Their Employees, Approved June 1, 1898." All parties to this arbitration having stipulated in writing, and incorporated in the record an agreement, extending the time within which the award may be made and filed, from the second day of April, 1913, to and including the twenty-third day of April, 1913, the arbitrators now, on this twenty-third day of April, 1913, signed this award without dissent in any particular to any of its provisions by any one of them, and have required the secretary to attest the same.

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General News.

At a "Safety rally" of employees of the Buffalo, Rochester & Pittsburgh at DuBois, Pa., on the 12th, three thousand persons were present.

A controversy between the International & Great Northern and its firemen has been settled by an agreement on new working conditions and slight advances in pay, affecting about 300 men.

Twelve experienced dining car conductors have been brought from England to work on the Canadian Pacific. One of the twelve was for eight years in the service of the Central South Africa Railway.

The Brotherhood of Railroad Trainmen has presented to the railroad commission of Louisiana a petition asking that changes be made in the rules issued by the commission relating to the duties of flagmen.

A jury in the federal court at Minneapolis has awarded H. W. Otis, of Willmar, Minn., a judgment of $50,000 against the Great Northern Railway on account of the loss of a leg while coupling cars equipped with an old style coupling where there should have been an automatic coupler.

The new federal law prescribing severe punishment for stealing from freight cars engaged in interstate commerce has been made the subject of a placard, which has been issued by the general manager of the Pennsylvania Railroad and posted in all stations of the road.

The Missouri Pacific and the Denver & Rio Grande have reduced the running time of passenger trains between Denver and St. Louis by about three hours. The new passenger train put in service on April 20, leaves Denver at 11:55 a. m. and arrives in St. Louis at 7:25 p. m. the next day.

At a recent meeting of representatives of various commercial clubs in Kansas and Colorado a committee was appointed to ask the Atchison, Topeka & Santa Fe to electrify its lines west of Dodge City, Kan., using power developed from the Arkansas river, and to sell a part of the current to farmers for use in irrigation.

The latest achievements of the aviators have included a flight of 250 miles into the Sahara Desert by four aeroplanes of the French army, and a tour by two men, in a single machine, which covered parts of England, France, Belgium and Holland, the whole trip taking only four hours and seven minutes. The distance traveled was 245 miles, and the crossing of the English Channel is treated as merely an incident of the flight.

William H. Schroeder, the engineman who was at fault in the collision at Corning, N. Y., last July, and who was not prosecuted, has been reindicted, apparently in consequence of the charge made by President Truesdale, of the road, and published in the newspapers, that the failure to punish Schroeder was because of some bargain between the friends of the engineman and the officers of the law.

Mayor Harrison, of Chicago, has taken some of the life out of the agitation for electrification of the Chicago railway terminals, which was revived last week by the appointment of the city council committee on railway terminals, and the introduction of a resolution providing for immediate action on the question, by announcing that he will endeavor to have the council settle the questions of telephone and electric light regulation, and also the local transportation question, before taking up electrification.

A bill has been introduced in the Canadian Parliament to regulate changes of railway terminal and division points. It proposes that a railway shall secure the approval of the Railway Commission before changing a terminal or divisional point; and that when such a change is made employees forced to move to another town shall be compensated for their loss by the railway company; and in case of dispute the amount to be paid by the road shall be fixed by the Dominion Railway Commission.

The elaborate report on the financial condition of the New York, New Haven & Hartford, which has been made to the Interstate Commerce Commission by its accountants and examiners has been the subject, during the past week, of a public hearing in Boston, presided over by Commissioner C. A. Prouty. Officers of the New Haven, and also of the Boston & Maine were questioned, and Mr. Brandeis, appearing as counsel for a Boston merchants' association, was allowed to cross question. The counsel for the New Haven protested that the government's report was being made public, and the officers of the road questioned concerning it, before they had had an opportunity to examine it.

There is a bill before the New York legislature, No. 1897, introduced by Mr. Cronin, providing that motormen of multiple-unit electric trains shall have had at least one year's experience on a steam or electric railroad, and must be familiar with train rules, train orders, standard code signals, etc. If this bill should become a law it would produce on the electric zones of the New York Central and of the New Haven and on the Interborough Rapid Transit Lines in New York City the same conditions that prevailed in Yonkers, N. Y., a few months ago, when, because of a strike of motormen, the street railroads were tied up absolutely, an ordinance of the city forbidding the employment of inexperienced men as motormen.

Governor Major, of Missouri, has signed a bill requiring foreign railway corporations operating in the state to incorporate in Missouri, and also the full crew law, requiring three brakemen on all freight trains of 40 cars or more, and a flagman and a brakeman on all passenger trains of six cars or more. In a statement regarding the incorporation law he states that it cannot be applied to roads now operating in the state, but only to those which seek to enter the state in the future. In a statement regarding the full crew law he says that the increase in the length and speed of trains and the volume of traffic without any increase in the number of men handling such trains, "no doubt accounts for the increase in the number of men killed and injured, and our increased number of wrecks and tieups. The addition of one man on these long trains would give better facilities for detecting defects and inspecting the condition of the train while in transit, thereby reducing the chances of wrecks and tieups."

The "New England Conference on Transportation," organized at the suggestion of the governor of Massachusetts, met in Boston last Wednesday, and discussed the general proposition of uniform railroad legislation with the Massachusetts legislative committee on railroads. Representatives were present from all the New England states except New Hampshire. The meeting was called by Gov. Baldwin, of Connecticut, chairman of the Conference. The states were represented as follows: Maine, F. W. Cram, C. H. Osgood; Vermont, William B. Howe, Percival H. Clement; Massachusetts, Marcus P. Knowlton, Francis T. Bowles and the Governor; Rhode Island, William C. Bliss and Marsden J. Perry; Connecticut, George M. Woodruff and Costello Lippett. A temporary organization was effected by the selection of Percival Clement as chairman and Francis T. Bowles as secretary. These with Mr. Cram were made a committee to confer with President Wilson and the governors of the New England states in regard to the scope of the work desirable for the Conference to undertake, and to report at a meeting to be called by the temporary chairman.

Locomotive for University of Illinois Testing Plant.

The first locomotive to be tested in the new locomotive laboratory of the College of Engineering of the University of Illinois arrived on April 11. The locomotive is an Illinois Central large, modern freight engine, No. 958, lent to the university temporarily for testing purposes. It is of the consolidation type, eight driving wheels coupled. Its total weight, with the tender, is 182 tons, with 100 tons on the driving wheels.

Telephones in the Floods.

The remarkable usefulness of the telephone in the distressing conditions that prevailed in Ohio and Indiana during the last week in March is known to all readers. The emergency work done by the different companies would make a story filling a volume. The Bell companies, all working in unison with the parent company in New York, not only utilized all of their ordinary resources, by no means small, but also spent thousands

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of dollars on special transportation and extra work in shops, and in the field. The Western Electric Company shipped 125 tons of telephone cable to Ohio, from New York City, by express. A trainload of poles was shipped from the company's yards in Michigan. The shops at Hawthorne, Ill., were at once put to running 24 hours a day, and shipments from the warehouses at Hawthorne and other cities were started by passenger train within a few hours after the flood became dangerous. The company at once ordered from the Pacific coast 50,000 cross-arms, and material for indoor facilities was drawn from the company's reserve stocks at Boston, New York, Philadelphia, Richmond, Atlanta, Kansas City, St. Louis, Minneapolis and Dallas. The sleet storm of February 20 already had brought a demand on the Chicago shops for over 200 tons of copper wire, besides large quantities of office hardware. To Dayton alone 5,000 telephone sets were shipped, and 40 private exchange equipments. At Dayton and other cities, where the telephone exchanges, being in the second or third stories of buildings, were able to continue in operation even after the streets were flooded, operators were taken to and from their work in boats. The American Telegraph & Telephone Company lost 4,000 poles in the floods, and the Western Union 8,000. These figures gives some little idea of the losses of wires and the labors of the linemen.

A Condensed Analysis.

It seems very simple to see the trains run in and out of the station; to order the freight car and send the grain to market; to telegraph to the city for supplies, and in 24 hours have them delivered. But it is not so simple as it seems, and there is danger today that the next great uplift in business will find the railroads sorely taxed to furnish the transportation needed for the commerce of the country. Why? Because a misdirected public opinion is demanding rates too low, taxes too high, wages too high, service too elaborate; and there are not cents enough in the dollar to meet all these obligations and still permit the business to be attractive enough so the man with the dollar will invest it. Our American railroads have done good work, and can do better, and it is to the farmers' selfish interest to see that they are so treated that they will be ready at all times to handle business. To be ready requires constant expenditure.—*Leslie's Weekly.*

Proposed Utility Commissions in Illinois.

A joint committee appointed by the Illinois legislature two years ago has submitted a report recommending a single state commission to regulate all public utilities in this state, and strongly opposing the proposal for separate commissions for the state and for the city of Chicago. The report severely criticises the handling of questions of public utility regulation by the city of Chicago in recent years, and also objects to separate commissions on the ground that two commissions would inevitably lead to conflicts in authority. A bill introduced in the legislature to carry out these recommendations provides for a state public utility commission of five members at a salary of $10,000 each, two to be appointed from Chicago, and one each from northern, central and southern Illinois, with broad powers over all utilities except steam railroads, which are to be left for the present under the jurisdiction of the present railroad and warehouse commission. Governor Dunne's bill providing for a state public utilities commission, and giving Chicago and all other cities having a population of over 25,000 the option of regulating their own public utilities or delegating this power to the state commission, has also been introduced. The administration bill abolishes the present railroad and warehouse commission. A third bill has been introduced on behalf of the minority of the joint committee, which would create a state commission and a separate commission to handle Chicago affairs, the Chicago commission to be appointed by the mayor.

Rigid Rules.

The Pennsylvania Railroad has established a rule which will debar from employment in its dining car and restaurant department any person with even a tendency toward a communicable disease. There is to be a quarterly physical examination of every employee who has anything whatsoever to do with the preparation or serving of food; dishwashers, kitchen helpers, cooks and waiters; and only with a 100 per cent. report can they remain in the service. The further precaution is taken of debarring these defectives from employment in places where linens and tableware are kept. At "lay-over points" for dining car stewards, waiters and cooks, special lodgings are provided, with clean linens, clean beds and every sanitary protection. These lodgings are inspected by the superintendent of dining cars and restaurants, by service inspectors, and by medical examiners of the company.

The Three-Dollar Demurrage Rate.

With the successful results of a high charge for demurrage on freight cars in California our readers are well acquainted. Within the last few months a rate of $3 has been charged on interstate as well as intrastate shipments, and the change, as was to be expected, has proved of marked benefit. Mr. Mote, manager of the Pacific Car Demurrage Bureau, prints a letter from J. P. Thomas, agent of the San Pedro, Los Angeles & Salt Lake, at Los Angeles, telling of the improvement as follows:

"When this $3 rate on interstate cars became effective, our yard efficiency was almost immediately increased because of the tendency on the part of consignees to dispose of shipments immediately upon arrival, instead of allowing them to be placed on the hold-track. This largely decreases the average number of switching moves on cars and thereby lessens not only the congestion in the yard, but the danger of damage to cars and contents by continued switching.

"I find that we also have less disputes with consignees as to the correctness of demurrage charges, doubtless due to the fact that the higher rate tends to the keeping of more accurate records by consignees. Station and yard employees are very much gratified with the results."

Chicago Switchmen's Controversy Settled.

The controversy between the yardmen and the railways in the Chicago district regarding wages and working conditions, was settled on April 17, by a compromise reached after several weeks of negotiations conducted by Commissioner of Labor Neill, and his assistant, G. W. W. Hanger, under the mediation provisions of the Erdman act. Although the railways conceded most of the demands of the men, the agreement omits the rule on which they had most strongly insisted, providing for the payment of time and a half for overtime, Sundays and holidays. The concessions gained by the men include an increase of wages for a number of men in "backup" service—backing passenger trains to and from train sheds—a rule giving yardmen a right to handle milk runs in the Chicago switching district, compensation for time on account of attending investigations and re-examinations, a concession of 30 minutes in the starting time rule, one day's pay for yardmen when called and not used, and other minor provisions regarding employment.

Fast Handling of Emergency Order for Levee Protection.

At noon on Monday, April 7, the Carnegie Steel Company, of Pittsburgh received an emergency order for 500 tons of U. S. steel sheet piling, to be forwarded to New Orleans, to reach that point not later than April 17, for installation in the Lafourche District for the protection of the levees.

The order was the result of a decision to take precautionary measures in anticipation of what extraordinarily high water might cause, on the part of the Texas & Pacific and New Orleans & Northeastern railroads, acting in conjunction with the commissioners of the LaFourche levee district, and Captain Sherrill of the U. S. engineer corps, the government officers having arranged to drive the sheet piling with their apparatus immediately on arrival. Owing to extraordinary efforts put forth by the makers of the steel and the carriers which transported it, the date set was anticipated by three days, a remarkable achievement on the part of the railroads, particularly between Pittsburgh and Cincinnati, considering the soft condition of the tracks, bridges, and culverts, owing to recent floods.

The rolling was begun at midnight April 7, and proceeded with continuously until Wednesday night, April 9. The piling, after rolling, was promptly cut and punched, and loaded into a special train of 12 cars, consisting of steel gondolas and steel underframe gondolas of the Baltimore & Ohio. Cars were

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previously carefully inspected while empty, and the last car of the train was weighed at the Hayes Yard of the Union Railroad at 11:50 a. m. Thursday, April 10; delivery was made by the Union Railroad to the Baltimore & Ohio at Port Perry Transfer, at 12:18 p. m., after which the train was switched to the Glenwood yards of the Baltimore & Ohio, and another minute examination made of the cars under load, so as to avert any possible transportation danger to the equipment, owing to the fast running required. The train was then promptly despatched by the Baltimore & Ohio, reaching Benwood, W. Va., at 10 p. m. Thursday night, April 10, and immediately delivered to the Ohio River division of the Baltimore & Ohio for movement thence to Parkersburg, at which point it arrived at 5:22 a. m., Friday, April 11. It was transferred at once to the higher line of the Baltimore & Ohio Southwestern, leaving at 6:30 a. m., April 11, which line brought the train into Cincinnati at 2:45 a. m., Saturday, April 12. Prompt transfer at Cincinnati was made to the Queen & Crescent route, but here a delay of several hours ensued, necessitating revision of part of the lading in order to avert danger while crossing the Ohio river, as it was not known to what extent, if any, the floods might have weakened the bridge. The train finally started towards New Orleans at noon Saturday, April 12, on a schedule that approximated 20 miles an hour, to complete the last leg of the journey, 836 miles (out of a total journey, from point of origin to destination, of 1,230 miles). Birmingham, Ala., 481 miles out, was passed at 8 o'clock Sunday morning, April 13, and at 3:30 p. m. the train passed Meridian, Miss., 200 miles from New Orleans, reaching the last named city at 3:15 a. m., Central time, Monday, April 14.

Thus, the order was received, executed, loaded, shipped and delivered at destination in less than one week from the time it was received, under all the adverse conditions and circumstances that presented themselves. Owing to wash-outs on the B. & O. regular route to Cincinnati, an alternate route via Benwood and Parkersburg had to be selected, lengthening the distance to Cincinnati approximately 40 miles, and the movement of the freight was necessarily slow at times, because of soft track and other conditions, due to the floods.

New Harriman Dissolution Plan.

Robert S. Lovett, chairman of the executive committee of the Union Pacific, appeared before Circuit Judges Sanborn, Hook and Smith at St. Paul, Minn., on April 21, and presented a motion for an extension of time in the Union Pacific-Southern Pacific dissolution proceedings until July 1, together with a revised plan for the separation of the roads. The motion was taken under advisement following the receipt of a telegram from the attorney general declaring his aequiescence in the plan for the extension. A synopsis of the new tentative plan was given out, including the following points:

"The amended plan in brief is that the entire $126,650,000 in Southern Pacific stock to be distributed shall be deposited with a trustee and disfranchised while so held; that certificates of interest shall be issued by the trustee against said shares, which shall carry no voting right and which shall be exchangeable for Southern Pacific shares held by the trustee only on the filing of an affidavit by the applicant for such exchange, showing that such applicant does not own 1,000 shares or more of Union Pacific stock, and that these certificates of interest shall be offered for subscription and purchase to all Union Pacific stockholders at a distribution ratio of not less than 38 per cent.

"The largest Union Pacific stockholders (368 in number, according to the September stock list, which was before the Supreme Court) are by this amended plan excluded from the acquisition of any of the Southern Pacific shares to be distributed. They may purchase their ratable shares of the certificates of interest, but they cannot themselves convert the certificates of interest into the deposited shares.

"Even if it be assumed that any concert of action by the 21,782 holders of Southern Pacific stock, resulting in a control of the elections of the Southern Pacific company, were possible, the effect would not be to continue the previous combination. These 21,782 holders, assumed to be able to control the Southern Pacific company by the holding of virtually 46 per cent. of its stock, are not in control of the Union Pacific Railroad Company and are not able to elect its directors, since the aggregate holdings of Union Pacific stock amount to only 37.2 per cent. of the Union Pacific stock, and as the remaining 368 stockholders hold 62.8 per cent., they naturally represent the controlling interest of the Union Pacific company.

"The certificates of interest acquired on the open market will still be subject to the condition that they cannot be converted into stock by any Union Pacific shareholder holding 1,000 shares or more."

After this plan had been informally submitted a statement was given out by the court as follows:

"Circuit Judges Sanborn, Hook and Smith are not concerning themselves regarding the sale of Central Pacific stock, as this phase of the situation was not mentioned in tentative plan, but are confining their attention to the disposition of the $126,650,000 of Southern Pacific stock which is now unlawfully held by the Union Pacific Railroad Company.

"In this connection the following suggestions have been submitted by the judges to counsel for the Union Pacific, and also to District Attorney Houpt, of St. Paul, representing the government for Attorney-General McReynolds, as a guidance in future dissolution plans:

"1. Any plan for disposing of the $126,650,000 of Southern stock owned by the Union Pacific company should have regard to the amount of Southern Pacific stock already owned by Union Pacific stockholders, so that the present holdings of these stockholders as a body shall not, by the affirmative action of this court, be increased to the point of practical control of the competing company.

"2. In the memorandum of March 1, 1913, submitted by counsel for the Union Pacific Company, to a very large extent the 23,000 individual stockholders of the Union Pacific are also included among the 15,000 stockholders of the Southern Pacific Company.

"3. It was intimated at a time when it was supposed that Union Pacific stockholders did not hold more than $50,000,000 of the stock of the Southern Pacific Company that not more than $40,000,000 of the Southern stock should be transferred to Union Pacific stockholders. It now appears that the stock books of the two companies of February, 1913, show that 4,440 Union Pacific stockholders also own $92,162,400 of Southern Pacific stock, exclusive of the $126,650,000 of stock involved in this suit. Among these 4,440 stockholders are brokerage concerns whose principals are undisclosed, but if they were excluded the fact would still remain that individual Union Pacific stockholders own a very large amount of Southern Pacific stock.

"In view of these facts it seems that the disposition of as much as $40,000,000 of Southern Pacific, with voting power to the stockholders of the Union Pacific might give practical control of that company to Union Pacific stockholders and the question of what amount, if any, of the Southern Pacific may be safely transferred to them is suggested for an argument and consideration."

A New Cunarder Launched.

The Cunard steamship Aquitania was launched at Glasgow last Monday. The Aquitania is the largest steamship ever built in Great Britain, about 47,000 gross tonnage. The vessel is 901 ft. long and has engines of more than 70,000 h. p. It is expected that her speed will be about 23 knots, considerably less than that of the Lusitania and the Mauretania. The Aquitania will have a double skin throughout the vulnerable part of the vessel, the two skins being separated by a space of about 15 ft.

A. R. E. A. Rail Committee.

Last week we published on page 902 a list of the names of the members appointed for A. R. E. A. 1913 committee assignments. The data for the rail committee was not then available and is as follows:

COMMITTEE IV.—RAIL.

"1. Recommend standard rail sections.

2. Continue investigation of rail failures and deduce conclusions therefrom.

3. Continue special investigation of rails.

4. Make comparative study and report on designs for joints, and recommend standard spacing for bolt holes and spike slots.

J. A. Atwood, P. & L. E., chairman; W. C. Cushing, P. L. W., vice-chairman; Chas. S. Churchill, N. & W.; R. Montfort, L. & N.; E. B. Ashby, L. V.; A. S. Baldwin, I. C.; M. L. Byers, D. & H.; F. A. Delano, Wabash; P. H. Dudley, N. Y. C.; S. H. Ewing, P. & R.; L. C. Fritch,

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C. G. W.; C. W. Huntington, C. R. R. of N. J.; John D. Isaacs, S. P.; Thos. H. Johnson, P. L. W.; Howard G. Kelley, G. T.; C. A. Morse, C. R. I. & P.; Geo. W. Kittredge, N. Y. C. & H. R.; J. P. Snow, Con. Eng.; A. W. Thompson, B. & O.; R. Trimble, P. L. W.; M. H. Wickhorst; G. M. Davidson, C. & N. W.; A. H. Hogeland, G. N.; H. B. MacFarland, A. T. & S. F.; C. F. Loweth, C. M. & St. P.; Geo. W. Vaughan, N. Y. C. & H. R.

Western Railway Club.

An invitation of Dr. W. F. M. Goss, dean of the College of Engineering, and director of the Engineering Experiment Station of the University of Illinois, to the members of the Western Railway Club to attend the formal dedication of the new transportation building, the locomotive laboratory, and the mining laboratory, on May 9, has been accepted by the club, and arrangements are being made for a special train if a sufficient number of members signify their intention of going. The dedicatory programme includes many distinguished speakers representing the railway and mining interests of the country. The locomotive testing plant will be in full operation, and special tests will be conducted. Practically all of the technical organizations of the state have been invited to participate in the exercises.

The Railway Safety First Association.

The chairmen of the safety departments of thirty-four railways met in Chicago last Monday for the purpose of organizing the Railway Safety First Association, the purpose being to establish an association in which shall be represented all railroads in North America on which safety departments have been or shall be organized. A. W. Smallen, chairman of the general safety committee of the Chicago, Milwaukee & St. Paul was chosen chairman of a committee to effect a permanent organization. It was voted to ask the American Railway Association, at its meeting next month, for recognition by that association.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

American Association of Demurrage Officers.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

American Association of General Passenger and Ticket Agents.—W. C. Hope, New York.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

American Association of Railroad Superintendents.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Electric Railway Manufacturers' Assoc.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

American Railway Association.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

American Railway Engineering Association.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

American Railway Tool Foremen's Association.—A. R. Davis, Central of Georgia, Macon, Ga.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—J. B. Wentlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

American Wood Preservers' Association.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-23, 1914, New Orleans, La.

Association of American Railway Accounting Officers.—C. G. Phillips, 142 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 75 Church St., New York.

Association of Water Line Accounting Officers.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

Bridge and Building Supply Men's Association.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal. Meetings, 2d Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—L. S. Thorpe, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

Engineers' Society of Pennsylvania.—F. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineering Society of Western Pennsylvania.—J. Tilles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Walter F. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

General Superintendents' Association of Chicago.—E. S. Koller, 226 W. Adams St., Chicago. Wed. preceding 3d Thurs., Chicago.

International Railway Congress.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

International Railway Fuel Association.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

International Railway General Foremen's Association.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

Maintenance of Way & Master Painters' Association of the United States and Canada.—W. G. Wilmot, Easton, Pa.

Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

Master Car Builders' Association.—J. Kirkaldy, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

Master Car and Locomotive Painters' Assoc. U. S. and Canada.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

National Railway Appliance Assoc.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

New England Railroad Club.—W. E. Kenney, 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railroad Club.—C. L. Kennedy, G. M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Peoria Association of Railroad Officers.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Business Association.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

Railway Club of Pittsburgh.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Electrical Supply Manufacturers' Assoc.—J. Scribner, 1021 Sandwich Block, Chicago. Meetings with Am. Elec. Ry. Assoc.

Railway Gardening Association.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-13, Nashville, Tenn.

Railway Development Association.—W. Edmonds, Kansas City Southern, Kansas City, Mo.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa. Meetings, June 11-12, New York; convention, October 14, Nashville, Tenn.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

Railway Supply Manufacturers' Assoc.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. & A. R. A.

Railway Tel. and Tel. Appliance Assoc.—W. E. Harkness, 284 Pearl St., New York. Meetings with Am. Ry. Eng. Assoc.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

Roadmasters' and Maintenance of Way Association.—I. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Signal Appliance Association.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Traffic Club of St. Louis.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting, first Monday in December; meetings October to May.

Train Dispatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

Utah Society of Engineers.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

The Merchants' Association, New York City, has moved its offices from 54 Lafayette street to the Woolworth Building, 233 Broadway.

Ralph C. Richards, general claim agent of the Chicago & Northwestern, addressed the Traffic Club of Chicago at its monthly luncheon on April 22, on the subject of "Safety First."

Hon. B. H. Meyer, of the Interstate Commerce Commission, also gave a short talk.

Beginning on June 1 tickets between St. Paul and Minneapolis and the Pacific coast both over the Northern Pacific and the Great Northern, will be made optional via Duluth with stop-over privileges. The change is made after considerable agitation by the Duluth commercial interests, who have also been trying to persuade the roads to run through passenger trains to the coast from Duluth.

J. S. Marvin, traffic manager of the National Association of Automobile Manufacturers, has addressed a letter to railway officers throughout the country, complaining that special cars for automobile shipments after being unloaded are too frequently used as ordinary box cars and retained in local service, or reloaded and routed at variance with railway rules and without regard to the requirements of the automobile industry. He urges special attention to keeping these cars in the service for which they are intended.

About 70 manufacturers and shippers of Chicago have arranged a special train containing exhibits of their products, which is being sent out through the territory tributary to Chicago for the purpose of trade promotion. The train consists of six exhibition coaches, two sleepers and a diner. Stops of from one to three days will be made in each city, and the public will be invited into the train, where the exhibits will be explained by representatives. The first trip is to be through Indiana, and will cover seven weeks, during which 28 cities will be visited.

The Queen & Crescent Route, when the recent floods interrupted service on all the direct lines, put on through sleeping cars between Cincinnati and New York, running them on the "Carolina Special" via Harriman Junction, Knoxville and the Southern Railway. By this route a large number of passengers were carried to eastern points. The distance is 1,142 miles, or 391 miles greater than by the direct route. The Ohio river at Cincinnati on April 1, reached a stage of 69.8 ft., but the Queen & Crescent maintained freight and passenger traffic with the South without interruption. When the high water made the use of the regular passenger station impossible, a temporary station with a platform was established on McLean avenue, which withstood the highest stages of water.

A new plan of improving the relations between railways and shippers was inaugurated by officers of the Southern Pacific, the St. Louis & San Francisco, the Texas Midland and the Pacific Fruit Express, at Houston, Tex., last week. The shippers were invited to attend a meeting of railway officers presided over by F. M. Lucore, assistant general manager of the Sunset-Central Lines, to discuss such subjects as the movement and distribution of empty cars, through schedules to St. Louis, Kansas City and Chicago, terminal changes and car inspection, icing arrangements, re-consignments, arrival notices and tracers. The railways have usually held such meetings to make plans for the movement of the fruit and vegetable crop, and it was decided to make the meeting an open one, in order that shippers might see what efforts were being made in their behalf, and to allow them to participate.

Chairman Mayfield, of the Texas Railroad Commission, and Commissioner Watson, of the Oklahoma commission, recently addressed letters to the Interstate Commerce Commission asking an investigation of the action of the Southwestern Passenger Association in refusing a special rate of one cent a mile on account of the Confederate veterans' reunion to be held at Chattanooga. The railways announced a rate of two cents a mile. Commissioner Clements replied that the Commission felt it "could hardly with propriety undertake to influence the carriers to make lower rates in any instance than they could lawfully be required to do; for, while the carriers may, under the law, as they often do, establish special fares for attendance on conventions, reunions, etc., we did not feel justified in urging them to do so, for the reason that it is our duty to pass upon the question of reasonableness of rates, fares and practices of the carriers and the lawfulness thereof."

The bi-monthly dinner and business meeting of the Traffic Club of Pittsburgh was held on April 14 at the Hotel Schenley. The feature of the program was a series of moving pictures entitled "Mine to Molder," presented by Henry B. Yergeson, of Rogers, Brown & Co. The pictures portrayed the various stages in the movement of iron ore from the mines in the Lake Superior region through the various processes to the finished rail in the plant of the Lackawanna Steel Company. At the conclusion of the entertainment features a business meeting was held and a nominating committee was appointed to select candidates for the offices of the club to be voted on at the annual election in June. The committee includes: G. G. Herring, general agent, Southern Pacific; F. A. Ogden, division freight agent, Jones & Laughlin Steel Company; C. L. Cordes, division freight agent, American Steel & Wire Company; Robert Main, division freight agent, Canadian Pacific, Soo Line; L. C. Bibler, traffic manager, Carnegie Steel Company; C. S. Belsterling, traffic manager, American Bridge Company; J. C. Kimes, commercial freight agent, Baltimore & Ohio.

Federal versus State Authority.

In the Supreme Court of the United States last Monday, Assistant Attorney General Denison asked permission to file a brief, amicus curiae, in the pending state rate cases. Similar questions are involved in cases pending before the Commerce Court. There are forty-five cases, including the Minnesota case, and the government asked simply for leave to file the brief which it has filed before the Commerce Court in the Houston East & West Texas et al vs. United States, and Texas & Pacific vs. United States (the Shreveport cases). Mr. Denison said: "As cause for this motion it is shown that the above-mentioned cases involve some of the fundamental points at issue in the state railroad rate cases. The questions have been argued before the Commerce Court, but have not been decided by that court, and it is hardly expected that they will be decided until this court has passed upon the matter." The question is "whether a state may deliberately shut out interstate commerce by the artificial manipulation of intrastate freight rates; and whether, where this manipulation results in a discrimination against the interstate shipments, the Interstate Commerce Commission may correct it." The court granted the government's application; which is supposed to mean the indefinite postponement of a decision in the cases.

Of the forty-five cases pending, the most important is the "Minnesota rate case," based on the railroads' dispute of the order by the Minnesota commission, in 1907, calling for a reduction in certain freight rates of as much as 25 per cent., and supplemented by an act of the Minnesota state legislature ordering further reductions. The roads contended, among other things, that the new rates would make impossible a fair return on the invested capital and that thereby the state tariff, through rendering non-remunerative the rates for traffic within the state, threw a burden on interstate traffic, which made it impossible for the companies to observe the federal Interstate Commerce Commission's orders without loss.

In September, 1910, a special master in chancery appointed to take testimony reported in favor of the railways on both points. In April, 1911, Judge Sanborn approved the master's decision, incidentally holding that 7 per cent. net income on the approved value of a railway's property was not more than a fair return. Later in 1911 the case went to the United States Supreme Court on the appeal of the State of Minnesota. In April, 1912, a brief was filed with the Supreme Court by Governors Harmon of Ohio, Hadley of Missouri, and Aldrich of Nebraska, protesting against Judge Sanborn's decision, on the ground that if sustained it would subordinate state rights to railroad rights, and would involve the destruction of the state's control over its own internal affairs.

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INTERSTATE COMMERCE COMMISSION.

The commission has suspended from March 31 until September 30, certain tariffs which propose to cancel joint rates in connection with the Chicago, Zeigler & Gulf.

The commission has suspended from April 17 until August 15, the supplement to the tariff of the St. Louis, Rocky Mountain & Pacific, which contains schedules withdrawing the present through joint rates applicable to the transportation of bituminous coal from mines located on the St. Louis, Rocky Mountain & Pacific in New Mexico to points in Oklahoma, Nebraska, Kansas and other states located on the Rock Island Lines, and providing that on and after April 17, 1913, combination rates will apply. This results in advances ranging from 50 cents to $2.50 per ton.

The Interstate Commerce Commission will hold a public hearing on proposed amendments of or additions to its regulations governing the transportation of explosives and other dangerous articles in Washington, D. C., on May 26. Prior to the date of hearing, it is understood that Col. B. W. Dunn, chief inspector of the Bureau for Safe Transportation of Explosives, will prepare and distribute printed copies of proposed changes and additions to the regulations. All parties who desire to suggest changes, should submit them at once to Col. Dunn, as well as to the commission.

The commission suspended from April 15 until April 30, certain items contained in the tariff of the Oregon-Washington Railroad & Navigation Company, which would cancel through joint rates applicable to the transportation of wool and mohair, c. l., from points in Oregon, Washington and Idaho routed via Wallula, Wash., the Northern Pacific and eastern connections to Chicago, New York, Boston and other points. Tariffs of other carriers canceling through rates via Spokane, Denver and certain other western gateways were suspended until the same date by orders previously entered in same docket.

The commission has suspended from April 12 until August 9, the supplement to the tariff of the Pennsylvania Railroad, which contains schedules advancing rates for the transportation of petroleum and its products, in carloads, from Emlenton, Pa., and a number of other points located on the Pennsylvania Railroad north of Pittsburgh and south of Franklin, Pa., to Detroit, Mich., Milwaukee, Wis., and other points of destination. The advances range from ½ to 2 cents per 100 lbs. Complaint was made that the proposed rates would create a discrimination in favor of Franklin and Oil City, more distant points, from which no increase in rates is proposed, and from which similar traffic would move at lower rates, as Emlenton and the other points affected, to the same destinations.

Commissioner B. H. Meyer began a hearing at Chicago on April 21, on a complaint filed by the Chicago Board of Trade against the Illinois Central, Atchison, Topeka & Santa Fe, Chicago & Eastern Illinois, Wabash and Chicago & Alton, alleging failure on the part of these roads to absorb the switching charges and to apply Chicago rates to and from Chicago points on grain as on other commodities. The complaint grows out of the reciprocal switching agreement which was put into effect in Chicago two years ago as the result of a long series of conferences between the carriers and the shippers, which failed to provide for the absorption of switching charges on grain, coal, coke and live stock, because the five defendant roads would not agree to the plan. In other respects the plan was allowed to go into effect after a hearing before the commission with the thought that the agreement might at a later date be extended to cover the commodities excepted.

Complaint Dismissed.

Merchants' Freight Bureau of Little Rock, Ark., v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Clements:

The commission decided that the rate of 17 cents per 100 lbs., for the transportation of cement from Kansas Gas Belt points to Little Rock, Ark., was not shown to be unreasonable. (26 I. C. C., 543.)

McKnight Keaton Grocery Company v. Chicago, Milwaukee & St. Paul et al. Opinion by the commission:

The complainant contends that the rate of 40½ cents per 100 lbs., for the transportation of cheese in less than carloads from Plymouth, Wis., to Cairo, Ill., is unreasonable. The commission found that the evidence was not conclusive. (26 I. C. C., 563.)

Board of Improvements, Waterworks District No. 1, Fort Smith, Ark., v. St. Louis & San Francisco et al. Opinion by Commissioner Clements:

The commission decided that the rate of $6.85 per net ton for the transportation of cast iron pipe and connections from Chattanooga, Tenn., to Fort Smith, Ark., was not shown to have been unreasonable. (26 I. C. C., 541.)

Chamber of Commerce, City of Augusta, Ga., v. Buffalo, Rochester & Pittsburgh et al. Opinion by Commissioner Clements:

The commission decided that the rate of 37 cents per 100 lbs., for the transportation of apples, potatoes, cabbage and onions from Rochester, N. Y., to Augusta, Ga., was not shown to have been unreasonable. (26 I. C. C., 559.)

Board of Improvements, Waterworks District No. 1, Fort Smith, Ark., v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Clements:

The commission decided that the rate of 15 cents per 100 lbs., for the transportation of cement from Kansas Gas Belt points, Ada, Okla., Bonner Springs, Kan., and Sugar Creek, Mo., to Fort Smith was not unreasonable. (26 I. C. C., 539.)

Goldfield Consolidated Mining & Transportation Company v. Atchison, Topeka & Santa Fe et al. Opinion by the commission:

In this case the complainant contends that the rate of $2.08 per 100 lbs., for the transportation of cyanide of potassium in carloads from San Diego, Cal., to Goldfield, Tonopah and Millers, Nev., is unreasonable to the extent that it exceeds $1.16 per 100 lbs. Reparation is asked. Prior to January 2, 1911, this rate was $2.37 per 100 lbs. The commission decided that as the present rate was considerably lower than when the complainant's industries were established, and as the traffic of the commodity in question was light and the earnings of the principal defendant were small, no change should be made in the rate in question. (26 I. C. C., 567.)

Ash Lumber Rate Reduced.

J. F. Shoupe & Company v. Trinity & Brazos Valley. Opinion by the commission:

The complainant contends that the rate of 42 cents per 100 lbs., for the transportation of ash lumber in carloads from Jackson, Tex., to St. Louis, Mo., is unreasonable to the extent that it exceeds 19 cents per 100 lbs. Reparation is asked. The commission found that the present rate was excessive and decided that as a rate of 24 cents per 100 lbs., would yield a revenue of about 5 mills per ton per mile, it would be just and reasonable. That rate was prescribed for the future. Reparation was awarded. (26 I. C. C., 570.)

Through Routes and Joint Rates on Grain Established.

Omaha Grain Exchange v. Chicago, Burlington & Quincy et al. Opinion by Chairman Clark:

The complainant seeks the establishment of a through route and joint rates from points on the line of the Great Northern between Great Falls and Billings, Mont., to Omaha, Neb., via Billings, over the lines of the Great Northern and the Chicago, Burlington & Quincy, not exceeding the rates from the same points to Minneapolis over the Great Northern. The commission found that the rates on grain from the points of origin in question to Omaha were at least 9.1 cents per 100 lbs. higher than to Minneapolis. The commission decided that a through route and joint rate should be established from stations on the Great Northern, Great Falls—Billings line, Hesper to Spion Kop, inclusive, not higher than the rates from the same points to Minneapolis via the Great Northern. As the Great Northern could secure a longer haul by establishing a through route and joint rates to Omaha via Sioux City, that company may apply for an amended order, although the latter route is considerably longer than the route via Billings.

The complainant also seeks the establishment of a through route and joint rate via Billings and Omaha to Chicago with transit privileges at Omaha, which shall not exceed the through rate from the same points of origin to Chicago via Minneapolis, with transit privileges at Minneapolis. The commission denied this prayer. (26 I. C. C., 553.)

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Axle Grease Rate.

Marshall Oil Company v. Chicago & North Western et al. Opinion by the commission:

The defendants permit the shipment in mixed carloads at carload rates of practically all products of petroleum except axle grease. The complainant contends that the exclusion of axle grease from the mixed carload privilege is unreasonable. The commission decided that the provision of the defendants' tariffs excluding axle grease from the products of petroleum that may be transported in mixed carloads at carload rates, while similar products are given this privilege, resulted in discrimination and ordered the defendants to remove this discrimination. (26 I. C. C., 575).

Rate on Common Brick Reduced.

Collingwood Brick Company et al. v. Pere Marquette. Opinion by the commission:

In this case the complainant contends that the rate of 70 cents per ton on common brick between Toledo and Detroit is unreasonable to the extent that it exceeds 60 cents per ton, the rate in effect prior to May 21, 1911. The commission decided that the present rate was unreasonable, and ordered that in future the rate of 60 cents per ton should apply. (26 I. C. C., 572.)

Rate on Butchers' Blocks Reduced.

National Refrigerator & Butchers' Supply Company v. St. Louis, Iron Mountain & Southern et al. Opinion by the commission:

The complainant contends that the rate of 43 cents per 100 lbs., for the transportation of butchers' blocks in less than carload lots from Whitewater, Mo., to Memphis, Tenn., is unreasonable to the extent that it exceeds the rate from St. Louis, Mo., to Memphis; also that this rate was in conflict with the fourth section in that it exceeded the rate from Whitewater to New Orleans, La. The defendants tried to justify this violation of the fourth section on the ground that the lower rate from St. Louis was forced by water competition; also that Whitewater was nearer the source of raw material. The commission found that on traffic to New Orleans Whitewater was accorded the same rate as St. Louis. The commission decided that the rate charged the complainant on its shipments from Whitewater to Memphis was unreasonable to the extent that it exceeded the rate from St. Louis to Memphis, and prescribed that rate for the future. Reparation was awarded. The application of the defendants for relief from the fourth section on this traffic was denied.

The complainant also contends that the rate of 49½ cents per 100 lbs., for the transportation of butchers' blocks in less than carloads from New Memphis, Ill., to Memphis, Tenn., was unreasonable to the extent that it exceeded a rate of 30 cents per 100 lbs. The commission found that no through rate was applicable to the shipments and that the lowest combination of intermediate rates was 39.1 per 100 lbs. The commission decided that there had been an overcharge on these shipments, but that the rate of 39.1 cents per 100 lbs. should not be changed. The complainant contends that the defendants violated the fourth section of the act by charging a rate of 30 cents per 100 lbs., for the transportation of butchers' blocks to Memphis from St. Louis, Bellville and Nashville. The commission decided that the rate complained of was not unreasonable and that the defendants were justified in violating the fourth section because of water competition at St. Louis and rail competition at Bellville and Nashville. The defendants were ordered to refund the overcharge on the shipment from New Memphis, Ill., to Memphis, Tenn. (26 I. C. C., 525.)

Rates on Grain Not Changed.

Board of Trade of the City of Chicago v. Illinois Central. Opinion by Chairman Clark:

There is an established relation between the rates on grain in carloads from Omaha, Neb., to Chicago and the rates on the same commodity from Omaha to New Orleans, La., for export. In 1912 the Omaha-New Orleans rate was reduced, but subsequently restored, without any change in the Omaha-Chicago rate. During the existence of the reduced rates to New Orleans, a complaint was filed alleging that the resulting adjustment was discriminatory against Chicago in favor of New Orleans, and also that the rates from Omaha to Chicago were unreasonable in themselves. The commission decided that the restoration of the old rate from Omaha to New Orleans had removed the discrimination complained of, and also that the rates from Omaha to Chicago were not shown to be unreasonable in themselves.

The complainant also urged the commission to determine what would be a reasonable rate from Omaha to Chicago as compared with rates from Omaha to New Orleans, should the latter again be reduced. The commission decided that in this case where only one carrier operating over only a part of the through route to the Atlantic ports was defendant, it could not determine the question of differentials in a general adjustment of rates. The commission decided further that if the rate from Omaha to New Orleans were again reduced it could be suspended pending investigation. (26 I. C. C., 545.)

Transfer of Shipment Permitted.

Dubuque Shippers' Association v. Chicago & North Western et al. Opinion by the commission:

The complainant requests the commission to require the defendants to forward a carload of package freight, originating each day at Dubuque, Ia., without transfer at Galena, Ill., to destinations on the line of the Chicago & North Western in Wisconsin. For several years a merchandise car of less than carload shipments, destined to points on the Chicago & North Western, between Galena and Madison and Woodman, has been loaded each day by the Illinois Central at Dubuque, and moved over that company's line to Galena, where it was accepted by the Chicago & North Western just as received and immediately forwarded to the destinations. Recently the Chicago & North Western has refused to forward the car as received from the Illinois Central and insists on transferring the packages and rearranging them in its own cars at Galena, which results in a delay of from 24 to 48 hours. The Dubuque shippers compete with shippers at other points, so this delay constitutes an important factor in the competition. The defendant's reasons for not accepting the Dubuque car without transfer are the large number of claims for shortage and damage to consignments; the presence of packages for which there was no billing; bad billing; lack of checking at Galena; and indiscriminate loading instead of station order loading, resulting in delays to the train. The commission found that a carrier should not be required to accept a carload of miscellaneous freight from another without checking the contents, so as to discover the quantity and kind of goods for which it becomes responsible. Neither should the defendant be denied the right of transferring the packages to other cars, so as to arrange them in convenient order for delivery. The complaint was dismissed. (26 I. C. C., 565.)

STATE COMMISSIONS.

The South Dakota Railroad Commission has asked railways in the state to file a statement showing the salaries paid to officers.

The Illinois Railroad and Warehouse Commission has entered an order allowing an increase in the switching rates on coal in the Chicago district by the Chicago, Milwaukee & St. Paul, but the commission holds that other roads must not increase their coal rates on this account to exceed the rates allowed by the commission in August, 1911.

The Illinois railroad and warehouse commission has ordered the Chicago & Alton to stop its Chicago-St. Louis fast trains at East St. Louis. Heretofore many of the trains have been entering and leaving St. Louis by the Merchants' bridge, thus avoiding the city of East St. Louis. It is said that the East St. Louis Commercial Club will seek another order directing other roads to stop their eastbound trains from St. Louis at East St. Louis.

COURT NEWS.

In the United States court at Boston, April 16, a fine of $5,000 was imposed on the New York, New Haven & Hartford for granting illegal concessions in the price of transportation of milk from certain points in Connecticut to Boston.

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1913.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Maintenance—Way and structures.	Maintenance—Of equipment.	Operating expenses—Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Interest charges, comp. with last year.
Alabama Great Southern	309	$2,897,706	$955,292	$4,028,799	$846,859	$97,578	$112,825	$1,405,426	$111,189	$3,008,877	$1,111,922	—$5,940	$114,427	$996,905	$2,143
Cincinnati, New Orleans & Texas Pacific	332	2,512,986	755,015	3,448,249	781,062	194,084	23,044	1,267,240	120,273	2,585,208	863,041	—1,161	209,000	333,380	128,647
New Orleans & Northeastern	142	1,132,147	153,015	1,360,456	78,667	79,886	8,645	574,345	46,762	1,008,305	352,151	.....	37,500	314,651	1,564
Hocking Valley	331	403,917	59,530	497,614	46,702	118,089	8,681	174,670	12,600	360,742	136,872	.....	37,500	99,372	—76,413
New Orleans, Mobile & Chicago	547	155,255	24,422	191,025	36,231	26,707	4,369	93,828	8,622	168,257	22,768	—178	7,405	14,685	—35,031
Ohio Railway & Land Co	101	60,302	23,027	89,879	7,848	5,133	662	21,279	4,604	39,526	50,353	—5,264	6,500	38,589	3,241
Ulster & Delaware	129	49,578	13,360	65,960	6,101	12,172	1,125	34,801	2,585	56,784	9,176	83	3,300	5,959	12,966
Wabash	2,515	1,631,166	450,323	2,295,952	237,661	373,460	28,807	1,184,562	60,836	1,935,326	360,626	—7,926	78,949	273,751	143,107
Western Maryland	543	506,943	56,799	576,896	54,190	84,373	16,073	291,931	14,031	460,598	116,298	.....	20,000	96,298	—67,298
						EIGHT MONTHS OF FISCAL YEAR, 1913.									
Alabama Great Southern	309	$12,894,454	$894,868	$13,489,940	$403,305	$759,412	$103,715	$1,099,133	$77,214	$2,441,979	$1,047,970	—$4,296	$117,312	$926,362	$66,704
Cincinnati, New Orleans & Texas Pacific	332	5,426,870	1,760,827	7,061,049	673,087	1,381,375	184,439	1,981,012	134,624	4,374,887	2,446,162	—5,870	279,600	2,250,692	210,160
New Orleans & Northeastern	142	2,268,375	306,755	2,760,130	580,000	1,000,000	61,000	1,212,000	80,000	3,000,000	—239,870	.....	24,000	—263,870	—1,263,717
Hocking Valley	331	4,232,715	630,430	5,202,194	530,827	1,062,629	71,047	1,537,149	111,352	3,003,004	1,994,390	.....	312,600	1,591,790	—18,060
New Orleans, Mobile & Chicago	547	1,370,977	241,119	1,670,394	276,518	176,124	28,409	621,617	65,890	1,162,558	507,836	—641	39,832	467,363	27,951
Ohio Railway & Land Co	101	545,019	181,733	772,825	71,691	48,884	4,788	166,923	36,439	328,725	443,100	15,747	49,016	415,831	50,898
Ulster & Delaware	129	452,271	77,971	564,394	100,248	103,028	10,426	318,258	20,592	552,552	210,842	584	26,400	185,026	2,784
Wabash	2,515	14,906,892	4,060,014	21,634,962	2,707,883	3,617,931	683,567	8,897,541	517,565	16,424,487	5,210,375	—35,735	582,229	4,587,311	579,899
Western Maryland	543	4,100,257	672,592	5,016,334	742,056	711,359	125,828	2,150,107	106,026	3,837,376	1,179,958	.....	160,000	1,020,958	—496,767

Average mileage operated during previous period—3,351; 2,404; 7,99. —Indicates Deficits. Losses and Decreases.

Railway Officers.

Executive, Financial and Legal Officers.

C. S. Sikes, auditor of traffic accounts of the Pere Marquette, has been appointed auditor, with headquarters at Detroit, Mich. During the absence of the comptroller, his duties will be performed by Mr. Sikes.

W. L. Maury, who has been auditor of the International & Great Northern since 1888, has been appointed consulting auditor, a newly created office. W. J. Werner, assistant auditor, succeeds Mr. Maury as auditor, with headquarters at Houston, Tex., and the former position is abolished.

Operating Officers.

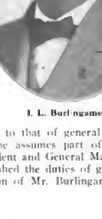
George F. Dickson, trainmaster of the Georgia & Florida, at Douglas, Ga., has been appointed superintendent, with office at Douglas, succeeding D. F. Kirkland, resigned to accept service with another company.

J. J. Brcheny, trainmaster of the Colorado division of the Chicago, Rock Island & Pacific, has been appointed trainmaster of the Kansas division, with headquarters at Herington, Kan., in place of C. I. Kerr, deceased.

The headquarters of the following officers of the Long Island Railroad have been transferred from Long Island City, N. Y., to Jamaica: H. W. Thornton, general superintendent; J. B. Austin, Jr., superintendent; W. L. Jarvis, steam passenger trainmaster; H. E. Lewis, chief despatcher; J. M. McGee, assistant trainmaster, and R. W. Farrell, superintendent of station service.

A. G. Wells, general manager of the Atchison, Topeka & Santa Fe Coast Lines, has been granted a six months' leave of absence, and I. L. Hibbard has been appointed acting general manager, with headquarters at Los Angeles, Cal. J. R. Hitchcock, superintendent of the Los Angeles division at Los Angeles, Cal., has been appointed acting general superintendent, with office at Los Angeles, in place of I. L. Hibbard. J. B. Galivan, trainmaster at San Bernardino, Cal., succeeds Mr. Hitchcock as acting superintendent of the Los Angeles division. A. R. Woods has been appointed acting trainmaster of the Second district, Albuquerque division, with office at Winslow, Ariz., in place of E. E. McCarty, who has been appointed acting trainmaster at San Bernardino in place of Mr. Galivan.

Ira L. Burlingame, who on April 14, was made general manager of the Terminal Railroad Association of St. Louis, as has already been announced, was born September 6, 1862, at Franklinville, N. Y., and was educated at Ten Broek Academy. He entered railway service in 1879 as a telegraph operator for the Ohio & Mississippi, and from 1883 to 1895 was a train despatcher on that road. He was then for nine years trainmaster of the Baltimore & Ohio Southwestern, and in December, 1903, left that road to go with the Terminal Railroad Association of St Louis as assistant superintendent. He was superintendent of that association from March, 1904, to November, 1905, and on the latter date became general superintendent, from which position he is now promoted to that of general manager, as above noted. Mr. Burlingame assumes part of the duties heretofore performed by President and General Manager W. S. McChesney, Jr., who relinquished the duties of general manager, and recommended the election of Mr. Burlingame to that position.



I. L. Burlingame.

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Edward James Gibson, whose appointment as superintendent of the Iowa division of the Rock Island Lines, with headquarters at Des Moines, Iowa, has been announced, was born February 9, 1865, in Perry county, Indiana. He received a common school education, and began railway work in 1878, with the St. Louis, Kansas City & Northern, now the Wabash, as a telegraph operator. From 1880 to 1886 he was agent for the Missouri, Kansas & Texas, and the following three years was train despatcher on the Fremont, Elkhorn & Missouri Valley. Mr. Gibson went with the Atchison, Topeka & Santa Fe in April, 1889, with which road he remained until April 3, of this year, when he resigned to become superintendent of the Iowa division of the Rock Island Lines, as above noted. While with the Santa Fe he was train despatcher, chief train despatcher and superintendent, having been in Mexico on the Sonora road five years, from 1896 to 1901, when that road was owned by the Santa Fe. His last position was that of superintendent of the Albuquerque division, with headquarters at Winslow, Ariz.

E. J. Gibson.

Frederick J. Hawn, who recently became superintendent of the Fort Worth division of the St. Louis Southwestern, and superintendent of the Dallas Terminal & Union Depot Company, with headquarters at Mt. Pleasant, Tex., was born June 15, 1863, at Stevens Point, Wis. He was educated in the public schools and began railway work in 1877, with the Wisconsin Central. He remained with that road until September, 1888, serving in many capacities, including call boy to chief despatcher, some years in the mechanical department, and as brakeman and conductor, until September, 1894. He was then appointed trainmaster, leaving the Wisconsin Central in 1898 to go with the Great Northern. On the latter road he was successively assistant superintendent of the Cascade and Montana divisions, and superintendent of the Breckenridge division. Mr. Hawn became connected with the St. Louis Southwestern in 1903, and was made superintendent of transportation, with headquarters at Tyler, Tex., on February 17, 1907, which position he held until his recent appointment as superintendent of the Fort Worth division, as above noted.

F. J. Hawn.

Traffic Officers.

Opie Reid has been appointed traveling freight agent of the Rock Island Lines, with headquarters at Lake Charles, La.

T. Kight has been appointed traveling freight agent of the Gulf, Colorado & Santa Fe, with headquarters at San Antonio, Tex.

W. E. Robinson has been appointed freight solicitor of the Star Union Line at Indianapolis, Ind., in place of Volney E. Huff, promoted.

John J. Morton has been appointed acting assistant import freight agent of the Canadian Pacific, with office at Chicago, effective May 1.

G. S. Hinkins has been appointed freight soliciting agent of the Southern, with office at Huntsville, Ala., succeeding G. W. Lewis, transferred.

C. A. Lindsey, formerly assistant general passenger agent of the Colorado & Southern, has been appointed city passenger agent of the Denver, Boulder & Western at Denver, Colo.

R. F. Fox has been appointed traveling passenger agent of the Colorado & Southern, with headquarters at Denver, Colo., succeeding W. T. Spicer, resigned to go with the Missouri, Kansas & Texas at Dallas, Tex.

J. I. Hazzard, formerly general agent of the El Paso & Southwestern System at St. Louis, Mo., has been appointed general western agent of the Western Maryland at Chicago, succeeding John S. Talbot, resigned.

C. J. Hellær, traveling passenger agent of the Wabash, with headquarters at Denver, Col., has been appointed general agent at that place, succeeding J. D. Lund, who has been transferred to Cincinnati, Ohio, as commercial agent in place of George A. Rump, deceased.

J. R. L. Wulff, commercial agent of the Southern at Omaha, Neb., has been transferred to Kansas City, Mo., in a similar capacity in place of P. J. Tapp, deceased. C. M. Ross, assistant chief clerk in office of general freight agent at Memphis, Tenn., has been appointed traveling freight agent, with headquarters at Kansas City, succeeding C. M. Agnew, promoted.

Engineering and Rolling Stock Officers.

R. R. Black has been appointed roadmaster of the Atchison, Topeka & Santa Fe at Rincon, N. M., in place of C. L. McCallister.

L. C. Maxwell has been appointed engineer maintenance of way of the Algoma Central & Hudson Bay, with office at Sault Ste. Marie, Ont.

W. S. Basinger has been appointed division engineer of the Southern Kansas division of the Atchison, Topeka & Santa Fe at Chanute, Kan.

W. D. Manchester has been appointed chief engineer of the Manistee & North Eastern, with headquarters at Manistee, Mich., succeeding J. J. Hubbell, deceased.

T. R. McLeod, master mechanic of the Halifax & Southwestern at Bridgewater, N. S., has been appointed master mechanic of the Canadian Northern Ontario, with headquarters at Parry Sound, Ont., succeeding C. L. Webster, resigned.

W. H. Alderson, heretofore chief draftsman in the bridge department of the consulting engineer's office of the Union Pacific and Southern Pacific in New York, has been appointed bridge engineer of the Oregon-Washington Railroad & Navigation Company, with headquarters at Portland, Ore., effective April 23.

R. J. Gatewood, division engineer of the Atchison, Topeka & Santa Fe at San Marcial, N. M., has been transferred to the New Mexico division in a similar capacity, with headquarters at Las Vegas, N. M., succeeding T. A. Williams. W. J. Lank, division engineer of the Pecos division, with office at Clovis, N. M., succeeds Mr. Gatewood, and J. W. Walter has been appointed acting division engineer of the Pecos division in place of Mr. Lank.

Samuel Lenzner, who has been appointed master car builder of the Michigan Central, with headquarters at Detroit, Mich., as has been announced in these columns, was born June 30, 1861, at Lancaster, N. Y. He has been with the Michigan Central since July 12, 1886, when he began railway work as a coach carpenter. In September, 1889, he was made foreman of the cabinet department, and in March, 1909, was advanced to general foreman of the car department, which position he held until his recent promotion on April 1, to master car builder, as above noted.

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F. L. Thompson, who, on April 1, was appointed engineer of construction of the Illinois Central, as has already been announced, was graduated from the University of Illinois in civil engineering, with the degree of B. S., in 1896. He entered the service of the Illinois Central June 18 of that year as chairman on the reconstruction and lowering of the tracks on the lake front in Chicago, and later was made rodman and inspector on the concrete work. From February of the following year to February, 1898, he was rodman at Vicksburg, Miss., on the work of removing a 700-ft. tunnel and making it an open cut and had charge of a concrete arch and building of a large freight house. He was then until January, 1900, rodman and assistant engineer on surveys and on grade reduction work, Fulton to Memphis, and from the latter date to August, 1901, assistant engineer in charge of grade reduction and double track work, Wickliffe to Fulton, Ky. He was subsequently for six months in charge of double track and grade reduction work from Irvington to Carbondale, Ill., and from February, 1902, to February, 1903, was assistant engineer in the chief engineer's office at Chicago. The following eight months he was acting roadmaster of the Chicago division, being transferred to the Louisville division as roadmaster in October, 1903, and remaining in that capacity until January, 1907, when he was made assistant engineer of bridges. On July 1, 1910, he was promoted to engineer of bridges and buildings, which position he held until his recent appointment as engineer of construction, as above noted.

F. L. Thompson.

OBITUARY.

Jeremiah J. Coakley, superintendent of the Terminal Railroad Association of St. Louis, and the St. Louis Merchants' Bridge Terminal Railway, died in St. Louis, Mo., on April 21, aged 54 years. He had been with the Terminal association for 35 years.

Frank D. Tracy, real estate and tax agent of the Chicago & Alton, died suddenly in Chicago on April 18, aged 71 years. Mr. Tracy had been connected with the Chicago & Alton for 40 years.

Henry C. Dickson, traveling passenger agent of the Delaware, Lackawanna & Western, with headquarters at Chicago, died suddenly in that city on April 16, aged 50 years.

MILEAGE OF THE BUENOS AYRES GREAT SOUTHERN, ARGENTINA.—The average number of miles of line operated during the last half of the calendar year of 1912, including the lines operated under agreement, were 3,510 miles, compared with 3,343 miles for the corresponding period of 1911.

RAILWAY MILEAGE IN URUGUAY.—The total length of the standard gage lines in Uruguay is 1,533 miles, of which 1,031 miles are under state guarantee. The operation of the guaranteed railways during 1912 has resulted favorably and the outlook for the future is also promising. During 1912, 56 miles of new line were added to the mileage of guaranteed railways. The net profits of the year were $1,221,622 compared with $1,082,728 in 1911. The guarantees paid by the state amounted to $720,737 or $622,827 less than the full amount for which it holds itself responsible. The gross receipts of all the railways amounted to $6,526,697, of which passenger traffic contributed $1,808,166, freight $4,202,847, and miscellaneous and baggage $454,664. Operating expenses amounted to $3,715,379, leaving a net profit of $2,811,318.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE SEABOARD AIR LINE is understood to have placed its order for locomotives. Details will not be available for several days.

BERTRON, GRISCOM & COMPANY have ordered one consolidation locomotive from the American Locomotive Company. The dimensions of the cylinders will be 20 in. x 24 in., the diameter of the driving wheels will be 52 in., and the total weight in working order will be 138,000 lbs.

THE TAUPO TOTARA TIMBER COMPANY, of Australia, has ordered one Mallet (2-4-4-2) locomotive from the American Locomotive Company. The dimensions of the cylinders will be 10 in. & 16 in. x 23 in., the diameter of the driving wheels will be 32 in., and the total weight in working order will be 66,000 lbs.

THE IMPERIAL TAIWAN RAILWAY, Formosa, has ordered one Pacific type locomotive from the American Locomotive Company. The dimensions of the cylinders will be 18½ in. x 24 in., the diameter of the driving wheels will be 63 in., and the total weight in working order will be 137,000 lbs. This locomotive will be equipped with a superheater.

CAR BUILDING.

THE MISSOURI PACIFIC is in the market for 1,000 forty-ton stocks cars.

THE HARRIMAN LINES have ordered 201 passenger cars from the Pullman Company.

THE NORTHERN PACIFIC has ordered 12 postal cars from the Pressed Steel Car Company.

THE BALTIMORE & OHIO is expected to place an order for 72 passenger cars immediately.

THE ILLINOIS CENTRAL has ordered 800 furniture cars, 500 refrigerator cars and 500 stock cars from the American Car & Foundry Company.

THE GRAND TRUNK has ordered 1,000 additional box cars from the Pressed Steel Car Company, and has ordered 3,000 freight cars from the Canadian Car & Foundry Company.

THE SEABOARD AIR LINE has ordered 500 box cars from the Pressed Steel Car Company, 250 flat cars from the American Car & Foundry Company and 250 hopper cars from the Standard Steel Car Company.

IRON AND STEEL.

GENERAL CONDITIONS OF STEEL.—The volume of orders in the steel industry continues to be light but specifications are heavy and the mills are operating at as near their full capacity as possible. The Steel Corporation has enough orders on its books to keep its mills operating at full capacity until about November 1. The corporation is having difficulty in producing sufficient billets for its own consumption and has recently had to buy nearly 50,000 tons of billets in the open market. Prices are high and there is no prospect of any change in the immediate future. The contracts which are being filled at the present time were booked at current prices, so the earnings from now on should be larger. It is estimated that the earnings of the Steel Corporation for the first quarter will be in the neighborhood of $37,000,000, compared with $17,826,973 earned in the first quarter of 1912. The flood will not seriously affect the earnings of the steel companies, as the loss in production will be offset to a large extent by the new orders for replacement.

NEW LINE FOR INDIA.—The frontier 2-ft. 6-in. railway on the right bank of the Indus will shortly be opened from Bassnu to Kalabogh, and is being extended to Tank.

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Supply Trade News.

The Grip Nut Company is moving its Chicago office from the Old Colony building to 661-663 McCormick building.

Westinghouse, Church, Kerr & Company, New York, has moved its general offices from 10 Bridge street to 37 Wall street.

The National Railway Equipment Company, Chicago, has moved its offices from the McCormick building to 661 People's Gas building.

The Union Spring & Manufacturing Company, Pittsburgh, Pa., has moved its New York office from 149 Broadway to 50 Church street.

W. F. Hebard has been appointed district sales agent for the electric truck department of the Buda Company and for the Canton Culvert Company, with headquarters at 1200 Karpen building, Chicago.

J. J. Hubbard has been made resident manager of the Federal Signal Company, Albany, N. Y., with office in New York, and J. W. Hackett has been made sales engineer of the same company, with office in New York.

Edward C. Meeker, assistant eastern purchasing agent of the Pullman Company, Chicago, with office in New York, died at his home in Brooklyn, N. Y., on April 19, at the age of 47. Mr. Meeker had been with the company for 30 years.

Andrew Thompson, general manager of the Titanium Alloy Manufacturing Company, Niagara Falls, N. Y., will hereafter have charge of the sales of that company. A. C. Hawley has been made representative of the company for the Pittsburgh district, with office in Pittsburgh, Pa.

The Davis-Bournonville Company, New York, maker of oxy-acetylene welding and cutting apparatus, has moved its general offices from the West Street building, New York, to its demonstration plant at Marion Station, Jersey City, N. J., and has moved its New York office to the Hudson Terminal building, 30 Church street. The Chicago office of the company has also been moved from 515 Laflin street to the Monadnock block.

TRADE PUBLICATIONS.

BORING HEADS.—Marvin & Casler Company, Canastota, N. Y., has published an illustrated booklet describing its Offset boring heads.

VENTILATORS.—The Gold Car Heating & Lighting Company, New York, has published a small illustrated folder describing its curtain window ventilators, which are designed to give fresh air without draughts.

CLEANING LOCOMOTIVE ARCH TUBES.—The Lagonda Manufacturing Company, Springfield, Ohio, has published a brief illustrated folder describing its special devices for cleaning locomotive arch tubes by air and steam.

HEADLIGHTS.—The General Electric Company, Schenectady, N. Y., has devoted bulletin No. A-4061 to illustrations and descriptions of its electric arc headlights. This bulletin supersedes this company's previous bulletin on this subject.

WATTHOUR METERS.—The Sangamo Electric Company, Springfield, Ill., has devoted bulletin No. 35 to its type D and D-4 direct current watthour meters. This bulletin is very thorough in its descriptions and illustrations of these meters. Prices are included.

BANGOR & AROOSTOOK.—The passenger department has issued an illustrated booklet of 160 pages, entitled "In the Maine Woods." The booklet is devoted to the hunting, fishing and camping in the region, and also includes a section devoted to the agricultural possibilities of Maine.

MOTOR CARS.—Mudge & Company, Chicago, has issued an unusually attractive catalogue, No. 101, describing and illustrating inspection motor cars, section motor cars, the Au-Tra-Kar, and railroad motor car accessories. The catalogue contains unusually clear illustrations and specifications, together with descriptions of the service given by various types of cars.

Railway Construction.

BALTIMORE & OHIO.—This company has recently given contracts for building a 11 mile low grade double-track line to be known as the Magnolia cut-off between Orleans Road, W. Va., and Little Cacapon, on the east end of the Cumberland division. The improvement will cost about $6,000,000, and owing to the heavy character of construction the work will be extended over a period of about two years. The work is to be divided into eight sections, and contracts have been let as follows: Sections 2, 3 and 4 to H. S. Kerbaugh, Inc., New York; sections 5 and 7 to Bennett & Talbot, Greensburg, Pa., and section 6 to Smith, McCormick Company, Easton, Pa. Contracts for sections 1 and 8 have not yet been let. The work includes piercing a tunnel about 3,000 ft. long, with three smaller tunnels. The construction of the new line will involve several changes in the present double-track line and between Orleans Road and the present location of Doe Gully tunnel, which is to be eliminated and converted into an open cut, the old line will be raised to make a four-track line. Between Doe Gully and Hansrote the present line will be relocated to eliminate curves. The old line will also be relocated to some extent at Paw Paw.

BRUCE MINES & ALGOMA.—See Lake Huron & Northern Ontario.

CHARLESTON, PARKERSBURG & NORTHERN.—An officer writes that contracts will be let during the next three months to build from Parkersburg, W. Va., south via Rockport, Sandyville, Ripley, Fairplain, Kenna, Sissonville, and Guthrie to Charleston, about 75 miles. Maximum grades will be 2 per cent., and maximum curvature 6 deg. There will be 7,400 ft. girder bridges, also five trestles 2,000 ft. long, with an average height of 30 ft., and five trestles to have a total length of 5,500 ft. The company will use gasolene motor cars for passenger traffic. K. B. Stephenson, president, and R. R. Cutler, engineer, Citizens Trust & Guaranty building, Parkersburg.

CHICAGO, MILWAUKEE & ST. PAUL.—The Puget Sound & Willapa Harbor has been incorporated in the state of Washington with $2,500,000 capital, to build from Helsing Junction, Wash., southwest to Raymond on Willapa harbor, 47 miles.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—Double track between Greenwood, Ky., and Cumberland Falls, 4.44 miles, has just been put in service, making a total of 87.41 miles of double track now in operation on this road. Second track is now being constructed between Erlanger, Ky., and Williamstown, 29.6 miles, and work is about finished on 2 miles between Citico, Tenn., and Boyce. (June 21, p. 1589.)

GREAT NORTHERN.—A contract has been given to Grant Smith & Co., it is said, to pierce a 1,200 ft. tunnel through the Cascade mountains in the state of Washington.

GRAND TRUNK PACIFIC.—According to press reports, a contract has been given to T. Daly, Montreal, Que., by the general contractors of the section of the National Transcontinental from Levis, Que., to the New Brunswick boundary for the completion of that section.

GULF, TEXAS & WESTERN.—An officer writes regarding the report than an extension is to be built from Seymour, Tex., west, that the company contemplates such an extension, but has not yet decided when the work will be carried out. (April 4, p. 821.)

HOUSTON & TEXAS CENTRAL.—Work will soon be begun, it is said, on an extension from Llano, Tex., northwest to Brady, about 60 miles.

INTERMARINE RAILWAY & NAVIGATION COMPANY.—The Manitoba legislature has authorized the construction of this line. The projected route is from a point near the head of Lake Winnipeg northeasterly for 122 miles to a junction with the Dominion government railway to Hudson Bay at mile 151 from Pas, Manitoba. The provisional directors include W. J. Robertson, P. J. Gordon, W. D. Boyd, K. Clemes, C. F. Just, Winnipeg, Man.

LAKE HURON & NORTHERN ONTARIO.—This is the new name of the Bruce Mines & Algoma, which built a 17-mile line from

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Bruce Mines, Ont., on Lake Huron north to Rock Lake. A bill is before the Ontario legislature permitting the new company to buy land, and to build an extension. The plans call for a line having a total length of 325 miles. M. J. O'Brien, Pembroke, Ont.; W. H. Hewing, Montreal, Que.; J. J. Gartshore, Toronto, Ont.; H. A. Appleton and G. P. McCallum, Sault Ste. Marie, Mich., are back of the project.

LAKE WINNIPEG & NELSON RIVER.—Incorporated in Manitoba to build from Township 48, range 14, west 1st meridian, northeasterly to Township 56, range 11, thence northerly to the south of Burntwood lake, with branches to the Nelson river, in Township 62, range 2; in Township 72, range 1, and Township 68, range 5. The provisional directors include J. B. Henderson, G. G. Lennox, H. G. Holman, J. E. Kyle, J. Scott, Winnipeg, Man.

LEHIGH VALLEY.—Bids have been asked for building an extension of the Seneca Falls branch from Seneca Falls, N. Y., east to Cayuga Junction.

LOMAX TERMINAL.—Incorporated in Illinois, with $25,000 capital and office at Lomax. The company plans to build from Nauvoo, Hancock county, northeast to Stronghurst, Henderson county, about 30 miles. The incorporators include W. T. Love, J. F. Smith, H. W. Beardsley, C. H. Kisner and L. O. Beardsley, all of Lomax.

NEW YORK CONNECTING.—The contract for the towers above the bases of the Hell Gate arch bridge at New York, has been let to Snare & Triest, New York City.

PUGET SOUND & WILLAPA HARBOR.—See Chicago, Milwaukee & St. Paul.

SOUTHWESTERN OF ALABAMA.—An officer writes that the plans call for building from Montgomery, Ala., southwest via Haynesville, Snow Hill and Camden to River Ridge, about 107 miles. It is undecided when contracts to build the line will be let. About 12 miles of track has been laid. W. S. Richardson, Montgomery, is president.

TEXAS ROADS.—Plans are being made by Jesse Gandy, Broken Bow, Neb., and associates, it is said, to build from San Antonio, Tex., southeast via Mathis and to Aransas Pass, about 150 miles.

VIRGINIA-CAROLINA.—According to press reports work is now under way on a 9-mile extension. The road is now in operation from Abingdon, Va., east via Damascus to Konnarock, 31 miles. It is expected that the company will ask for bids soon, for work on an additional 45 miles south toward Boone, N. C. The line may be eventually extended further south to Blowing Rock.

RAILWAY STRUCTURES.

ALTOONA, WIS.—The Chicago, St. Paul, Minneapolis & Omaha has begun work on a new 32-stall roundhouse, machine shops and other improvements.

BEAUMONT, TEX.—The Texas & New Orleans has begun work on new machine shop buildings and other improvements, to cost about $40,000.

FAYETTEVILLE, N. C.—The Atlantic Coast Line will build a steel bridge, it is said, over the Cape Fear river near the present single-track bridge. Contract is reported let for the concrete work to W. Z. Williams & Co.

LEXINGTON, KY.—According to press reports the Louisville & Nashville will build a freight house, and is making plans for putting up a roundhouse, shops, etc., in Lexington.

MICHIGAN CITY, IND.—The Chicago, Indianapolis & Louisville has prepared plans for improved terminal facilities, including a new passenger station and a new freight house.

NEW YORK.—See New York Connecting under Railway Construction.

SOMERSET, KY.—Important improvements in the Ferguson shops near Somerset, Ky., are to be made by the Cincinnati, New Orleans & Texas Pacific. The work includes an extension to the shop building, additional storehouse and repair track capacity, and the installation of a number of modern appliances.

Railway Financial News

MERIDIAN & MEMPHIS.—This company, which is building a line from Meridian, Miss., to Union—40 miles, and has 10 miles completed, has made a mortgage securing an issue of $800,000, 30 year, 5 per cent. bonds.

MISSOURI, KANSAS & TEXAS.—Speyer & Co., New York, are offering $19,000,000 two year 5 per cent. secured notes dated May 1, 1913, at 98 yielding 6½ per cent. on the investment. This is part of a total authorized issue of $25,000,000. The $19,000,000 notes are issued now against deposit of $24,516,000, Missouri, Kansas & Texas consolidated mortgage 5 per cent. bonds of 1910-1940, the issue of which has been authorized by the public utilities commissions of Kansas and Missouri. The proceeds of these $19,000,000 notes are to be used to retire $17,500,000 5 per cent. notes maturing May 1, 1913, and for other corporate purposes. The remaining $6,000,000 notes are reserved for issue against the deposit of an additional amount of consolidated mortgage bonds, taken at 77½ per cent. The average annual surplus of the Missouri, Kansas & Texas Railway System for the five fiscal years ending June 30, 1912, after providing for all fixed charges, taxes, rentals, etc., amounted to $1,108,381. For the eight months ended February 28, 1913, the surplus of the Missouri, Kansas & Texas, after providing for all fixed charges, taxes, rentals, etc., was $2,063,120, an increase of $2,321,367.50 over the same period of the previous year. From July 1, 1912, to March 31, 1913, the operating revenues (partly estimated) of the system amounted to $25,251,139.84, an increase of $3,239,461 over the same period of the previous year.

NEW YORK CENTRAL & HUDSON RIVER.—J. P. Morgan has been elected a director, to succeed his father, J. P. Morgan, deceased.

NEW YORK, NEW HAVEN & HARTFORD.—J. P. Morgan has been elected a director to succeed his father, J. P. Morgan, deceased.

SEABOARD AIR LINE.—The *Commercial Financial Chronicle* says that negotiations are pending for the purchase by the Seaboard Air Line of the North & South Carolina. The North & South Carolina runs from Hamlet, N. C., to Georgetown Junction, S. C., 79 miles.

SOUTHERN PACIFIC.—Of the $10,120,000 equipment trust certificates, the issue of which has been approved by the California Railroad Commission, $5,000,000 are to be sold in the near future. Kuhn, Loeb & Company, New York, have underwritten these notes.

See new plan for sale of Southern Pacific stock by Union Pacific in General News.

UNION PACIFIC.—See new plan for sale of Southern Pacific stock in General News.

BAGHDAD RAILWAY, ASIA MINOR.—After having come to a full stop for so many years at the end of its first 124-mile section, the Baghdad Railway is now beginning to make rather good progress. From the engineering standpoint, the most difficult part of the scheme is the construction of the line across the Taurus Range, and although the actual mountain section is not yet in hand, a good deal of approach work on each side has already been finished. On the southern side, the approaches include the little railway from Mersina to Adana, via Tarsus which has now been incorporated in the Baghdad undertaking. The works are already so far advanced that on the completion of the Taurus mountain section and the bridging of a short gap to the west, through railway communication will be given from Scutari to the Holy Land, via Aleppo and Damascus. Advantage is being taken of the section already open to shorten the journey between Baghdad and the Syrian coast, motor-boats having now been placed on the Euphrates to run to and from the present railway terminus. This has led to the shortening of the journey between Baghdad and the coast by one-half, the time being eight and a half as against the former 17 days

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Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$6.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,000 copies were printed; that of these 8,000 copies, 6,601 were mailed to regular paid subscribers and 850 were provided for counter and news companies' sales; that the total copies printed this year to date were 155,900—an average of 8,664 copies a week.

VOLUME 54. MAY 2, 1913. NUMBER 18.

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*Illustrated.

WHILE it would hardly be proper to say that Prof. Ripley represented the critics of the railroads in the discussion at the Economic Club dinner, he did represent the "outside" thinking public. This fact, that he is in no sense an advocate for the railroads, combined with the deep study that he has devoted to the present problem of the relations between the railroads and the country as a whole and with the unusual clear presentation of the subject which he gave, made his convictions impressive. These convictions were that railroads must in the near future be permitted to raise some of their rates and furthermore that if the roads went about it in the right way the Interstate Commerce Commission would permit substantial rate increases. A railroad man with just as deep convictions as Prof. Ripley would have seen a great many difficulties in the way of any specific proposal to remedy existing conditions. The very fact that Prof. Ripley was not intimately familiar with the more minute details of railroad operation and of the difficulties and obstacles involved in any change, made his presentation of the subject all the clearer. In a case such as this it is easily conceivable that the man who is in daily contact with the facts and the practical details is too close to the question he is studying at least to make a clear presentation of the problem as a whole and possibly even to himself grasp the problem in its broadest aspects, and for this reason especially Prof. Ripley's discussion, printed elsewhere in this issue, should be of unusual interest to railroad men.

FROM time to time in the past two weeks more or less incoherent accounts of the hearing held by Commissioner Prouty in regard to the New York, New Haven & Hartford, have appeared in the daily newspapers. It has not been so much that the papers have tried to present a one-sided view of the hearing, as it is that as yet only one side of the case has been presented, and the case is a very complicated one. If expert accountants spent two months trying to get some clear idea of the New Haven's affairs from its books, it is hardly to be wondered at that even Commissioner Prouty has found the statements of witnesses and the addresses of counsel at times almost incomprehensible. The papers that have attacked Mr. Mellen have laid great stress on the accounts that have been carried in his name. In justice to President Mellen it should be said that it is not at all unusual in banking and stock transactions, or as far as that is concerned in the transfer of real estate, to make transactions in the name of an individual, although that individual may simply represent his company or firm and have no personal or private interest in the transaction whatsoever. The New Haven's side of the controversy has not been heard. Regardless of whether or not there is a satisfactory explanation for the numerous involved transactions through the mazes of which the New Haven's affairs have been conducted in the last four or five years, the method of bookkeeping and of conducting the corporate affairs of a railroad company is a survival—not of the fittest—of methods that should have been abandoned along with rebating and other now discredited practices.

A CHICAGO newspaper published the other day a cable despatch, announcing that the Prussian parliament had decided to electrify the belt lines of the Berlin City Railway, encircling that city. The article began with the words, "Berlin is about to set Chicago a big example," the implication being that it was going to set Chicago the example of electrifying the terminals of its steam trunk lines. The fact is, that the Berlin lines in question connect the various stations and suburbs of the city, and in respect of traffic and other conditions are comparable with the Chicago elevated lines rather than with the steam railways, with their network of freight tracks and yards. It would have been more accurate to have said that the conversion of the elevated roads in Chicago and New York from steam to electric traction set Berlin an example which it is following at this late day after years of consideration. The Chicago newspapers that have been insisting on the expenditure of hundreds of millions for electrification in that city might find a "big example" suggested in a paragraph of the despatch referred to which reads, "There are some objections to the scheme to pay for the initial cost of electrification by a slight increase of fares, but the newspapers of Berlin point out that the quicker and cleaner service will be worth the fractional higher cost." The newspapers of American cities usually provide for the cost of electrification by the simple expedient of doubling the volume of the traffic. Apparently in extenuation of the attitude of the Berlin papers we are told that fares in Berlin "now are low. For less than five cents one can ride three or four miles." Suburban fares on the Chicago steam roads are at rates as low as this, and on the more comparable elevated lines one may

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ride eight or ten miles for five cents. Possibly American railways are less in need of examples than some American newspapers.

THE report of the chief inspector of locomotive boilers for the year ending June 30, 1912, showed that of the 856 accidents reported, resulting in 91 deaths and 1,005 injuries, 243 accidents, or over 28 per cent., were due to defective squirt hose and connections and caused 245 injuries; while 165, or over 19 per cent., were due to burst water glasses, which resulted in one death and 168 injuries. The department of locomotive boiler inspection of the Interstate Commerce Commission has been giving special attention to bringing about better conditions in this respect and is receiving hearty co-operation from most of the railroads, many of which have taken active steps in the matter in connection with the safety first movement. The Lake Shore & Michigan Southern Mikado locomotives, described on another page of this issue, are not only of special interest because of their being the heaviest of their class of which we have a record, but because they are equipped with a device for taking cold water from the tender tank for wetting down the coal, thus eliminating danger from squirt hose and connections, which take the hot water direct from the boiler and often burst, scalding the enginemen. The details of this device are not yet available for publication, but it is one of several schemes which are being developed to eliminate the necessity of conducting steaming hot water through ordinary rubber hose, which soon becomes defective. The locomotive also has a new type of water glass shield fitted with two heavy glass plates, set at an angle of 45 deg. with each other, so that both the engineman and fireman may easily see the water glass without inconvenience. The shield entirely surrounds the water glass and is fitted with a large pipe at its lower end, through which the broken glass, steam and hot water may be conducted down and outside of the cab if the water glass breaks. Many of the shields now in use are defective because, although they may protect the enginemen from flying glass, the escaping steam and hot water is liable to injure the fireman, particularly when he attempts to close the lower water glass cock after the glass has broken. Another interesting innovation, from the standpoint of boiler inspection, is a manhole located a short distance back of the dome, which makes it possible to enter the boiler without removing the throttle standpipe, which is necessary when the inspector enters through the dome.

CONCENTRATING AUTHORITY TO REGULATE IN THE INTERSTATE COMMISSION.

THERE are certain features of current railway regulation that are discouraging to those who want to see it made both effective and fair. The tendency of the people and state legislatures to interfere unduly and unwisely with the work of regulating commissions and its effects were touched on recently in these columns (April 18, p. 867). There are other aspects of the situation that are encouraging. The most important is the trend of legislation and the decisions of the courts toward concentrating authority in the federal government, and especially in the Interstate Commerce Commission.

The earliest regulation of any importance related to rates. Numerous state legislatures passed laws requiring wholesale reductions in them. The courts at first held that this action was final, and could not be reviewed, however unreasonable. The courts subsequently reversed their attitude, holding that the determination of the reasonableness of rates was essentially a judicial function, and that they could and would prevent the lawmaking bodies from fixing rates that were confiscatory. Another long step was taken when it was held that a state could not regulate interstate rates, even if it nominally restricted its regulation to the part of the hauls within its borders. A few years ago the question was raised whether a state could reduce rates applying entirely within its borders if the necessary effect would be to cause reductions of interstate rates or discrimination against interstate commerce. In the Minnesota rate case Judge Sanborn of the United States Circuit Court held that such state regulation was invalid, being an interference with interstate commerce. In a case brought by Shreveport, La., the Interstate Commerce Commission held similarly, ruling that when the railways accepted low rates from points in central Texas to points in northeast Texas, prescribed by the Texas commission, it was their duty to make corresponding interstate rates from Shreveport to the same points in Texas; and the Commerce Court has just upheld this ruling. This means if the Supreme Court also so holds, that railways must either litigate unreasonably low state rates prescribed by state authority or so adjust their interstate rates as not to discriminate against interstate commerce. If the railways must face this dilemma there is no doubt as to which horn of it they will take. It seems to be the disposition of Congress to turn the entire work of federal regulation of rates over to the Interstate Commerce Commission, which means, in view of these decisions, that, broadly speaking, the commission has control of all rates, state as well as interstate.

The decisions involving regulation of rates are precedents for cases involving regulation of operation. In some instances the courts already have held invalid state regulations of operation which interfered with federal regulations. For example, the Minnesota reciprocal demurrage law was nullified on the ground that it was an interference with interstate commerce. The states in the exercise of their police power can impose many requirements on railways in the interest of public safety which affect interstate commerce. But it does not follow that they can pass in the pretended interest of safety any kind of legislation they may choose. If state legislation is merely nominally designed to further safety, and is really in purpose and effect not safety legislation at all, and interferes with interstate commerce, there can be little question that the courts can nullify it. This is especially true if it not only interferes with interstate commerce, but interferes with regulations of such commerce that have been adopted by Congress or by the Interstate Commerce Commission. For example, the full crew laws that are being passed in the various states are nominally intended to promote safety. They have, however, little or no tendency to do this, while they are an obvious and direct burden on interstate commerce, increasing, as they do, the cost of carrying it on. It seems possible, therefore, that the courts might hold them invalid even in the absence of train crew legislation by Congress, and quite probable that they would be held invalid if Congress should legislate on the subject.

Federal legislation requiring increases in the size of train crews regardless of local conditions would be as undesirable as like state legislation. But federal legislation giving the interstate commission jurisdiction over the matter might be desirable. The commission could then exercise its reasonable judgment in determining in what, if any, circumstances, more men ought to be employed; and the unreasonable state legislation on the subject probably would be made to nullity. Indeed, it probably is desirable that the Interstate Commerce Act should be so amended as specifically to give the commission the same kind of authority over operation that it has over rates — that is, authority, when, after investigation, it finds particular conditions of operation or service unreasonable, to correct them. This would protect employees and the public, and at the same time wipe out much existing undesirable state legislation. Certainly it is much more desirable that authority over railway operation and service should be concentrated in the Interstate Commerce Commission as authority over rates is being than that state legislatures, and in some cases commissions, should continue to regulate operation and service in the unwise and harmful way that they are doing now.

The already heavy duties and responsibilities of the interstate commission, and the further increases in them that seem probable, give timely interest and importance to the suggestion made by T. J. Norton, general attorney of the Santa Fe, that Congress shall "create deputy commissioners to sit throughout the

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country somewhat as district judges hold court, with authority to try cases and decide them, and with the right of the losing party, if he believes that he has not received his due, to appeal to the central commission at Washington." (*Railway Age Gazette*, April 25, p. 951.) Another suggestion which has been made is that the state commissions should be correlated with the Interstate Commerce Commission. The trouble with the latter plan is that the state commissions frequently seek to promote local, at the expense of national, interests. Deputy interstate commerce commissioners would know local conditions and give due consideration to them, but would not try to subordinate national interests to them. Railway regulation is a national, not a local, problem; and regulation of both operation and rates should be on national lines. This will be best secured by concentrating the regulating authority in the Interstate Commerce Commission.

THE FIREMEN'S INCREASED WAGES.

THE locomotive firemen of the eastern roads have secured by the arbitration award, which was published last week, rather more than what the roads were willing to give them before they reached the deadlock where the controversy was referred to arbitrators. A well-informed railroad officer estimates that they have not got much more, and his estimate appears to be as accurate as can be made at the present time. The actual money to be paid, to the firemen, as figured out by a number of roads, will be around 8 per cent. greater than before. Every manager's estimate is of limited value, except for his own information, because the old rates are so varied and the changes are so complicated that an average, which is all that anybody offers, gives no measure of the justice of either the old or the new rate for any specific job. The gross increase in payrolls, including additional helpers required by the award, and very large increases to hostlers in some instances, will in many cases probably amount to a good deal more than 8 per cent. On the Erie the estimated gross increase will be 13 per cent.; and the Erie has been paying pretty good rates.

For one of the least complicated examples we may take that of the Delaware & Hudson, where the estimated total addition to the payrolls of firemen will be about 8½ per cent., and where the rates per 100 miles are as below:

Passenger Firemen.

Weight, thousand lbs.	Present Rate.	New Rate.	Increase.
80	$2.40	$2.45	$0.05
80 to 100	2.40	2.50	.10
100 to 140	2.40	2.60	.20
140 to 170	2.40	2.70	.30

Freight Firemen.

Weight, thousand lbs.	Present Rate.	New Rate.	Increase.
80 to 100	$2.60	$2.85	$0.25
100 to 140	2.85	3.00	.15
	2.60	3.00	.40
140 to 170	2.85	3.10	.25
170 to 200	2.85	3.20	.35
200 to 250	3.00	3.30	.30

The largest aggregate increase in this list will be in the item where freight firemen receive $3.20 a day, an increase of 35 cents, there being 101 engines in this class. The enginemen's award resulted, on the Delaware & Hudson, in a gross increase of 4½ per cent., a larger increase probably than on most of the stronger roads, as the D. & H. has a large proportion of short passenger runs.*

The salient features of the present award are that the firemen's minimum rates—those for the smallest engines—are somewhat above 60 per cent. of the rates paid to enginemen; that where there is more coal to be shoveled, the pay is increased, the increase being adjusted according to the weight of the engine (on drivers) and that the basis of payment for overtime is made simple and uniform.

The firemen's award, aside from the differences made in the rates to adjust the pay to the amount of coal shoveled, follows pretty closely the enginemen's. For the enginemen the arbitrators made the highest existing minimum the universal minimum; a decision which bore hardest on the smaller roads, the high minimum being already in force on the stronger ones. Enginemen wanting rates above the minimum, whether for seniority or severer work or responsibility, were given nothing (except a guarantee that high rates already in force should not be reduced); and were left to settle with the roads individually. The firemen for their extra physical work are treated liberally. The weight on an engine's drivers is not an exact measure of the coal used, but it is probably near enough to work out with substantial equity as between different engines, so far as concerns any differences due to size of cylinders or of driving wheels; though there are cases where engines fitted with firebox arches, superheaters or other recent improvements are decidedly easier to fire than are lighter engines, not having the improvements on which the pay will be less. The man working the hardest will receive the smallest wages.

The demand for a second fireman on large engines was not settled. Every such question must be settled with each road on its merits. The Pennsylvania has for a number of years managed this matter rationally by having the front brakeman (qualified for promotion to the position of fireman and accorded his right of seniority for such promotion) take the place of the fireman over certain sections of the road, say one or two hours at a time as the up grades may make necessary. At the outset neither of the two brotherhoods interested accepted this arrangement very cheerfully, but the plan seems to have worked pretty well, and there does not appear to be any reason why it should not be adopted generally. On slow freights the front brakeman for long stretches of time has nothing to do but ride, and he usually rides in the engine cab. An extra fireman simply puts in a fourth man where there is none too much room for three. The question of the second man is pretty sure to lose its importance as the mechanical stoker comes gradually into use; and as the economy of large engines is now everywhere appreciated, it is to be expected that large engines—and mechanical stokers—will become more and more numerous.

As has been observed already the percentage of increase in total payments either to enginemen or firemen, is a figure relatively of little significance to the outsider because of the wide differences in the items which make up the average; but there is one marked difference between the enginemen's case and the firemen's, which is due to the length of time over which the increase applies. The enginemen were awarded rates in November which dated from May 1, thus giving many individuals hundreds of dollars in back pay. The firemen asked and expected ten months' back pay but did not get it, the arbitrators adopting the view presented by the railways that, under the law, the decision could not be made retroactive. This makes a difference of from 10 to 50 per cent. in the gross burden, according to the length of time that the arbitration stands. For example, assume that the present decision stands for four years, a road paying $1,000 a month additional, will thus be expending, as a result of this award, $48,000; but if the award had begun to run from last July the total would have been $58,000. Or, to put it in another way, if the $48,000 equals 10 per cent. increase from the present time, the setting back of the date would have changed it to over 12 per cent.

One significant clause in the present decision which did not appear in the engineer's or in any previous arbitration is that in Article 9, to the effect that a fireman's earnings shall not be increased (above the higher rates of pay and conditions hitherto in effect and now guaranteed to him) by a combination of the new rates with the old conditions, or the old rates with the new conditions. A man, for example, who gets $3.60 for a run which ordinarily takes about 10 hours, with extra pay after 12 hours, will continue to receive $3.60, though the new rate for the run will be $3, with overtime after ten hours; but if the man continues to enjoy the old mileage rate, he must also submit to the old time limit; he must continue to work the 11th and 12th hours without overtime pay.

The firemen's settlement now reinforces the enginemen's in confirmation of the principle that a road making scanty profits,

*The result of the present increase on one of the larger roads is noticed in another column.

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or even one doing business at a loss, must pay as good wages as a more prosperous line. The fundamental principle that the roads shall act together and shall recognize the brotherhoods as authoritatively representing their employees is also further entrenched. These points settled, arbitration must become more and more common, for each controversy becomes of such magnitude that no railway officer and no labor leader will take the responsibility of abating his demands, except under the most thorough investigation of facts and the most strenuous efforts at impartiality that it is possible to secure.

The firemen's problems were in a sense easy because, to so large an extent, the basis of their settlement could be found in the engineemen's agreement. (*Railway Age Gazette*, November 29, 1912, page 1039.) For this reason the weaknesses of the Erdman law do not specially stand out in this case. But those weaknesses still exist, and the duty resting on Congress to cure them is as grave as ever.

THE NEED FOR CONCERTED ACTION REGARDING VALUATION.

A GREAT part of the public regards the railways of the United States as a big trust. Many people think that regarding matters affecting only the railways of a particular territory all of the railway managers in that territory stand and work together; and that likewise in matters affecting all of the railways of the country all the railway managers get together and present a united front. No view could be more incorrect. No class of men in the same line of business differ more or find it harder to pull together than railway managers. This is chiefly due to competitive rivalries both between individuals and between the railways they represent. Only when confronted with strong necessity can the railways be brought to work harmoniously together, and even when the need for close co-operation between them seems obvious and great, they often pull apart and work at cross purposes. One of the classic examples was the way they handled the rate advance cases. Not only did not the eastern and western roads present a united front, but even roads in the same territory presented their cases to the commission on conflicting and mutually destructive theories. It was largely due to the bungling failure of the railways to get together in the handling of these cases that they completely lost both of them. This is pretty generally admitted now by railway officers. It is unfortunate that in spite of their great ability, the hindsight of many railway managers, like that of many other people, is often much better than their foresight.

Never has there arisen in this country any matter more imperatively demanding constructive and concerted action by the railways than the valuation of railway properties that has been provided for by Congress. There is hardly a point regarding the subject of valuation of railways on which there is an approach to agreement by engineers and economists. Many people think that the valuation should be based entirely on the cost of reproduction, but there is no general agreement as to what factors should enter into the cost of reproduction, as to how they should be ascertained, or as to the weight that should be given to each of them. There are varying opinions in regard to the unit costs that should be used, as to the way in which the right of way should be appraised, as to the amount that should be allowed for depreciation of the track and equipment on account of its use, as to the amount that shall be allowed for appreciation because of solidification and adaptation of roadbed, and so on *ad infinitum*. The way that these various questions are settled will affect by hundreds of millions, if not actually by billions of dollars, the total amount of the valuation. Again, some people contend that no weight should be given to the intangible values of railways, while others contend that great weight should be given to them; and the way this question is settled will also affect the valuation as a whole by an enormous sum. The purpose of valuation is the same as to every railway. The principles on which, and the methods according to which, the valuation of all the railways should be made are the same. Therefore, it would seem that it should be possible for the managers of all the railways, through some organization created for that purpose, to work out a harmonious, unified plan to present to, and urge upon the attention of, the Interstate Commerce Commission.

It is not conceivable that the commission would make any objection to this being done. On the contrary, it would seem that the commission should welcome such action by the railways, for it would greatly simplify the commission's work. That some such concerted action by the railways themselves is desirable and would be advantageous, seems clear. Every railway manager concedes that the railways as a whole have lost heavily in the past by not hanging together when it was important that they should do so. There is no reason for thinking that working at cross purposes, or without a well defined plan or a good organization to carry it through will have any better results in this instance than it has had in others. There will be a scheme of valuation adopted and carried out. If the railways act harmoniously together they doubtless can exert much influence on the formulation and execution of that scheme. If they do not do so they will have mighty little influence on either its formulation or its execution.

The executives of a large number of railways met in New York last week and discussed what attitude the railways should assume and what action they should take. The meeting resulted in the appointment of a committee whose functions and duties have not been clearly defined. It is to be hoped that this is the first step toward harmonious, unified and organized action, and is to be followed by the appointment of a strong working committee. Ever since the Esch-Townsend bill was presented in Congress the record of the railways in dealing with proposed regulation has been very largely one of discord, bungling and defeat. Surely past experience contains a lesson that should be applied in handling this enormously important matter of valuation.

NEW BOOKS.

Valuation of Public Service Corporations; Legal and Economic Phases of Valuation for Rate Making and Public Purchase. By Robert H. Whitten, Ph.D. 708 pages, 5¾ in. x 9¼ in. Buckram. Published by the Banks Law Publishing Company, New York. Price, $5.50.

The subject with which this book deals is at present one of leading public interest and importance. Its interest and importance have been much increased by the legislation providing for a valuation of all of the railways in the United States by the Interstate Commerce Commission. The work deals chiefly with the legal and economic phases of valuation, although it touches on pertinent engineering matters.

The three main purposes for which valuations of public utilities may be made are to furnish bases for taxation, for the regulation of rates and for public purchase. It is valuation for the latter two purposes that Dr. Whitten chiefly discusses. He believes there is a very close relationship between valuation for rate purposes and for public purchase. He recognizes the fact, however, that in a valuation for public purchase the net earnings must be given much weight, while valuation for rate purposes is really to determine, not what the commercial value of a property is, but to a large degree, what it ought to be, and that therefore, it is desirable to treat valuation for the two purposes separately.

The book covers quite thoroughly the views expressed by valuation engineers and in the opinions of commissions and courts regarding the various factors that should be included in valuations and the weight that should be given to them. Among the important points treated are the weight to be given to the cost of reproduction and to actual cost; the proper methods of appraising lands; the consideration to be given to land donated

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or acquired without cost; to value added by expenditures from earnings, to adaptation and solidification, to physical depreciation, to going value, and to franchise value; the rate of return that should be allowed, etc.

Dr. Whitten's expressions of opinion on disputed points indicate that he believes that valuation for rate purposes should be made and the percentage of return fixed on bases which officers of public utilities would consider unfair to their companies. Doubtless his connection with one of the public service commissions of New York has influenced his attitude. The Wisconsin Railroad Commission, which has won an enviable reputation for fairness and effectiveness, has generally followed a less restrictive policy than Dr. Whitten seems to favor. The same thing may be said of the New York Public Service Commission for the Second District and of the Washington Railroad Commission. However, while Dr. Whitten himself favors a policy of regulation that would be likely to hamper more or less the development of public utilities, his book, as has been indicated, fully presents the views of the authorities. It is, in fact, an interesting and valuable work, and deals very satisfactorily with the legal and economic aspects of valuation. The last chapter contains an excellent bibliography.

The Biographical Directory of the Railway Officials of America. 1913 Edition. Compiled and edited by Harold Francis Lane, associate editor of the *Railway Age Gazette*. 623 pages, 7 in. x 9 in. Published by the Simmons-Boardman Publishing Company, New York, and distributed by the McGraw-Hill Book Company, 239 West Thirty-ninth street, New York. Cloth. Price, $4.

The 1913 edition of the Biographical Directory is the seventh in a series begun by the Railway Age Company in 1885 for the purpose of furnishing a concise record of the railway history of the men who build, control and carry on the operation of the railways of North America, arranged alphabetically for personal reference, rather than under the titles of their companies. Previous issues have been published in 1885, 1887, 1893, 1896, 1901 and 1906, and the book is too well known to require extended description. It has come to be recognized as an indispensable reference book in every railway library as the only comprehensive history of the professional careers of American railway officials. On account of the large number of changes in railway personnel that have come about in the seven years since the last edition was published the present edition, in which the sketches are brought up to March 1, should be especially valuable.

The first issue, in June, 1885, contained 3,764 names, not all of them accompanied by a personal record, requiring 276 pages. The present volume includes over 4,200 personal histories, occupying 623 pages. Each successive volume has shown many new officials added and many old names removed by death or retirement from railway life, and while there are many names in the 1913 edition that were also included in the first edition in 1885, the records for 1913 will be found to be largely those of men not named in the volume for 1885—many of them not even in the 1906 edition. A new generation has come into command of our railways.

Over four hundred sketches which were included in the preceding volume, for 1906, have been eliminated on account of death and many more on account of retirement from service or for other reasons, while more than 1,500 new sketches have been inserted. Many of these are of young men who have come to official rank since the last edition was published and there also appear a number of sketches of railway officials of extended service who had hitherto failed to furnish the necessary data. Included in this volume are the names of many men who have left important positions in railway service to engage in other business, but whose railway record still continues to be a matter of general interest. The policy has been continued of republishing sketches of former railway officials now retired where there is evidence that they are living.

As in the 1906 edition biographical sketches of the members of the Interstate Commerce Commission and of many of the state railway commissioners are grouped in alphabetical order at the end of the volume.

Letters to the Editor.

CAR UNDERFRAME DESIGN.

PITTSBURGH, PA., April 8, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have just read Mr. LaBach's article on horizontal bracing of a car, and following his line of argument may say that tender frames are often braced by diagonal members, also passenger cars. Freight car underframes with very few exceptions are considered sufficiently stiffened by the floors of the car, be it composite or steel. This is economical construction, inasmuch as the floor is necessary anyhow.

The general question of resistance of the car towards longitudinal shocks is not receiving the attention that it should. Suppose a car, weak in that direction, fails in a long train. It will naturally cause a wreck and suffer damage, but what is more significant, all the other cars, weak or strong, will suffer likewise. Therefore, all the cars offered in interchange should be made of a certain standard strength. We have standards and specifications for bolsters, wheels, arch bars, axles, bolts, brake beams, couplers, hose, and dozens of other details, but we have none for the car itself. Occasionally we hear persons advocating a standard car for all the roads, and rightly too, but until such a time we should have specifications covering the minimum strength longitudinally so as to make the trains of a uniform resisting strength.

This in turn would also protect the car trust companies more than heretofore, as a car of a certain capacity would then represent a more fixed value. At the present time possibly no two opinions would agree as to longitudinal strength required.

In the vertical direction, i. e., the carrying strength, we are somewhat better off, but even here rigid specifications as to maximum fiber stresses under certain maximum conditions are badly needed.

A. STUCKI.

CAPITALIZING BRAIN AND BRAWN.

BALTIMORE, Md., January 8, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Those who own and operate our railroads, particularly the men who hold the strings to the treasury and by their skilled diplomatic financiering can induce bankers and investors to furnish millions of dollars to readily redeem maturing obligations or pay for necessary improvements, are up against a most perplexing problem which will test their ingenuity. I refer to the investment of the surplus earnings of all railroad employees; that is, the creation of a means to protect them against loss of their savings by unfortunate speculation.

The statement may surprise some people, but it is nevertheless true, that many railroad employees are often prey for the unscrupulous stock promoter, the land and loan shark, and other rainbow fortune builders who believe that the railroad field has a perpetual crop of "Easy Marks" who can be fleeced with impunity.

The nature of the railroad man's daily occupation often makes him the "good fellow" who usually gets "bit," because he is too big hearted to turn down an acquaintance who he believes is doing an honest business. It is most regrettable that these "philanthropic investments" frequently prove to be "nightmares," and not alone affect the railroad man who is the unfortunate, but also cause hardship to his family or those dependent upon him.

It is a well-known fact that millions of dollars are set aside or are being accumulated by the railroads in insurance, pension, savings and other funds for the benefit of their hundreds of thousands of employees, which is commendable. But there is evidence to show that the surplus earnings of employees are not always diverted in the right direction, where profits would replace losses.

By protecting the interests of employees railroads are assured

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of greater efficiency in work performed, and employees generally become more contented. It requires wisdom—unusual tact—to guide the welfare, comfort and health of employees, perhaps to as great a degree as to guarantee safety to the traveling public, and the railroad management that can accomplish this task without causing unnecessary friction will carry the banner of prosperity for all time.

Various schemes to accomplish this work have been suggested at different times, but as a rule the men who guide the destiny of our railroads have been too busy with other duties pertaining to the physical improvement of the roads to devote careful thought to this problem the solution of which should be mutually beneficial. It is to the credit of a few of our railroad presidents that they seem willing to give the matter the attention it deserves, and it would not be surprising to learn that some plan will be adopted in the not distant future whereby railroad employees may invest their surplus earnings with security, perhaps in the stock or bonds of their employing railroad, payment for same to be made in instalments and at a convenient ratio to their salaries. Large corporations in other industries have adopted the "profit-sharing" idea with success, so why should not the railroads?

CHAS. C. SCHNATTERBECK.

THE CRIME OF 45.

IOWA, April 26, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Twenty years ago the question of tramp railroad men, particularly enginemen and trainmen, had become serious so far as it affected the standard of efficiency. Railroad managers seeking a remedy for the trouble looked to European railroad practice, but in doing so failed to realize the difference in conditions and that as the United States became settled and railroad construction materially decreased, the conditions prevailing here would, to a great extent, right themselves. It was simply a question of wanderlust and new territory and a demand for men which made it an easy matter to satisfy the craving.

While the establishment of pension funds by European railroads naturally induced men to remain with one railroad during their working life, the establishing of these benefits were not brought about by conditions similar to those existing in the United States, for the reason that the average European, particularly the Englishman, seldom has more than one trade, business or profession at his fingers' end; has no new country at home to explore and almost invariably remains with one employer as long as it is possible for him to do so.

American railroad managers considered they had the solution to their troubles in the pension fund and to a great extent they undoubtedly had and nothing but good would have resulted had they been content to adopt the European system without trying to make it effectual by arbitrary age limit rules. In England the rules of the pension fund in effect on most railroads provide, or did provide at the time they were established, that new men under 21 years of age, or men over 47 were not entitled to the benefits of the fund, and consequently would not be admitted to membership. We, wiser in our generation than the Britisher, conceived the idea of making the pension scheme complete and binding by also establishing an age limit rule—not a limit of age at which a man would be barred from participating in the benefits of the pension fund, but a limit of age at which we would take from him the undeniable right to work and support his family—hence the age limit rule, written and unwritten, now in effect on many of the larger and standard railroads of this, God's country.

Is this rule, in its application to the individual, just or unjust? Does the arbitrary application of the rule increase the standard of efficiency and is it a humane rule to enforce against labor?

The age limit rule practically says that no inexperienced man over 36 years of age, or experienced man over 45 years shall be employed. In other words the enforcement of this rule implies that an inexperienced man at 36 years of age, or over, is not considered good material for training, and an experienced man at 45 or over, should he unfortunately be seeking railroad employment, is not a desirable man to employ.

On the other hand should an inexperienced man between the age of 33 and 36, or an experienced man between 42 and 45, obtain employment it is, according to pension fund statistics, considered they will, provided they remain physically fit, render good service up to 65 or 70 years of age. In other words the factor in deciding a man's fitness is not his age, but whether he happens to be employed or unemployed at a certain age.

The rules of the pension fund, by fixing the age at which a man retires at 65 or 70, lead us to assume that statistics show that an experienced man can give good service up to, at the least, 60 years of age; yet the application of the age limit rule means to those seeking employment that notwithstanding their years of experience, at 45 years their services are no longer required by railroads. In the absence of a knowledge of the principles underlying these rules, it would appear that it is a crime to be 45 years of age and the unpardonable sin to be seeking employment at that age.

All sensible men will admit that a man should before reaching the age of 36, know what trade, business or profession he wishes to engage in; consequently the rule relative to the hiring of inexperienced men does not inflict much, if any, hardship on that class seeking employment, but to say that a man at 45 years of age, with perhaps twenty or twenty-five years' practical experience to his credit, able to pass physical and other examinations, cannot give equally as good, if not better service than the inexperienced man hired at the age of 33 or 34, is asking us to believe that which our experience and common sense tell us is not true.

Pension funds, relief departments and civil service rules have and always will prove a boon to the rank and file of American railroad men. They provide against old age and sickness; have helped increase the standard of efficiency of service; have in many instances advanced men, due to seniority in service, when under old conditions with no civil service rules, their fitness would be doubted. It is, however, a question whether these funds and the application of civil service rules encourage and promote individuality and initiative—individuality and initiative which have produced a score or more American railroad presidents and managers to whom the world takes off its hat. Pension funds and civil service rules make capable men, loyal men, and men who stick; but that these benefits and rules stand for individuality and initiative is open to question.

If equity is a law in our hearts and its proper object is to secure the rights of humanity decided by the consciousness of right and wrong, let us by every rule of equity wash out the crime of 45 before it becomes a question of man's inhumanity to man. Let us judge the fitness of men by their mental and physical condition instead of by an arbitrary age limit rule.

Equity requires us to do to others what in similar circumstances we would expect from them.

BUENOS ANO.

OIL FUEL IN INDIA.—India, like the rest of the world, is suffering from an increase in the price of everything, including coal. Hence locomotive engineers there are considering the use of oil, and the adoption of oil-engine locomotives has been seriously put forward in connection with the operation of the waterless track over which the Trans-Persian Railway would have to pass. This, however, is very much in the future, but there are still many places in India where oil fuel would be seriously worth consideration. In order to test the matter thoroughly, the Indian government will soon carry out an important series of trials on the North Western Railway, and has made a contract for the supply of about 7,000 tons of oil for the purpose. Six engines will be fitted in the first instance, and carefully trained crews employed so as to ensure a proper comparison between the practical values of Bengal coal and Persian oil under regular service conditions.

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ARE OUR RAILROADS FAIRLY TREATED?

A Discussion Before the Economic Club in Which the Bankers, the Public, the Railroads and Labor Were Represented.

The last dinner of the season of the Economic Club of New York was held on April 29 and the subject for discussion was "Are Our Railroads Fairly Treated?" The speakers were W. C. Brown of the New York Central, F. A. Delano of the Wabash, A. B. Garretson of the Brotherhood of Railroad Conductors, B. F. Bush of the Missouri Pacific and Prof. Wm. Z. Ripley of Harvard University. James Speyer, president of the club, made a short introductory talk in which, although he did not attempt to finally pass upon the question presented for discussion, he indicated clearly that in his opinion—that of a banker financially interested in thousands of miles of railroad—the railroads are not being treated in such a way as to induce new capital to seek investment in their securities.

Mr. Brown, viewing the question as a railroad president, spoke of the necessity for further investment in American railroads and outlined clearly how pressing were these necessities.

Mr. Garretson discussed the question from the point of view of organized labor, with a breadth of judgment, however, that is his own. He presented figures which he said were those on which the ordinary workingman on a railroad based his opinion as to whether or not the owners were receiving a fair return on their investment. According to these figures, the return on the investment in railroad property, and by this Mr. Garretson apparently meant dividends paid on railroad stocks, had increased very much faster during the past decade than had the rate of expenses of the roads, or than had the rate of investment of new capital. Mr. Garretson pointed out that the employees, and more particularly the railroad conductors, knew what was going on in the management of the properties, knew if the management was using improper methods and he made a strong plea that railroad managements do nothing which they could not give full publicity to. He closed his address by saying that in his opinion the dual control and dual regulation of railroad operation and activities by the states and the federal authorities was wrong in principle and put a hardship on the railroads that was wholly unfair and oppressive. He stated emphatically that in his opinion railroads could only be regulated fairly and properly by the federal authorities and the interference in this regulation by states was an unmixed misfortune.

Abstracts of Prof. Ripley's, Mr. Delano's and Mr. Bush's remarks follow:

PROF. RIPLEY'S ADDRESS.

The most striking feature of the railroad problem in 1913 is the contrast with conditions ten years earlier. Instead of unexampled prosperity, a period of great financial depression in transportation business has supervened. In place of practical domination in the economic life of the country, the carriers now seem to be more or less at the mercy of circumstances. Organized labor under threat of general strikes has forced substantial concessions both in wages and conditions. The carriers have acquiesced manfully in the mandate of the people that they shall be subject to public control. But they find themselves now by the pressure of increasing costs of operation and of ever greater demands from the public for more and better service, practically compelled to throw themselves upon the mercy of the Interstate Commerce Commission for relief. This relief is demanded, not alone in the interest of investors, but in order that much needed improvements and extensions commensurate with the development of the country may be made. It is a self-evident proposition that unless the railroads are prosperous and protected in the exercise of their property rights, a healthy growth of transportation facilities cannot be had. Adequate service and the convenience of the public require that the present plight of the railways should receive the most earnest consideration.

Railway net income which culminated in 1910 has now declined from that level by about one-eighth, despite a considerable increase in gross earnings. The latest evidence shows a halting and uncertain movement. This condition of affairs makes it practically impossible for the carriers to raise funds by the sale, even of bonds, except at high rates of interest. Further continuation of hand-to-mouth financing by issuance of short-term notes is fraught with danger. A menace to continued prosperity also is the successful pressure of the railroad brotherhoods for substantial increases of wages.

Under ordinary circumstances relief might be had from three directions, greater economy and efficiency, a substantial growth of traffic, or an increase of rates.

Economy and greater efficiency of operation, as a remedy for deficiency of revenue, played a large part in the rate advance cases of 1910. But it is clear that railroads, as a field for the introduction of scientific management methods, are considerably handicapped. Rigid rules of the railway brotherhoods are difficult to overcome. The wide geographical extension of operations renders detailed superintendence impossible. And the steadily increasing demands of the public for more and better service, regardless of cost, hinder the introduction of many plans for more scientific operation. On the whole, American railroads are operated at the high level of efficiency. Certain economies ought, nevertheless, to be effected. Among these should be a careful revision of purchasing department methods. Laxity and private profit ought to be rigorously excluded. Every advantage should be taken of the open market regardless of financial affiliation with the large industrial combinations. This point was especially referred to in the eastern rate advance cases of 1910. Contracts with private car and express companies ought to be reduced to the lowest possible figures, so that all suspicion of favoritism should likewise be eliminated. With houses thus set in order, the roads should be able to present a strong case for efficiency. They need fear no comparison with any other country in the world.

Increase in tonnage, as a remedy for the existing distress, promises less relief than might have been expected five years ago. This follows naturally from the rise of operating costs already mentioned. But it is also established by the clear demonstration that after a certain point of traffic congestion has been reached immediate, general and extraordinary outlay of capital is necessary in order to handle further increments of tonnage. Unless earnings, therefore, are sufficiently ample to permit of large annual improvements out of income, the demand for new capital seems bound to outrun the earning power.

It is apparent from the foregoing statements that relief can be afforded for the present crisis in a large way only by the sanction by the government under the new powers of control exercised since 1906-10, of a general increase of rates chargeable for service. Experience of the last ten years emphasizes the point that such relief can scarcely be afforded piecemeal. The growing unity of interest of all carriers arises, not only out of the close interrelation of rates all over the country under the stress of commercial competition, but also because of the practical standardization of the largest item in railway expenses, namely, the outgo for wages under pressure from the railroad brotherhoods. It would appear therefore that in place of attempts, road by road, to raise rates on individual commodities, what is needed is the formulation of a carefully prepared plan of more general revision.

A substantial increase of revenue by means of higher freight rates seems, then, inevitable. But the failure to secure the approval of the Interstate Commerce Commission in 1910, instead of being discouraging, should point out the way for the future. The commission at that time promised to consider similar proposi-

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tions in future without prejudice. They have, as a matter of fact, since 1910 permitted more raises of rates than they have denied, as shown by the following statement:

Proposed advances approved	66
Proposed advances approved in part	18
Proposed advances disapproved	60
Proposed advances voluntarily withdrawn	18

And then in addition to these cases of suspension, thousands of increases have been allowed to take place without interference. For New England, thus far, not a single proposed increase has been permanently prevented; and an aggregate increase of charges of over $3,000,000 has actually occurred since 1910. The policy of the carriers should be to cease crying "Wolf," thereby arousing distrust among investors, and to go confidently forward and prepare a strong and logically defensible schedule of advances to present to the proper authorities.

In the upward revision of rates the representatives of shippers should be consulted, as was recently done in the increase of transcontinental rates, just sanctioned by the commission. Many favors to the trusts which now exist through unduly low rates on such commodities as sugar, copper, cattle and beef and steel products should first of all be corrected. Despite the great rise in prices, rates on many of these trust-made commodities are no higher than they were in 1900. All suspicion that interlocking directorates have perpetuated these unreasonably low freight rates should be met. The relation between rates to large cities and industrial centers, as compared with local charges, needs attention also. If the railways come with clean hands, well ordered houses and a proper scheme of increases, the Interstate Commerce Commission can scarcely fail to recognize the justice of their demands.

Positive remedial legislation in the interest of railroads, as distinct from mere administrative sanction of rate increases, is distinctly demanded also by the situation respecting arbitration of wage disputes. The Erdman Act of 1898 is notoriously unfair to the carriers, leading, as it always does, to a compromise decision rather than to a settlement upon the merits of the case. This results from the fact that the entire responsibility for the final decision rests upon the third member of the arbitration board representing the public, as distinct from the other two representatives of the carriers and their organized employees respectively. The law should be amended to provide for a commission in part composed of permanent government experts, the remainder of its membership being made up of members chosen to represent directly the three parties in interest, the railroads, the employees and the public. But the public representation should at all times out-number that of the carriers and the operatives. Only thus, by a massing of responsibility in strictly impartial hands, may decisions be expected on the real merits of the case.

MR. DELANO'S ADDRESS.

"Are Our Railroads Treated Fairly?" Although that question is the subject of our debate, it is not my intention to attempt to answer it. I shall make an effort to tell briefly the history of the situation and describe the present conditions, and let you decide for yourselves, from the facts.

The first steam railroads were built scarcely more than 80 years ago. As you all know, in no country of the world has their growth been as rapid as here, and nowhere else has so much been accomplished by private enterprise. During the first 60 of these 80 years every possible encouragement was given to the promoter and investor to build into new territory or to duplicate existing lines. The evils which flowed from excessive railroad building and over-speculation in railroad construction cannot be laid wholly at the door of the railroad men of the time, but must be shared equally by the general public, for everything was done to encourage the lust of conquest. Full and complete dependence was placed upon the competitive theory. And yet, through all this period, in spite of all the glowing prospectuses of the promoters of the day, it was recognized that investments in railway securities were hazardous. Forty and fifty years ago the interest rates on railway bonds were 7 to 10 per cent., and this, with discounts and stock bonuses given, brought the net interest burden upon the railroads to fully 10 per cent. Usually neither the states nor the communities gave any guarantees whatever. On the other hand, there was no intimation that profits would be limited to what the courts now call "a fair rate of interest on the investment." The reasonable expectation of the investor was that, while some of these investments might prove disastrous, they might prove very profitable.

Towards the end of this first 60-year period, the evils of the competitive system began to make themselves felt, and public opinion demanded remedial legislation. Briefly stated, those evils were excessive discrimination between communities and even between individuals. The first important legislative effort at a remedy was the passage of the Interstate Commerce law, 25 years ago. Since that time, especially within the last 20-year period, there has been a constantly growing public sentiment of hostility towards the railways. I shall make no attempt to justify the acts of the railways during these first decades of development, although I think much might be said on that score. Any student of the question can readily see that the conditions were the natural result of the method. Communities everywhere did all they could to get the railroads competing with each other, in order to secure by this very competitive system discrimination in their own favor; large industries in their own sphere did the same thing, and the reaction finally came when there were not enough favors left to go around. Communities and individuals who got less than they thought they ought to get began to raise objections to the system which they had themselves helped to create.

Briefly, then, the history of the railroads has been:

First. Sixty years of rapid extension and competitive building, leading to intense strife for traffic, encouraged in every possible way by the communities.

Second. Growing dissatisfaction with the railroads during the latter part of this period.

Third. An entire change of policy in the last 20-year period, compelling an entire readjustment by the railways.

This latter phase is the one in which we are particularly interested today. It is not necessary to tell a body of business men or economists that readjustment is the most difficult problem which business has to encounter. We have a good example of that in the tariff question. Many of us favor a decided reduction of the tariff, but even the most ardent believer in a tariff for revenue rather than a tariff for protection can see the immense difficulties of readjustment when it is remembered that wages and all the methods of manufacture have been predicated on one set of conditions and must be rudely or quickly readjusted to another set of conditions. In this period of readjustment the railroads have also been confronted by the swelling tide of dissatisfaction which has shown itself chiefly in an unfriendly, if not hostile, public opinion. It may be said that in the 60 years of our growth we "sowed the wind" and are now "reaping the whirlwind," but in any fair review of the facts I think it will have to be acknowledged that the whole community shared in bringing about this result.

The greatest difficulty the railways have today arises from the fact that the policy of the country as a whole is inconsistent and unsettled, for, while the federal and state governments have emphatically adopted the theory of the regulation of rates, public opinion and the law still retain the theory of the competitive system. In other words, the community as a whole seems unwilling to trust the regulation theory or else wants to get all the advantage of both theories.

The plea of the railroad man to-day is that either he be let alone to work out his own salvation under the competitive system, or that the country shall acknowledge that the competitive system is so objectionable in some of its results that

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we must rely solely on federal and state authorities to pass upon or fix rates. Someone will say this is a plea for "pooling," and the evils of the old "pool" days will be recalled; but that is not the contention. The claim is that if we must submit to the regulation of rates, then we should be free to make binding agreements between ourselves in respect to rates, time schedules, terminal allowances and multitudinous matters in connection with our public duties, subject always to full and complete publicity and the approval of the state and national authorities.

The hostile public opinion to which I have already referred has borne down upon the railroads in numerous exactions of law, sometimes veiled under the guise of the necessities of public safety, but more often nothing more nor less than in the spirit of retaliation against the railroads. Unfortunately, too, during the latter portion of the period of which I am speaking, much of this legislation has been fathered by labor organizations among our own employees who, instead of being loyal to their employers, are actually "lobbying" against us. I am not saying this in unfriendliness to labor men, but because I feel that I must in this discussion talk plainly and not mince matters.

I shall attempt a brief review of some of this legislation that you may have the matter clearly before you:

Legislation for the Two-Cent Fare Law.—The net effect of this legislation has been a severe impairment of railway passenger earnings.

Postal Legislation.—Great reductions in the compensation by the government to the railroads for carrying the mails have been made, until this service on many railways is done at an actual loss and at the expense of other business.

The Hours of Service and Safety Appliance Laws, although adding to the burdens borne by the railways, were so obviously regulations intended to promote safety that I mention them not in complaint, but only as a matter of record.

The Boiler Inspection Law.—The ostensible object of this law was to promote the safety of engineers and firemen, but its effect has been very much more far reaching. The fact that the inspectors ordinarily use discretion and common sense in administering the law, that they do not always enforce its provisions to the letter, is the only reason that it is operative at all; but that is poor satisfaction to the railroad official.

Electric Headlight Laws.—In a number of states electric headlight laws have been enacted, ostensibly for the protection of the locomotive engineer and the traveling public, but really for the promotion and benefit of an electric headlight corporation, in the official ranks of which members of the Brotherhood of Locomotive Engineers are prominent. This is certainly not a creditable record for an organization which is justly proud of its long reputation for honorable dealing and conservatism. These state laws in many cases do not require a headlight of adequate candle power, for by specifying an electric light or very high candle power, they exclude equally effective acetylene headlights, although it is a notorious fact that these have proved simple and satisfactory in service on automobiles all over this and other countries.

The So-Called "Full-Crew" Laws.—I need hardly tell a New York audience about these laws. They are among the most unjust exactions which railroads have ever had to face. Several years ago the federal government required the railroads to equip all their freight cars, as well as passenger cars and locomotives, with air brakes, and stipulated that the speed of trains should be entirely controlled by the locomotive engineer. Now comes this organization of trainmen, boasting a membership of over 200,000, and under an offensive and defensive alliance with the other railroad organizations, having the tacit support of all, and by means of its lobbies and pre-election pledges, is trying to compel the railways to employ unnecessary men. The object of this trainmen's organization is purely selfish. Its members realize as well as every employer or economist that wages are controlled in the long run by demand and supply; that by compelling the railroads to employ this additional brakeman on every train, they will increase the demand and help to exhaust the supply; thus influence wages.

The results of these changes in policy and the enforced readjustments are beginning to be apparent. They should have your consideration, for they are of immense importance.

First of all, it is very clear that the period of railroad building and extensions is over. A great deal of capital is needed and will be used in completing and improving existing railroads and in adding to their equipment and facilities; but the period of building extensions into new territory is over, because there is no encouragement to the investor.

Second, the railroads' cost of living has gone up enormously in the last twenty years. Staple necessities, such as fuel and ties, have increased very largely in cost, and at the same time the standards of service which the public demands have greatly risen. In order to increase their efficiency, railroads have been compelled to use larger locomotives, increase their tons per train; this in turn has created a demand for larger and stronger cars, heavier rail, better roadbed, and so on.

Another important point is that in recent years the general rate of interest has risen. It has risen against the railways as well as against other borrowers, and, therefore, to raise adequate capital the railways must pay, and must, therefore, earn a larger return on capital than formerly was necessary. Railways which a few years ago could sell 3½ per cent. bonds at par cannot now sell 4½ per cent. bonds at par. The net earnings of the railways have not increased in proportion to the increase in the amount that they must pay to get new capital or to refund old securities.

Third, every new public demand of the federal or state government or the municipality puts a burden which is especially heavy to bear by the railway company with small resources. It is perfectly clear to railroad men that the day of the small railroad has absolutely gone. A railroad of less than 500 miles which is not an adjunct to an important mining or manufacturing concern has little show for existence. Although public opinion more or less resents the great railroad corporations and the excessive centralization of authority incident to these large corporations, yet it is perfectly clear that the many exactions of law to which I have briefly referred have had much to do with bringing them into being. In the battle for existence only the strongest have been able to survive.

Fourth, it has been sometimes pointed out that poverty and wealth are largely comparative terms; and certainly this applies to railway corporations just as much as to individuals. The plea of the relatively poor corporation for an advance in rates is unheeded. Our commissions think only of the profits which our richest corporations will make by reason of a possible advance. The fact that the richest corporations represent relatively small proportion of the total mileage; that they are rich by reason of fortunate chance or extraordinary foresight; that many of them are corporations which went through a long struggle in their early history and only after bankruptcy were put upon a paying basis, is forgotten. The very complexity of all these questions points clearly to the principle that the public should more and more depend on expert knowledge in the regulation of the railways, and not attempt this regulation by annual legislative enactments.

Fifth, the greatest hope of the railways and the public in the future lies in intelligent regulation. Railway officers whom I meet and talk with do not in the least fear the results of regulation by commissions free from political pressure, with a fair knowledge of the facts. Our experience is that these commissions, as they come to know the problem better, are more and more willing to understand the railroad man's point of view, and, as we think, deal fairly with us. One of the great troubles is that while the public and the legislatures have created these commissions on the theory that they will

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be most competent to solve the problems of public regulation, the public and legislatures will not refrain from interfering with the work of the commissions. In many states the legislatures or the people by referendums have adopted laws to reduce rates or impose unreasonable restrictions or burdens on the railways when the legislation was openly opposed as unreasonable, unjust and harmful by the commissions. The public shows too much of a disposition to disregard injunctions of experts to be fair and moderate, even when they proceed from its own experts, and to trust and follow only those public men who advocate radical and even violent measures. We are not blind to the danger which lies in the public clamor for better service and more exacting requirements. It sometimes seems as if every man's hand were against us, and as if few men in public life could be found to possess the requisite courage to withstand the pressure; but my opinion is that while the public is slow in making up its mind, it finally comes to a right conclusion and the reaction is all the more effective when it does come. The time is sure to arrive when the public will see that if there isn't a fair profit in railway operation the development is bound to cease, because capital will seek other and more gainful occupations.

MR. BUSH'S ADDRESS.

As to how the railroads can secure the money necessary to make the improvements and extensions to efficiently provide for the carriage of the existing and increasing traffic, so that all lines of industry may develop and operate to full advantage and our vast tide of commerce still further expand and flow unrestricted to its final haven, is "The Railroad Problem."

As the conditions are today, by reason of not having the means at their command, the railroads, with few if any exceptions, cannot give proper movement to the large volume of existing traffic. This was likewise true in 1906, 1907, 1910 and 1912. The transportation facilities are not keeping pace with the increasing traffic requirements.

Legislation of the most onerous character has in recent years been enacted by federal and state authority, entailing numerous expenditures without any compensatory provision, many of the acts being entirely without beneficial results to the public and only an economic waste. Three or four bills now being urged upon Congress are estimated to involve an expenditure by the railroads within the next four years of nearly a billion and a half dollars.

These many expenses over which the railroad manager has no power of control have steadily increased the unit cost of operation, and as the unit of compensation for transportation service is regulated by federal and state authority, and is more often reduced than advanced, it follows that the unit of profit is steadily decreasing. If these two opposing units of conditions, cost and compensation, are allowed to continue in their course, it means they will meet in time and all profit will be expunged.

It may be thought, however, that the revenue derived from the increased business will more than offset the increased expense Such is the view of the ordinary layman who has given the matter only cursory study. If the roads were not working to their full capacity—that is, if they had unused engines, cars, tracks and terminal facilities, they could to some degree for a time offset the increased expenses by additional earnings, but when as in 1906, 1907, 1910 and 1912, they were burdened with business beyond their capacity, the excess entails an expense much greater than the average cost.

The Interstate Commerce Commission in 1907 declared that the inadequacy of transportation facilities was alarming, yet when the railroads sought to advance their rates in 1910 to enable them to make better provision for the public demands and establish a higher financial credit, the commission would not sanction the advance. The earnings of the roads for the two following years, 1911 and 1912, increased $11,054,000, but the operation, expenses and taxes were swelled $98,544,000, leaving a less net revenue for 1912 than for 1910 by $87,490,000. This loss was equivalent to the impairment of their ability to raise over $2,187,000,000 at 4 per cent.

It is a mistaken conception, though one generally prevalent, that the railroads are over-capitalized and seek to obtain exorbitant rates from the public to pay interest on the excessive capital. The fact is that the physical properties of the railroads could not be duplicated today for anything like the present capitalization. The money of the owners which has not been capitalized, that has been expended on the roads from year to year since their pioneer days, in betterments and improvements, roadbed, equipment and their accessories, has long since absorbed any water there may have been in the securities.

I believe that it can truthfully be said that the causes of complaint in the past against the railroads have been entirely eliminated.

Shippers naturally endeavor to get the lowest rates possible, and from the standpoint of their individual interests they believe that unjust inequalities exist in rates, although such inequalities may be the result of inexorable economic laws beyond the earrier's power to control. In the adjustment of these differences between markets or rival communities, the decision of the commission is almost invariably in the direction of reducing the higher rates to the lower level. In this way there is a constant nibbling at the rate fabric which ultimately will prove as injurious as a wholesale reduction.

The census shows that notwithstanding the large increase in the capital of manufactures of 105 per cent., the net return to the owners on the total of twenty and one-half billions was over 12 per cent. Yet on the railway capital there was nothing paid on three and one-half billions, and less than 5 per cent. on seven and one-half billions. The services of the railroads make secure the most liberal returns on the enormous capital of fifty-nine and one-half billion dollars invested in these two industries, and therefore the manufacturers and farmers should willingly aid in an effort to get the transportation rates advanced. It is of paramount importance to their own continued welfare that they exert themselves in that direction.

The marvelous resources and latent strength of this country are in many respects scarcely trenched upon. Of the total land area of the country 46 per cent. is in farms, and of this land in farms only 54 per cent. is improved. Only 25 per cent. of our great domain is producing anything of value. My friend, ex-Governor Hadley of Missouri, when in office, stated in a public address that the development of Missouri's natural resources had scarcely begun; that there were three counties in the state which had no railroads and seven counties with less than twenty-five miles; and that of the forty-four million acres of land in the state more than one-half had never been touched with a plow. A like statement is applicable in many of our western and southern states. The opening up and cultivation of these undeveloped lands by the building of railroads would give a further impetus to general trade and industry.

There are vast mining lands with their hidden treasures yet awaiting development. The completion of the Panama canal will open to us more directly the trade of the Orient and western South American countries with their hundreds of millions of beings whose wants may be supplied with our merchantable wares.

In all these we have a magnificent vista of possibilities which portends the continual upward trend of our trade and commerce with its concomitant of future steady employment for our people —the desideratum of all governments. The illimitable prospects betoken its continuance if ample provision is made for transportation.

Now, with the present traffic of the railroads reaching the stupendous figures of over 283 billions of units of service, what will the future increase mean if kept up in the ratio of the past?

You all know something of the capacity of the New York Central Railroad, and the magnitude of its operations and transportation facilities. Four per cent. of the volume of traffic now annu-

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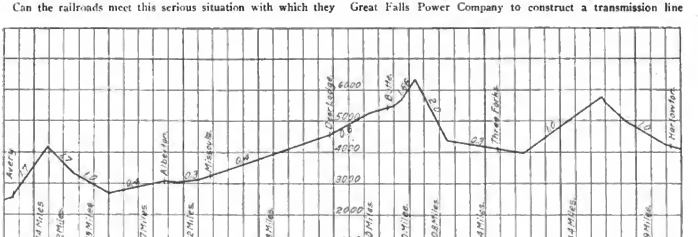
ally moved by our railways would at the present day tax the full capacity of that road, working day and night for one year. The commerce is increasing on an average of 8 per cent. and more per year, and notwithstanding that one-half of this yearly increase would tax the capacity of one of the first railroads in the land, no provision is being made and no provision can be made under the rates now received for transportation service for the proper and safe conduct of this prospective traffic.

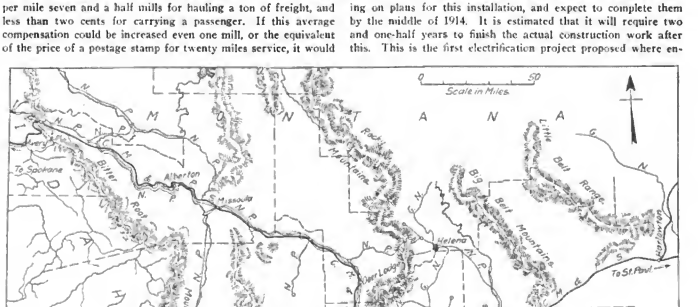
Can the railroads meet this serious situation with which they are confronted? Yes, if allowed to charge a fair compensation for their services. The railroads now receive on an average per mile seven and a half mills for hauling a ton of freight, and less than two cents for carrying a passenger. If this average compensation could be increased even one mill, or the equivalent of the price of a postage stamp for twenty miles service, it would extricate them from all further trouble and anxiety. It is scarcely conceivable that such a slight advance would injuriously affect any trade, industry or person, yet it would be the means of conferring untold benefits upon the entire business interests of the country.

C. M. & ST. P. ELECTRIFICATION THROUGH THE ROCKY MOUNTAINS.

Announcement was made in the *Railway Age Gazette* of January 10, 1913, of the plan of the Chicago, Milwaukee & St. Paul to electrify that portion of its main line to the Pacific coast between Harlowton, Mont., and Avery, Idaho, a distance of 440 miles, and of the granting of a permit by the government to the Great Falls Power Company to construct a transmission line across public lands to carry power for this electrification. Engineers of the electrical manufacturing companies are now working on plans for this installation, and expect to complete them by the middle of 1914. It is estimated that it will require two and one-half years to finish the actual construction work after this. This is the first electrification project proposed where entire engine districts will be covered, and for this reason the operation will be watched with much interest.



Profile of C. M. & St. P. Line Which Is to Be Electrified.



Location of That Portion of the C. M. & St. P. Which Is to Be Electrified.

Between Harlowton and Avery, three mountain ranges, the Belt, Rocky and Bitter Root, are crossed. The maximum grade westbound is 2 per cent. for 20.8 miles on the eastern approach

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to the Rocky mountains, and the maximum grade eastbound is 1.7 per cent. for 24 miles approaching the St. Paul pass tunnel through the Bitter Root mountains. The hardest problem, however, is considered to be presented by the continuous grade of 1 per cent. for 44 miles ascending the western slope of the Belt mountains. One of the conditions imposed upon manufacturers is the construction of locomotives which will pull trains of 2,500 tons up this grade at 20 miles per hour, the heavier grades being operated with pusher locomotives as at present. The necessity for operating the motors at the maximum capacity for this distance is a problem that has not been presented in connection with other work of this nature, and its successful solution will mark an important advance in this field.

In addition to the main line, about 10 miles of side and yard tracks will be electrified, these tracks being mainly located in the freight yards. Besides the yards at Harlowton and Avery, terminals are now operated at Three Forks, Deer Lodge and Alberton. These yards are all small, as trains of 1,700 tons are now hauled across the three ranges with Mikado and Mallet engines without breaking up. Also, as Butte and Missoula are the only cities of importance along this line, comparatively little local traffic originates here, the traffic being almost entirely through business. One important advantage expected from the proposed electrification will be the practical elimination of the intermediate yards at Three Forks and Alberton, as it is planned to run the electric locomotives continuously over two of the present engine districts, or about 220 miles, changing crews midway. In this way the two intermediate yards will be required only for the storage and repair of bad order cars and other minor purposes.

While contracts have been made for the power, the details of the development are still unsettled, depending largely upon the type of installation adopted. Power will be derived principally from Great Falls and Thompson Falls, although these plants are connected with a number of others. The number of points of delivery of power to the line and their location are also dependent upon the exact sources of the power and the type of construction adopted.

VALUATION OF RAILWAYS BY THE GOVERNMENT.

At a meeting of railroad presidents in New York City April 24, Samuel Rea, president of the Pennsylvania Railroad, was chosen chairman of a committee of 18 members, representing the principal railroads of the country, to consider what action should be taken in relation to the act of Congress empowering the Interstate Commerce Commission to make a valuation of the property of all railroads doing interstate business, which act became effective May 1. The members of the committee have not all been finally selected, but there will be seven to represent eastern railroads, seven, the western roads, and four, the southern.

Appointments by the Commission.

The Interstate Commerce Commission has announced the names of the men who have been selected to lay out plans for the work of valuation as noted below. The commission, in its statement, says:

"The first important step will be the selection of a board of engineers who will assist the commission in formulating plans, and who will have direct charge of carrying out those plans in different portions of the country. These engineers will be selected from widely separated localities and from different lines of work and environment, but in each instance exclusively on the basis of individual merit and with due consideration of experience. This board will meet in Washington and proceed immediately, in co-operation and conference with the commission, to outline plans for the engineering features of the work.

"Each member of the commission will participate actively in the preliminary work until all the more important questions of methods and principles which can at this time be determined have been decided, and will keep in the same close touch with this work throughout its continuance.

"The tentative valuations reached by the commission must be submitted to the carriers, to the department of justice, and to the governors of states in which the properties are located, and to such additional parties as the commission may prescribe. In case of protest against a tentative valuation the commission will proceed to hold hearings at which testimony by the most competent of men will be presented, supported by briefs, and, doubtless, by oral argument, prepared and presented by able counsel.

"The commission will select an advisory board of three, composed of men fully competent to advise on the many and large questions presented at the outset and which will arise as the work progresses. Aside from those above referred to, all who are employed in the valuation work will be selected through the medium of the Civil Service Commission. As soon as the working plans have been approved by the commission, forces will be organized for early active operations in the field, and as soon as the work is started along satisfactory lines, the forces will be multiplied and the work be pressed on the most extensive scale feasible, and consistent with efficiency.

"The engineering problems are, from the viewpoint of physical work, the most extensive and will therefore have to be pushed more aggressively during the early stages of the valuation work. Running parallel with that work and supplementary thereto, financial, statistical and economic studies will be taken up. These studies will be begun by parts of the present organization of the commission, supplemented from time to time by such additional help as is found necessary. No doubt many men will be employed in the different branches of this work, but none will be taken on until the need for his services is present.

"A division of valuation has been created which will probably not be fully organized until the field work has made substantial progress. This division will probably be the center of the valuation work after the original inventory has been completed, and in the making of the original valuation it will assist wherever experience shows that it can be advantageously used, and in that way the permanent organization will be developed. Certain sections in the division of valuation will be under temporary supervision of chiefs of existing bureaus; in other words, the commission intends to develop the new organization from its present organization, the members of which are known to the commission and have been thoroughly tried out."

The valuation work will be directed, along lines previously approved by the commission, by Commissioner Prouty.

Three days after the issuance of the foregoing the commission announced the names of the five men selected for the board first above mentioned. They are the following:

R. A. Thompson, now employed in valuation work by the California state commission, and formerly employed in like work by the Texas commission. The California commission has agreed to release Mr. Thompson.

Prof. W. D. Pence, chief engineer of the Wisconsin Railroad and Tax Commissions, and who has for some time been in the employ of the Wisconsin commissions in valuation work.

J. S. Worley, Kansas City, Mo., a consulting engineer in private practice, who has had experience in valuation work.

Howard M. Jones, Nashville, Tenn., a consulting engineer in private practice, and who has had much experience, and who is especially familiar with bridge engineering.

E. F. Wendt, Pittsburgh, Pa., president of the American Railway Engineering Association, and assistant engineer on the Pittsburgh & Lake Erie.

The commission hopes to arrange to have an army engineer added to this board.

PROPOSED SPANISH RAILWAY CONSTRUCTION.—A Spanish newspaper calls for tenders for the construction of a railway line from Barbastro to Boltana, 14 miles. Electric power may be used if necessary. Proposals are also requested for the concession of a railway from Betanzos to Ferrol in the province of Corunna, Spain.

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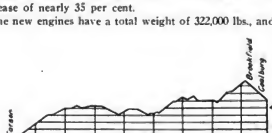
POWERFUL MIKADOS FOR THE LAKE SHORE.

They Are the Heaviest of Their Type and Include Several Interesting Improvements in the Design of the Details.

Heavy freight service on the Lake Shore & Michigan Southern has been handled by superheater consolidation locomotives; after a careful study of the situation it was decided to order twenty Mikados from the American Locomotive Company. Although the tractive effort has been increased but 22½ per cent., as compared with the consolidation locomotives, the tonnage rating for main line work gives the new Mikados 4,300 lbs., while the superheater consolidation locomotives are rated at 3,200 tons. This is an increase of nearly 35 per cent.

The new engines have a total weight of 322,000 lbs., and with a



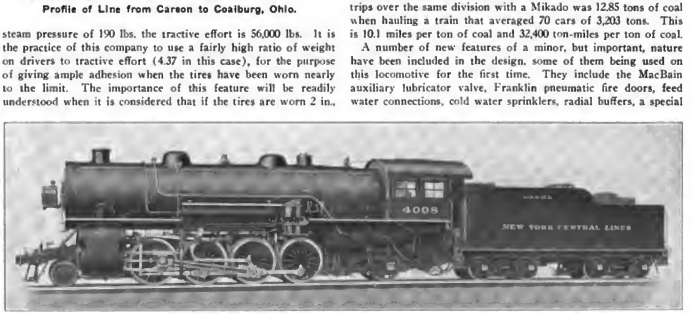
Profile of Line from Carson to Coalburg, Ohio.

steam pressure of 190 lbs. the tractive effort is 56,000 lbs. It is the practice of this company to use a fairly high ratio of weight on drivers to tractive effort (4.37 in this case), for the purpose of giving ample adhesion when the tires have been worn nearly to the limit. The importance of this feature will be readily understood when it is considered that if the tires are worn 2 in., thus reducing the diameter of the wheels by 4 in., and if at the same time the cylinders have increased ½ in. in diameter, the tractive effort will be raised to nearly 62,000 lbs. This reduces the factor of adhesion from 4.37 to 3.95.

An idea of the power of these locomotives can probably best be obtained from a knowledge of the trains they are hauling on the road. A profile of the section between Carson and Coalburg, Ohio, is shown in one of the illustrations. The maximum grade for the direction in which the test runs were made is 16 ft. to the mile. The average train for three runs over this section contained 100 cars having a tonnage of 6,345 tons and was hauled at an average speed, excluding delays, of 14.58 miles per hour. These, of course, are test runs, but a comparison of the tonnage rating of these locomotives and the consolidations in regular service over various divisions, shows what they are doing in every day work. The consolidations with which they are to be compared have a total weight of 239,500 lbs., of which 214,400 lbs. is on drivers. The tractive effort is 45,800 lbs., the cylinders are 25 in. x 32 in., steam pressure 200 lbs. and the drivers 63 in. in diameter. They are equipped with superheaters having about 600 sq. ft. of superheating surface and the evaporating heating surface of the boiler is 3,023.1 sq. ft. On the eastern division out of Collinwood, the consolidations have a tonnage rating of 3,200 tons, while the Mikados are given 4,300 tons. Out of Seneca, the consolidations have a rating of 2,600 tons, while the Mikados are given 3,500 tons. On the Franklin division, out of Youngstown, the consolidations are given 3,400 tons and the Mikados 4,300 tons, while on the Toledo division the consolidations have 3,000 tons and the Mikados 3,500 tons.

In addition to the increase in power which would be expected with a larger engine, there has also been a notable economy of coal and water. Records taken from the Eastern and Michigan divisions give a somewhat unfair comparison which, however, indicates what may be expected under ordinary operating conditions. The average for three trips of a superheater consolidation locomotive having a total weight of 241,000 lbs. showed that it burned 15.9 tons of coal per trip of about 130 miles when hauling a 60-car train of 2,335 tons. This makes 8.17 miles per ton of coal, or 19,100 ton-miles per ton of coal. The average of three trips over the same division with a Mikado was 12.85 tons of coal when hauling a train that averaged 70 cars of 3,203 tons. This is 10.1 miles per ton of coal and 32,400 ton-miles per ton of coal.

A number of new features of a minor, but important, nature have been included in the design, some of them being used on this locomotive for the first time. They include the MacBain auxiliary lubricator valve, Franklin pneumatic fire doors, feed water connections, cold water sprinklers, radial buffers, a special design of pipe clamp, a new water glass shield, and very long main driving boxes.



Heaviest Mikado Locomotive; Lake Shore & Michigan Southern.

Vanadium steel is used for the main frame, driving springs, piston rods, main and side rods, driving axles, trailer springs and main rod straps, as well as for the links, link blocks, pins and bushings in the motion work of ten of the locomotives. The cylinders are also made of cast iron with a content of vanadium alloy.

The firebox is of a normal radial stay arrangement, with two fire doors, and does not include a combustion chamber. Two inch tubes, 21 ft. in length, are used. The superheater elements are included in forty-three 5½ in. superheater flues. An inspection manhole, 16½ in. in diameter, is located just back of the dome and about 2 ft. ahead of the back tube sheet. The cover plate of the inspection manhole carries the safety valve. The stringent requirements of the boiler inspection law make it necessary to frequently enter the interior of the boiler and since, when this is done through the ordinary dome, it requires

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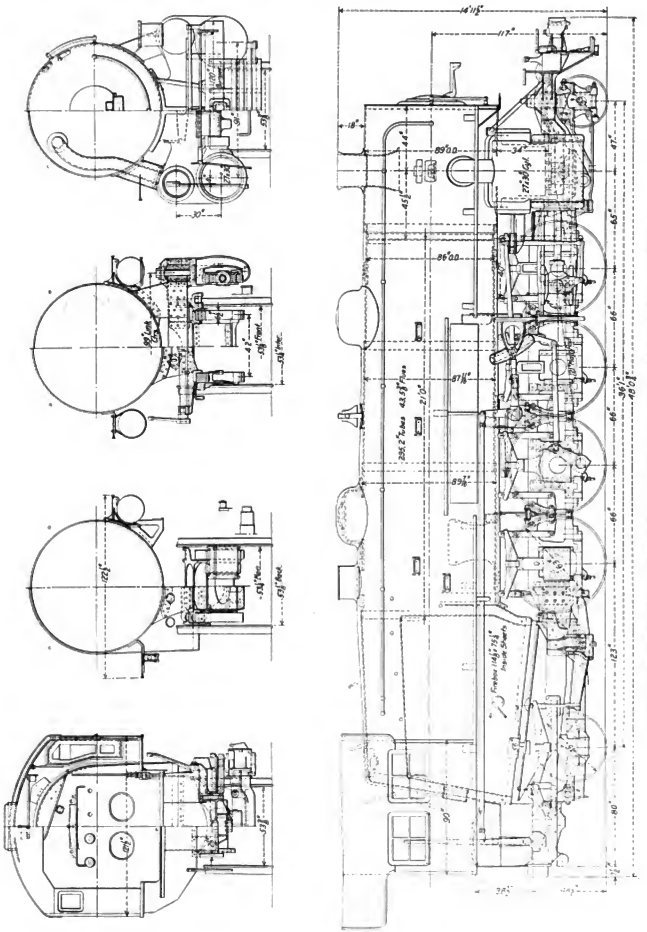

Heavy and Powerful Mikado (2-8-2 Type) Locomotive for the Lake Shore & Michigan Southern.

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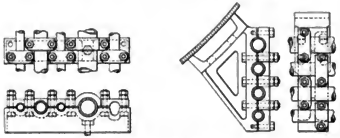
the removal of the throttle stand pipe, this auxiliary manhole is an improvement that is welcomed by the inspector.

Five of the engines are equipped with the O'Connor type of fire door flange and all have a full installation of flexible staybolts with the exception of six longitudinal rows of button head radial stays at the top of the crown sheet. There are four 2 in. combustion tubes placed in each side water leg. These permit air to enter the firebox over the top of the fuel bed and thus promote combustion.

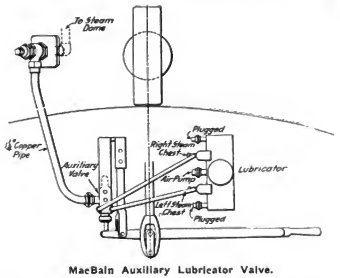
Vanadium cast iron is used in the cylinders, which are cast integral with the saddles and are interchangeable, right and left.



Ayers Pipe Clamp.

Both the cylinders and valves are bushed with Hunt-Spiller gun iron and the piston and valve packing rings and the crosshead shoes are made of the same material.

The locomotives are equipped with an arrangement for forcing the oil through the feed pipes when the throttle is open that was designed by D. R. MacBain, superintendent of motive power. It employs a valve that is held seated by a spring and is so located and arranged that its extending stem will be forced inward by an extension on the throttle lever when the latter is open. This unseats the valve and allows a passage for steam directly from the boiler to the oil pipes leading from the lubricator to each cylinder. It insures the proper lubrication of both

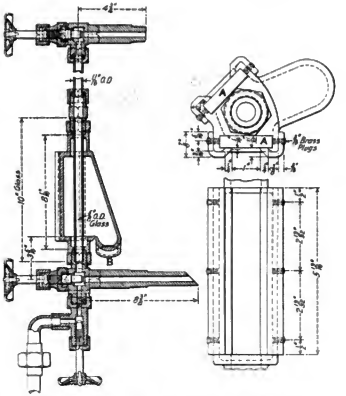


MacBain Auxiliary Lubricator Valve.

cylinders as soon as the throttle is open, but when the latter is closed the lubricator will feed in the ordinary way only.

Special designs of pipe clamps have been prepared by A. R. Ayers, general mechanical engineer of the New York Central Lines West of Buffalo, which not only hold them firmly in place but provide a separate clamp for each pipe so that one may be removed without disturbing the others. The arrangement is most substantial and the pipes will not be subjected to the vibration which so often leads to failure at the joints. Furthermore, the pipe fitters have a definite alignment to work to, as the piping is laid out in the drawing room, and each pipe is in a definite place and can only be attached in that place. This not only makes the work much easier for the pipe fitters, but prevents them doing their work in a haphazard manner.

A new design of water glass shield has recently been made standard on this road. It completely encloses the water glass, the only outlet being at the point marked *B* in the illustration, from which a pipe leads downward through the floor of the cab. There are two glass plates marked *A*, which are 1 13-16 in. x 6 in. x 13-32 in. and are set at an angle of 45 degrees to each other in the shield. This shield completely protects the water glass from danger of accident by external means and also prevents any accidents in case the glass should break of itself, as the steam and water will pass down through the outlet pipe to the outside of the cab and there will be no opportunity for small pieces of glass to fly. As will be seen, it offers no obstruction to the ready application of a new glass when necessary.



Water Glass Shield Used on the Lake Shore Mikados.

General dimensions, weights and ratios of these locomotives are shown in the following table:

General Data.

Tractive effort	56,050 lbs.
Weight in working order	322,000 lbs.
Weight on drivers	245,000 lbs.
Weight on leading truck	27,500 lbs.
Weight on trailing truck	49,500 lbs.
Weight of engine and tender in working order	477,800 lbs.
Wheel base, driving	16 ft. 6 in.
Wheel base, engine and tender	68 ft. 10½ in.

Cylinders.

Kind	Simple
Diameter and stroke	27 in. x 30 in.

Valves.

Kind	Piston
Diameter	16 in.
Greatest travel	6 in.
Outside lap	1 in.
Inside clearance	0 in.
Lead	⅛ in.

Wheels.

Driving, diameter over tires	63 in.
Driving, journals, main, diameter and length	11½ x 22 in.
Driving journals, others, diameter and length	11 x 12 in.
Engine truck wheels, diameter	33 in.
Engine truck journals	6 x 12 in.
Trailing truck wheels, diameter	45 in.
Trailing truck journals	8 x 14 in.

Boiler.

Working pressure	190 lbs.
Outside diameter of first ring	86 in.

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Firebox, length and width	114⅛ x 75⅝ in.
Firebox plates, thickness	⅜ and ⅝ in.
Firebox, water space	4½ in.
Tubes, number and outside diameter	295 2 in.
Flues, number and outside diameter	43 5½ in.
Tubes and flues, length	21 ft.
Heating surface, tubes	4,494 sq. ft.
Heating surface, firebox	246 sq. ft.
Heating surface, total evaporating	4,730 sq. ft.
Superheater heating surface	1,065 sq. ft.
Grate area	59.6 sq. ft.
Smokestack, height above rail	14 ft. 11½ in.

Tender.

Frame	Cast Steel
Wheels, diameter	36 in.
Journals, diameter and length	5½ x 10 in.
Water capacity	7,500 gals.
Coal capacity	12 tons

TRAIN ACCIDENTS IN MARCH.[1]

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of March, 1913:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
†14.	Union Pacific	Gothenberg.	rr.	P. & P.	4	13
22.	Chi., M. & St. P.	Haskell, Mont.	bc.	P. & P.	0	5
23.	Kanawha & M.	Kanauga.	bc.	P. & P.	0	12

Derailments.

Date.	Road.	Place.	Cause of Derailm't.	Kind of Train.	Kil'd.	Inj'd.
2.	Texas & Pacific	Finlay, Tex.	b. rail.	P.	0	8
5.	Central Georgia	Athens.	unx.	P.	0	2
9.	Louisville & N.	White's.	eq.	P.	0	6
14.	Chic., M. & St. P.	Hokah, Minn.	washout.	P.	1	1
15.	Lake Shore & M. S.	Toledo.	unx.	F.	1	1
15.	Atlanta, B. & A.	Warm Springs.	d. bridge.	P.	2	0
18.	Minn. & St. Louis	Marshalltown.	unx.	P.	0	14
18.	Georgia S. & F.	Bonaire.	b. rail.	P.	0	6
20.	Chi., Peoria & St. L.	Sudduth.	b. rail.	P.	0	16
22.	Boston & M.	Lyndonville.	d. bridge.	P.	0	0
23.	Illinois Central	Memphis.	acc. obst.	P.	0	1
23.	Cleve., C., C. & St. L.	St. Paul.	flood.	P.	0	0
25.	Cleve., C., C. & St. L.	W. Liberty.	flood.	P.	0	0
25.	Wheeling & L. E.	Brighton.	flood.	P.	3	0
25.	Wabash	Alderney, Mo.	slide.	P.	1	5
30.	New York Central	Yonn.	washout.	F.	0	0
30.	Boston & M.	East Putney.	washout.	F.	1	6
30.	Chicago & N. W.	Bagley, Mich.	b. rail.	P.	0	5
31.	Southern	Conover.	b. rail.	F.	3	0

Other Accidents.

Date.	Road.	Place.	Accident.	Kind of Train.	Kil'd.	Inj'd.
3.	Penn.	Rahway.	boiler.	P.	1	1
29.	Texas & Pacific	Handley.	boiler.	F.	1	2

The trains in collision at Gothenberg, Neb., on the 14th were eastbound passenger trains No. 12 and No. 4. No. 4 was standing at the station and was run into at the rear by No. 12. The collision occurred at 3:37 a. m. in a blinding snow storm. Four passengers were killed and 11 passengers and two trainmen were injured, the killed having all been in the sleeping car at the rear of train No. 4. The line at this point is equipped with automatic block signals, and the signal west of the station is situated 1,100 ft. in the rear of the point where the train was standing. Train 12 had disregarded a distant signal as well as the home signal 1,100 ft. back of the stopped train.

The trains in collision on the Chicago, Milwaukee & St. Paul, at Haskell, Mont., on the 22d of March, were westbound freight No. 75 and eastbound freight No. 76. The trains were not running very fast, but both engines and several cars were damaged. Five trainmen were injured. The men in charge of the eastbound train had overlooked a meeting order received at Drummond, the next station west of Haskell.

The trains in collision at Kanauga, Ohio, on the 23d, were northbound passenger No. 5 and southbound passenger No. 2. Train No. 5 entered the main track when the switch was set against it, and got in the way of No. 2. Eight passengers and four employees were injured, none of them seriously.

The passenger train derailed near Finlay, Tex., on the morning of the 3d, was a westbound special carrying members of the Chicago Grand Opera Company. Eight employees were slightly injured. The passengers were severely shaken, but none seriously injured. The cause of the derailment was a broken rail.

The train derailed at Athens, on the morning of the 5th, was an eastbound freight. The caboose and three cars fell through a trestle bridge about 45 ft. to the bed of the river below. The conductor and one brakeman were injured.

The train derailed near White's Station, Ky., on the 9th, was northbound passenger No. 38, drawn by two engines. Three cars were ditched and overturned. Six trainmen were injured, but the passengers all escaped serious injury. The cause of the derailment is believed to have been the dropping of brake rigging of the tender of one of the two engines.

The train derailed near Hokah, Minn., on the morning of the 14th, was eastbound passenger No. 8. It was running slowly, but the fireman was killed. The engineman was injured, but no other person was hurt. The train ran off the track at a point where the roadbed had been undermined by a heavy shower. The surface looked all right to the track watchman. No trouble had been experienced at this place before.

The derailment at Toledo, Ohio, on the 15th, occurred in the yard at Air Line Junction about 4 a. m. A switching engine jumped the track while running at moderate speed. The engineman jumped off and was killed, and the fireman jumped off and was badly injured.

The train derailed near Warm Springs, Ga., on the 16th, was westbound passenger No. 23. The engineman and fireman were killed. The engine and first car fell through a trestle bridge which had been weakened by a flood.

The train derailed near Marshalltown, Ia., about 3 a. m., on the 18th, was the northbound Twin City Limited, and three passenger cars were overturned. Two of these cars took fire, and were burnt up, but not until all passengers had got out of them. Twelve passengers and two trainmen were injured. The cause of the derailment was not determined. The train was running on straight track at about 48 miles an hour.

The train derailed at Bonaire, Ga., on the 18th, was the northbound Dixie Flyer, and three sleeping cars and one passenger ear were ditched. The train was running at moderate speed and only six persons were injured. The cause of the derailment was a broken rail.

The train derailed near Sudduth, Ill., on the night of the 20th, was a northbound passenger, and three passenger cars were ditched. Twelve passengers and four trainmen were injured. Two of the ears took fire, but the flames were quickly extinguished by the express messenger, A. D. Campbell, with a fire extinguisher. The accident was due to a broken rail, eight ft. of which broke into many pieces. The fault was piping. The rail was 70-lb., made in 1890.

The train derailed at Memphis, Tenn., on the night of March 23, was northbound passenger No. 4, and one trainman was seriously injured. The two engines attached to the train were overturned. None of the passenger cars went off the track and no passengers were seriously injured. The cause of the derailment was sand, washed on the track at a point where tracks were being elevated.

The train derailed near St. Paul, Ind., on the 25th, was a westbound passenger, and the cause was the unprecedented flood prevailing at that time, which had caused a bad washout. The train was running slowly, but the engine and one car fell into Hog Creek. The passengers and trainmen escaped with slight injuries.

The train derailed near West Liberty, Ohio, on the morning of the 25th, was an express of the Pennsylvania Lines which had been sent over the C. C. C. & St. L., because of a break in the track of the Pennsylvania. The cause of the derailment was the unprecedented flood prevailing in the Mad river at that time. The train was running at low speed, the engine backing. The derailment occurred at a bridge which was in position, though one abutment had been washed out. A sleeping car

[1] Abbreviations and marks used in Accident List:
rr, Rear collision——bc, Butting collision——rc, Other collisions——b, Broken——d, Defective——und, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——m, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

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next to the engine was partly submerged. The passengers in this car, and also the trainmen, had narrow escapes from drowning, the engine having been entirely submerged; but all came out with their lives and with only slight injury.

The train derailed at Brighton, Ohio, on the 25th, was an eastbound freight. The cause of the derailment was the unprecedented flood which prevailed at that time, and which had caused the failure of a trestle bridge. The engineman, fireman and one brakeman were killed.

The train derailed near Alderney, Mo., on the night of the 26th, was westbound passenger No. 1. The fireman was killed, and the engineman and four other persons were injured. The cause of the derailment was a landslide in a cut, which occurred at the moment the engine passed.

The derailment at Yosts, N. Y., on the 30th, was occasioned by the unusual floods prevailing at that time. The accident was reported in the *Railway Age Gazette* of April 4, with an illustration.

The train derailed on the Boston & Maine near East Putney, Vt., on the 30th, at 4:25 a. m., was one of the Central Vermont, consisting of a locomotive and a caboose. Both the engine and the caboose fell into the Connecticut river and the fireman was drowned. Six other trainmen escaped with slight injuries, although some of them narrowly escaped drowning. The cause of the derailment was the undermining of the roadbed by high water.

The train derailed at Bagley, Mich., on the night of the 30th, was an express train running south. The engine and first three cars were ditched. Three trainmen and two passengers were injured. The derailment was caused by a broken rail.

The train derailed near Conover, N. C., on the morning of the 31st, was westbound freight No. 73. The engine was overturned and the engineman, fireman and conductor were killed. The cause of the derailment was a broken rail. It was broken into 17 pieces. The fault was a transverse fissure.

The locomotive which was wrecked by the explosion of its boiler at Rahway, N. J., on the 3d, was that of a westbound special passenger train. The engineman and fireman were injured, the former fatally.

The locomotive of a freight train was wrecked at Handley, Tex., on the 29th by the explosion of its boiler. The engineman was killed and the fireman and one brakeman were injured. The cause of the explosion was low water.

Canada.—A passenger train of the Wabash was derailed at Cayuga, Ont., on the third of March, and five passenger cars fell down a bank. The number of passengers injured was twelve or more.

Electric Car Accidents.—Of the accidents to electric cars reported in the newspapers as occurring in the United States in the month of March, three are charged with fatal results. In a collision at Sunbury, Pa., on the sixth, a motorman was killed. In a derailment at Cincinnati on the 12th, one person was killed and eight injured; and at Youngstown, Ohio, on the 13th, a street car which was run into by a locomotive was wrecked and one person was killed and 23 were injured.

NEED OF RAILWAYS IN INDIA.—The northeastern districts are the wealthiest in Eastern Bengal and have up to the present time been sadly neglected in the matter of railway communications, the only railway being the Dacca Mymensingh branch of the Eastern Bengal State Railway, which does not adequately meet their wants. The whole district is under extensive jute cultivation, and it is with the object of securing this traffic that both the Eastern Bengal and the Assam Bengal railways are putting forward extensive proposals for feeder lines. By the construction of the Singhjhaai Fulchari branch the Eastern Bengal Railway has already entered the district, and contemplates another branch from Serajgunj to Sara, which will give a more direct route to Calcutta on the completion of the Sara bridge, a much needed improvement.

AN ELECTRIC ROCK DRILL.

In the construction of the Duluth, Winnipeg & Pacific, between Virginia, Minn., and Duluth, which was completed last year, a 469 ft. tunnel was driven through a very hard grade of stratified rock known as dacite. The drilling in this rock was successfully handled by 8 electrically driven rock drills made by the Fort Wayne Electric Company, Ft. Wayne, Ind. These drills are of the rotary hammer design, the drill mechanism consisting of two parts, a revolving helve containing the hammers and the chuck mechanism for holding and rotating the steel. Within the helve are two chambers in each of which a solid steel hammer floats freely. As the helve revolves the hammers are thrown outward by centrifugal force, and at each revolution, strike a blow upon the projecting head of the drill steel cap which transmits the force of the blow to the drill steel. The hammer helve revolves at a speed of 850 r. p. m., each

Electric Drill Working from a Tripod.

hammer delivering a blow at every revolution. The retention of the drill steel is effected by a heavy worm gear reduction driven from the helve shaft.

It is necessary in all hammer type drills to employ some method for removing the cuttings from the hole that is being drilled. A simple method of effecting this purpose is used with this electric drill, the drill steel being designed with spiral threads to act on the principle of the spiral conveyor. These veins or ribs, which give it an auger-like appearance, have nothing to do with the drilling, their sole function being to remove the cuttings from the hole.

NEW LOCOMOTIVE SHOPS FOR VICTORIA.—The Victoria railway commissioners have decided to build locomotive workshops at Bendigo and Ballarat. The preparation of the plans is being expedited and tenders will shortly be called for the work. The approximate cost of the equipment at each workshop will be about $140 000. It is believed that the work will be rapidly pushed to completion.

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WEIGHING METHODS ON AN EASTERN TRUNK LINE.

The defects in the present methods of weighing carload freight and in the installation and maintenance of track scales have been given much prominence within the past year. In view of the faulty conditions which have been exposed on several roads, the description of the organization and method of handling the scales and weighing on an eastern trunk line, as presented in one of the hearings before the Interstate Commerce Commission, will show what some roads are doing and may serve as a guide for other roads which have not devoted as much study to this subject.

All matters pertaining to scales and weighing are under the direction of a special officer, who reports to the general superintendent of transportation. This officer has a staff composed of four special inspectors, and a scale inspector for each of the six grand divisions, four of whom in turn have assistant inspectors. The duties of the special inspectors are not primarily to test scales, but to investigate complaints on the ground when necessary, to see that scales are properly maintained and operated, and that instructions with regard to weighing are carried out and to check L. C. L. freight. Irregularities noted by these inspectors are reported through the officer in charge of scales and weighing to the division superintendents for correction, or if of sufficient importance, are taken up with the general superintendent.

The scale inspectors have charge of new installations, and all renewal and repair work on their respective divisions, which work is done by the division forces under their direction. The cleaning and routine inspection of the scales is done by forces under the control of the division superintendent, who are instructed in their duties by the scale inspectors.

Programs of proposed scale expenditures are prepared by the officer in charge of scales and weighing, and submitted to the engineer of maintenance of way for approval. All requisitions for scale material and plans for installation and renewal of scales are approved by the officer in charge of scales and weighing, subject to the final approval of the engineer of maintenance of way. New scales are installed by forces under the division engineer, supervised by the scale inspector. The general instructions for the installation of a 50 ft., 150-ton, suspension platform track scale, which is standard for new installations on this road, provide that the scales be supported on concrete piers and walls of modern approved design. Special attention is given to keeping all pits as dry as possible, and where the scales are installed under conditions where seepage of water through the walls may occur the outside of the walls is waterproofed. Also at points where there is not sufficient fall from the pit for drainage, sumps are provided outside of the pits at an elevation such that the pits will drain into them. A scale shop is maintained for the purpose of making all necessary scale repairs; this shop being in charge of a competent scale mechanic as foreman.

Careful attention has been paid to the securing of accurate test weights. A 50-lb. weight and other smaller weights of tobin bronze verified by the government Bureau of Standards at Washington, to within Class A tolerance, form the basis from which other weights have been scaled. A two section track scale of 100,000 lb. capacity and sensitive to 1 lb. has been installed on a concrete foundation inside of the scale shop. This scale has been sealed by test weights to the weight of the heaviest test car. Six all-metal scale cars varying in weight from 30,000 to 50,000 lbs. each are tested on this scale approximately every 60 days.

The practice is to test the track scales owned by the road, as well as those owned by individuals located along its lines whose weights are accepted for billing, with one of these scale test cars approximately every 60 days. After the scale has been adjusted by sections to the weight of the scale car, it is also tested with a loaded car on the scale with the test car wherever the length of the scale permits. A number of scales have also been tested within the past year with two test cars of different weights. In addition to the tests with the scale car, the instructions also provide that a test shall be made each week by weighing a heavily loaded car with a short wheel base on each end and on the center of all track scales. When the scale is equipped with an automatic recording attachment, the car is weighed standing on the trip end of the scale and also in motion with the automatic attachment connected. A daily test is also made in the same manner on each scale equipped with an automatic recording attachment. Complete reports of these tests are made to the officer in charge of scales and weighing. If they show an error above a reasonable tolerance the scale inspector makes an immediate inspection and tests the scale with the scale car if necessary. To check the work of weighmasters it is required that five cars weighed on certain scales be weighed on a certain number of other scales each month and the results reported to the officer in charge of scales and weighing.

The general rules for the installation, maintenance and use of scales are printed, framed and posted at each track scale on the system so that all employees concerned may be familiar with them. These rules outline the methods of ordering and making repairs, the use of the scales, dead rails, methods of weighing in motion, making tests, etc. Whenever a part is broken, the weighmaster advises the superintendent and also the officer in charge of scales and weighing, giving the location and number of the scale and the name and number of parts broken. A complete record of all scales on the system is kept by the officer having jurisdiction over scales and weighing, and upon receipt of this information repair parts may be sent at once if kept in stock or the scale ordered sent to the shops if it cannot be repaired on the ground.

Rules governing the weighing of carload and less-than-carload freight have been covered in two circulars; one relating to the weighing of property, except coal and coke, and the other to the weighing and waybilling of coal and coke. These circulars have been issued to all agents interested, and not only contain in

Chart Showing Scale Stations Weighing and Waybilling Coal.

Mine	Weighed and Waybilled at Eastbound	Weighed and Waybilled at Westbound	Waybills headed from
Eastern Division			
Clarion	Clinton	Shawnetown	Mines
Piedmont	Davis	Charleston	.....
Central Division			
Phoenix	Fairmore	Newark	C. & P.
Jamestown	Feru	Princeton	Bebington
Western Division			
Jackson	Lebanon	Keyser	C. & P.
Tankerburg	Browns	Jackson	Keyser

Fig. 1—Scale Chart for Use of Agents in Billing Coal and Coke.

Scale Station Reference Table—Southwestern Division.

To	From Nelson to Canton, both exclusive.	Canton.	Canton to Akron, both exclusive.	Akron to Columbus.	Columbus to Piqua, both exclusive.	Piqua.	Piqua to Shawnetown, both exclusive.	Shawnetown.	Shawnetown to Lorain, both exclusive.
Nelson and points east	53	102	53	17	53	66	53	48	53
Nelson to Canton, both exclusive	..	102	102	17	17	66	17	48	17
Canton	102	..	102	17	102	66	102	48	102
Canton to Akron, both exclusive	102	102	..	17	17	66	17	48	17
Akron to Columbus	17	102	17	..	17	66	17	48	17
Columbus to Piqua, both exclusive	17	102	17	17	..	66	66	48	66
Piqua	66	102	66	17	66	..	66	48	66
Piqua to Shawnetown, both exclusive	17	102	17	17	66	66	..	48	48
Shawnetown	48	102	48	17	48	66	48	..	48
Shawnetown to Lorain, both exclusive	17	102	17	17	48	66	48	48	..

Fig. 2—Scale Chart Showing Weighing Stations for Car Load Merchandise Shipments.

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SCALE STATIONS—NUMERICALLY ARRANGED.

Index Nos.	Station.	Length. Feet.	Capacity. Pounds.
17	Akron	42	200,000
48	Piqua	50	200,000
53	Neilson	50	200,000
66	Barstow	50	160,000
102	Canton	50	300,000

Fig. 3—Index Numbers and Data Regarding Scale Stations Referred to on Chart for Car Load Merchandise Shipments.

coal and coke circular also provides rules for re-consignments, waybilling, deliveries, etc.

The feature of these circulars which deserves special attention is the method of insuring that cars will be weighed and the weights properly reported. Both circulars contain charts indicating at what scales freight from each station shall be weighed, and the forwarding agent is required to insert the proper scale station on waybills accompanying each shipment, making him

TACK.

THE BOSTON & CHICAGO RAILROAD CO.

Car Initial ..... No. .....

(Kind) Car (Use) ..... Capacity .....
(Box, steel or wood hopper, drop-bottom or flat-bottom gondola.)

MEMORANDUM FOR AGENT AT

(Name of Scale Station.)

From .....
(Name of Mine or Station.)
..... 191

Consignor, ...

Consignee, ...

Destination .....

Via .....

Contents .....
(If Coal, state kind.)

(Show if car is loaded full.)

For Weighmaster's Bill Only.

WEIGHTS { Gross ..... Tare ..... Net .....

Freight .....
(Show if prepaid or collect.)

From, inbound to
Collect Charges .....

(Shipper's Signature.)

SEE INSTRUCTIONS AND FORM NUMBER ON OTHER SIDE

Fig. 4—Scale Card, Form 423, for Coal and Coke Shipments.

Car No. .....

To .....

Via { ..... TRAIN

Weigh at .....

Lading .....

Combined Weight of Car and Lading for Engine Rating ..... Tons.

Boston & Chicago R. R. Co.

ORDINARY FREIGHT CARD WAY-BILL.

From .....

Consignor .....

Consignee .....

Destination .....

Via .....

MARKED CAPACITY OF CAR. ..... Lbs.	ESTIMATED WEIGHT. (See Tariff Estimation.) ..... Lbs.
For carload property, indicate by cross (X) mark below two weights now obtained	Gross ..... Lbs.
1. Railroad Scale Wt.	Tare ..... Lbs.
2. Tariff Estimated Wt.	Net ..... Lbs.
3. Authorized Shipper's Wt.	WEIGHED AT
4. Joint Weighing Bureau Wt.	.....
5. Foreign Line Wt.	 191
When buying the weight is used also mark 1, 2, 3 or 4 when possible. When weights other than above are used, such leaves are obtained.	WEIGHED BY
	DATE OF SHIPMENT.

Agent .....

Transferred to ..... Car No. .....

At ..... Date 191

Fig. 4a—Card Waybill, Form 115, for Merchandise Shipments.

Car No. .....

Weigh at

.....

To .....

Via { .....

From .....

Lading .....

TO BE FILLED IN BY FORWARDING AGENT.

Boston & Chicago R. R. Co.

MERCHANDISE SCALE CARD.

Weighed at .....

Date .....

Gross .....

Tare .....

Net .....

TO BE FILLED IN BY WEIGHMASTER.

Weighmaster.

Fig. 4b—Merchandise Scale Card, Form 121.

structions for the weighing of freight, but also how the weight shall be obtained when impossible to weigh, when obtained in any other way than weighing on the railroad track scales, or where necessary to deviate from the regular instructions. The entirely responsible for this, instead of leaving it to the judgment of train-conductors or way-masters en route. All cars must be weighed at the station specified, unless otherwise ordered by the division superintendent, and cars arriving at des-

THE BOSTON & CHICAGO RAILROAD CO.

COMBINATION CARD AND REVENUE WAY-BILL FOR COAL OR COKE.

CONTENTS (Kind of Coal or Coke.) | INITIAL | NUMBER

W. B. No. ..... Date W. B. ..... Date Loaded .....

From ..... To ..... Final Dest'n .....

Consignor ..... Consignee .....

Via ..... R. R., Via ..... R. R., Via ..... R. R., Via ..... R. R.

Via ..... R. R., Via ..... R. R., Via ..... R. R., Via ..... R. R.

WEIGHT OF CAR AND CONTENTS | CAPACITY OF CAR. | RATE AND DIVISIONS. | FREIGHT | ADVANCES | PREPAID

Tons ..... Lbs. | Gross .....

W. B. made at ..... Agt. | Tare .....

Trfd to ..... Car No. | Net .....

Trfd at ..... Date | Min. .....

THIS IS THE ONLY WAY-BILL THAT WILL BE ISSUED FOR THIS CAR. | Tons .....

Fig. 5—Combination Card and Revenue Way-Bill, Form 402, Used for Coal and Coke Shipments.

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tination unweighed must be reported to the superintendent if they have passed a scale station en route.

Coal and coke shipments are forwarded from mines or ovens on a scale card, shown as form 423, which is made out by the shipper and serves the purpose of a shipping order. This card is either tacked on the car or given to the conductor and authorizes the movement of the car from the mine or oven to the scale station. After the car is weighed at the scale station, the weights are inserted on the card, or where an automatic weighing machine is installed, are stamped directly on the scale card. A combined card and revenue waybill form 402 is made up from the scale card, and the latter is systematically filed as a permanent record.

The card and revenue waybill provides for the movement of the car from the scale station to destination, and is the only waybill made. The part which goes with the car is of cardboard, while the copies to be distributed to others interested are made on thin paper, all being written at the same time on special typewriters which have been provided. A special carbon paper is used to prevent blurring of waybills.

A few carload commodities, such as lime-stone, are handled in the same manner as coal and coke, but for most carload merchandise shipments, card waybill form 115 is made up by the originating agent, showing all information except the weight. This is attached to the merchandise scale card, form 121, printed on blue paper, which form is also filled out except the weight. This is a distinctive form and insures the car being weighed at the proper scale station. The originating agent also makes out a revenue waybill, leaving the weight blank, which is either forwarded by mail to the scale station or attached to the card waybill. When a car is weighed at the scale station, the weights are inserted on the card waybill and scale card, and a correction is issued by the agent at the scale station, a copy being attached to the revenue waybill, and both sent to the agent at destination. Copies of the correction are also sent to the forwarding agent, auditing department, and others interested, while the merchandise scale card is also returned to the forwarding agent. A distinctive feature of both the card waybill and the revenue waybill is the information showing how the weight has been obtained and when weighed on railroad scales, where the service was performed, and the date, with the signature of the weighmaster.

The investigation of weight discrepancies and claims is handled through the scale department, which form its record of railroad scales, conditions surrounding the weighing, and the facilities for expert investigation of shippers' and consignees' scales, tends to thoroughness and consistency. The handling of all matters pertaining to scales and weighing in one department results in closer supervision, and any defects are discovered promptly and remedied.

THE VALUE OF COST STATISTICS.

In an informal talk before the Traffic Club of Chicago on April 22, Commissioner B. H. Meyer, of the Interstate Commerce Commission, discussed the subject of cost data in connection with some evidence presented before him at a hearing on Chicago grain switching rates, in which he spoke in part as follows:

"It is an old, long-drawn-out controversy, this question of cost and its significance. But if I, as a member of the Interstate Commerce Commission, could have before me just those costs and traffic data which appear in this proceeding, and which I imagine some of the witnesses have been grouping, it would be of very material assistance. And I wish to suggest whether it might not be a good thing for us to put aside, for a moment at least, all preconceived notions as to the significance and value of that kind of data, and re-examine that old question of cost and see whether there is not something there that may be of value to us. I am not talking about the man who says cost makes rates. I assume that any one who is very familiar with the subject won't talk that kind of thing. At any rate, I have never heard that that was a debatable question. But isn't this one of the questions: Has cost anything to do with these controverted matters that come before the Commission, and that you gentlemen are busy in presenting? And if cost has anything to do with them, let me have it. I imagine no one will say cost has nothing to do with them, and the only alternative then is, let us all arrive at the facts and use them like intelligent men. Let us not make all the analogies we can, but let us use the data intelligently.

"And the same with traffic statistics. We are constantly in need of definite information regarding the volume of movement between certain points. Now, in any event it is a tremendous task, and it may be a very expensive thing, to get those statistics. I feel—and I am sure my colleagues feel the same way about statistics that involve excessive cost—that the expense of collecting them may be in excess of their value. But if we can get these things they will be of very great assistance to us. We will develop in every railway property, in every railway business, a sober statistical and traffic consciousness which will serve you traffic men and you attorneys, and possibly also you operating men."

TWO COMMERCE COURT DECISIONS.

Shreveport Case.

*Decision by Presiding Judge Knapp.**

The question to be decided in this case has been so thoroughly discussed by the commission, and kindred questions have been so fully considered in various cases recently decided or now pending in other courts, that little can be profitably said beyond a statement of our conclusions.

There is no dispute about the material facts, and they are easily comprehended. The interstate rates of petitioner from Shreveport, La., to Dallas, Tex., and intermediate points on its line, are very much higher in proportion to distance than the state rates of petitioner from Dallas to the same intermediate points in the state of Texas. For example, the rate on farm wagons from Shreveport to Marshall, a distance of 42 miles, is 56 cents per 100 lbs., while the rate from Dallas to Marshall, a distance of 147 miles, is only 36.8 cents. Under such an adjustment of freight charges it is obvious that Shreveport is severely if not fatally handicapped in its competition with Dallas for the trade of the intervening territory, most of which is situated in the state of Texas. It appears that operating conditions are substantially the same throughout the entire line and in both directions between these two cities, and petitioner makes no claim that the disparity in rates can be justified by differences in the cost of transportation. Indeed, it seems to be conceded—and certainly no other inference is permissible—that the rate situation here in question would clearly constitute undue prejudice to Shreveport and undue preference to Dallas, within the meaning of the third section of the act, provided that section be applicable, if the intrastate rates from Dallas, like the interstate rates from Shreveport, were voluntarily established by the carrier. But while the discrimination in fact against Shreveport is admitted, the contention is made that as matter of law it is not and cannot be undue, or otherwise in violation of the act, because the intrastate rates in question are made by authority of the state of Texas and the petitioner is under legal compulsion to observe them. In other words, it is insisted that a violation of the third section cannot be predicated upon a rate relation, however unjust, which is brought about, not by the voluntary action of the carrier, but by the command of a state which the carrier is constrained to obey.

In this suit the order of the commission is sought to be set aside only so far as it affects commodity rates, and the commission has found, in effect, that petitioner's interstate commodity

*Though this decision is abstracted the original language is preserved insofar as possible.

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rates from Shreveport to these Texas destinations are reasonable rates for the service rendered. From this finding, in connection with other facts stated, it seems necessarily to follow that the intrastate commodity rates of petitioner from Dallas to the same destinations, which the Texas commission has prescribed, are materially less than petitioner is justly entitled to charge; and this involves the further consequence that the Texas commission, by imposing upon petitioner lower rates than it should rightfully receive, has placed an undue burden upon interstate commerce, and thereby obstructed the freedom of its movement. If this is a correct analysis of the situation, as is virtually admitted, it can hardly be doubted that the action which produces such a result, whether intended or otherwise, is in derogation of the power and authority of congress under the commerce clause of the constitution.

The right of a state to control the movement of its internal commerce and the instrumentalities employed in such movement is not unlimited, as the supreme court has repeatedly declared. In the first case which involved the scope and meaning of the commerce cause, *Gibbons* v. *Ogden* (9 Wheat., 1), the line of demarkation between state and federal power was defined by Chief Justice Marshall. His definition has been uniformly accepted and the language itself quoted with approval in a number of cases.

In the light of these decisions, and many others of similar import, it seems clear to us that congress is invested with ample power to prevent or remove such a discrimination as is here considered. This is not seriously disputed by petitioner, but the contention is pressed that congress has not exerted its power, even if the power be possessed, to the extent necessary to reach this particular kind of discrimination, and therefore the commission's order should be set aside because in excess of its authority.

The power which congress has exercised in this regard finds expression in the third section of the act to regulate commerce, as follows:

> That it shall be unlawful for any common carrier subject to the provisions of this act to make or give any undue or unreasonable preference or advantage to any particular person, company, firm, corporation, or locality, or any particular description of traffic, in any respect whatsoever, or to subject any particular person, company, firm, corporation, or locality, or any particular description of traffic, to any undue or unreasonable prejudice or disadvantage in any respect whatsoever.

It would be difficult to frame a more comprehensive and unqualified declaration. It applies to all interstate railroads and makes unlawful every act which operates to the undue prejudice of any locality. Taken by itself, the paragraph quoted brings within its condemnation the rate adjustment here involved. And it would follow from this view of the section that the commission had authority to correct the ascertained injustice by making the order sought to be enjoined. The opposing view is based upon two general grounds which present the real controversy in this case.

In the first place, it is said that the provisions of the third section, above quoted, are to be read in connection with the proviso in the first section, and that this proviso defines and limits the power which congress intended to exercise by expressly excluding transportation "wholly within one state." In other words, the proviso is claimed to be an exception which exempts from regulation under the act the rates on intrastate traffic, and therefore deprives the commission of authority to found a violation of the statute upon the relation between state and interstate rates, no matter what may be the effect of that relation upon the movement of interstate traffic. The proviso reads as follows:

> Provided, however, that the provisions of this act shall not apply to the transportation of passengers or property, or to the receiving, delivering, storage, or handling of property wholly within one state and not shipped to or from a foreign country from or to any state or territory aforesaid.

The intent and meaning of this proviso has been quite fully discussed by this court in *Denver & R. G. R. Co.* v. *Interstate Com. Com'n* (195 Fed., 968), and a conclusion therein reached substantially adverse to the contention here considered.

Adhering to the views then expressed we hold that this proviso is a mere disclaimer of any intention on the part of congress, in enacting the act to regulate commerce, to exceed its constitutional power, and that it was not designed to limit or confine the power which congress could exercise—and, in our opinion, has exercised—in respect of such matters as are here in dispute. If this construction be correct, it follows that the proviso in no way prevents the application of the third section to the facts of this case, and therefore it was within the authority of the commission to make the order in question.

It is argued in the second place, as above stated, that the "undue preference" and "undue prejudice" which are declared unlawful by the third section of the act, as that section has been construed by the supreme court, can be predicated only upon the voluntary action of the carrier, and therefore the lower rates from Dallas than from Shreveport are not in violation of the third section, whatever may be the resulting disadvantage to Shreveport shippers, because such lower rates are not voluntarily accorded but are imposed upon petitioner against its will by the Texas commission.

The petitioner called attention to a paragraph in *East Tenn. &c. Ry. Co.* v. *Interstate Com. Com'n* (181 U. S., 1, and cases there cited) to show that carriers are not responsible if discriminations result from conditions wholly beyond their control. The case referred to envolves the long and short haul clause and the decision has no bearing on this case.

This of course does not meet the argument that petitioner is under compulsion as respects the state rates in question and therefore not chargeable with any violation of law because those rates are relatively much lower than its interstate rates from Shreveport. In the last analysis this claim of coercion would seem to beg the question to be decided, since it assumes that petitioner is bound at all events to observe the rates fixed by the Texas commission, although the order sought to be enjoined justifies the application of higher charges. But if the action of the Texas commission regarding these interstate rates is in derogation of the regulating power of congress, the petitioner is not bound by that action, but has the right to readjust its schedules in conformity with the order of the Interstate Commerce Commission.

In the report upon which that order is based the commission has found that the local rates here involved were imposed by the Texas commission for the purpose of favoring the industries and communities of that state. Indeed, the evidence is said "to demonstrate that Texas has a policy of her own with respect to the protection of home industry, which has been made effective by consistent and vigorous action on the part of her commission." And in this policy, as is further found, the petitioner and other carriers in like situation have apparently acquiesced. This plainly means, nor is it seriously disputed, that these Texas rates were prescribed not with reference to their intrinsic reasonableness, or on the basis of just compensation for the service rendered, but with the undisguised intention of giving preference and advantage to the dealers of that state as against their competitors in Louisiana and other states. As Commissioner Lane puts it, "the Texas commission is acting *in loco parentis* to the jobbing interests of Texas." It also means, as the record indicates, that the rates so established have been accepted by petitioner without more, at most, than a perfunctory protest.

In view of these uncontradicted facts we are constrained to reject the plea of compulsion, not merely or mainly because petitioner has assented to the protective policy of the Texas commission, but because that policy directly affects other states and the flow of commerce from those states, and thereby encroaches upon the field in which federal authority is exclusive and supreme. To hold otherwise in this case is virtually to admit that the purpose of the federal act may be thwarted and its operation made ineffective by the laws and administrative effort of the state of Texas. The effect of this action by the Texas commission is not merely incidental and unimportant, but direct, substantial, and to an extent prohibitive. In our judgment it is a

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positive interference with interstate commerce, which congress alone has power to regulate, and constitutes a violation of the law which congress has duly enacted. To say that conditions thus arising do not offend the federal law and cannot be corrected by the commission appointed to administer that law is to say in effect that state authority is superior to federal authority when they come in conflict, whereas the reverse proposition has been repeatedly and invariably affirmed by the supreme court of the United States.

It is not claimed that the precise question here presented has been passed upon by the supreme court, but in various decisions of that court principles have been laid down which seem to us clearly applicable if not controlling. Paragraphs were cited from the *Eubank* case (184 U. S., 36); *Pullman Company* case (216 U. S., 65); *Southern Railway* case (222 U. S., 2); *Pennsylvania Railroad* case (139 Fed., 81) following the *Illinois Central* case (215 U. S., 452).

It is true that the laws and orders involved in these decisions pertain to the physical operation of interstate railroads and not to the relations between state and interstate rates; but in our opinion the underlying question is essentially the same in both classes of cases, and the doctrine of the supremacy of federal authority should have the same controlling application in the latter as in the former. If state regulation under state laws, respecting such matters as safety appliances, car distribution and the like, must be subordinated to and may be virtually annulled by national regulation under the national laws now in force, there is even greater reason for asserting the sufficiency of the existing acts of congress, and the authority of the tribunal by which they are administered, to remove such a palpably unjust and injurious discrimination in freight charges as is here presented, although that discrimination is caused by the action of a state commission. This is not to interfere with any power of regulation which a state may rightfully exercise, which does not "affect other states," or materially impede the flow of commerce from one to another, but to give complete and adequate potency to the law which congress has enacted in pursuance of its plenary and exclusive power to regulate commerce "among the several states." The *Shepard* v. *Northern Pac. Ry. Co.* case (184 Fed., 795), was also referred to.

It is the duty of an interstate railroad so to adjust its schedules that all dependent shippers and communities, regardless of imaginary state lines which may divide them, shall be able to use its facilities on relatively equal terms; and the Interstate Commerce Commission, in our judgment, is empowered by the present law to enforce the performance of that duty as occasion may require. Indeed, we see no escape from multiplied difficulties arising under our dual form of government, except by broadly defining the constitutional power of congress and its exertion, and by upholding the full application of that law to such controversies as the one here considered. We are therefore in accord with the views of Commissioner Lane, speaking for the majority of the commission, as expressed in the following extracts from his report:

> An interstate carrier must respect the federal law, and if it is also subjected to state law it must respect that in so far as it can without doing violence to its obligations under the national authority. Before us are carriers which undeniably discriminate directly against interstate traffic. To this charge they plead that all they have done was to obey the orders of a state commission, as against which they were helpless. They appealed to no court for relief, nor to this commission. When the state of Louisiana after years of endurance makes complaint to this body these carriers make no showing of the reasonableness of their rates other than that heretofore dealt with—a traffic adjustment equalizing gateways—and even in this defense all the carriers do not join. . . . While the Texas commission has evidenced a policy of home protection for its own state cities, there is every evidence that the carriers moving into and within Texas accepted this policy as their own, claiming that not to have adopted it would have led to reprisal on the part of the state authorities. Such conditions may not continue under this act. The interstate carrier which adopts a policy, even under state direction, that makes against the interstate movement of commerce must do so with its eyes open and fully conscious of its responsibilities to the federal law which guards commerce "among the states" against discrimination.

The Interstate Commerce Commission investigated the complaint filed with that body on behalf of the shippers and dealers of Shreveport. In its report of that investigation, and upon proofs that seem to permit no other conclusion, the commission found the act of unjust discrimination as alleged, and duly made an order requiring its removal. The commission also found by necessary inference that the interstate commodity rates in question were not unreasonable, and this in effect sanctioned the continuance of those rates. It is likewise a necessary inference from the report and order that the unlawful discrimination against Shreveport, so far as commodity rates are concerned, was caused by the imposition of intrastate rates which are lower than petitioner is justly entitled to charge. This being so, it follows that petitioner is at liberty and has the right to comply with the commission's order by making a proper increase of its Texas rates. Indeed, since its interstate rates are not excessive, such an increase appears to be the only method of compliance which would be just to both shipper and carrier.

When this order was made it had the effect, in our judgment, of relieving petitioner from further obligation to observe the intrastate rates which the Texas authorities had prescribed. The petitioner was no longer under compulsion in respect of those rates. Whether petitioner should have applied to the courts for relief in the premises, basing its application upon the commission's order and the rights of petitioner thereunder, or could advance its Texas rates in the first instance, relying upon the order as a defense against any prosecution under Texas laws, is not for us to determine. It is sufficient to hold, as we do, that petitioner cannot resist the order on the ground of involuntary action, because the effect of that order was an exemption of these intrastate rates from Texas authority.

As was suggested at the outset, the general question here involved has been presented in numerous cases, more or less closely allied, and is perhaps the most conspicuous and important subject of current litigation. In the course of that litigation every decision of possible bearing has been repeatedly cited and every opinion critically examined, whilst the ablest lawyers in briefs and at the bar have exhausted the resources of argument. We can add nothing to what has been so often said, and deem it unnecessary to extend the discussion. In our judgment the order in question was within the authority of the commission and ought not to be set aside.

The petition will therefore be dismissed.

Judge Mack, concurring, said in full as follows:

I agree that an intrastate rate voluntarily established by the railroads may be the basis for an order of the Interstate Commerce Commission declaring such a rate to involve an undue prejudice as against an interstate rate and requiring that the two rates be equalized.

I fully agree also that congress has the constitutional power and may by proper legislation grant to the Interstate Commerce Commission authority to prevent undue prejudice in interstate commerce resulting from a rate not in the true sense voluntary, and irrespective of whether it be interstate or intrastate.

In view, however, of the passage cited from E. Ry. Co. vs. Interstate Commerce Commission, 181 U. S. 1, and of the decision of this court in Atchison, T. & S. F. Ry. Co. v. U. S., 191 Fed. 856, now pending on appeal in the supreme court, I am of the opinion that the Interstate Commerce Commission under the legislation now in force cannot base such an order upon a compelled rate, whether interstate or intrastate, and whether compelled by competition, by statute, by court decree or by the order of a commission.

In my judgment, the Texas state rates cannot be treated by the Interstate Commerce Commission as if they were absolutely null and void, even though upon direct attack in the state or federal courts they would be nullified and their enforcement permanently enjoined as infringing upon the exclusive power of the federal government to regulate interstate commerce. In the absence of a judicial decree, temporarily or permanently sus-

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pending the force and effect of the Texas rates, the railroads would be compelled to obey them, just as the railroads and the public are required to observe interstate rates duly made and published by the railroads, even though they be such as would be set aside for unreasonableness, unjust discrimination, or undue prejudice on direct attack before the Interstate Commerce Commission.

The order of the Interstate Commerce Commission therefore gives only an apparent but not a real alternative, either to raise the Texas rates or to lower the interstate rates; in effect it compels the reduction of the interstate rates to a point far below what the Commission itself considers a reasonable rate, at least until a court of competent jurisdiction shall have enjoined the enforcement of the Texas rates.

If the Texas rates here in question must necessarily be held to be involuntary and compelled, I should be of the opinion that the order of the Interstate Commerce Commission must be set aside.

Inasmuch however as there seems to be some basis, though slight, for the view that the failure of the railroads to attack the Texas rates was due to their voluntary or negligent acquiescence therein, and that therefore these rates may be said to have been not compelled but voluntary in the sense of having been voluntarily assented to instead of having been actively attacked, and inasmuch as the conclusions of my brethren are based in part at least upon this view, I concur for this reason only in upholding the Commission's order.

ANTHRACITE COAL CASE.

*Decision by Judge Hunt.**

The Lehigh Valley Railroad Company, petitioner herein, prays for a decree enjoining an order of the Interstate Commerce Commission reducing the rates on anthracite coal from the Wyoming region in Pennsylvania to Perth Amboy on New York harbor.

The United States and the Interstate Commerce Commission and the intervener have moved to dismiss the petition for lack of equity.

Two principal contentions are advanced by petitioner: First, confiscation; second, lack of substantial evidence before the Commission on which to rest the conclusion reached. Petitioner argues that (*a*) the order of the Commission compels the carrier to operate its entire plant for a return of less than four per cent. upon its value, and (*b*) that the order deprives the carrier of its right to receive for transporting tidewater coal an amount sufficient to cover operating expenses, depreciation and a reasonable compensation for the use of that portion of the facilities used in handling tidewater coal.

Reducing essential facts to a narrow compass, we find that the order of the Commission affects the traffic on 165 miles out of a total of 1,407 miles of petitioner's railroad, and about 2,000,000 tons of anthracite coal out of a total anthracite coal tonnage of over 11,000,000 tons; that the anthracite tonnage involved is four fifty-sevenths of the entire freight traffic of the petitioning road; and that the effect on the gross income of the road, which is $36,000,000, when measured by the traffic of the year prior to the making of the report of the Commission, was to make a reduction of $247,000.

The argument is that the order reduces the annual return from $12,800,000 to $12,050,000, which is less than four per cent. of the value of the petitioner's road, which, as stated by the petitioner, is $312,500,000, and that the loss of income brought about by carrying out the order cannot be made up from rates on other traffic because such other rates, so far as applicable to anthracite, are as low as they can consistently be put. The assumption is that the Commission cannot and would not approve of any increases in other anthracite rates, while rates on commodities other than coal are for the most part joint rates covering competitive traffic, which are made under such circumstances that larger divisions cannot be obtained and that it is beyond the petitioner's power to increase materially its revenue from those sources.

Where the tariffs are constructed by the carrier and, after full hearing, an individual rate is found to be unreasonable and an order is made by the Commission which reduces such individual rate merely to a point where such reduction will reduce the total income of the carrier to four per cent. approximately, the carrier has no case of confiscation *prima facie*, but must prove that its rates other than the one involved in the order are in fact reasonably high and cannot be advanced above the point fixed by the tariffs it has filed. The courts cannot lay down any general rule as to what shall constitute confiscation with reference to railroad rates where the facts, as in this case, show a profit of approximately four per cent. The just compensation secured by the constitution does not mean a guarantee to a carrier as against the public of any fixed percentage of profit upon an investment.

The total anthracite coal tonnage, or 11,000,000 tons, represents 47 per cent. of the gross earnings of the road; and inasmuch as but 2,000,000 tons of anthracite are affected by this order, it becomes evident that the order of the Commission affects only two-elevenths of 47 per cent. of the total revenues of the road, or two-elevenths of $15,000,000, representing the revenue derived from coal traffic.

At once the inquiry arises whether the rates upon the balance of the traffic of the road are reasonable, and whether the proportion of the petitioner's other earnings, the 53 per cent. in bearing its fair share of the expenses of the road? How can the court say that the reduction of the particular rate complained of to a point admittedly not below cost of service and some substantial profit is confiscatory merely because it will reduce the gross income? Investigation into the proportions borne by other rates would have to be made to arrive at a just conclusion.

The allegations that the rates as fixed by the order are not and will not be sufficient to pay the cost of conducting the assembling, transporting, storing, and transshipping "and a just or fair return upon the value of that proportion of petitioner's property used in said service," fail to state grounds for equitable relief when they are put alongside of the further allegation that the rates fixed by the Commission cover the cost of service in transporting coal from the Wyoming district to Perth Amboy, which is 90 cents per gross ton, and that the average of the rates allowed by the Commission as applied to the traffic for all sizes of anthracite coal affected is $1.35 per gross ton, with depreciation cost of 10 cents on the facilities. This is an admission that the profit left above the cost of service is sufficient to yield an annual return on the value of that portion of petitioner's facilities employed in that particular traffic, which, though less than six per cent. on the value—not specifically stated—of the facilities employed, is at least of such a substantial margin as to prevent a conclusion that petitioner's property is being taken without just compensation.

Other averments of the bill to the effect that the Commission excluded and refused to consider facts and circumstances that ought to have been considered, or that the rates prescribed were fixed arbitrarily and are not just and fair, fall when we examine the report of the Commission which is before us, disclosing that evidence relevant to the issues which the petitioner raised herein, except those matters which it is alleged accrued since the report was made, was considered.

We have given careful attention to the briefs and arguments made by counsel, but do not find any well-founded reason for interference with the action of the Commission.

The motions to dismiss are granted.

*The decision is abstracted but the original language is preserved insofar as possible.

NEW CONSTRUCTION IN URUGUAY.—Work continues on the Tres Arboles to Piedra Sola branch, the 36 miles of which will be completed this year. Construction of the line from La Paloma to Tricnta y Tres was commenced by the Uruguay Railway in November, 1912.

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WELDON VIADUCT OVER THE ROANOKE RIVER.

A Steel Structure 3,688 Ft. Long Built by the Atlantic Coast Line on a Piece of New Main Line in North Carolina.

The Atlantic Coast Line has recently completed and put into operation three and one-half miles of new main line between Gary, N. C., and Weldon, 80 miles south of Richmond, Va., the principal feature of which is the Weldon viaduct across the Roanoke river.

In former years the old Petersburg Railroad, which connected with the Wilmington & Weldon Railroad at Weldon, crossed the Roanoke river on a bridge of its own, but this was destroyed and an agreement was entered into with the Seaboard & Roanoke Railroad whereby, instead of rebuilding, the Petersburg Railroad would operate over the tracks of the former from Gary, N. C., into Weldon, to its Wilmington & Weldon connection. In later years, the Seaboard & Roanoke was absorbed by the Seaboard Air Line and the Petersburg Railroad and the Wilmington & Weldon became a part of the main line of the Atlantic Coast Line, but the same joint operating arrangement was continued until 1909, when it was decided, by mutual agreement, to terminate it.

In determining the best location for the Atlantic Coast Line's new line, consideration was given to the interchange of passengers, baggage, express and freight with the Seaboard Air Line at Weldon, the avoidance of a grade crossing with the Seaboard and grade highway crossings in the town of Weldon, the danger from high water in the Roanoke river and the reduction of maximum grades. A line which had been surveyed some years before was adopted without change, as the only undesirable feature it contained was the arrangement for exchanging passengers, baggage and express at different levels, and this could not be avoided without sacrificing the other advantages. A new union station, ordered at this time by the State Railroad Commission, was given equal consideration with the rest of the work and located where the exchange between the two roads could be handled with the least trouble. The line adopted is above grade through the town of Weldon and over the Seaboard tracks with undergrade highway crossings at First, Second, Third and Sixth streets. It is double-track except through the viaduct section and has a maximum grade of 0.5 per cent. The depot was located in the angle of intersection of the two roads on the level of and parallel to the Seaboard tracks, with a stairway and electric baggage and express elevator to the Atlantic Coast Line platform above, on which will eventually be placed enclosed waiting rooms and an umbrella shed.

The gauntlet and all switches in main line tracks, at the south end of the Weldon yard, are controlled by a 30-lever electro-mechanical interlocking plant of the latest type, located at the

Weldon Viaduct Showing Web Struts Connecting Pedestal Piers.

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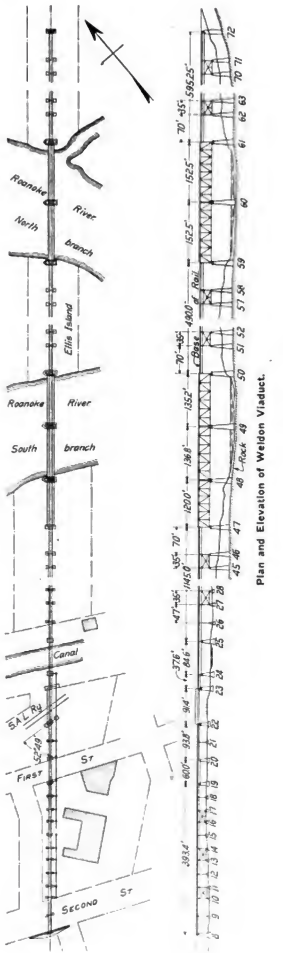

Plan and Elevation of Weldon Viaduct.

south end of the yard. All home signals are semi-automatic, power operated, of the three position upper right-hand type. Movements from stop to caution are controlled by electric levers built above and interlocked with the mechanical levers. The movement from caution to proceed position is automatic, and is governed by the indication of the first signal in advance. All other units are pipe connected. Approach, and home indicators, to announce the presence of trains on main line tracks; back, approach, and route locking are employed. The tower and lead-out are supported on a concrete foundation and steel frame, thus eliminating all wood. The interlocking is being installed by company forces.

The viaduct is a steel structure 3,688 ft. long with separate girder spans over Third and Sixth streets. It is carried on concrete masonry, is designed for Coopers E-50 loading, and is built in accordance with the Atlantic Coast Line's standard bridge specifications. The line is tangent and the grade level throughout the steel work with the base of rail 29 ft. 6 in. above the top of the masonry across the river bottom, and 30 ft. above extreme high water. From the north end southward the steel work is arranged in a viaduct section 595 ft. long of alternate 35

Portion of Weldon Viaduct Showing Steel Work for Station Platform.

ft. tower and 70 ft. intermediate spans across the bottom land; two 152 ft. 6 in. riveted deck truss spans across the north branch of the river; 400 ft. of 35 and 70 ft. span viaduct across Ellis Island; two 136 ft. 6½ in. and one 120 ft. riveted deck truss spans across the south branch of river; 1,145 ft. viaduct across the bottom lands; an 84.6 ft. deck plate girder across the canal, a 37.6 ft. deck girder span to the north abutment of the Seaboard crossing; one 91.4 ft. through plate girder over the Seaboard tracks; 93.8 ft. of viaduct; one 60 ft. deck plate girder over First street, and 393.4 ft. of viaduct to the south line of Second street. The viaduct south of the canal is arranged with one 30 ft. girder on a tower and two 35 ft. intermediate girders with a single bent between. The train platform extends from the south bank of the canal to the south side of Second street, 676 ft. It is 14 ft. wide and is carried on the track girders on one side and a row of posts on the other. This construction is shown in one of the accompanying cuts. The total weight of the steel work is about 2,500 tons. It was erected throughout with a derrick car.

The masonry through the town and to a point north of the canal, was founded on a hard, sandy clay and the remainder of it, across the river bottoms and the river piers, was carried to rock, which was about 40 ft. below the surface at the deepest place. This was necessary, as nothing was found above the

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rock that would safely carry the load, and permanent moisture was too low down to enable piles to be used with advantage. The river piers and some of the pedestals are accordingly about 60 ft. high, and the latter, on account of their height, were designed with webs connecting each pair of pedestals. To secure the necessary lateral stability for these piers it was deemed advisable to connect them together from a point 10 ft. below their tops down to the foundation. For this purpose concrete web struts, reinforced with old rails, were built connecting each pair of pedestals. This method was decided upon to avoid the expense of building massive piers up to the top, which would have involved a large volume of useless concrete. While the continuous pedestals would have been sufficiently stable for the imposed load, it was considered expedient to provide for the impact caused by heavy masses of drift which might come during heavy freshets, at which times the water rises to a level about 4 ft. below the top of the masonry. The reinforced webs are amply strong to meet these conditions and their use effected a considerable saving in cost. The main body of the masonry throughout is a 1-3-5 concrete, with copings and back walls of 1-2-4 and the total structure contains about 17,000 yds. of concrete.

The work was done under the direction of E. B. Pleasants, chief engineer of the Atlantic Coast Line Railroad.

GASOLENE MOTOR CAR FOR INTERURBAN SERVICE.

The Holton Interurban, Redlands, Cal., has placed in service a type M-6 gasolene motor car made by the Hall-Scott Motor Car Company, San Francisco, Cal. This is the second Hall-Scott motor car purchased by this company, one having been placed in service about two years ago. The power plant consists of a six-cylinder gasolene engine of 150 h. p. capacity, with a speed range of from 4 m. p. h. to 60 m. p. h. in four stages in either direction. This flexibility of speed control will permit of yard switching and of the handling of one or more trailers, dependent, of course, on grade conditions.

The car is of steel construction, the steel body, trucks, gasolene motors and driving mechanism being designed and built in the builders' factory at West Berkeley, Cal. It is 60 ft. long over end sills and has a seating capacity for 64 passengers in the main passenger compartment. The baggage room is 16 ft. long and is equipped with lift wall seats for eight additional passengers. Baggage and mail may also be carried in the engine room, a space 12 ft. long x 3 ft. wide being available for that purpose. The total weight of the car is 67,850 lbs.

During the first three months of service this car made an average of 75.6 miles per day. The following table gives the operating cost during this time.

Results of Operation for Three Months Ending February, 1913.

	1912.	1913			Average cost for car operating under
	December	January	February	Average	ordinary conditions
No. miles traveled	2,238	2,458	2,138	2,278	.....
No. miles traveled per day	72	79	76	75.6	.....
Gallons gasolene used	767	785	725	759	.....
Gallons gasolene used per mile	0.342	0.319	0.339	0.333	.....
Cost gasolene per gallon	0.23	0.215	0.215	0.22	0.10
Cost gasolene per mile	0.079	0.068	0.073	0.074	0.033
Total cost gasolene	$176.41	$168.77	$155.87	$167.02	$75.90
Gas engine oil used	26	37	24	29	.....
Cost gas engine oil per mile	0.006	0.0078	0.0058	0.0066	0.005
Cost gas engine oil per gal	0.52	0.52	0.52	0.52	0.40
Engine oil per mile	0.011	0.015	0.011	0.012	.....
Total cost engine oil	$13.52	$19.24	$12.48	$15.08	$11.60
Machine shop bill	33.35	31.90	27.15	30.80	.....
Cost repairs per mile	0.0149	0.013	0.0126	0.0135	0.0135
Cost operators per mile	0.089	0.081	0.093	0.087	0.087
Total operative cost per mile	0.189	0.169	0.184	0.181	0.1385

Operator's cost figured on basis of $125.00 per month for motorman.
Operator's cost figured on basis of $75.00 per month for conductor.

Note that cost of gasolene and oil is excessive on account of the car being operated so far from distributing points for oil and gasolene. The last column at the right shows the operating cost for the car on the basis of Eastern prices for oil and gasolene.

The engine is mounted directly on the center sills of the car underframe. The clutch is of the contracting band type. The transmission is hung on the forward axle of the rear truck, and the axle is driven through a train of bevel and spur gears of hardened forged steel. The operating levers are placed on the right hand side of the car in a position convenient for the operator, being similar in their functions to automobile practice. The circulating water is cooled by a radiator placed directly in front of the car, which provides a positive thermo-syphon circulation of the water and a ready means of completely draining the whole circulating system. A cooling fan is placed directly back of the radiator.

Gasolene Motor Car for the Holton Interurban.

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The car is equipped with the Westinghouse automatic and straight air brake systems; a double-cylinder water cooled air compressor directly driven from the main engine; and an electric generator, also driven from the main engine, which charges the storage batteries for lighting and starting the main engine.

BROWN HOISTING MACHINES AT BALTIC STREET, BROOKLYN.

The New York Dock Company has installed "Brownhoist" rapid freight handling machinery at its docks at the foot of Baltic street, Brooklyn, N. Y., for moving freight to and from lighters, wagons, warehouse, freight house, railroad cars and delivery trucks. The company's docks extend along the Brooklyn shore of New York Bay for about 2¼ miles, the property covering 300 acres, entirely occupied with warehouses and railroad tracks. The company has its own system of railroad tracks which extend along the entire water front. The only connection with the different railroads is by car ferries. There are 27 piers, but none of the railroad tracks run out on to the piers.

The handling machinery is used in connection with warehouse No. 117, which is used for sorting and storing the export and import freight. The machinery consists of a single runway bridge on the wharf, a double runway bridge over the railroad yard and reaching the freight house, two I-beam tracks through the warehouse connecting the single and double runway bridges, and two man trolleys. The tracks on the two bridges consist of 15 in. I-beams, and there is a continuous I-beam track from the wharf, through the warehouse to the freight house, on which the man trolleys travel.

The single runway bridge, shown in one of the views extends from the warehouse door to the face of the dock, a distance of 76 ft. spanning two tracks and the wharf. It has a raisable apron, 28 ft. long, which reaches out over the water. By means of a counterweight and a hand winch, this apron is raised to allow the lighters to dock. This apron constitutes an extension of the I-beam track so that the trolleys can run out over the boats with their loads. Just within the doors of the warehouse the track branches into two tracks, running to the rear of the warehouse. There they turn to the right, and pass by an elevator and out in the rear. The I-beams are suspended from the ceiling in the warehouse by patent hanger bolts, and are bolted together by patent joining plates.

The man trolleys have a capacity of 2½ tons each. Each trolley is suspended from two 4-wheel trucks by swivel and pin connections and it rounds curves of 15 ft. radius. The hoisting motor is carried on the front of the trolley and is geared to two hoisting drums. The limiting height of hoist is 30 ft. The trolley has a hoisting speed of 50 ft. a minute, with full load, and 120 ft. per minute with no load, and has a traveling speed of 450 ft. per minute with full load and 550 ft. per minute with no load. Each trolley is equipped with a hand traveling brake, and with an automatic safety mechanical brake, as well as a solenoid brake used in hoisting. The mechanical friction brake operates only on the downward direction of the load, and the solenoid brake operates when the hoist motor is not being driven. The load can be held at any desired height by means of these two hoisting brakes. The current, 220 volts, d. c. is obtained through spring collectors with bronze collector wheels, which run on a copper trolley wire strung along the I-beam tracks.

For carrying the freight 12 special 2-ton Brownhoist trucks are used. These are best shown in the second illustration. The truck is equipped with ball bearing wheels, two 19 in. wheels at one

"Brownhoist" Freight Conveyors, Brooklyn, N. Y.
The Load is a Sheet of Metal.

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end and two 2-wheel swivel casters at the other end. Each truck is 8½ ft. long by 3½ ft. wide over all. In warehouse 117, the trolleys work in conjunction with the elevator and with a chute which runs from the top floor down to the second floor. If a trolley has a truck loaded with freight which is to be stored for several days, it takes it into the warehouse and deposits it at the door of the elevator. The truck is pushed onto the elevator and carried to one of the four floors above. When taken out, the freight, if not fragile, and if of small size, is sent down the chute to the second floor of the building and there loaded on wagons.

The plant is not running to full capacity, but so far the equipment has replaced 12 men. The trolleys handle all the freight as fast as it can be delivered to them, whereas heretofore some shipments suffered delays. The equipment has eliminated the congestion of wagons on the dock.

This equipment was built and installed by The Brown Hoisting Machinery Company of Cleveland.

Double-Track Freight Conveyor, New York Dock Company.

PICKED UP ON THE ROAD.

By Gulf.

Few people who travel in Pullman cars find the toilet conveniences quite up to the standard of convenience to which they are accustomed at their homes or their hotels. The wash and dressing room is the smoking compartment, and is crowded, and not a thing to be desired at the best. Every morning, in every sleeping car there is some man or men, who after dressing deliberately and from a curious choice sit down and remain there to look out of the window and watch the proceedings. They are unmitigated nuisances and very much in the way. It is, therefore, respectfully suggested to the Pullman Company that they have signs made and the porters instructed to hang them in the toilet rooms every morning. The signs might read to the effect that, "Gentlemen who have finished their toilet are requested to leave and not occupy seats in this room until the other passengers have finished their toilets." In the ladies' room they might post a sign saying that, "Ladies are requested to remember that others are waiting while they are occupying this room." If this should only occasionally cause the would-be washroom observer to get out it would be a boon to the rest of the travelers.

Speaking of the amenities of the toilet room leads me to comment upon another matter where dumb example seems to be making an impression. Most men make quite a muss in and about the basin in the course of their ablutions. It is evidently quite impossible for the porter to follow each one and clean

* * *

It does not always seem to be lack of ability of the engines to run at speed. But there is always a hot box, or dirty coal, or station delay, or a freight train in the way, or a rail up, or some trifle that is just enough to cause a hesitation or stop that means the sending back of a flagman, and then waiting to call him in. On the trip referred to, out of four station stops, two were of such duration that the flagman's recall had to be sounded. It is a pity, and one wonders whether the management is in a trance, or dreaming over its schedule of what might happen, but rarely does.

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General News.

A bill requiring separate cars for negroes has been reported unfavorably by a committee of the Illinois senate.

A new law in Pennsylvania, signed by the governor April 25, requires railroads to pay their employees twice a month.

Telegraph operators on the Erie are taking a vote on a proposal to strike for increases in wages said to average 12 per cent.

The Southern Railway has supplied all its passenger conductors with collapsible paper drinking cups, which are to be furnished free to passengers who ask for them.

The Denver & Rio Grande has refused a demand from representatives of its blacksmiths, machinists, boilermakers and sheet metal workers for increases in pay ranging from 7 to 13 per cent.

A bill has been introduced in Congress, by Representative Wallin, of New York, which would require all railroads to issue interchangeable mileage books, good on all railroads, at two cents a mile, with no time limit.

The Canadian Pacific, in co-operation with the provincial Department of Agriculture, is planning to run a "Better Farming Special," beginning in May and making a tour through the province of Ontario extending over about two months.

According to press reports officers of the Great Northern have been inspecting the site of a hydro-electric power plant on the Chelan river in Washington, with a view to possible extension of the electrified zone through the Cascade mountains.

The Missouri Pacific has increased the pay of blacksmiths from 2 to 12 cents an hour and has granted increases averaging 2½ cents an hour to boilermakers, machinists, machinists' helpers, painters and carmen. This is the result of conferences covering seven weeks.

In the United States district court at Indianapolis, April 20, the Michigan Central was fined $5,000 on two indictments charging the granting of unlawful reductions in rates to Chapin & Company, grain shippers of Milwaukee. The shippers also have been indicted, but have not yet been tried.

Warrants charging embezzlement have been issued for Edward F. Young, treasurer of the Chicago, Terre Haute & Southeastern Railway, with office at Chicago. Mr. Young is said to have disappeared from his office on April 22, leaving his accounts in such shape as to indicate a considerable shortage.

Starting from Biarritz, France, on the border of Spain, on the morning of April 27, E. F. Guillaume flew in an aeroplane nearly 1,000 miles, across France to Kollum, Holland, making the trip in about 24 hours and stopping only twice. The stops were for fuel, one at Bordeaux and the other near Paris.

One hundred and twenty complaints charging violations of the federal hours of service law have been filed in the federal court, at Detroit, Mich., against the Grand Trunk. Twelve complaints have been filed against the Michigan Central, charging violation of the laws regulating the transportation of livestock.

The New York, New Haven & Hartford announces that its five hour trains between New York and Boston, three each way daily, have been on time or nearly on time, on every trip, except ten, since February 1. When these trains are late more than thirty minutes in reaching destination, each passenger is paid a rebate of $1. Seven of the ten delays occurred in February.

Employees of the New York Central Lines in and around Cleveland, Ohio, attended a "Safety First" meeting on April 23. Addresses were made by M. A. Dow, general safety agent of the New York Central Lines; F. H. Wilson, assistant general superintendent; Frank V. Whiting, general claims attorney; D. R. MacBain, superintendent of motive power; F. B. Cook, superintendent, and several employees.

Governor Cruce, of Oklahoma, has signed a bill passed by the legislature, authorizing the state corporation commission to fix new passenger rates. An article in the state constitution originally fixed the passenger rate at two cents per mile. Since the two cents a mile rate has been enjoined, in the case now pending before the Supreme Court, it is said the commission proposes to fix the rate at 2½ cents. A bill fixing the rate at 2¼ cents was vetoed by the governor.

Press despatches of April 30 report that in the states of Sonora and Sinaloa, Mexico, the rebels who are fighting the government have taken complete control of the railroads, and are running trains to suit themselves, collecting revenue and using it to support their rebellion. The lines of the Southern Pacific between Nogales and Guaymas, 265 miles, and between Guaymas and Ouliacan, 332 miles, are said to have been thus confiscated. Officers of the road have been ousted and the repair of tracks is neglected.

A committee of the lower house of the Pennsylvania legislature has presented a favorable report on a bill providing that no person shall be employed as conductor on any railroad in the state unless he has been engaged in train work 18 months; and that no one shall be appointed to the position of engineman unless he has been employed as fireman for 18 months (on some road) or on the same road for three months prior to his appointment. The Pennsylvania Railroad has issued a circular calling attention to the oppressive character of the proposed law. In the preamble it is described as an act to promote the safety of the traveling public, but its purpose, of course, is to make difficult or impossible the operation of a railroad, in case of a strike of trainmen, except by making terms with the strikers.

Louis D. Brandeis, the most prominent lawyer for the critics of the New York, New Haven & Hartford road, is the subject of an advertisement, filling a half page or more, which President Charles S. Mellen has published in the Boston newspapers. Mr. Mellen quotes records to show that in 1892 Mr. Brandeis was a member of the firm of Warren & Brandeis, who prosecuted a suit in court against the New York & New England Railroad to restrain the directors from declaring a dividend, which suit was abandoned after the price of the railroad company's stock had been forced down in the market. The railroad company averred that the prosecution was inspired by Austin Corbin and was malicious, and this averment seems not to have been challenged. Mr. Mellen was general manager of the New York & New England at that time.

Norfolk & Western Valuation.

Vice-President N. D. Maher, of the Norfolk & Western, announces that Charles S. Churchill, chief engineer; W. S. Battle, Jr., general claim agent and J. M. Rodgers, statistician, have been assigned to special duty as a Valuation Committee for the purpose of devising a plan of valuation of the company's property in accordance with the new federal law, and afterwards carrying on the work. The work of this committee, says Mr. Maher, is a stupendous task and will require a long period; therefore the regular duties of the officers named will be taken up by Joseph E. Crawford, acting chief engineer, J. B. Baskerville, acting claim agent and W. B. Moss, acting statistician, whose appointments take effect May 1.

Trespassers on the New Haven.

The New York, New Haven & Hartford, which for years has been attempting to abate the trespassing evil, is making renewed efforts to decrease accidents of this character. The company is asking the active co-operation of the cities and towns along its lines, and an order has just been placed for 10,000 additional warning signs to be posted on the highways. School superintendents are being requested to caution their pupils of the dangers of playing around the tracks. For many years the efforts of the company's officers have been centered upon the magistrates and prosecuting officers of the towns and cities, but, as elsewhere the magistrates are loath to prosecute this class of offenders. On the New Haven the records show that the company is troubled with an extremely small number of tramps. The most difficult problem is that of the small boy or young man who for one reason or another "jumps" a freight train or tries to "beat" his way. Despite the fact that the road maintains a corps of special agents, under the supervision of a competent officer, and the large number of arrests

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that have been made, the company has not had the success wished for in preventing trespassing of this character. There are 207 of these special agents. Unlike most other roads, the agents of the New Haven are not permitted to accept fees for making arrests, and therefore are not under the temptation of bringing charges against people unjustly.

Officers of the road say that they are much annoyed by that particular type of trespasser, the small boy of reckless proclivities who, in riding on a coal car, throws pieces of coal at signals. A little severity may be the means of preventing that boy and perhaps other boys from being seriously injured or even killed at some later date, and stringent enforcement of the law is the most humane method of dealing with the question. The trespasser who uses the rights of way of the railroad in going to or from work represents every walk of life and an accident resulting in his death is often a serious loss to the community in which he lives. It is almost impossible to obtain a conviction of this type when he is arrested. In some towns the railroad tracks are almost considered a public highway and hundreds use them every day to and from business. The company in such places has ordered an extra number of signs to be displayed warning trespassers that they are forbidden to use the tracks or remain on the premises; but these signs are often destroyed or defaced. Even fences are useless in such places as they are torn down at the first opportunity. Cases of sawing down iron fences are not unfamiliar.

United States Steel Corporation's Earnings.

The report of the United States Steel Corporation for the quarter ended March 31, 1913, shows that the total net earnings were $34,426,801, after deducting all expenses incident to operation, including those for ordinary repairs and maintenance of plants, and fixed charges of subsidiary companies. This compares with $17,826,973 earned in the corresponding quarter of 1912 and $23,519,203 in the same quarter 1911. The earnings for the first quarter of 1913 showed a decrease of about $500,000 from the last quarter of 1912, and were not as high as was expected. The surplus for the quarter was $7,369,600 as compared with a deficit of $6,292,134 for the corresponding quarter of 1912, and a surplus of $31,155 for the corresponding quarter of 1911. The net earnings for the months of the first quarter of 1913 were $11,342,533 in January, $10,830,051 in February and $12,254,217 in March.

Barney & Smith Car Company and the Recent Floods.

The Barney & Smith Car Company, Dayton, Ohio, on April 21 resumed operations after the temporary shutting down of its plants owing to the damage done by the floods. Operations were at a standstill for about six days during the high water, but a large force of men has been at work continuously for the past two or three weeks, cleaning up the plant and putting it in working order. It will not be possible to make a correct estimate of the loss for several weeks. None of the cars under construction at the plant at the time of the flood was ruined and all such cars will be cleaned, finished and shipped within a short time. The supply of lumber floated away, but only for a short distance, and has since been re-claimed and re-piled. No difficulty was experienced in securing oxen, teams and supplies to put the plant in working order. The men were paid in cash, so that the trouble of cashing checks would be avoided. It is expected that the plants will be operating at full capacity in a few days.

Baltimore & Ohio Losses by Floods.

The Baltimore & Ohio announces the restoration of its line across the Miami river at Lawrenceburg, Ind., 25 miles west of Cincinnati, and the resumption of through trains over all of the company's lines. The bridge at Lawrenceburg was 1240 ft. long and 820 ft. of the steel structure was carried away. The total property loss to the Baltimore & Ohio by the floods of a month ago is now estimated at $3,000,000. About 500 miles of track was badly damaged and twelve important steel bridges were destroyed or disabled. The total length of these bridges was about 4,000 ft. and the length of wooden trestles destroyed was about four miles. The work of restoration carried on during the past month has engaged the services of about 8,000 men, using 18 pile-drivers and numerous steam shovels and other machines. At many places work was carried on both day and night.

The Pennsylvania's Flood Losses.

President Samuel Rea says that the estimated cost of the damage to the Pennsylvania Lines West of Pittsburgh caused by the recent floods will be $3,610,000. Twenty-four bridges were destroyed and fifty were damaged, covering a total of about a mile and a half of track. The cost of replacing and repairing these bridges will be about $1,145,000. It was necessary to build temporary trestle work equivalent to 4.28 miles of track at a cost of about $362,000.

The length of road requiring repairs amounted to 163.39 miles, affecting 218 miles of track; estimated cost $1,587,000.

Adding the cost of damage to stations, equipment, telegraph lines and other property, the total loss on all Pennsylvania Lines amounts to $3,610,000, as above stated, divided among the various companies as follows:

Pennsylvania Company	$1,640,000
Pittsburgh, Cincinnati, Chicago & St. Louis	1,600,000
Vandalia	342,000
Grand Rapids & Indiana	28,000
	$3,610,000

In his statement Mr. Rea says:

"The above items of expenditure, under the rules of the Interstate Commerce Commission, are charged to operating expenses, but not compulsorily included in the year incurred.

"These losses take no account of the reduction in revenue for March and April due to the very serious interruption of traffic.

"The officers and employees have done remarkably efficient work in restoring the lines to service. Immediately the seriousness of the storm damage was known, the company placed all its facilities at the command of the state authorities of Ohio and Indiana for the relief of the afflicted area.

"No event in the history of railroading in this country has shown more convincingly the necessity for the railroads to be permitted to earn sufficient revenue not only to make reasonable return on invested capital, but also to have a surplus sufficient to meet emergency expenditures like these and to improve the properties in those respects which, even if not adding to gross revenue, make the lines better adapted to withstand the ravages of storm and flood and the better able to perform their duties to the public with efficiency and satisfaction."

Dedication of New Buildings at the University of Illinois.

The new Transportation building and the Locomotive and Mining laboratories of the University of Illinois, at Urbana, Ill., are to be dedicated on May 8, 9 and 10. An extensive program of addresses on various departments of engineering endeavor has been arranged. The program for Thursday, following an informal reception, include an address by J. G. Pangborn, special representative of the Baltimore & Ohio. On Friday morning there will be a railway conference in the Transportation building, at which the following addresses and discussions will be presented:

"Modern Problems of the Steam Railroad," B. A. Worthington, president Chicago & Alton; "Modern Problems of the Electric Railway," W. B. McKinley, president Illinois Traction System; "Modern Problems of the Manufacturer," Charles B. Moore, vice-president Jacobs-Shupert United States Firebox Company, and G. R. Henderson, mechanical engineer, Baldwin Locomotive Works.

"The Changing Character of the Problems of the Railroad," D. F. Crawford president American Railway Master Mechanics' Association; Albert Reichmann, president Western Society of Engineers; T. H. Goodnow, president Western Railway Club; F. H. Clark, past-president Master Car Builders' Association.

"Proper Aims in Training for Railway Service," H. G. Hetzler, president Chicago & Western Indiana.

"Vocational Education in Connection with Railroad Work," W. L. Park, vice-president Illinois Central.

"How Can the Technical School Help in the Solution of Railway Problems?" Robert Quayle, general superintendent motive power Chicago & North Western.

"Research as a Factor in Railway Administration," Samuel O. Dunn, editor *Railway Age Gazette*; H. E. Chubbuck, vice-presi-

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dent and general manager Illinois Traction System; C. B. Young, mechanical engineer of the Chicago, Burlington & Quincy Railroad.

In the afternoon will be held the formal dedicatory exercises in the University auditorium. A congratulatory address will be delivered by President C. H. Markham, of the Illinois Central. The program also includes a mining conference on Friday and Saturday, including addresses by a number of men prominent in this industry, and addresses will be given by the governor of the state, and officers of the university. On Friday afternoon there will be an inspection of the Transportation building, the Locomotive laboratory and the Mining laboratory.

Increases In Firemen's Pay.

The award of the arbitrators on the wages of the firemen of the eastern railroads as given out last week, resulted, on one of the larger roads, in changes of from 5 cents to 55 cents per 100 miles in the pay of road firemen, as shown in the following statement:

"Passenger firemen (approximately 600 men) who formerly received $2.40, $2.45, $2.50 per 100 miles will now receive $2.45, $2.50, $2.60, $2.70, $2.85 per 100 miles. In other words the increases range from 5 cents to 35 cents per 100 miles, the average being 23½ cents per 100 miles.

"Freight firemen (approximately 1,000 men) who formerly received $2.70, $2.85, $2.95 and $3 per 100 miles will now receive $3, $3.10, $3.20 and $3.30 per 100 miles in through freight service, and $3, $3.15, $3.25 and $3.35 and $3.45 in local freight service. In other words the increases range from 5 cents to 55 cents per 100 miles, the average being 33 cents per 100 miles. This does not include firemen on Mallet engines who have been receiving $3.20 and under the award will receive $4, an increase of 80 cents per 100 miles.

"Switch firemen (approximately 600 men) who formerly received $2.35 and $2.50 per day of 10 hours, will now receive $2.50 and $2.60 per day of 10 hours. Twenty-two per cent. of the switch firemen will get no increase under the award; 64 per cent. will get increases of 1 cent an hour and 14 per cent. will get increases of 1½ cents per hour.

"Miscellaneous service, such as pusher and helper and work train service, by reason of the application of through freight rates to this service, receive increases somewhat larger than the increases accorded the employees in other grades of service. The number of firemen performing this character of work is approximately 125. The increases in pusher service range from 25 cents to 95 cents per day of 10 hours, and in work train service from 15 cents to 80 cents per day of 10 hours."

Report of Legislative Committee on Pere Marquette.

The joint committee of the Michigan legislature, which has been investigating the management and affairs of the Pere Marquette, submitted its final report on April 24. The committee expresses the opinion that the flat two-cents-a-mile passenger rate is too low for branch lines, and also that the freight rates are inadequate. A readjustment of the rates by the Interstate Commerce Commission is recommended. The committee believes that "the present management under the receivership is capable and is doing its utmost to improve the service, and should be given a reasonable opportunity to demonstrate whether the road can be made to earn its fixed charges. If it fails to do this, a reorganization must be had on a basis that will be assigned." The committee finds that there has been mismanagement of the property under former administrations, and says it has not had time to demonstrate what is needed to make the Pere Marquette the railroad the state requires, but is inclined to believe the receivership will afford opportunity to find out just what the property can be made to do.

With reference to "watered bonds," which formed an important feature in the inquiry, the report said:

"Your committee is satisfied that the money represented by the funded debt of approximately $70,000,000 has been paid into the Pere Marquette corporation; that all the bonds are honest; that none of them is watered, and that the persons owning them have honest claims against the Pere Marquette on account of said bonds."

B. & O. Club.

The B. & O. Club was organized at Atlantic City, N. J., June 17, 1912, as was mentioned in the Daily edition of the *Railway Age Gazette* of June 18, page 1459, to promote friendship between the persons now or heretofore employed by the Baltimore & Ohio. The organization committee, S. M. Dolan, American Car & Foundry Company, St. Louis, Mo., chairman, will be prepared to submit for ratification the constitution and by-laws at the next annual meeting, which will be held at Atlantic City during the time of the conventions of the M. M. and M. C. B. associations next June. Charles L. Sullivan, Cowles-MacDowell Engineering Company, Chicago, is secretary.

Railway Development Association.

The annual meeting of the Railway Development Association will be held on May 6 and 7, at the Tulane hotel, Nashville, Tenn. The meeting will be devoted to matters of interest to the industrial, immigration, and agricultural departments of the railways, and the program will include discussions on the following subjects: Efficiency of Centralized Power Plants; Agricultural Development; Reclamation of Wet Lands by Drainage, and Immigration Matters. William Nicholson, industrial agent of the Kansas City Southern, is secretary.

American Railway Association.

The spring meeting of the American Railway Association will be held at the United Engineering Society building, 25 West Thirty-ninth street, New York City, on Wednesday, May 21.

Reports will be presented by the committees as usual, including one from the joint committee on automatic train stops; transportation of explosives and other dangerous articles; the committee on electrical working and the committee on nominations. A second vice-president is to be elected.

Railway Business Association.

The Railway Business Association has moved its offices from 2 Rector street to suite 739, 30 Church street, New York.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 29, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. Q. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Liebly, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wettlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, E. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andrucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

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BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City.—N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—S. Pompeny, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—F. R. Daniels, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Wren J. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—F. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1913, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. S. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. H. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY MASTER MECHANICS' ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, Wednesday and Thursday, June 11-12, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—F. W. Cozzens, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOCIATION.—W. Harkness, 286 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 9-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—A. Nyquist, 1a Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—C. F. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, F. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

Most of the ports on the south side of Lake Erie are reported as congested with coal, large shipments having been made from the mines while vessels on the lakes are unable to go out because of ice in parts of the lakes.

The Texas railways have issued Texas joint passenger tariff No. 1 quoting one-way fares between all points in the state, taking effect on May 1. The tariff represents two years of work and contains 379 pages and approximately 20,000 rates. The cost of compilation of the tariff is estimated at $18,000.

"A legislative commission" in North Carolina has requested the railways of the state to reduce freight rates generally 25 per cent. The commission conferred with officers of the railways at Raleigh last week and the railways made a tentative offer to reduce rates five per cent., but this was not at all satisfactory to the representatives of the law makers. They have asked the railways to reply at once to the 25 per cent. proposition.

The grand jury in the United States court in New York City is investigating charges of extensive fraud in the collection of damage claims from railroads for alleged losses of eggs. The frauds, according to the reports, have been prosecuted by consignees in collusion with inspectors who have reported eggs as broken when they were whole. The reports say that one railroad has paid out $80,000 on these claims during the past year, over and above its freight receipts on eggs.

At Washington last week the Interstate Commerce Commission heard the complaint of the "National Baggage Committee," claiming that excess baggage rates throughout the country are unreasonably high. On the baggage of a passenger over and above 150 lbs., a charge of 1½ per cent. of the first-class passenger fare is made. This extra baggage rate was increased about four years ago from 12½ per cent. of the passenger fare. The complainant asks to have the old rate restored.

Officers of the railroads in Official Classification territory are discussing the propriety of laying before the Interstate Commerce Commission new freight tariffs, making general increases of about 5 per cent. over present rates; and the presidents of the principal companies are said to have had conferences on the subject; but the publication of items in the daily newspapers, for which no railroad officer will formally vouch, is the only tangible news thus far made public. Mr. Rea of the Pennsylvania, and Mr. Willard, of the Baltimore & Ohio, are spoken of as leaders in the movement, but neither of them has made any definite statement.

The Northern Pacific, on April 27, put in service a new passenger train between Duluth and Staples, Minn., for the purpose of giving Duluth a direct connection with the North Coast Limited the fast train to the Pacific coast. The train will carry observation and dining cars, and will leave Duluth at 10 a. m., arriving at Staples in time to connect with the North Coast Limited. Returning the train will leave Staples at 7:05 p. m., arriving at Duluth at 11:45 p. m. The Duluth commercial interests have been agitating for better connections with the through trains from the Twin Cities for a long time, and the new train represents an effort on the part of the Northern Pacific to meet this demand.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 141-A, giving a summary of car surpluses and shortages by groups from January 3, 1912, to April 15, 1913, says:

The total surplus on April 15 was 70,715 cars; on April 1, 68,292 cars; and on April 11, 1912, 94,943. Compared with the preceding period; there is an increase in the total surplus of 1,923 cars, of which 1,636 is in coal, 690 in miscellaneous, and a decrease of 299 in box and 104 in flat car surplus. The increase in coal car surplus is in groups 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 3 (Ohio, Indiana, Michigan and Western Pennsylvania), and 7 (Montana, Wyoming, Nebraska and the Dakotas). The increase in mis-

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cellaneous car surplus is in groups 1 (New England lines), 2 (as above), 4 (the Virginias and Carolinas), 7 (as above), and 11 (Canadian lines). The decrease in box car surplus is in all groups except 2, 4, 7 and 11 (as above). The decrease in flat car surplus is in all groups except 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 6 (Iowa, Illinois, Wisconsin and Minnesota), 8 (Kansas, Colorado, Oklahoma, Missouri, Arkansas and Oklahoma), 9 (Texas, Louisiana and New Mexico) and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona).

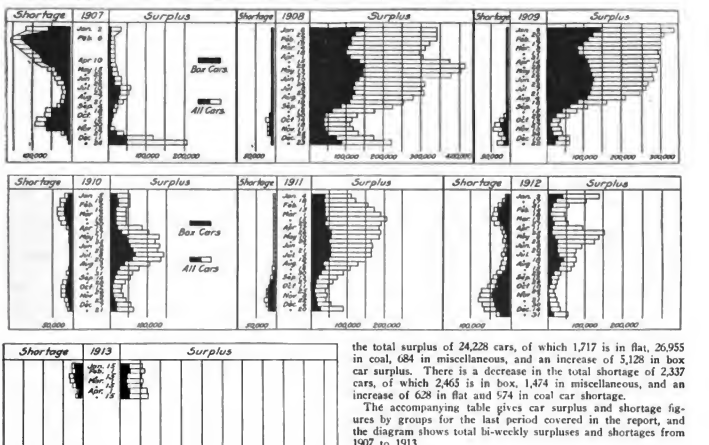
The increase in box car shortage is in groups 1, 3, 4, 7, 8 (as above). The increase in flat car shortage is in groups 3, 4, 6, 8 (as above), 10 (Washington, Oregon, Idaho, California, Nevada and Arizona), and 11 (as above). The increase in coal car shortage is in groups 1, 4, 5, 6, 8 and 10 (as above). The increase in miscellaneous car shortage is in groups 1, 4, 8 and 10 (as above).

Compared with the same date of 1912; there is a decrease in the total surplus of 24,228 cars, of which 1,717 is in flat, 26,955 in coal, 684 in miscellaneous, and an increase of 5,128 in box car surplus. There is a decrease in the total shortage of 2,337 cars, of which 2,465 is in box, 1,474 in miscellaneous, and an increase of 628 in flat and 974 in coal car shortage.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—April 15, 1913	7	558	501	167	165	1,391	98	33	39	1	171
" 2.— " 15, 1913	35	698	59	5,221	1,538	7,516	138	0	150	0	288
" 3.— " 15, 1913	34	503	376	5,856	1,460	8,195	1,670	288	424	268	2,660
" 4.— " 15, 1913	10	5,648	23	776	1,072	7,519	1,321	485	1,069	275	3,150
" 5.— " 15, 1913	27	106	25	132	477	740	853	372	195	27	1,447
" 6.— " 15, 1913	31	1,312	305	2,211	3,512	9,340	339	233	71	6	649
" 7.— " 15, 1913	6	2,279	135	1,965	1,185	5,564	45	0	5	0	50
" 8.— " 15, 1913	18	1,329	441	4,036	2,560	8,367	328	21	168	793	1,310
" 9.— " 15, 1913	16	1,556	452	613	1,515	4,136	0	1	33	9	43
" 10.— " 15, 1913	25	5,953	1,431	22,721	80,087	10,192	6	56	21	305	390
" 11.— " 15, 1913	7	861	199	127	568	1,755	2,383	474	11	191	3,059
Total	216	22,744	3,967	21,845	22,159	70,715	7,181	1,965	2,196	1,875	13,217

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

The diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report, and

souri and Arkansas), and 9 (Texas, Louisiana and New Mexico).

The total shortage on April 15, 1913, was 13,217 cars; on April 1, 10,804 cars; and on April 11, 1912, 15,554. Compared with the preceding period; there is an increase in the total shortage of 2,413 cars, of which 131 is in box, 738 in flat, 796 in coal and 748 in miscellaneous cars. The increase in box car

Summary of Revenues and Expenses of Steam Roads in February.

The Bureau of Railway Economics' summary of revenues and expenses and comments thereon for February are as follows:

The month of February contained 28 days in 1913, while in 1912 it had 29 days. As a consequence all returns for February, 1913, shown in the aggregate and per mile of line, other things equal, would be one twenty-ninth, or nearly four per cent. less than in February, 1912. This fact should be borne in mind while studying the February comparisons in this summary.

The railways whose returns are included in this bulletin operate 221,970 miles of line, or about 90 per cent. of the steam railway mileage in the United States. Total operating revenues

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for the month of February, 1913, amounted to $225,376,930. Compared with February, 1912, the total operating revenues show an increase of $13,686,777. These total operating revenues per mile of line amounted to $1,015 in February, 1913, and $964 in February, 1912, an increase of $51, or 5.3 per cent. Freight revenue per mile increased 4.7 per cent. and passenger revenue per mile 5.1 per cent.

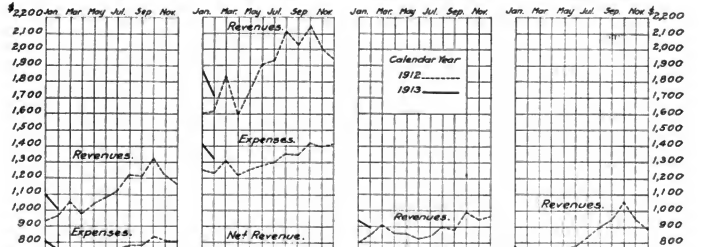
Operating expenses amounted in February to $167,759,591. This was $11,764,165 more than for February, 1912. These operating expenses per mile of line amounted to $756 in February, 1913, and $710 in February, 1912, an increase of $45 per mile, or 6.4 per cent. All the five primary operating expense accounts showed increases per mile over 1912.

Net operating revenue amounted in February to $57,617,339. This was $1,922,612 more than for February, 1912. Net operating revenue per mile of line amounted to $260 in February, 1913, and $254 in February, 1912, an increase of $6 per mile, or 2.4 per cent.

Taxes for the month of February amounted to $10,218,528, or $46 per mile, an increase of 5.7 per cent. over February, 1912.

Comparison of the returns for the eight months of the fiscal year with those of the corresponding months of the previous fiscal year reveals an increase in total operating revenues per mile of 10.2 per cent., an increase in operating expenses per mile of 9.1 per cent., and an increase in net operating revenue per mile of 12.5 per cent. This net operating revenue per mile of the eastern railways increased 10.3 per cent. as compared with the corresponding period of the previous year, that of the southern railways increased 5.9 per cent. and that of the western railways increased 17.1 per cent.

When the returns for the two months of the calendar year 1913 are compared with those of the corresponding months of 1912, they show an increase in total operating revenues per mile of 11.1 per cent., an increase in operating expenses per mile of 8.6 per cent., and an increase in net operating revenue per mile of 19.1 per cent. This net operating revenue per mile increased 16.5 per cent. in the eastern district, as compared with the corresponding period of the previous year, increased 23.0 per cent. in the southern district, and increased 20.7 per cent. in the western district.



Monthly Revenues and Expenses Per Mile of Line In 1912 and 1913.

Operating income amounted in February to $212 per mile of line, and in February, 1912, to $208. This was an increase of $4, or 1.8 per cent. Operating income for each mile of line for each day in February averaged $8 and for February, 1912, $7.

The operating ratio for February was 74.4 per cent., which is comparable with 74.0 per cent. in January, 1913, and 73.7 per cent. in February, 1912.

The railways of the eastern district show an increase in total operating revenues per mile of line as compared with February, 1912, of 6.4 per cent., the railways of the southern district an increase of 5.9 per cent., and the railways of the western district an increase of 4.4 per cent. Operating expenses per mile increased 7.6 per cent. on the eastern railways, 6.1 per cent. on the southern railways, and 5.6 per cent. on the western railways. For the eastern railways net operating revenue per mile increased 2.6 per cent., for the southern railways it increased 5.4 per cent., and for the western railways it increased 1.2 per cent. The increase in taxes per mile was 4.6 per cent. in the eastern district, 7.4 per cent. in the southern district, and 6.6 per cent. in the western district. Operating income per mile increased 1.3 per cent. in the east, 5.5 per cent. in the south, and 0.9 per cent. in the west.

The diagram shows the variations in operating revenues, operating expenses, and net operating revenue per mile for the separate months of the calendar year 1912 and of the calendar year 1913 to date. The following table shows the per cent. of operating revenues consumed by each class of expenses:

Per Cent. of Total Operating Revenues.

	February.		Fiscal year ended June 30.		Calendar year ended Dec. 31.	
	1913.	1912.	1912.	1911.	1912.	1911.
Maintenance of way and structures	11.7	10.9	12.7	12.9	12.8	12.7
Maintenance and equipment	18.0	17.3	15.8	15.3	16.0	15.7
Traffic expenses	2.2	2.3	2.2	2.2	2.0	2.1
Transportation	39.8	40.5	35.9	35.5	35.5	35.4
General expenses	2.7	2.7	2.5	2.5	2.4	2.5
Total operating expenses	74.4	73.7	69.1	68.6	68.7	68.4

Car Location.

The table on page 1009, which is taken from Car Location, bulletin No. 5, of the American Railway Association, gives a summary of the location of freight car equipment by groups on April 1, together with surpluses and shortages on the same date.

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INTERSTATE COMMERCE COMMISSION.

The commission has suspended until August 16, certain tariffs, which proposed to cancel through joint class and commodity rates from and to stations located on the Kansas City & Memphis and points located on or reached via the St. Louis & San Francisco, providing that combination rates apply, which would result in material advances.

The commission has suspended from April 15 until August 13, the supplement to the tariff of the Chicago, Rock Island & Pacific, which contains schedules advancing rates on wheat and corn, in carloads, from Omaha, Neb., and other Missouri river points to certain stations in Wisconsin, viz., Mann, Spencer, Unity, Colby and Abbottsford.

The commission has suspended until August 13, certain schedules in supplements to Agent W. H. Hosmer's tariff, which proposed to increase rates on building stone in carloads, seven cents per 100 lbs. from Sandstone and Banning, Minn., to Kansas City, Mo., and other destinations. The present rate is 12 cents, and the proposed rate 19 cents per 100 lbs.

The commission has suspended from April 25 until August 23, the item in a supplement to Agent F. A. Leland's tariff, which would advance the rates on grain products from 22 stations in southern Illinois, including such points as Evansville, Murphysboro, Sparta, Waterloo, etc., to points in Texas. In most instances the advance is 7 cents per 100 lbs.

Minneapolis & St. Louis west of Hanley Falls, Minn., via Minnesota Transfer and the Chicago, St Paul, Minneapolis & Omaha were not unreasonable or discriminatory. The order of suspension was vacated. (26 I. C. C., 595.)

Lake-and-Rail Class Rates from Pennsylvania Points.

In re investigation and suspension of advances in class rates from points in Pennsylvania and New York to St. Paul, Minn., and other destinations. Opinion by Commissioner Harlan:

The commission decided that the advances in lake-and-rail class rates from points in trunk-line territory to the Northwest through the Lake Superior ports had not been justified. The carriers were ordered to cancel the suspended tariffs. The contention of the carriers that they are relieved of the burden of proof because the proposed rates, while advances over those now in effect, are on a lower level than the one in effect on January 1, 1910, was not sustained. (26 I. C. C., 669.)

Rates on Paper Labels Reduced.

Pacific Creamery Company v. Southern Pacific et al. Opinion by the commission:

The defendants apply to the transportation of paper labels in less than carloads via rail and water from New York to Creamery, Ariz., their first-class rate of $3.50 per 100 lbs. The commission decided that this rate is unreasonable, and that for the future the rate on this commodity between the points in question should not exceed the rate contemporaneously maintained on

CAR LOCATION ON APRIL 1, 1913.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Utah.	Cana dian Lines.	Grand Total.
Total Cars Owned	98,247	677,089	282,511	196,333	174,414	472,873	17,036	151,256	33,486	130,577	130,921	2,356,443
Home Cars on Home Roads	43,078	364,614	92,115	103,960	77,813	290,809	4,214	74,496	15,199	67,716	80,567	1,214,581
Home Cars on Foreign Roads	47,169	312,475	190,396	92,373	96,601	181,264	12,822	77,260	18,287	62,861	50,354	1,141,862
Foreign Cars on Home Roads	53,584	298,232	211,741	103,609	87,907	203,502	11,820	76,443	23,869	59,035	63,021	1,194,283
Total Cars on Line	98,662	662,866	303,856	207,569	164,820	494,711	16,034	150,939	39,068	126,751	143,588	2,408,864
Excess or Deficiency	8,415	*14,223	21,345	11,236	*9,594	22,838	*1,002	*817	5,582	*3,826	12,667	52,421
Surplus	1,675	6,299	2,465	7,821	2,499	12,289	2,784	7,909	4,130	19,486	1,625	68,792
Shortage	736	1,400	1,724	1,357	1,588	1,082	73	270	43	296	2,850	10,981
Shop Cars—												
Home Cars in Home Shops	4,228	30,887	15,578	8,567	12,257	21,551	550	8,752	1,715	4,777	3,816	112,678
Foreign Cars in Home Shops	1,233	7,941	6,766	2,275	2,482	5,179	651	2,374	984	2,725	752	33,362
Total Cars in Shops	5,461	38,828	22,344	10,842	14,739	26,730	1,201	11,126	2,699	7,502	4,568	146,040
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	47.73	53.85	32.61	52.95	44.61	61.60	24.74	49.09	45.39	51.86	61.54	51.54
Total Cars on Line	100.79	97.90	107.42	105.72	94.50	104.80	94.12	98.31	116.67	97.07	109.68	102.22
Home Cars in Home Shops	4.30	4.56	5.51	4.36	7.03	4.58	3.23	5.78	5.12	3.66	2.91	4.85
Foreign Cars in Home Shops	1.02	1.17	2.40	1.16	1.42	1.17	3.82	1.46	2.94	2.09	.58	1.43
Total Cars in Shops	5.71	5.73	7.91	5.52	8.45	6.05	7.05	7.29	8.06	5.75	3.49	6.28

*Denotes deficiency.

The commission has suspended from April 14 until June 20, certain items in a supplement to the tariff of the Chicago, Milwaukee & St. Paul which would cancel milling-in-transit privileges at Minneapolis, Minn., and a number of other milling points, applicable upon wheat and coarse grain originating west of the Missouri river when the milled product is destined to certain stations in Wisconsin.

Lake-and-Rail Rates from Central Freight Association Territory.

In re investigation and suspension of advances in class and commodity rates from points in Trunk Line and Central Freight Association territory to Minneapolis, Minn., and other points via rail and lake. Opinion by Commissioner Harlan:

The commission decided that the advances in rail-and-lake rates from central freight association territory to the northwest through the Lake Superior ports had not been justified. The carriers were ordered to cancel the suspended tariffs. (26 I. C. C., 671.)

Rates on Grain Products Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of grain, grain products and seed between Aberdeen, S. Dak., and other points, and Duluth, Minn., and other points via Chicago, St. Paul, Minneapolis & Omaha Line. Opinion by Chairman Clark:

The commission decided that the withdrawal of joint rates on grain, grain products and seed from certain stations on the paper wrappers or printed wrapping paper. Reparation was awarded. (26 I. C. C., 578.)

Class Rates to Watertown, South Dakota.

In re investigation and suspension of advances in class rates by carriers from Chicago, Ill., St. Louis, Mo., and other points to Watertown and other stations in South Dakota. Opinion by Commissioner Clements:

The commission decided that the proposed advance in class rates from Chicago, Peoria, St. Louis and points taking same rates, to Watertown and other destinations in South Dakota were not unreasonable or unjustly discriminatory. The order of suspension was vacated. (26 I. C. C., 635.)

Furniture Rates in the Northwest.

In re investigation and suspension of advances in rates by carriers for the transportation of furniture in carloads from Burlington, Iowa, Port Washington, Wis., and other points to St. Paul, Minn., and other points. Opinion by Commissioner Meyer:

The respondents propose to advance commodity rates on furniture, including the general mixture of furniture, church and school furniture, and opera seats, and chairs and cribs in carloads from and to points in Wisconsin, Illinois, Indiana, Iowa and Missouri, to and from St. Paul, Duluth and Winona, Minn., and points taking the same rates. Comparisons are made of present and proposed commodity rates with third-class rates, with rates on light and bulky articles similar to furniture, with

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furniture rates in other parts of the country, and also comparisons of the minimum revenue per car resulting under these various rates at their specific minimum carload weights. The commission decided that the equipment required to move furniture under commodity rates involved, at the comparatively high minimum of 20,000 lbs., is more expensive, and the greater weight of the loaded cars entails greater transportation costs, than under class rates at the comparatively lower minimum of 12,000 lbs., hence the earnings per car should be somewhat larger under commodity rates than under class rates. A moderate advance in the commodity rates may be justifiable.

The tariffs disclose a number of Wisconsin producing points from which no advances are proposed corresponding to those in question, thereby disturbing the established adjustment between producing points.

Should further investigation show that, under published rates, St. Paul will be discriminated against through loss of territory naturally tributary to it as a distributing center, carriers will be expected to remove the discrimination.

Carriers should withdraw suspended tariffs and file new tariffs in harmony with this report and with a view of removing discriminations and inconsistencies pointed out. (26 I. C. C., 655.)

Concentration of Cotton at Memphis, Tenn., and Blytheville, Ark.

In re investigation and suspension of the withdrawal of rules governing concentration and reshipping of cotton and cotton linters at Memphis, Tenn. Opinion by Chairman Clark:

Certain large cotton dealers having erected a cotton compress at Blytheville, Ark., the respondent proposes to establish rules requiring compression at Blytheville of the cotton grown in an important district from which cotton has moved to Memphis for compression. The commission decided that if shipments moved on original contract for carriage from points of origin to final destinations, and the carrier performed itself all the compression on its lines, there could be no objection to the location of its compresses at such points as it might select with a view to economies in transportation and conservation of equipment. Under similar conditions of shipment the situation would be much the same if all the compression were performed by commercial compresses owned and operated by those who had no interest in the cotton.

Where cotton is not shipped from point of origin under a contract for through shipment to final destination, but where the transportation charges are assessed to the compress point, and from the compress point to final destination, and subsequently adjusted to the basis of the through rate from point of origin to final destination, with carriers' right of compression in transit, a rule which requires compression at the compress of one who is the owner of or interested in cotton grown in that district and compressed at the same point, is not free from unjust discrimination or undue preference.

Where the rates provide carriers' right of compression in transit the carrier pays for the compression, and the one who is employed to perform the compression becomes the agent of the carrier and as such necessarily gains knowledge as to the business and shipments of his competitors, probably in contravention of the provisions of section 15 of the act.

The territory which respondent's suspended tariff proposes to make tributary to Blytheville only should be open via respondent's lines to both Memphis and Blytheville.

The suspended tariff must be canceled, and new rules in accordance with the commission's findings must be established. (26 I. C. C., 585.)

STATE COMMISSIONS.

The Railroad Commission of Louisiana has issued an order prescribing a distance scale of freight rates on fruits and vegetables.

The Texas Railroad Commission has issued a new tariff of freight rates on crushed stone, sand, paving clay and analogous articles, involving reductions varying from 10 to 15 per cent.

The Louisiana State Railroad Commission has ordered that all passenger cars shall be thoroughly cleaned and disinfected at the end of each run, or, in the case of certain short runs, at least each day. The order says that "coaches in service shall be kept as clean as possible without disturbing passengers."

The New York State Public Service Commission, Second district, acting in accordance with a law which has been passed by the legislature this year has assumed authority over baggage and transfer companies. In accordance with this law baggage and transfer companies are subject to regulation in regard to rates, service and capitalization, as are steam railroads.

The Louisiana State Railroad Commission, at the request of the brotherhoods of conductors and of trainmen, has modified its order No. 1517 regulating flagging. Flagmen must be examined once a year, instead of every six months; and where a man cannot read and write, the examination need not be in writing. An employee must not be promoted to the position of flagman until he has served as brakeman or switchman for six months; provided that on a freight train he may serve as both brakeman and flagman if he has had thirty days' experience as flagman.

The railway commissioners of Canada have ordered the express companies to submit at once new tariffs reducing by 20 per cent. the rates on merchandise in the prairie and mountain sections of the dominion. The commission desires to have the new rates prepared so that the tariffs can be published by July 15. In eastern Canada the commissioners found that the business of the Canadian Express Company, which does most of the business in that part of the Dominion, had been much less profitable during the past year than prior to that time. The cost of service has increased and the compensation paid to the Grand Trunk Railway has been made larger. On account of the reduction in profits the board will defer action in relation to that company.

COURT NEWS.

Unsecured Creditors Given New Rights.

The Supreme Court of the United States by a vote of five to four, in a suit against the Northern Pacific, lays down the rule that stockholders and bondholders in a corporation cannot defeat the claims of unsecured creditors by reorganization plans, if the creditor shows the proper diligence in presenting his claim.

The decision, by Justice Lamar, is concurred in by Justices McKenna, Day, Hughes and Pitney. A dissenting opinion was read by Justice Lurton and concurred in by Chief Justice White and Justices Holmes and Van Devanter. Justice Lurton characterized the majority opinion as "alarming."

The case involved a claim of more than 25 years' standing, in which Joseph P. Boyd was the creditor. The original claim was for $23,675, but it grew to $71,000, with interest and costs.

The judgment now affirmed is against the Northern Pacific Railway Company, which took over the Northern Pacific Railroad Company under a reorganization plan. The Northern Pacific Railroad Company was held as the debtor on account of its acquisition of the Coeur d'Alene Navigation Railroad Company, against which the claim was made originally. The case was admitted to be a test case.

Two questions were involved. One was whether or not Boyd, the creditor, had been diligent in prosecuting his claim, and on this the court divided. The majority opinion held that he had been reasonably diligent, while Justice Lurton, for the minority, characterized his methods as "sluggish." The other question was whether the transfer of the property of the old Northern Pacific Railroad Company, when it was an insolvent concern, to the reorganized Northern Pacific Railway Company could defeat the claims of unsecured creditors if they were non-assenting. The majority opinion holds that "as against the non-assenting creditors such a sale is void in equity regardless of the motive with which it was made."

Justice Lamar held that the transfer of the property to the reorganized company "was not a moral fraud, but the decree by which stockholders of the old company secured an interest in the new company does not necessarily operate against unsecured creditors of the old company."

The minority opinion holds that the objects of securing a receivership and a sale and reorganization of a great property that has become insolvent would be defeated if the rule laid down by the court is to be applied in the future.

Justice Lamar declared that "stockholders cannot defeat unsecured creditors by transferring property from themselves to themselves."

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Railway Officers.

Executive, Financial and Legal Officers.

F. W. Meyer has been appointed auditor of the St. Joseph & Grand Island and the St. Joseph Terminal Railroad, with headquarters at St. Joseph, Mo., succeeding S. G. Danforth, acting auditor, who has been assigned to other duties.

W. S. Battle, Jr., general claim agent, and J. M. Rodgers, statistician of the Norfolk & Western, at Roanoke, Va., having been assigned to special duties J. B. Baskerville has been appointed acting general claim agent and W. B. Moss has been made acting statistician. See an item in General News.

Operating Officers.

William Doherty has resigned as assistant general manager of the New Orleans, Texas & Mexico and the St. Louis, Brownsville & Mexico at Kingsville, Tex.

A. S. Johnson, freight agent of the Terminal Railroad Association of St. Louis, has been appointed superintendent, with office at St. Louis, Mo., succeeding J. J. Coakley, deceased.

D. F. Kirkland, superintendent of the Georgia & Florida at Douglas, Ga., has been appointed superintendent of the Birmingham division of the Atlanta, Birmingham & Atlantic, with office at Manchester, succeeding C. B. Wilburn, resigned.

Traffic Officers.

W. L. Donaldson has been appointed westbound agent of the freight department of the Lehigh Valley, with office at Chicago.

B. B. Hickman has been appointed freight agent of the Terminal Railroad Association of St. Louis, at St. Louis, Mo., succeeding A. S. Johnson, promoted.

A. B. Schmidt has resigned as general agent of the passenger department of the St. Louis & San Francisco at Chicago to become traffic manager of Sears, Roebuck & Company, of Chicago.

Engineering and Rolling Stock Officers.

A. J. Wharf has been appointed chief engineer of the Peoria & Pekin Union, with headquarters at Peoria, Ill., to succeed W. E. Emery.

W. C. Steffa has been appointed superintendent of car service of the Chicago & Alton, with office at Chicago, succeeding E. M. Stanton, resigned.

J. W. G. Brewer, superintendent of shops of the Baltimore & Ohio at Mount Clare, Baltimore, Md., has been promoted to assistant district superintendent of motive power of the main line district, with headquarters at Baltimore. P. Coniff, master mechanic at Cumberland, succeeds Mr. Brewer. T. R. Stewart, master mechanic of the Riverside shops, Baltimore, has been transferred to Cumberland in the same capacity, succeeding Mr. Coniff. J. Kirkpatrick, master mechanic at Newark, Ohio, succeeds Mr. Stewart. J. F. Bowden, master mechanic at Garrett, Ind., succeeds Mr. Kirkpatrick. F. W. Rhuark, master mechanic at Lorain, O., succeeds Mr. Bowden, and J. A. Anderson, general foreman, has been promoted to master mechanic at Lorain, succeeding Mr. Rhuark.

Leon F. Lonnbladh, who recently was appointed engineer maintenance of way of the Missouri, Kansas & Texas, with headquarters at Parsons, Kan., was born December 7, 1877, at Boras, Sweden. He was graduated from the Boras Technical College, Sweden, in June, 1898, and began railway work the same month as assistant engineer of the Boras-Ilerrljunga Railroad in Sweden. From September, 1898, to May, 1899, he was an assistant engineer on various railroad surveys and locations, and from the latter date to September of that year was locating engineer. He was then until April, 1902, successively assistant engineer, resident engineer and locating engineer on construction of the Ystad-Brosarp Railroad in Sweden. In June, 1902, Mr. Lonnbladh became office engineer for the Tennessee Construction Company, and in December of the following year was made assistant engineer of the Tennessee Central Railroad. From August, 1904, to December, 1905, he was successively engineer of construction and chief engineer of that road, when he left to go to the Southern as assistant to the chief engineer of construction. In February, 1907, he was appointed principal assistant engineer of construction of the New Orleans, Texas & Mexico and the Beaumont, Sour Lake & Western. From January 1 to July 1, 1908, he was in charge of location work, and on the latter date was made chief engineer of the Tennessee Central; in October, 1912, he was appointed superintendent also, which positions he held until he resigned April 1 to go to the Missouri, Kansas & Texas as engineer maintenance of way, as above mentioned.

J. R. Greiner, whose appointment as master mechanic of the San Pedro, Los Angeles & Salt Lake, with headquarters at Milford, Utah, has already been announced in these columns, was born February 15, 1881, at Circleville, O. He received a high school education at Delaware, Ohio, and began railway work March 1, 1900, as an apprentice with the Cleveland, Cincinnati, Chicago & St. Louis at Delaware. In April, 1904, he went to the Cincinnati, Hamilton & Dayton as machinist at Indianapolis, Ind., and in September of that year was transferred to Lima, Ohio, in a similar capacity. From January, 1905, to December 28, 1907, he was employed as machinist by the Mobile, Jackson & Kansas City at Mobile, Ala.; Norfolk & Western at Portsmouth, Ohio; Cleveland, Cincinnati, Chicago & St. Louis at Delaware, and the Cincinnati, Hamilton & Dayton at Lima. He was then made roundhouse foreman of the latter road at Toledo, Ohio, and was promoted to master mechanic at Lima in March, 1911, which position he held until the office was abolished on January 1 last. Mr. Greiner then became connected with the National Boiler Washing Company at Chicago, leaving that firm to go with the San Pedro, Los Angeles & Salt Lake as master mechanic, as above noted.

J. R. Greiner.

OBITUARY.

E. B. Wakeman, who was superintendent of the Minneapolis Union Railway from April, 1895, to September, 1904, died on April 20 at Hollywood, Cal.

John H. Weller, formerly superintendent of the Dayton & Michigan, now the Toledo division of the Cincinnati, Hamilton & Dayton, died on April 22, at his home in Dayton, Ohio, at the age of 83. His death was due to paralysis and to the effects of his exposure for several days without food or warmth during the recent floods in southern Ohio.

A. W. Quackenbush, formerly master mechanic of the Quincy, Omaha & Kansas City, died in Kansas City, Mo., on April 19, aged 68 years. Mr. Quackenbush began railway work in 1862 and, after completing an apprenticeship as machinist with the Hudson River Railroad, he filled various positions as foreman of machine shops and master mechanic on various eastern roads until 1880, when he went to the Wabash, St. Louis & Pacific as master mechanic. From January, 1887, to July, 1889, he was general master mechanic of the Wabash Western and then until December, 1892, was superintendent of machinery of the Chicago & Alton. He was superintendent of motive power of the St. Louis, Cape Girardeau & Ft. Smith from July, 1893, to October, 1899, when he became superintendent of motive power and rolling stock of the Omaha, Kansas City & Eastern, the Omaha & St. Louis and the Kansas City & Northern Connecting railroads. Subsequently he was made master mechanic of the Quincy, Omaha & Kansas City, successor to the former roads, which position he held at the time of his retirement from active service in February, 1911.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE SOUTHERN RAILWAY is in the market for 45 locomotives.

THE ST. LOUIS & SAN FRANCISCO is in the market for 30 locomotives.

THE SEABOARD AIR LINE has ordered 40 Pacific type locomotives from the American Locomotive Company, 5 switching locomotives from the Baldwin Locomotive Works.

THE CAPE GIRARDEAU NORTHERN, Cape Girardeau, Mo., has ordered 2 mogul locomotives from the American Locomotive Company. The dimensions of the cylinders will be 18 in. x 24 in., the diameter of the driving wheels will be 54 in., and the total weight in working order will be 113,000 lbs.

THE CUBA RAILROAD has ordered 14 ten-wheel freight locomotives and 1 ten-wheel passenger locomotive from the American Locomotive Company. The freight locomotives will have 18 in. x 24 in. cylinders, 52 in. driving wheels, and in working order will weigh 129,000 lbs. The passenger locomotive will be equipped with a superheater, will have 21 in. x 26 in. cylinders, 68 in. driving wheels, and in working order will weigh 137,000 lbs.

CAR BUILDING.

THE WABASH is making inquiries for 1,000 box cars. This road did not apply to the courts for permission to buy more equipment as was recently mentioned in these columns.

THE ERIE is in the market for 1,000 refrigerator cars.

THE SOUTHERN RAILWAY is in the market for 1,800 freight cars.

THE ILLINOIS CENTRAL has ordered 18 coaches, 6 postal cars, 13 combination mail and baggage cars, 3 dining cars and 3 express cars from the Pullman Company. Of this order, 8 coaches, 3 express cars and 3 combination mail and baggage cars are for the Central of Georgia.

THE GRAND TRUNK, mentioned in the *Railway Age Gazette* of April 18 and April 25, as having placed large orders for freight cars both in Canada and in the United States, has placed orders as follows: 3,000 box cars, Western Steel Car & Foundry Company; 1,000 drop-bottom special service cars, Pressed Steel Car Company; 2,000 box cars, Canadian Car & Foundry Company; and 2,000 box cars, Eastern Car Company. This item supersedes the two items above mentioned.

IRON AND STEEL.

GENERAL CONDITIONS IN STEEL.—The volume of orders for new business has been extremely small during the past week, but the mills continue to operate at almost full capacity and specifications are heavy. Prices are high and consumers appear to be holding off in expectation of reductions. The orders placed by the railroads are very small indeed, and the volume of orders pending is light. A heavy increase in orders for freight cars is expected in the near future to enable the railroads to handle the heavy fall traffic.

YARD LIGHTING AT MELBOURNE, AUSTRALIA.—Among the improvements which the scheme for the electrification of the Melbourne suburban system will introduce, will be the illumination of the station yards and semaphores. Provision has been made for the lighting of the whole of the yards in the suburban area by current generated at the railway department's own power station. At present a number of the stations are lighted with primitive kerosene lamps. The annual cost of lighting all the stations and yards with these lamps and with electric current bought from a private source within the suburban radius is estimated at $75,000. It is estimated that this sum will be considerably reduced when the complete scheme of electric lighting is carried out.

Supply Trade News.

H. B. Kraut, of the export department of Joseph T. Ryerson & Son, Chicago, will sail for Europe on May 6, in the interests of the company's foreign business.

Francis T. West, northwestern sales agent for the American Iron & Steel Manufacturing Company, has removed his office from The Rookery, to 1547 McCormick building, 332 South Michigan avenue, Chicago.

E. R. Schoenberger, formerly connected with the Griffin Wheel Company, Chicago, has been made manager of the western railroad department of the U. S. Metal & Manufacturing Company, New York, with office in Chicago.

Raymond J. O'Brien has resigned his position in the railway engineering department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., to accept a position with Gibbs & Hill, consulting engineers.

The Union Spring & Manufacturing Company, New York, mentioned in the *Railway Age Gazette* of April 25 as having moved from 149 Broadway to 50 Church street, has not made this change, but is still located at 149 Broadway.

H. Martin Gower, formerly in charge of the apprentice work on the Canadian Pacific, has accepted a position in charge of the railway department of the A. R. Williams Machinery Company of Winnipeg, Ltd., with headquarters at Winnipeg, Man.

W. W. Coleman, who has for the past five years been in the estimating department of the Union Switch & Signal Company, Swissvale, Pa., with office in New York, has resigned that position to go to the Edison Storage Battery Company, Orange, N. J., as sales engineer.

C. Wadsworth has established an office at 961-3 Woodward avenue, Detroit, Mich., as manufacturers' agent for the purpose of representing manufacturers of contractive machinery and materials of construction, making more or less of a specialty of municipal equipment and supplies.

The Standard Asphalt & Rubber Company has received an order for Sarco waterproofing for nearly 1,000,000 sq. ft. of surface on subways and viaducts on the lines of the Kansas City Terminal Railway leading to the new Union station. This is in addition to a previous order for nearly 700,000 sq. ft. of surface on the Union station.

J. Allan Smith, vice-president and general manager of the United States Light & Heating Company, New York, has been made president of that company, succeeding D. W. Pye, resigned. Charles A. Starbuck, vice-president of the same company, resigned that position to become chairman of the board of directors. Frank P. Frazier, a director of the company, was made a vice-president. William P. Hawley, manager of the New York office, was made a vice-president, and A. H. Ackermann, assistant general manager, was made general manager.

Willard Doud on April 1 resigned his position as shop engineer of the Illinois Central to engage in special work on industrial engineering projects as consulting engineer with office at 15 West Kinzie street, Chicago. For the past 11 years Mr. Doud has been engaged in railroad work, principally in the design, construction and supervision of railroad shops and power plants. In 1902, after a course in mechanical engineering at the University of Illinois, he entered the employ of the Kenefick Construction Company, Kansas City, Mo., which was engaged in railroad construction work in the Indian Territory. In 1904 he resigned his position with that company to enter the mechanical department of the Kansas City Southern as machinist helper, with office at Pittsburg, Kan., later serving as draftsman and chief draftsman with that company. In 1905 he was made draftsman of the Chicago, Burlington & Quincy, and after two years, shop engineer. While with the Burlington, Mr. Doud had general supervision over the mechanical end of shop improvements, and supervised the electrification of the West Burlington, and the old Havelock shops, and also had charge of the construction work of the new Havelock shops. In February, 1911, he went to the Illinois Central as shop engineer, which position he retained until April 1, as mentioned above.

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Railway Construction.

CAROLINA & GEORGIA.—A contract has been let for building this line, and work will be started by May 15. The capital stock is to be increased from $100,000 to $2,500,000, and a bond issue of $2,000,000 has been authorized. The line between Augusta, Ga., and Columbia, S. C., 75 miles, is expected to be finished during 1914. Both steam and electricity may be used as the motive power. G. E. Sland and James U. Jackson, Augusta, may be addressed.

CHAMBERSBURG & SHIPPENSBURG (Electric).—Bids are wanted until May 12, for the grading, track laying and ballasting, also for the masonry and culverts, from Red Bridge Park, Franklin county, Pa., to Shippensburg, Cumberland county, Pa., about 8.4 miles. T. M. Mahon, president, and J. G. Schaff, secretary, Chambersburg. (April 4, p. 821.)

FAIRMOUNT & VEBLEN.—An officer of this company, which was organized last year, writes that financial arrangements have been made and contracts have been let to Whittier & Brolander, to build about 46 miles of railway from Veblen, in Marshall county, S. Dak., east, thence north to Fairmount, N. Dak. There will be three trestles on the line, and the grading involves handling a total of about 500,000 cu. yds. The company expects to develop a traffic in grain, lumber, stock and dairy products. J. Rosholt, president, and J. S. Thomas, chief engineer, Minneapolis, Minn. (December 27, p. 1288.)

FALLON RAILROAD (Electric).—This company has been organized in Nevada, with a capital of $300,000, to build from Fallon, Nev., northeast to Stillwater, about 15 miles. A. R. Merritt, president, and C. A. Hascall, general manager.

INTERURBAN RAILWAYS.—A franchise has been granted this company in Slidell, La. Application will soon be made for a charter to build a line to connect New Orleans, Slidell and Covington. Gas-electric cars will be used for the motive power. J. Blythe and T. S. Ranlett are interested.

KANSAS CITY, MEXICO & ORIENT.—Work on the extension from Fort Stockton, Tex., to Alpine, 63 miles, has been finished, and this section is now open for business.

KETTLE VALLEY.—According to press reports bids will be asked for in about one month to build a section between the summit of the Hope mountains down the valley of the Coquehalla river, west to Hope, B. C.

LANCASTER & CHESTER.—An officer of this company which operates a line from Chester, S. C., to Manchester, 29 miles, writes regarding the report that an extension is to be built, that the company will increase its capital from $50,000 to $500,000, and the line may be extended.

LAKE ERIE & NORTHERN (Electric).—This company has started work on the line from Galt, Ont., south via Brantford to Port Dover, and several miles have been cleared between Paris and Galt, and grading has been started between Paris and the Harrisburg line of the Grand Trunk. Work is also to be started at once on the section between Waterford and Simcoe. The company plans to have all the grading work finished by November 1, and to have the track laying completed between Brantford and Galt by October 15. The track laying to Port Dover is expected to be completed by May, 1914. John Muir, president; W. P. Kellett, chief engineer, Brantford. (August 30, p. 409.)

NEW BRUNSWICK ROADS.—Application has been made for a charter in New Brunswick to build from Bristol, N. B., east to a point on the National Transcontinental (Grand Trunk Pacific) at Juniper brook. D. H. Lamont, J. McIntosh and R. Ronald, Glassville, are back of the project.

OKLAHOMA ROADS (Electric).—Plans are being made, it is said, to build from Pryor creek, Okla., east to Salina, and to Locust Grove, about 22 miles. J. A. Quinn, Pryor, may be addressed.

PARIS & MOUNT PLEASANT.—This company has just finished the extension from Bogata to Mt. Pleasant, 32 miles. It is understood that work on the extension northwest from Paris to Atoka, Okla., and to the Lehigh coal fields, about 60 miles, will soon be started. (January 3, p. 39.)

PENNSYLVANIA RAILROAD.—Contracts have been let to the James McGraw Co., Philadelphia, and to the Duquesne Contracting Company, Pittsburgh, for a revision of nine miles on the Buffalo division between Glynden, Pa., and Corry.

An officer writes that the improvements contemplated at Erie, Pa., consist of changes in yard tracks in order to handle the increasing lake traffic. The plan provides for an increase in storage tracks for east-bound and west-bound Anchor Line business. In addition, a run-around track will be constructed at the ore pier in order to give a continuous movement to empty cars in and loaded cars out.

PIGEON VALLEY.—An officer writes that the plans call for building from Pigeon Falls, Wis., to Hay creek in the town of Bridge Creek, about 20 miles. A preliminary survey has not yet been made. H. A. M. Steen is president, Northfield. (April 18, p. 925.)

SAN BENITO & RIO GRANDE VALLEY.—Financial arrangements are said to be made for building an extension north from Alton, Tex., to San Antonio, about 250 miles, also for an extension east via San Benito to Point Isabel on the Gulf coast. The company was authorized some time ago to issue $10,000,000 of bonds to provide for the proposed extensions. (November 29, p. 1064.)

SANTA ROSA, PALMA & ALBUQUERQUE.—Organized in New Mexico to build from Santa Rosa, N. Mex., west to Albuquerque, about 125 miles. To provide for making the necessary surveys and other preliminary work $25,000 has been subscribed by residents of Santa Rosa.

SHENANDOAH VALLEY (Electric).—An officer writes that contracts will probably be let in two months to build from Williamsport, Md., southwest via Hedgesville, W. Va., thence south via Martinsburg and Charlestown, to Winchester, Va., about 60 miles. Gray Silver, president, Martinsburg, W. Va., and Dudley D. Britt, chief engineer, Clarksburg. (April 18, p. 925.)

RAILWAY STRUCTURES.

ALBERT LEA, MINN.—It is reported that the Minneapolis & St. Louis is planning to expend $300,000 for a new station, freight depot, offices and yards at this point.

FORT WORTH, TEX.—The St. Louis Southwestern will begin the construction of extensive new freight terminals within the next 60 days, including a warehouse and a bridge over the Trinity river.

LACKAWANNA, N. Y.—See Rochester.

MONTREAL, QUE.—The Canadian Pacific has given a contract to D. G. Loomis, it is said, for putting up a one-story addition, 150 ft. x 600 ft. at the Angus shops.

NORTH BAY, ONT.—The Canadian Pacific has started work, it is said, on the construction of additional shops at North Bay, to cost $249,000. A large erection shop will be constructed, and another large building will be used for car construction and repairs.

OTTAWA, ONT.—The Canadian Northern will put up a roundhouse and car shops, it is said, at Ottawa.

ROCHESTER, N. Y.—An officer of the Buffalo, Rochester & Pittsburgh writes regarding the reports that a new warehouse is to be built at Rochester, that it is undecided when the building will be put up, as the plans have not yet been completed. Work has been started on a combined passenger and freight station at Lackawanna, to be of frame construction, 20 ft. x 63 ft., and to cost $6,200. The work is being carried out by the company's men.

SOMERSET, PA.—The Baltimore & Ohio has plans made for building the new passenger station at Somerset. It is to be a two story stone structure, 28 ft. x 92 ft., to cost $30,000. (March 14, p. 481.)

THIEF RIVER FALLS, MINN.—The Minneapolis, St. Paul & Sault Ste. Marie has prepared plans for a new passenger station.

TORONTO, ONT.—The Canadian Northern has decided to establish yards and extensive shops at Leaside.

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Railway Financial News

ALABAMA, TENNESSEE & NORTHWESTERN RAILWAY.—This company has been organized to take over the Alabama, Tennessee & Northwestern Railroad, the Tombigee Valley and the Mobile Terminal & Railway. The company has an authorized issue of $25,000,000, 30 year first and refunding mortgage bonds of which $2,000,000 have been issued and deposited to secure $1,000,000, 3 year, 6 per cent. notes due May 1, 1916. These notes have been bought by F. J. Lisman & Co., New York, and are being offered to the public. The reorganized company operates about 225 miles of railroad running from Mobile, Ala., to Reform on the Mobile & Ohio.

BIRMINGHAM & NORTHWESTERN.—Wells, Humphrey, Niehol & Ford, Detroit, Mich., are offering $450,000, 6 per cent. collateral notes maturing in three years at par. The notes are guaranteed principal and interest by the Mercantile Trust Company, Jackson, Tenn., and are secured by $800,000 first mortgage bonds and all of the common stock of the B. & N.

BOSTON & MAINE.—It is understood that plans are being discussed for the issue of equipment trust certificates amounting to in the neighborhood of $9,000,000. If these plans are carried out the proposed sale of $7,500,000, 4½ per cent. debentures will be indefinitely postponed.

DENVER, LARAMIE & NORTHWESTERN.—According to the *Wall Street Journal*, negotiations for the sale of this property which is now in the hands of the receiver, to one or two eastern syndicates are now under way.

LAKE SHORE & MICHIGAN SOUTHERN.—Morgan, Grenfell & Co., London, have bought from the company and resold in London £2,000,000 ($10,000,000) 1 year notes dated May 15. The notes were sold to the public on a 5½ per cent. basis.

LARAMIE, HAINES PEAK & PACIFIC.—The bondholders' protective committee has asked first mortgage bondholders to give their consent to the issuance of $315,000, 2 year, 6 per cent. receiver's certificates. The committee offers to buy the January 1, 1913, certificates of all of the bondholders who consent.

NEW YORK CENTRAL & HUDSON RIVER.—J. P. Morgan & Co., New York, have bought from the company and resold $10,-000,000, 1 year, 5 per cent. notes. This is in addition to the £2,000,000 ($10,000,000) notes recently sold in London.

NEW YORK, NEW HAVEN & HARTFORD.—See brief comment on the hearing before Commissioner Prouty in the editorial columns.

TENNESSEE CENTRAL.—H. C. Pierce, testifying in a suit in St. Louis on April 25, said that in assuming the liabilities of the Tennessee Central, which is now in the hands of a receiver, he had obligated himself to about $4,000,000.

UNION PACIFIC.—The attorney general has filed in the Supreme Court a brief in regard to the extensions of time in the Union Pacific tests. This brief says in part, "Under the peculiar circumstances shown I am of the opinion that to extend the time during which a plan for disposing of the Southern Pacific stock in question may be presented until July 1, 1913 may be greatly to the public's interest . . . but I emphatically oppose any extension beyond that date and with equal emphasis oppose an order granting the District Court power to enlarge such time as it may decide."

Union Pacific in its answer to the attorney-general's objections says:

"All actual control by petitioners over the management of the Southern Pacific has been terminated and the stock of the Southern Pacific held by petitioners is disfranchised. The public interests will not, therefore, be affected in the slightest degree by any delay in the ultimate disposition of said stock.

"The control of this court over its decree and mandate will terminate on the adjournment of the present term. Upon the expiration of the term at which a decree is entered, such decree passes beyond the court and cannot be corrected, modified or set aside. In view of the exceptionally large amount of stock to be disposed of, the manifest difficulties of the problem, the collateral objects of the government as indicated by the first plan submitted to the District Court, it would seem to be most unfortunate to permit this case to get into a condition in which neither this court nor the District Court would have power to extend the time for working out a satisfactory plan for dealing with the complex situation.

"The only adequate relief which can be afforded by this court is either an extension of time for a long period, or, as prayed in the pending motion, a modification of the mandate committing the matter of time entirely to the discretion of the District Court."

WABASH PITTSBURGH TERMINAL.—See Wheeling & Lake Erie.

WHEELING & LAKE ERIE.—The reorganization plan—independent —which has been prepared by Daniel B. Ely & Co. provides for the consolidation of Wabash Pittsburgh Terminal and the Wheeling & Lake Erie under the name of the Wheeling, Lake Erie & Pittsburgh. Under this plan the new company would have an authorized issue of $100,000,000 first and refunding 5 per cent. 50-year bonds, secured by a mortgage on the entire property of both companies, subject only to $20,113,867 underlying liens. Of these bonds $30,000,000 would be issued at once and in addition there would be issued an undetermined amount of bonds stamped non-cumulative for seven years to pay off the debt to the Wabash. The new company would have $25,000,000 first preferred non-cumulative 4 per cent. stock, $12,000,000 second preferred 4 per cent. non-cumulative stock and $22,500,000 common stock held under a 10 years' voting trust. The total amount of capital required is $25,500,000, of which $20,370,000 is to be raised through the sale of notes secured by the $30,000,000 new first and refunding bonds and the remaining $5,130,000 to be raised by what amounts to an 11 per cent. assessment on the holders of Wabash-Pittsburgh first mortgage bonds and all three classes of Wheeling minority stock.

PROPOSED SPANISH RAILWAY.—Proposals are requested by the Ministerio de Fomento Seccion de Ferrocarriles, Madrid, Spain, for the concession and construction of a railroad from Avila to Salamanca by way of Penaranda de Bracamonte, about 75 miles. This road will connect with the Northern Railway at Avila. Tenders must be submitted to the ministry by June 25, 1913, accompanied by $18,000 cash. A further guaranty of $180,000 is required within 15 days after the granting of the concession, this latter sum to be returned on completion of the work.

A RAILWAY "CRUISE" IN SPAIN.—The Madrid-Caceres-Portugal & Western Railway announces an excursion on somewhat novel lines, with the idea of introducing tourists to the little known but interesting country between Madrid and the Portuguese frontier. A special "cruiser" train, consisting of parlor, sleeping, and restaurant cars, will leave Venta de Banos on May 22, for Leon, Astorga, Salamanca, etc., and at various points along the line, motor cars, carriages, or mules, will be provided, and excursions will be made to places of interest outside the railway zone, rejoining the train, which will thus serve as a sort of traveling hotel, at some other station further along the route. The travelers will in this way be able to visit places quite off the beaten track with the assurance of being able to get back each night to a comfortable dinner and bed in what is practically a private car. The excursion will take 11 days, and the number of passengers will be limited to 30.

COAL CONSUMPTION ON SUPERHEATER ENGINES.—Vincent L. Raven, chief mechanical engineer of the North-Eastern Railway of England, in a recent address stated that in 1911 the North-Eastern designed and built 20 express locomotives for the heavy main-line express trains between York and Edinburgh. Ten of the engines were of the ordinary type with a pressure of 180 lbs. to the sq. in. and having 15½-in. cylinders. The other 10 were equipped with superheaters and had a pressure of 160 lbs. to the sq. in. and 16½ in. cylinders. At the end of the year 1912 it was found that the coal consumption for the ordinary engines averaged 47.8 lbs. per mile and for the superheater engines it averaged only 38 lbs. per mile, showing a saving of 9.8 lbs., or 20 per cent. per mile. Not only was there this economy, but it was found, after 18 months' trial, that the boilers of the superheater engines were in better condition than were those of the ordinary type. These results were so gratifying, added Mr. Raven, that they were extending the practice with regard to new engines and in many cases where reboilering was done.

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Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	10 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,000 copies were printed; that of those 8,000 copies, 6,561 were mailed to regular paid subscribers and 946 were provided for counter and news companies' sales; that the total copies printed this year to date were 168,895—an average of 8,639 copies a week.

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THE first cost of applying air brakes to freight cars has been very large, but its advantages are so fully understood that no one would for a minute question the advisability of having the cars so equipped. It is rather surprising, however, that after applying such an expensive apparatus so many of the roads fail to appreciate the necessity of seeing that it is maintained in such a condition as to insure a high degree of efficiency in service—and this is all the more important, since long heavy trains have become so common. That careful attention to the upkeep and condition of the air brake apparatus will be amply repaid is indicated by the paper on "Undesired Quick Action," which was read before the Air Brake convention at St. Louis on Tuesday morning, and which is reproduced in another part of this issue. The actual damage to the cars by such failures is important, but not nearly so much so as the resulting delay to the movement of trains and the added cost of wages for the train and engine crews. The draft gears, underframe, and superstructure of freight cars have been greatly strengthened in recent years to guard against failure, but it will be folly to carry this beyond a certain point, because of the added weight of the equipment. Every reasonable means should thus be taken to guard against failure of the air brakes and the abuse of the equipment.

THE Interstate Commerce Commission has made a good start in forming its organization for the valuation of railways. It is announced that the work will be in general charge of Commissioner Prouty. Five of the engineers who are to have charge of the engineering work have been selected. They are R. A. Thompson, W. D. Pence, J. S. Worley, Howard M. Jones and Edwin F. Wendt. Mr. Thompson is now chief engineer of the California commission, and was formerly chief engineer of the Texas commission. The fact that he was formerly connected with the Texas commission is not apt to give railway officers a favorable opinion of his fairness, but his attitude at times was decidedly more fair than that of the commission. Mr. Pence has been professor of railway engineering of the University of Wisconsin and chief engineer of the state commission for seven years, and has had charge of the commission's valuation work; and the Wisconsin commission's valuations, as well as its work as a regulating body in general, have usually been ably and fairly done. Mr. Wendt has been in railway service throughout his active professional career, is assistant engineer of the Pittsburgh & Lake Erie, and was this year elected president of the American Railway Engineering Association. His election as president of this great engineering organization is a sufficient indication of his standing as a railway engineer. Mr. Worley is a consulting engineer at Kansas City, and Mr. Jones a consulting engineer at Nashville. It is announced that an army engineer also probably will be appointed. If the rest of the personnel of the commission's organization is as good as the part already announced it will command and deserve the confidence of railway managers and the public.

THE mechanical department officers of a trunk line were surprised to find a number of years ago that the engine failure records showed a greater number of failures during the hot summer months than during the winter season. Special efforts had always been made to prevent failures during the severe winter weather and the men were kept keyed to a high pitch in their efforts to reduce them to a minimum. When the warmer weather set in and the elements were more favorable, the men gradually relaxed in their efforts to prevent failures and accidents. Special steps were made to overcome this tendency and as early as January and February the officers started to emphasize the necessity of guarding against failures when the warmer weather set in and the operating conditions were more favorable. The results were remarkable; the failures were very much less in number than for a corresponding period during the previous years. The same thing is undoubtedly true of accidents, and those who are in charge of "safety first" movements and boiler inspection will do well to agitate this matter at the present time with a view of reducing such accidents during the coming summer. In this connection the number of accidents reported to the division of locomotive boiler inspection of the Interstate Commerce Commission for each month during the year ending June 30, 1912, is of interest.

1911.		1912.	
July	100	January	70
August	92	February	73
September	52	March	81
October	68	April	51
November	64	May	74
December	58	June	73

These figures must not be taken as conclusive, because it is quite probable that due to misunderstandings the railroads did not report all of the accidents that they should when the law first went into effect in 1911. It would appear, however, that the

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number of accidents during July and August is considerably higher than for the other months of the year, and it will be interesting to see whether this condition still exists when the next annual report is made.

THE LABOR LOBBY.

ADMIRATION for the ingenuity of the legislative lobbies of the labor brotherhoods in devising bills to strengthen the position of labor in dealing with the railroads, and for their skill in getting legislatures to pass them, grows apace among those who follow their activities. No argument based on facts, reason or the public welfare has been sufficient to keep numerous legislatures from passing, and governors from signing, train crew bills. The demonstration that practically their only effects were to increase the number of employees and the amount of the operating expenses of railways has been impotent when it has encountered the argument that the labor organizations have the votes. These ingenious and skillful lobbyists are also actively pushing other classes of bills which are equally pernicious. One class of them is designed to make it impracticable for the railways to get men to fill the places of those who quit in case of strikes. These usually take the form of requirements of a specified length and character of experience as a prerequisite for holding certain positions. They are put forth as measures to promote safety, but their real purpose is to prevent the railways from resorting to the employment of strikebreakers.

Just how sincere is the solicitude of the brotherhoods' lobbies for safety is indicated by recent experience with a measure to prohibit trespassing in Texas, where, as elsewhere, a large majority of all the people killed on railways are killed while trespassing. It had been thought the bill would pass. Then some influence suddenly caused a loss of interest in it, and it was shelved. Inquiry developed the fact that the brotherhoods, whose support had been counted on, had instead offered opposition. Their *volte face* was caused by the discovery that, as, in case of a strike their members would cease to be employees, under the proposed legislation they would lose their right of access to railway property, which might hamper some of the ingenious practices resorted to where strikes are on, such as throwing emery dust into the bearings of a locomotive, or soap into the boiler!

Another example of the brotherhood lobby's interpretation of "safety first" is afforded by a bill recently introduced in the New Jersey assembly, providing that where tests of apparatus are to be made in connection with the operation of trains previous notice shall be given in writing to the engineman. This would effectually stop "surprise tests" to determine if signals are being obeyed, by taking out the "surprise." Such tests have proved one of the most effective methods of preventing accidents, because they cause employees to be careful in the observance of signals and orders, and if it be considered desirable to stop them a much better and safer method than that provided by this bill could be adopted. This would be to require enginemen and other employees to give railway operating officers notice in writing when they are going to disobey a rule, order or signal.

The effective power of reiteration and continuous pressure has undoubtedly assisted the passage this year of some of these so-called safety bills that in past years have aroused little interest among the legislators. According to press reports the brotherhoods are knocking at the doors of the California assembly with a bill of a kind which appears to be new. It provides that railways before "docking" or discharging an employee for wrongdoing or violation of orders on the evidence of "spotters" shall give the accused a chance to reply to the "spotter" face to face. This opprobrious word "spotter" is simply a synonym for detective. The railways, in the interest of good discipline, have found it necessary to employ detectives to learn whether their conductors are collecting and reporting fares properly and whether their engineers are drinking, just as they have found it necessary to conduct surprise tests to make signal indications effective, and just as the government finds it necessary to employ inspectors and examiners to see that the railways themselves obey the laws passed to regulate them. Naturally "spotters," detectives and examiners are not popular in railroading or elsewhere. The honest, careful man resents espionage, and the dishonest or reckless one resents it even more. As the "spotter" is employed on only a single road he must work incognito to be of any value. Even under present conditions the men are apt to identify him, when it is necessary to transfer him to some other division or discharge him entirely. If required to support his charges openly he would become a marked man. The spotter once spotted would not longer spot with success. He would be about as valuable to his employer as the surpriseless surprise tests provided for in that New Jersey bill.

Bills such as those in New Jersey and California here referred to are extreme, but they are hardly worse than many measures which have been promoted by the labor lobbies in the past and actually passed by legislatures. The railway employees of the United States rank above the average of our citizenship in intelligence, sobriety and public spirit. Many persons doubtless have wondered why they support measures, few of which are meritorious, most of which are against the public interests, and some of which are almost idiotic. A very large proportion, and probably a majority, of the members of the brotherhoods really do not favor the legislation pressed in their names. But labor politics, like political policies, are dictated by the most active and aggressive, not by the most numerous, and once they have been decided on a brotherhood member who opposes them finds things disagreeable for him, if he does not lose his brotherhood membership. The kind of methods used by the labor lobbies to get the measures they favor passed is indicated by the following from a statement issued by the lobby at Springfield, Ill. on May 3 and published in the morning newspapers of May 4:

> International officers of the railroad men are on their way to Illinois to assist the representatives (in other words, the lobbyists) in their attempt to persuade the lawmakers to "do it now." . . . The proposed law known as the full crew act is in the Senate sub-committee. The Brotherhood of Railroad Trainmen has more than 10,000 members in the state and is backing the measure. For a second choice they will support a car limit bill for freight trains, and as this will appeal to the public it may be the compromise decided upon. . . . The situation is increasing in tenseness every day. A few railway employees are trying to ride the top rail of the fence and still touch ground on either side. *These the railway brotherhood officers are threatening with dire penalties for insubordination.* (The italics are ours.) A. D. Burbank, representing the trainmen's union, speaks very hopefully of the outlook, and, as he is one of the big five—Culp of the Engineers', McCarthy of the Firemen's, Carroll of the Conductors' and Comora of the Switchmen's—besides having the united support of the American Federation of Labor, the prospects of several measures backed by the united labor lobby seem to be very good. "If we don't get a part of our proposed legislation there will be 20,000 railroad men on the warpath in this state," said Mr. Burbank, "and they won't be after me, either."

The meaning of this is quite clear. First, the labor lobbies do not deny, but flaunt, their activities. Second, members of the brotherhoods who oppose legislation favored by them are threatened with dire punishment. Third, the lobbyists represent—or represent that they represent—several thousand votes, and will see that they are used against legislators who don't vote for the legislation the lobbyists demand. It is notable that there is not a syllable in the statement to indicate that it is even pretended that the bills being backed by the lobby are being pressed in the interest of the public welfare. Every one of them, if passed, would increase railway expenses, not for the benefit, but in the long run, to the detriment, of the public. In view of this fact the question arises as to why there has been so much agitation against lobbyists representing railways and other corporations, while so much tolerance is accorded to lobbyists representing railway brotherhoods. Certainly there is significance in the difference between the reception accorded in these days of reform to labor lobbyists with votes at their back and to representatives of railways with nothing but arguments to offer.

The railways formerly sometimes protected themselves against unfair legislation by buying up strike legislators with passes and

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cash. They recently have been trying to prevent such legislation solely by publicity and fair arguments. These honest and decent methods have in many instances proved ineffective when matched against the railway labor lobby backed by organized voting strength. Is it possible that developments are going to prove that those are right who contend that the only weapon corporations can use effectively against the bribing power of organized votes is the bribing power of cash? The universal presence of the labor lobby, and the results it has been getting are some of many striking evidences of the degraded level to which American state legislatures have sunk, in spite of all the reform talk and agitation of recent years.

PROPOSED RATE ADVANCES ON EASTERN ROADS.

IN its decisions two years ago denying the general advances in rates the railways then sought, the Interstate Commerce Commission intimated that if changes in conditions showed the railways really needed larger earnings it would let them take the action necessary to secure them. It is now announced by President Willard of the Baltimore & Ohio that the eastern roads will soon ask the commission to permit an increase of 5 per cent. in all their freight rates.

A good many things have happened within the last two years which affect the situation of the railways, and which may influence the attitude of the commission. The net operating income per mile of the railways of the entire country in the year ended June 30, 1910, was the largest in history. The commission referred to this in its decisions, and expressed not only the hope, but the opinion, that they would be still larger the next year. The opinion expressed proved incorrect; the hope was not realized. Operating income—which is what the carriers have left after paying expenses and taxes—was less in the fiscal year 1911 than in 1910, and less in the fiscal year 1912 than in 1911. In its annual report for 1911 the commission made comparisons between the earnings of railways operating 239,483 miles in 1910 with the earnings of the same roads in 1911. The operating revenues of these roads declined from $11,636.21 per mile in 1910 to $11,588.19 in 1911, and their net revenue from outside operations from $11.09 per mile to $8.52 per mile. Meantime, their operating expenses increased from $7,711.19 per mile to $7,957.56 per mile and their taxes from $437.70 per mile to $448.58 per mile, causing a decline in operating income from $3,498.41 per mile to $3,191.36 per mile. As to the eastern group of railways, the same report showed that the operating income of those earning more than $10,000,000 per year declined from $299,591,499 in 1910 to $266,623,158 in 1911, although the mileage included in 1911 was over 500 miles greater than that included in 1910. In its annual report for 1912 the commission gave some comparative figures for 1911 and 1912. These, instead of relating to practically all the railways of the country, covered only those earning in excess of $1,000,000 per year. The operating revenues per mile of these roads, whose mileage in 1912 was 219,373 miles, increased from $12,547.33 in 1911 to $12,601.14 in 1912. Meantime their net revenue from outside operations decreased from $5.82 to $2.22; their operating expenses increased from $8,603.16 to $8,707.82; taxes increased from $484.21 to $532.92; and their operating income decreased from $3,465.78 to $3,362.62. The same report shows that between 1911 and 1912 the operating incomes of railways in eastern territory earning more than $10,000,000 gross increased from $268,233,349 to $273,449,158, while meantime their mileage increased over 750 miles; this increase was far too small to offset the decrease in 1911.

It will be seen that the reductions in the net revenues of the railways have been chiefly due to increases in their operating expenses; and, of course, the increases in operating expenses have been chiefly due to increases in wages, with which the country is familiar. Some of the largest wage increases were made in 1910, but did not produce their full effect on expenses until 1911. Among those occurring in 1910 were the increases in the wages of conductors and trainmen, concerning which the president of the Brotherhood of Railroad Trainmen said in his report to the tenth biennial convention of that organization, "Conservatively estimating, the increases in the pay of conductors, trainmen and yardmen in the East as a result of this movement will approximate $30,000,000 per annum." The wages of engineers have been increased since then; increases in the wages of firemen are going into effect; and now the Brotherhood of Railroad Trainmen is back asking for additional increases in the wages of its members which, it is estimated, would amount to $17,000,000 per year.

Some other causes also have operated strongly to increase the expenses of many roads. Among these have been the extreme weather of the winter of 1911-1912; and the violent and widespread floods of the springs both of 1912 and 1913. It may be said that these conditions were but temporary; but the railway business is a peculiar business in which "emergencies" and "special conditions" are constantly developing, and in which, therefore, if the properties and service are to be kept up, provision for "emergencies" and "special conditions" must constantly be made in the form of earnings. The increases in taxes, as figures given above indicate, have been equally formidable in proportion. For 239,483 miles of line taxes amounted in 1910 to $104,821,374.70, or $437.70 per mile. For only 219,372.87 miles they amounted in 1912 to $116,909,458.76, or $532.92 per mile. There has been a change in the tendency of earnings since the beginning of the present fiscal year. In the eight months ending February 28 the total operating revenues of the railways of the country earning more than $1,000,000 a year increased 10.2 per cent.; the total operating expenses 9.1 per cent.; taxes 5 per cent., and operating income 13.9 per cent. In eastern territory the increases were, in operating revenues, 10.7 per cent.; in operating expenses, 10.8 per cent.; in taxes, 3.5 per cent.; in operating income, 11.3 per cent. But since the period covered by these increases the eastern roads have experienced the had floods which have cost millions; advances of wages have been granted to their firemen, and the legislatures of a number of states have been passing "full crew" and various other laws tending to increase operating expenses. Furthermore, it will be noticed that the percentage of increase in operating expenses in eastern territory, even during the months of the present fiscal year preceding the floods, was slightly greater than the percentage of increase in operating revenues. The showing made during these eight months as compared with the same months of last year is distinctly better than will be the showing made during the entire fiscal year, as compared with the last fiscal year.

Return on capital must, of course, be paid from net operating income. While net operating income was decreasing in 1908 and 1909 as compared with 1907, and in 1911 and 1912 as compared with 1910, the demands on it were increasing. The rate of interest that railways as well as other concerns must pay has continued steadily to advance. A few years ago old railways with good credit could borrow capital at 3 to 4 per cent. The Baltimore & Ohio is an old road in the heaviest traffic territory in the country; it is now exceedingly well managed; yet when it recently made an issue of bonds it had to fix the interest on them at 4½ per cent. and even then could not get par for them. Other strong railways that have tested the market either to refund old obligations or to raise new capital have had even worse success. As to stocks, some of the most reliable 6 per cent. dividend payers are quoted only around par, and others proportionately much lower. A new issue usually depresses the market; all of which means that few even of the strongest railways could issue stock on a 6 per cent. basis. While the railways meet such difficulties, and even impossibilities, in raising capital at rates which they can afford to pay, the public need for them to make improvements and extensions for which the raising of new capital is necessary grows more imperative. There was a congestion of traffic and a large car shortage last fall; and the situation would have been worse if weather conditions had not been almost ideal for handling business in the fall and far into the winter. The car shortage of 1912, though relatively small, was

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warning to prepare against a large one like those of 1906 and 1907. Extensive and costly improvements also are needed to make the railways as safe as the public welfare demands.

When the question of rate advances is presented to the Interstate Commerce Commission the point whether the railways are as economically operated as they should be may be raised again. Clearly, however, the burden of proof will be on those who may charge that this is not the case; and if ever there was a time when they could not sustain that burden the present is that time. In the railway, as in nearly every other industry, there are concerns that are not as well managed as they might be. But it is certain that never in the history of the railway industry in the United States have the railway managers as a whole tried harder to operate economically than during the last two years. They cannot be blamed for the principal increases in expenses, namely, the advances in wages, as they have strenuously opposed every one of them, and have made only those held to be reasonable by arbitration boards, most of them organized under the Erdman Act. Congress recently has passed a law providing for a valuation of railways, the main purpose of which is to ascertain whether the earnings of the railways are reasonable. It will be several years before this valuation is completed. It would seem, therefore, that the rate question should be decided for the present regardless of the valuation matter. The commission has been able to decide without the aid of a valuation that many rates were too high. Doubtless it will continue to be able to do so between now and the time the valuation is finished. If it can determine without the aid of a valuation that rates are too high, it can also determine without the aid of a valuation whether they are too low.

The advances proposed differ in a very important respect from those proposed a few years ago. The eastern roads then tried to advance class rates and some commodity rates, the argument made being that not only did the railways need more money, but that the rates in question were too low compared with other rates. The new plan is that all freight rates shall be advanced 5 per cent. Which of these plans is the more equitable depends on whether the existing relationships between rates in general are or are not fair. The commission by refusing to permit advances in specific rates in the previous case, and by its work of adjusting the relationships between rates over a period of many years, is almost estopped, it would seem, from holding that the present general relationship between rates is not fair. If the present general relationship between rates is fair, and the railways are entitled because they need more earnings to an advance in rates, then a proportionate advance in all rates would be the fairest. An advance of 5 per cent. in freight rates would increase the earnings of the eastern railways about $50,000,000 a year. The burden imposed upon shippers and consumers would be relatively small compared with the advantage that would accrue to the railways. Of course, however, the real question is not how little or great the additional burden imposed on shippers and consumers would be, but whether in the interest of the public as a whole it is desirable that the earnings of the railways should be increased by the means and to the extent suggested. It is inconceivable that if concerns in any other line of industry could make the same showing regarding proposed increases in their prices that the railways can make regarding the proposed increases in their rates, anybody would question the reasonableness of the proposed increases in prices.

RIGHT OF TRACK IN LARGE STATIONS.

STATIONMASTER STICE, of Terre Haute, Ind., has the courage of his convictions. When he sees a brakeman (of a passenger train) standing on the track in the trainshed of a union station (where all trains stop), holding a red flag in his hand, he thinks it looks foolish. He said so in connection with the investigation of a collision which occurred at Terre Haute last January, as reported in another column of this paper. Such protection, under such circumstances, looks foolish to many other people, also; and it will be worth while to consider the reasons for Mr. Stice's view.

The government report says that since the collision the Vandalia road has ordered that the flagging rule be observed in Terre Haute union station. The general practice at Terre Haute heretofore seems to have been the same as at most large trainsheds where the block system is not in force. Every movement was supposed to be made with speed under control, and flagging was neither required nor carried out. But, if Mr. Belnap's report gives all the facts, the specific fault was that this practice was based on tradition and not on a formal rule; and therefore the engineman who came in at 20 miles an hour did not break any definite speed regulation. The relative rights of No. 8 and No. 20 at 1:42 p. m. on that piece of track are not clearly explained. Ordinarily, No. 8 arrives 10 minutes ahead of No. 20, and leaves 45 minutes behind it. If No. 8 is customarily set off to make way for No. 20 it has apparently no right to return to the main track until No. 20 has passed; or until its leaving time (1:45) has arrived. However, this question is not, perhaps, of much importance, except to show, by its peculiarities, the futility of trying to provide in a satisfactory way for movements at large stations except by one of the two simple methods; either the space interval system, constantly enforced, or the universal requirement that speeds shall always be under control.

Why does the spectacle of a man with a flag in a trainshed "look foolish"? For one thing, because not once in a hundred thousand times will a man performing such a function at such a place prevent a collision. Mr. Stice may not have formulated his thought in terms of percentages, but everybody will agree with him that a precaution which seems so needless always has been and always will be extremely difficult to enforce; so difficult, indeed, that the only rational course is to adopt some other means of protection. The best course is the block system. The New York Subways adopt that, even to the extent of introducing a block system in which the signals are located less than 150 ft. apart. But even without the block system flagging at a large station looks foolish. Everybody agrees, in principle, that responsibility should not be divided. Why do we not more generally adopt the principle? It is a reasonable rule that trains shall always be moved in a large station with speed under control and the whole responsibility be made to rest on the engineman. Such a rule has been in effect for years at many places. The report of the Terre Haute collision indicates that, in fact, it was in force there, though it was not in the book; and that the engineman who allowed himself to take a great risk when a cloud of steam fell across his path, would, on a moment's reflection, admit that he was breaking an important unwritten rule. He seems temporarily to have followed the unwritten rule of 40 years ago that nothing may ever get in the way of a fast express. According to the testimony concerning the practice in that trainshed, he must have known that a flag was never to be expected there, whatever the obstruction might be; and he would have to admit that a train, or a car or an engine might get in the way, even of No. 20.

Flagging at large stations looks foolish because usually it is so difficult to estimate what needs to be done in a given case. With speeds of all trains very low the flagman need not go far from his own train. He estimates how fast an expected train will be moving. If he be instructed not to give himself that liberty, then he must go the maximum distance that may be necessary for safety. This often means ten times farther than is really necessary in the particular case if the approaching engineman is on the lookout. But flagging, to be entirely adequate, implies the use of torpedoes in addition to the flag. The constant use of torpedoes cannot be tolerated in and around large stations, especially where there are street crossings as at Terre Haute; and so we come back to the standard rule, to protect "when the conditions require it." Many of the considerations here mentioned, or suggested, apply on the open road, as well as at large stations. In probably 99 per cent. of a passenger train's stops, the flagman need not start back inside of the first

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30 seconds in order to comply with the rule; and in a large percentage of them he need not start within 60 seconds. In a good percentage probably he would be complying with the rule if he did not start for two minutes. But the individual flagman must himself decide these questions of seconds in each case, and, naturally, he gets down on the ground with his flag. Being in that position—not running back—he *seems* to be neglecting his duty; as he is if the conditions are such that he really ought to go back. That flagging often looks foolish—or, at least, illogical or inconsistent—will be generally agreed. And when our education is more nearly completed we shall agree that, although it is necessary in the absence of the block system, it is foolish as compared with the use of the block system. One well known railway manager, who used the block system throughout his line in 1885, said that it was "a crime" to run a road without it. That, perhaps, was extreme language, and he seems to have held views far in advance of his time; but how far?

The Terre Haute collision calls to mind numerous collision reports of 25 years ago, in England. The Board of Trade at that time had to secure the adoption of the block system by persuasion, the compulsory law not having been passed. Every now and then a collision would happen in a large station, and the investigation would show that, as at Terre Haute, the block system was in operation at all other parts of the road except in and near the station. The English inspector in his mild and cautious dignity would report that "the company are of opinion that they cannot work the block system in large terminals." Nevertheless they did finally do it. The difficulties, in reality, were small; but they were larger in some ways than they are now. At the present day the question of almost satisfactory signaling at a large passenger station is only one of money.

NEW BOOKS.

Steel Rails. By William H. Sellew, principal assistant engineer, Michigan Central Railroad. Detroit, Mich. Cloth, 550 pages, 7½ in. x 10½ in., 361 illustrations and 33 folding plates. Published by D. Van Nostrand Co., 25 Park Place, New York City. Price $12.50.

In view of the widespread discussion of the steel rail problem during the past two years, this book is most timely. It is a valuable addition to the literature of the subject with which it deals. Unlike most books treating of the rail problem, it is prepared more from the standpoint of the active railway man than of the metallurgist, and discussions of the intricate details of steel manufacture are written for men familiar with the subject only in a general way. The book is prepared upon a broad basis, and contains much valuable information regarding the important conditions affecting the service of rails.

In the first chapter the development of the steel rail is traced from the period of the iron rail to and including the adoption of the recent American Railway Association sections. The second chapter is devoted to the pressure of the wheel on the rail and analyzes the speeds and weights of modern locomotives and the effect of their motion, flat spots, etc., upon the rail. Photographs of and data regarding much of the recent equipment are also included. The third chapter discusses the supports of the rail, including reference to the more important concrete and metal ties. The fourth and fifth chapters are devoted to the stresses in and the strength of the rail, respectively, and are largely mathematical in their nature. There are 136 pages devoted to the influence of details of manufacture upon the rail; the chemical composition, mill practice, and other influencing factors all being discussed. In chapter seven are given comparisons of the leading American specifications with representative American and British specifications. The forms recommended by the Rail Committee of the American Railway Engineering Association for the various rail records are given in an appendix, with 33 plates showing standard rail sections, locomotive diagrams, and other important details.

The book should prove a valuable reference work for railway men interested in its subject. It is clearly printed on heavy paper with many excellent photographs and drawings.

The Special Law Governing Public Service Corporations. By Bruce Wyman, Professor of Law in Harvard University. Two volumes, 6¼ in. x 9¼ in., 1517 pages. Published by Baker, Voorhis & Co., New York. Price $12.50 for the two volumes bound either in leather or buckram.

There was a time when the law pertaining to railways and other public service corporations was of interest only to their law departments. That time has passed. The public regulation of this class of concerns has come to exercise a controlling influence over their ideals and methods of management. The extent to which public regulation ought to be carried is a question of economics. The extent to which it has been and can be carried is one of law. Interest in the latter phase of the subject is no longer confined to the law departments. Those who are interested in it naturally are prone to seek knowledge about it. Therefore, there is a very large number of persons besides lawyers, who nowadays are more or less keenly interested in the law of public service corporations. Professor Wyman's elaborate work on this subject is intended primarily for lawyers. There is no doubt of its comprehensiveness and authoritativeness from the lawyer's standpoint. At the same time it will be found of value to all who are interested whether as lawyers, economists, business men, or statesmen, in the general subject of regulation of concerns devoted to a public service. Professor Wyman's writings, in other works as well as this one, show that while he is first a lawyer, he is also an economist and in the best sense of the word, a publicist.

In his preface Mr. Wyman dwells on the clear distinction between the laws of public and of private callings. He says, however, that as time goes on he finds himself among the conservatives. He believes that the state should as far as possible confine itself to regulation, "leaving the companies to work out their own problems of management. . . . There should be swift reparation provided for any individual who has suffered harm. . . . When the state goes farther and attempts to dictate as to the policies which the companies shall adopt it usually goes too far. Legislation going to this extent really crosses the line which divides state control from state operation. The next step would be government ownership with its unknowable consequences."

While Professor Wyman makes very clear the difference between the law of public and of private callings, he gives a much broader application to the former than many writers. He takes the position that "whether a business is public or not depends upon the situation of the public with respect to it"; that any business which becomes practically a monopoly becomes affected with a public interest; and that when this situation develops the industry becomes subject to the law of public service corporations, even though prior to the establishment of monopoly in it it was not subject to that law.

The work is too comprehensive to admit of anything approaching a thorough review of it here. Among the chapters which will be especially interesting to our readers are those dealing with the general subject of regulation of public service, which includes a discussion of the general theory of rate regulation, of the proper basis of capitalization, and of the rate of return on capital to which public utilities are entitled. The methods of fixing and regulating the rates of public utilities, including railways, are quite fully discussed; and chapters included in the general discussion of "Prevention of Discrimination" relate especially to railway rates. The last chapter deals with the constitutional phases of public regulation, and in the Appendix are given the Interstate Commerce Act, the act creating the Commerce Court, the Elkins rebating law, the Expedition Act, forms for proceedings before regulating commissions and forms for proceedings involving orders of commissions. The work is one which might well be given a place in the library of every lawyer, economist and journalist interested in the general subject of public regulation.

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Letters to the Editor.

"BARGAIN FESTIVALS" AND OTHER THINGS.

Chicago, Ill., April 28, 1913.

To the Editor of the Railway Age Gazette:

The article printed in your issue of March 7 entitled, "When Accidents Are Not Accidental," and the reference to it in the editorial of April 4 should cause some managers to meditate a little. The cause of some causes of accidents is here clearly set forth. When general officers subvert the authority, and necessarily, also, the prestige, of the division officers, by reversing their decisions on discipline they set in motion a cause which surely has an effect. What is said in regard to unfit officials, and the resulting unfit men is equally significant. Mr. Brandeis could get a large part of his "million a day" saving out of this one leak.

"Superintendent," in his recital of the effect of frequent changes in managements, is true to life. I served in an official capacity on different western roads for several years. A management lasted from one to four years. Each manager had his followers, with which he filled the official positions, and a large per cent. of these men simply stayed to live, and lived to stay. Their chief interest seemed to be to hang on as long as their chief did. Happily, this condition has changed for the better; yet there is still room for improvement.

I served under one superintendent who was an old switchman and yardmaster. He could not see very much good in a man who did not at least appropriate a part of the vernacular of the tough switchman, including the "cuss" words, and who did not also have time to listen to him as he frequently expatiated on how he had handled great yards and terminals on other roads, and to laugh at his coarse and vulgar stories. I served under another who was an office man, and so aristocratic that he seldom got down close enough to the men to know what was really going on.

The practice of reinstating men dismissed for just causes should be abolished absolutely. This problem is strictly up to the managers. To get the best results the discipline should be as rigid as it is in the army.

On some roads at the present time the feeling among the men is that if worse comes to worst and a man is discharged, the local or general chairman of the brotherhood will get him back. It is obvious that in this situation the local railroad officers are greatly handicapped. As a matter of fact, the carelessly inclined element are taught by this very procedure that the trainmaster and the superintendent are too severe, or inconsiderate; or that they are incompetent. This is anything but an incentive to loyalty. General officers who have not had to deal with the rank and file, possibly for years, cannot be in touch with the many occurrences which demand the infliction of discipline; and even if they were, the basis of a punishment includes a man's past conduct and habits. A most serious mistake is made when they reinstate men on leniency pleas, or otherwise.

Exchanges which are made between the general officers of the brotherhoods and the railway managers in their annual adjustment meetings, when reinstatements are made and the employees' records are cleared of certain marks, to quiet or offset requests and demands for increases in pay and changes in working conditions, constitute a serious weakening influence. These bargain festivals have become so common on some roads, that when other means fail the men look forward more or less confidently to finally gaining their point at the yearly conference. In some quarters the men have succeeded so well that the word "discharged" is, to them, more or less of a misnomer. The brotherhoods have succeeded so well along these lines that they actually trump up grievances and make outrageous demands with no other end in view than effecting such deals.

I submit that a man not in the ranks, or in very close touch, can form only a very vague conception as to how this reinstating evil subverts the local officers' authority and prestige. Only the officer who has power, as well as character and ability, can win loyalty, and thus enforce discipline. Loyalty is a reciprocal proposition; only loyalty can win loyalty.

Unfitness of officers, which is one result of frequent changes in management, is alone responsible, more than any other thing, for the hold that the labor organizations have on the roads. This view is confirmed by the tight grip that the brotherhoods have on the roads where changes in management have been frequent. And this is perfectly natural. Frequent changes indicate a lack of stability; and stability is absolutely essential to good management.

Local Officer.

A REVERIE ON THE UNIT SYSTEM.

Texas, March 11, 1913.

To the Editor of the Railway Age Gazette:

It is not with an idea of criticising the unit system of operating railroads that I comment on it, as it is my opinion that if carried out in accordance with the ideas of the originator of the system it would be an advanced step in modern railroading. Mr. Hines abolishes the different titles formerly attached to the officers of the mechanical department, such as master mechanic, traveling engineer, resident engineer, etc., and clothes them with the title of assistant superintendent, thereby increasing their responsibility as officers of a railroad so that when they are traveling over the line they have the authority to correct any discrepancy or dereliction of duty on the part of station agents, train crews, maintenance of way employees, etc., which is a long stride in the right direction.

I do not wish to cast a reflection on transportation employees; unfortunately a few are inclined to be derelict if it is known that no one in authority is around to check their movements without fear of retaliation. For instance, the conductor may know the station agent or other employees are lax in their duties, causing inconvenience and delay. He may catechise or threaten to report the derelict, but through fear of retaliation, such report does not reach the proper officer. The conductor may be ever so attentive to his duties, not giving the slightest opening for retaliation, but his reputation as a fellow employee is at stake. Hence the authority of the master mechanic over the transportation employees while out on the line is of intrinsic value to the company.

The originator says his system opens a vast field of opportunity to the mechanical man making it possible for him to aspire to the most exalted position within the gift of a railroad. He is given the title and authority of an assistant superintendent, which is similar to putting a gyroscope engine in operation on a mono-rail. If his construction is correct he will be able to maintain his equilibrium if his gyrations are not interfered with. He is in charge of the mechanical department and responsible for its proper and economical maintenance. He is instructed by the superintendent of motive power (assistant general manager) strengthened by a copy of a letter from the president and general manager to the superintendent of motive power, to devote most of his time at the shops. He is expected to visit the several roundhouses on his division at least two or three times each month and regulate all mechanical matters. He is called to headquarters several times each month to confer on mechanical matters. His shop office is moved to the superintendent's office, which may be some distance from the shop, where all matters are handled and file records kept in conjunction with the superintendent's file, thus maintaining one file. He is expected to visit this office at least once each day and handle all correspondence requiring his attention.

All these duties he can perform if he is qualified for the position he is filling. He will be able to give valuable service to the company other than his regular duties as master mechanic while out on the line or in the superintendent's office by way of advice and instructions to subordinates, and if he is a reasonably close observer he will learn many things pertaining to the duties

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of assistant superintendent and become enlightened along such lines to the extent of fitting himself for promotion in case of a vacancy. His technical knowledge as a mechanic would be valuable to him as a superintendent, at least such is my understanding of the intentions of the originator of the unit system, and if the master mechanic is lucky enough to be on good terms with and shows a willingness to be subordinate to the superintendent there is no good reason for his failure. If conditions are otherwise and the orders he receives from the superintendent of motive power conflict with those received from the superintendent, making it impossible for him to obey all orders, some one must expect to go on the shelf, although conditions may be unavoidable by one of the three parties. As a rule the "under dog" is the victim.

The unit system provides that there must not be any correspondence between the general officers and the subordinate officers of the superintendent. All correspondence emanating from the general office must be addressed to the division superintendent, he in turn sending such correspondence to the assistant whom it interests, who will reply permitting the senior assistant to sign it "for and in the absence of the superintendent," thereby precluding all possibilities of the issuance of conflicting orders. This rule is infallible if lived up to. However, we must not lose sight of the fact that there are a great many verbal conferences between the assistant superintendent (mechanical) and the superintendent, also with the superintendent of motive power when the assistant is called to headquarters to confer (presumably) on mechanical affairs. If the division superintendent and the superintendent of motive power are inclined to be congenial all will go well and the unit system will be carried out successfully harmoniously and economically. OBSERVATION.

CAR WHEEL FAILURES.

CHICAGO, April 21, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Our purpose is to set forth facts with reference to an article published in the *Iron Age* under date of March 6, page 588, under the caption, "An Increase in Number of Car Wheel Failures." The article referred to is based upon accident bulletins of the Interstate Commerce Commission, and after summarizing the derailments due to broken flanges and burst wheels states:

> The necessity of bringing the quality of the chilled iron car wheel to a proper basis is emphasized today as it has never been, and the makers and users should get together and try and find means of improving the quality of car wheels to make them equal to present service conditions.

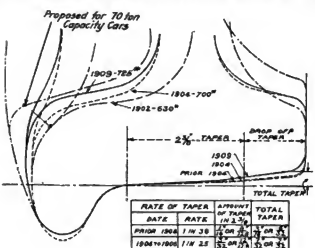
Apparently the writer does not know that the Association of Manufacturers of Chilled Iron Car Wheels, representing 95 per cent. of the wheels manufactured in the United States, and the Master Car Builders' standing committee on car wheels have been closely associated since the year 1909 for the express purpose of improving the quality of the chilled iron wheel.

Previous to the year 1909, individual wheel makers had made improvement in their patterns and product, but no concerted action had been taken until the year 1909, when standard wheels for the three classes of cars of 30, 40 and 50-tons capacity were submitted by the manufacturers and approved by the Master Car Builders' Association. Before these three standards were adopted there were as many diffcrent patterns as there were manufacturers, and many railroads had standard patterns of their own. The standards recommended were not in general use until the year 1911, because the Master Car Builders' Association gave the manufacturers a sufficient time to adjust their equipment to the new standards.

In analyzing the derailments caused by broken flanges and burst wheels for the purpose of determining what progress has been made in the quality of the the chilled iron wheel, we must consider the dates that the wheels were cast, and not charge all the failures during the year 1912 against the product of that year. This is the only proper basis upon which to proceed.

In determining the percentages of derailments of cars due to broken flanges and broken wheels, the number of failures in any one period cannot be consistently compared with another unless the number of wheels in service is considered, and it is manifestly unfair to state that during the period of 1902-3-4 there were 1,070 derailments, and during the period of 1910-11-12 there were 1,827, and figure an increase of 70 per cent., as was done by the above mentioned writer. In 1902 there were 1,500,000 freight cars in service, representing 12,000,000 wheels; in 1910 there were 2,133,000 freight cars in service, representing 17,068,248 wheels—an increase of 40 per cent. in the number of wheels in service; and this increase represents wheels serving under heavy capacity cars.

The Chilled Iron Car Wheel Manufacturers, in conjunction with the Master Car Builders' Association, have made greater progress in the chilled iron wheel industry since the year 1909 than has ever been made, and when consideration is given to the vast increases in car capacity, and the resultant increases in rail and axle during the last decade, and the slight increase in the weight of the wheel, it will be found that the chilled iron wheel has not only met every condition of service imposed for the past 52 years, but the record will show that the derailments due to broken flanges and burst wheels are actually decreasing. The



RATE OF TAPER		AMOUNT OF TAPER ON 2⅜"	TOTAL TAPER
DATE	RATE		
PRIOR 1904	1 IN 30	1/16 OR 2/32	1/16 OR 2/32
1904 TO 1908	1 IN 25	3/32 OR 3/32	5/32 OR 5/32
1908 TO 1909	1 IN 20	4/32	9/32 OR 9/32
1909 TO PRESENT	1 IN 20	4/32	13/32 OR 13/32

Changes Made in Flange and Tread Sections of Car Wheels Since 1904.

following table shows the changes that have been made in developing the 10-ton car to the 50-ton car:

Weight, increase in car capacity	400 per cent.
Weight, increase in rail	100 per cent.
Weight, increase in axle	149 per cent.
Weight, increase in chilled iron wheel	38 per cent.

One part of the chilled iron wheel that has not received due consideration is the flange. In an editorial in *Harper's Weekly* (industrial series), December 28, 1912, appears the following: "It is a curious fact that in this matter of flanges the cars of today are no better off than were the cars that carried soldiers and supplies to the battlefields of the Civil War."

This condition is not because the wheel makers have not been fully alive to the situation, but because they have been restricted in improvements due to the supposed limits of track clearance. The accompanying illustration will show such improvements in the flange as have been made since 1904. This indicates a slight increase of metal in the back of the flange in 1904, as the weight of the wheel increased from 630 lbs. to 700 lbs. It will also show that during 1909 a further increase was made, starting at a point slightly below the base line and extending around the flange and back of the tread, producing an increase in tread thickness and increasing the weight to 725 lbs. These slight changes, together with a reduction in the height from 1¼ in. to 1 in., are the only improvements made in the flange, and it must be remembered that the capacity of the cars has increased from 10 tons to 50 tons. This was all we could get, but not as much of an increase as we wished to make in order to increase the factor of safety.

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We are still trying to improve the flange, but cannot go further until such a time as the railroads will approve of a design similar to that shown in the illustration for a flange for 140,000 lbs. capacity cars. When this is done flange failures will be reduced to a minimum.

The flange of the wheel exercises the important function of guiding the trucks and, in going around curves, it is the flange that takes up the lateral thrusts of the car by being forced against the rail, and the contact between wheel and rail produces wear in both. A flange, therefore, does not improve in strength with age, and the longer it is used the more the wear, and the thinner and weaker it becomes. The imperative necessity of careful inspection follows, so that a wheel may not be allowed to wear in the flange beyond the condemning limit.

Many times in looking for the cause of a derailment a wheel will be found with a broken or chipped flange, and this cause is readily assigned, whereas, as a matter of fact, the flange may have been chipped or broken after it left the track, or through poor track, faulty truck construction, etc. We know of cases where a broken flange was reported as the cause of a derailment, and upon investigation we have found that the flange had been worn beyond the condemning limit. Many derailments are reported to the Interstate Commerce Commission caused by sharp flanges climbing the rail in going around curves, or passing crossings, frogs, or switches.

Let us examine the record of broken flanges for the year 1912, as compiled from the Interstate Commerce reports:

Year Cast.	Broken Flanges.	Year Cast.	Broken Flanges.
1898	2	1908	12
1899	9	1909	13
1900	4	1910	16
1901	7	1911	2
1902	12	1912	2
1903	10		
1904	8		170
1905	16	No record of year cast	457
1906	23		
1907	34	Total reported	627

As will be seen, we have a record of 170 wheels out of a total of 627 reported broken, or 27 per cent. The service is from one to twenty-four years, and the average life of all the 170 wheels is over six years.

As a flange is at its best when first put into service, it will be interesting to note the comparatively few failures for wheels cast during the years 1910-11-12. The total breakages of flanges in the three years amounted to 20 wheels. The report shows that during the year 1910 there were 16 breakages, only two in 1911 and two in 1912. As we only have a record of 27 per cent. of the broken flanges during this period, and as this record shows 16 wheels were cast in 1910, it would be reasonably fair to assume that the balance of the wheels (if tabulation could be made) would bear relatively the same proportion of breakages—therefore, we can assume that if we had a complete record, there would have been broken approximately 60 wheels cast in 1910. During the year 1910 there were in service over 2,000,000 freight cars, and there were running over 16,000,000 chilled iron wheels. This would represent one wheel broken for every 266,000 wheels in service. If we take the total breakages, which are reported as 627, and consider the number of wheels running, we will find that there is one breakage for every 25,000 wheels in service and the broken flange wheels which we have tabulated from the Interstate Commerce Commission reports show an average of six-and-a-half years' service. Surely this is not an alarming condition when we take into consideration that a very large percentage of those broken were of the old design and plainly show abuse due to sticking brakes and excessive wear.

Broken wheels are the result of temperature stresses arising from brake friction, and show conclusively that the metal has not been proportioned to the stress. In designing any structure, a unit of material is used to resist a unit of stress, and when all service conditions are known it is a simple matter to proportion the metal to fully meet them. If wheels were designed to meet the most severe service conditions instead of average conditions, there would be no broken wheels.

We will now analyze the report of broken wheels. Our record, as compiled from the Interstate Commerce Commission report, shows the detail of 109 broken wheels as to years cast, name of maker, etc. There were 229 breakages for which we could obtain no record. An analysis of the 109 wheels reported is shown in the following:

Year Cast.	Broken Wheels.	Year Cast.	Broken Wheels.
1889	1	1908	5
1892	1	1909	9
1897	1	1910	14
1899	1	1911	10
1900	5	1912	7
1901	3		109
1902	8		
1903	7	Broken and loose tires on engine drivers	19
1904	4	No record of year cast	229
1905	6		
1906	12	Total	357
1907	13		

It will be observed that the broken wheels, like the broken flanges, are distributed over a period of years, starting with the year 1889, and the average service of all wheels broken is over six years. The cause assigned for the breakage of 52 wheels out of the 109 reported by the Interstate Commerce Commission is "brakes sticking."

Fifty per cent. of the broken wheels were caused by "brakes sticking," and 50 per cent. of the broken wheels occurred in the mountainous regions of the East and West, where the maximum of brake resistance is required in descending grades. A large number of these wheels plainly show improper usage. For example:

A 625 lb. wheel designed for a car having a light weight of 28,000 lbs., as required in the M. C. B. standards, would be called upon to resist a normal heat stress resulting from 19,600 lbs. brake pressure when the train is braked at 70 per cent. of the light weight of the car.

A 625 lb. wheel for a car having a light weight of 50,000 lbs. braked at 80 per cent. would have to resist an abnormal stress of 40,000 lbs. brake pressure, or 150 per cent. greater stress demanded from the same weight of wheel.

It is no common thing to find 625 lb. wheels under cars weighing from 45,000 lbs. to 50,000 lbs.; in fact, many 60,000 lbs. capacity cars weigh light more than 100,000 lbs. capacity cars. Still, the wheels designed for 100,000 lbs. capacity cars weigh 100 lbs. more than those designed for 60,000 lbs. capacity cars, this additional metal being distributed in the plates of the wheel, which increases the strength and furnishes greater resistance to sticking brakes. The heat developed by excessive brake application is what causes wheels to break.

The Master Car Builders' in their 1912 Proceedings recognized the question of establishing the maximum braking power as well as gross load for each design of wheel, and called particular attention to the trouble experienced in using 625 lb. wheels under 60,000 lbs. capacity cars, having tare weight of 40,000 lbs. to 47,000 lbs., such as refrigerator cars, etc.; if their recommendations are followed broken wheels will be practically eliminated.

If we take the entire number of chilled iron wheels broken during the year 1912 and base these breakages upon the number of wheels in service, we will find there is, comparatively, one broken wheel for every 50,000 wheels in service.

The commerce of the country is dependent upon the chilled iron car wheel. It has successfully resisted the attacks of over half a century. It is the standard wheel for rail-borne traffic, and its universal use is an acknowledgment of its efficiency. It possesses the ideal structural advantages of hard tread, soft plates and soft hub, and each part of the wheel is so well fitted for the service demanded that it is no wonder that it has survived such a long period of use. It carries the car structure and contents all over the country, and because an occasional wheel breaks it does not follow that the wheel is to blame, because anything can be broken by abuse, and no one will deny that the chilled iron wheel has a tremendous burden to bear. The chilled iron wheel now carries over 500,000,000,000 tons one mile each year.

George W. Lyndon.

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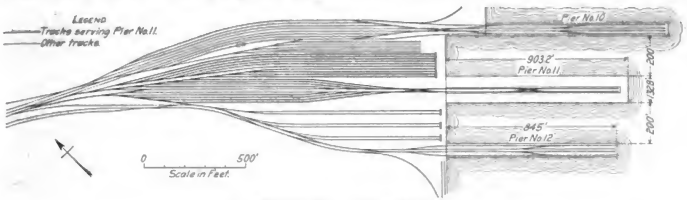
NEW FREIGHT PIER AT COMMUNIPAW, N. J.

A Modern Fireproof Structure of Concrete and Steel Construction for the Reception and Storage of Export Business.

The Central Railroad of New Jersey completed early last year a new covered freight pier of permanent construction to be known as pier No. 11 in its freight terminals at Communipaw, N. J., on the west side of the Hudson river opposite New York and just across the channel from Ellis Island. The new pier adjoins pier No. 10 and is reached on the water side by two 200 ft. slips with a depth of 22 ft. at mean low water, and on the land side by a double track line from a storage yard adjacent to the piers. The tracks leading out onto the pier are laid in a track well along the center of the pier, which is depressed so that the car floors are level with the deck of the pier. The new pier is 902 ft. 2 in. long by 132 ft. 10 in. wide. The substructure consists of creosoted pile bents which support a concrete deck slab floor. The superstructure is of steel frame with corrugated iron siding. In addition to the tracks mentioned, there are 10 stub tracks provided for storage.

The pile bents in the substructure of the pier are placed 9 ft. center to center. The intermediate bents consist of 30 piles each and alternate bents located under the columns of the superstructure have 38 piles. Every tenth bent has a double row of piles containing 60 in all. Each alternate one of these double bents has the piles cut off 6 in. above mean low water and capped with two 12 in. by 12 in. timbers to carry a reinforced concrete fire wall 18 in. thick at the bottom and battered to 12 in. thick at the top extending up to the concrete floor slab to which it is bonded. These fire walls divide the wooden substructure into five sections. The remaining double bents which alternate with those carrying the fire walls have 6 in. by 12 in. sheathing between the rows of



Track Layout at New Communipaw Pier.

piling extending from the low water line up to the deck. As piles can only be driven a short distance at the site of the pier, the bents are thoroughly braced both transversely and longitudinally.

As the piers are perpendicular to the tracks in the main yard, it is necessary for economical operation to locate small storage yards near each pier to store the cars intended for that pier. It is somewhat difficult to get a good track layout on account of this condition. The new yard serving pier No. 11 has been laid on a fill made from the dredgings from the channel and slips. The yard includes 10 tracks, each about 950 ft. long connecting with two ladders, five tracks leading from each ladder. These ladders are continued to form a double track lead into the pier. Double crossovers are provided between these two lead tracks just off the end of the pier and at a point about midway on the pier. These crossovers allow very free movement of cars to or from the pier without disturbing other cars that may be unloading. Loaded cars come into one of the five track yards and the empties are pulled off of the pier into the other set of five tracks.

The corners of the piers at the sea end are protected by cluster piles cut off 9 ft. above mean tide or 1½ ft. above pier level. Two anchor cribs are provided, one at the sea end and one near the middle of the pier. These cribs cover four bents and are the full width of the pier. They were built in place after the piles within their area had been driven and were sunk by being loaded with stone. The bulkhead wall at the shore end is of concrete carried on a timber bulkhead. The bearing piles are of creosoted yellow pine 14 in. in diameter, 2 ft. from the butt and 7 in. in diameter at the point. The cluster piles are of untreated white oak 16 in. and 7 in. in diameter. All other timber in the sub-

Sea End of New Pier.

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structure except the low water bracing, longitudinal and diagonal bracing and fender timbers is creosoted.

The entire deck covered by the shed is of concrete. The space outside of the shed, which is 4 ft. wide on the sides and 8 ft. wide on the sea end, is of 4 in. planks. The track well is 24 ft. wide and is depressed 5 ft. . The tracks are laid on 12 ft. centers. The platforms on each side of the track well are 50 ft. wide, being sloped 6 in. away from the track well. The floor slab is 7 in. thick and is supported on eight longitudinal concrete girders on each side of the track well. These girders are 1 ft. 6 in. deep and vary in width from 9 in. to 14 in. They are laid directly on the being crowned in each panel for drainage. A minimum thickness of 6 in. of ballast is used under the track ties. A vertical slab 5 in. thick is placed along the sides of the track well, having steel fire doors at intervals to allow access to the timber substructure. The floor slab is designed for a live load of 500 lbs. per sq. ft. and the track slab for a live load of 1,300 lbs. per sq. ft. The concrete in the slabs is a 1: 2½: 5 mixture with a surface coat of cement and trap rock screenings in a 1: 2½ proportion.

The columns and trusses of the superstructure are spaced 18 ft. center to center, all sections being built up of plates and angles. There are four rows of columns, the central span between col-

Exterior of Pier from Shore End.

caps of the pile bents and are reinforced with rods, some of which are trussed over the bents and others continuous in the lower plane. The girders are anchored to the caps by 22 in. dock spikes driven about 10 in. into the caps before casting the girders. The slabs are reinforced with No. 38 triangular mesh bent up to the top of the slab over the girders. The slab on each side of the track well is divided longitudinally by a continuous expansion joint over one of the girders. The reinforcement in that girder is divided so that the joint is continuous through the slab and the girder. Transverse expansion joints are spaced 54 ft. apart and are of similar construction.

The slab in the track well has a minimum thickness of 16 in.,

umns being 44 ft. and the spans on each side being 40 ft. The trusses and columns are designed for an assumed roof loading as follows: dead load, 22 lbs. per sq. ft.; live load, 50 lbs. per sq. ft., and wind load, 30 lbs. per sq. ft. of horizontal surface. The steel frame is covered with galvanized corrugated iron to a height of 17 ft. 5 in., the upper portion of the side wall consisting of continuous steel sash 5 ft. 10 in. high. A similar continuous sash in the monitor deck is provided with an operating device to allow for ventilation of the building. The roof is carried on channel purlins and is covered with 5 ply felt, tar and slag laid on a 1 : 12 pitch. Ventilators 2 ft. in diameter are located along the monitor deck at intervals of 18 ft. The doors on the sides and the sea end

Interior of Pier Showing Track Well, Platforms and Steel Superstructure.

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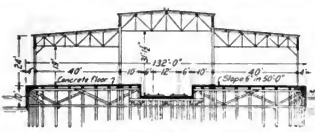
are 12 ft. 5 in. wide and 11 ft. 5 in. high, the two doors on the shore end being each 14 ft. wide by 22 ft. high. All doors are of steel frame construction with corrugated iron covering and are arranged to slide vertically, being counterweighted to make their operation easy. The doors on the side are arranged in pairs 18 ft. center to center, the pairs being spaced 54 ft. center to center. There are three ladders on each side of the building, allowing access to the roof. Copper downspouts at intervals of 36 ft. are provided to carry off the drainage.

The inside walls in the freight room between doors are protected by 2 in. by 8 in. spruce guard planks 10 in. center to center. At the shore end of the pier a supply and store room, boiler room, coal room, toilet and locker rooms are provided and two scale pits 4 ft. by 6 ft. in area are located at convenient points on the pier. The offices are located on a second floor in the first three panels of the superstructure at the shore end. The floor of this second story is laid on trusses supported from the columns, the



Typical Cross Section of Pier.

floor level being 19 ft. 9 in. above the pier level. A concrete slab is laid on these trusses which is covered by yellow pine flooring in the offices. The ceiling of the offices is hung by rods from the roof purlins. The space on this second floor is divided into a general office, record room, foreman's office, corridor and toilet. It is reached by two stairways and is lighted by skylights and side windows. A speaking tube and two bill elevators connect the general office with the main floor.

This pier was built under the direction of J. O. Osgood, chief engineer, Central Railroad of New Jersey, and A. E. Owen, principal assistant engineer, to whom we are indebted for the above information. The contract was let in three parts; the timber substructure being built by George Spearin, New York; the concrete deck by Henry Steers, Inc., New York, and the steel superstructure by the Hay Foundry & Iron Works, New York.

NEW LINE FOR PERU.—The government of Peru has now accepted the proposal to extend the railway at present operating between Tambo de Mora and Chincha to the districts of Castrovirreyna and Huancavelica, a concession having been granted to the Tambo de Mora Railway Company, a locally-owned enterprise, to construct the line which it is allowed to operate for a period of 90 years, after which the whole concern falls into the possession of the government without the payment of any indemnity to the company.

MALLETS ON THE NORFOLK & WESTERN.

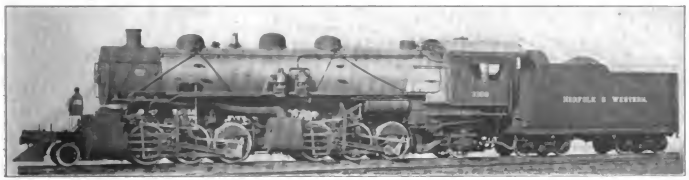
For the year ending June 30, 1912, the average revenue tons lading per freight train mile on the Norfolk & Western was 692.43, an increase of 7.75 per cent. over the preceding year. In connection with the development of heavier train units on that road ten Mallet locomotives were introduced in May, 1910; five of these were of the 0-8-8-0 type, and five were of the 2-8-8-2 type. In 1912 forty Mallets of the 2-6-6-2 type, built by the American Locomotive Company, were introduced and forty more are now in process of building. The addition of the trucks was made in order that the boiler capacity might be made larger, thus increasing the sustained capacity of the locomotives, which is necessary where they are used in road service, as the case on the Norfolk & Western.

In ordering this equipment, it was the purpose of the Norfolk & Western officials, not so much to dispense with the pusher service, as to increase the maximum train load over the division. On the Pocahontas division, between Eckman, W. Va., and Bluefield, five 0-8-8-0 type, five 2-8-8-2 type, and fifteen of the new 2-6-6-2 type Mallets are being operated in both head end and pusher service.

On the Radford division, between Bluefield and Roanoke, Va., five of the new 2-6-6-2 type Mallets are being operated in road service. This division is 105 miles long and includes a forty-mile grade of 0.4 per cent. and a ten-mile grade of 1.0 per cent. With the help of a pusher service on this ten-mile 1.0 per cent. grade the Mallets have increased the train tonnage from 2,800 to 4,000 tons.

The remaining twenty of the new 2-6-6-2 type Mallets are being operated in road service on the west end of the Norfolk division, between Roanoke, Va., and Crewe, a distance of 130 miles. Because of especially favorable terminal as well as road facilities, these Mallets are doing their best work on this division. Before the installation of the Mallets the tonnage on the division was handled by 4-8-0 type locomotives, having a total weight of 260,000 lbs., 220,000 lbs. being on drivers, and having a tractive effort of 52,500 lbs. Leaving Roanoke with a 3,500-ton train, which was the rating, two of these 4-8-0 type engines were at the head end. At Bonsack, Va., a 4-8-0 type locomotive was put behind the train to push it to Blue Ridge. At Blue Ridge, Va., the helper was cut out and returned light to Bonsack to await another eastbound train. From Blue Ridge the 3,500-ton train, with the two engines in the lead, proceeded to Phoebe, Va. At Phoebe the lead engine was cut out and the train and the one engine continued to Crewe. The one 4-8-0 type engine readily hauled the 3,500-ton train over this portion of the road, except that at Farmville, Va., it was assisted over the short grade by another 4-8-0 type engine.

At present, starting out from Roanoke with a 5,000-ton train, one of these Mallets is in the lead, double-headed by a 4-8-0 type locomotive. These two engines pull the train from Roanoke to Bonsack, a distance of 9 miles, made up of broken grades. At Bonsack another of the Mallets is put behind the train and pushes it to Blue Ridge, a distance of 6 miles. From Bonsack



Mallet Locomotive of the 2-6-6-2 Type as Used on the Norfolk & Western.

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to Blue Ridge there is a ruling grade of 1.2 per cent. At Blue Ridge the pusher cuts out and returns to Bonsack light. From Blue Ridge the two engines in the lead haul the train to Phoebe, a distance of 56 miles from Blue Ridge. This 56 miles is made up of broken grades, but includes a 0.5 per cent. grade 8 miles long. At Phoebe the leading 4-8-0 type engine is cut off and waits for a westbound empty train, helping as a double-header back to Roanoke. From Phoebe, therefore, the one Mallet or through engine hauls the train to Crewe, a distance of 59 miles of broken grade, with the exception of the 16 miles from Farmville to Burkeville. This 16 miles is made up of a continuous grade of 0.45 per cent. and a 4-8-0 type engine is used as a pusher. This means that on the Radford division train loads have been increased 79 per cent., and on the Roanoke division 43 per cent. Fifty-seven locomotives have been supplanted by these forty Mallets, and a reduction of 25 per cent. has been effected in the number of freight trains operated over the divisions.

The boiler of the 2-6-6-2 type locomotive incorporates a combustion chamber 78 in. long. This allows the firebox to be brought back of the rear driving wheels, thereby making it possible to obtain a good depth of throat sheet, without excessively increasing the length of tubes. As a result a throat sheet 18 1/16 in. deep is obtained with a tube length of 24 ft. High temperature superheaters and brick arches are used. Fifteen engines are equipped with Walschaert and twenty-five with Baker valve gear. All the engines have Street stokers. Reversing is effected by means of the builders' hydro-pneumatic reversing gear, which not only renders the operation of the engine easier than that of the ordinary simple engine, but allows the use of steam with a full throttle and the cut-off arranged at the most economical point. The builders' latest style of outside bearing trailing truck is used. This was also used on the Chesapeake & Ohio Mallets, and is similar in design to that successfully applied to a number of recent Pacific type locomotives. With the exception of the case above mentioned, the type of leading and trailing trucks applied to Mallet locomotives by the American Locomotive Company has been the radial swinging bolster type with journals inside of the wheels. The outside bearing truck used gives a wider supporting base and tends to add to the stability of the locomotive.

The American Locomotive Company's system of compounding, including intercepting valve, was also applied. With this system it is possible to increase the power of the engine about 20 per cent. at critical moments, by admitting live steam to all cylinders. At the same time, the intercepting valve so controls the pressure of the live steam entering the receiver pipe that equal work is done in all four cylinders.

Following are the principal dimensions, weights and ratios of the new 2-6-6-2 type locomotives:

General Data.

Type	2-6-6-2
Service	Freight
Fuel	Soft coal
Tractive effort working compound	72,600 lbs.
Weight on drivers	337,300 lbs.
Weight, total engine	405,900 lbs.
Weight, total engine and tender	583,000 lbs.
Wheel base, driving	30 ft. 0 in.
Wheel base, rigid	10 ft. 0 in.
Wheel base, engine	48 ft. 10 in.
Wheel base, engine and tender	79 ft. 3½ in.

Cylinders.

Kind	Compound
Diameter and stroke	22 in. and 33 in. x 32 in.

Wheels.

Driving, diameter	56 in.
Driving journals	10 in. x 12 in.
Truck, diameter, front	30 in.
Truck journals	6 in. x 10 in.
Truck, diameter, back	44 in.
Truck journals	8 in. x 14 in.

Boiler.

Type	Conical connected
Working pressure	200 lbs.
Diameter, front	83½ in.
Diameter, back	96 in.
Firebox, length and width	108⅞ in. x 96⅛ in.
Tubes, number and diameter	243—2¼ in., and 36—5½ in.
Tubes, length	24 ft. 0 in.
Combustion chamber	78 in.
Heating surface, tubes	4,625 sq. ft.
Heating surface, firebox	343 sq. ft.
Heating surface, arch tubes	25.4 sq. ft.
Heating surface, total	5,023.4 sq. ft.
Superheating surface	995 sq. ft.
Grate area	72.2 sq. ft.

Tender.

Wheels, diameter	33 in.
Journals, diameter and length	5½ in. x 10 in.
Water capacity	9,000 gals.
Coal capacity	14 tons

PROPOSED INCREASE IN FREIGHT RATES.

The committee of the railways in Official Classification territory, Messrs. Willard, Reed and Brown, has announced that the application of the roads to the Interstate Commerce Commission for authority to increase freight rates will be made in the shape of a petition for the re-opening of case No. 3400, which was heard and passed on by the commission in 1910. The proposition, in 1910, was to increase the so-called class rates and a few of the commodity rates. It proved impossible to accomplish anything on this basis and the present proposition is for a small advance on all rates. Numerous complaints which have been made during the past two years have shown that the relation of rates between localities is of greater importance to the public than the actual rate per se. The officers of the railways believe that with the increase in expenses which has taken place within the past few years, the margin of profit is now so small that an increase of 10 per cent. in all freight rates would be justified; but it is desired to cause the least possible disturbance of commercial conditions, and therefore only 5 per cent. will be asked for at this time. Some commodity rates are very low, and it has been urged that these ought to be raised; however, this cannot be done without the co-operation of the shippers with the railroads and with the assistance of the commission.

"Since the previous hearing (1910) the railroads generally have expended large sums for equipment and additional facilities, and while there has been some response in the way of increased gross revenues, the surplus income after paying charges and dividends, has been so narrowed as to not encourage the further expenditures required to keep the railroads abreast with the growing demand of the business of the country. Unless the carriers are enabled to increase their revenue in some manner—and the plan above proposed seems likely to meet with less opposition than any other—their ability, already limited, to provide such additional equipment and facilities as will be necessary to take care of the growing demands of the country will be very seriously impaired."

Self-appointed spokesmen for shippers have already given notice in New York, Philadelphia, Chicago and other cities, that the application of the railways will be opposed.

AMAZON-PACIFIC RAILWAY.—The Amazon-Pacific Railway, Peru, which is expected to do so much towards improving the foreign as well as the interior trade of the republic of Peru, is about to actively start upon its construction. Work will be commenced upon the Goyllarisquisga section, which is one of the most picturesque as well as one of the most important.

BRAVE RAILWAYMEN REWARDED IN ENGLAND.—At a meeting of the London & North Western board of directors, three men—Hugh Roberts, dock-gateman at Garston; Harry Holley, signalman at Ringstead; and Thomas George Cowell, junior porter at Northampton Castle, received the thanks of the board and checks for conspicuous acts of bravery. At Garston docks Roberts, who could not swim, let himself down by a rope and rescued a woman who had fallen into the water between a ship and a quay. Signalman Holley rescued a man who fell into Ringstead locks, and who died after being brought out; and Porter Cowell jumped into the Nene river while it was in flood and rescued a man who had fallen in.

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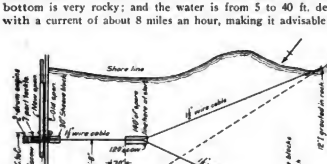
ERECTING THE ST. LAWRENCE RIVER BRIDGE.

Conditions Made It Advisable to Use a Very Small Amount of Falsework in the Erection of the Superstructure.

The Canadian Pacific bridge over the St. Lawrence river in the suburbs of Montreal, which was built as a single track structure including eight 240 ft. deck truss spans, two 270 ft. flanking and two 408 ft. channel spans, has just been replaced by two lines of single track spans supported on the original piers and on four intermediate piers which were built in the four northerly spans. The reconstruction of the piers and the general plan of erection of the superstructure were described in the *Railway Age Gazette* of October 11, 1912. At the bridge site, the river bottom is very rocky; and the water is from 5 to 40 ft. deep, with a current of about 8 miles an hour, making it advisable to



Anchorage of Scows for Launching Channel Spans.

erect the new superstructure with the use of a very small amount of falsework. The detailed erection methods are included in the present article.

The eight new 120 ft. spans which replace the four 240 ft. spans on the northern or Montreal end, were erected successively from the shore on 115 ft. falsework spans consisting of steel trusses 10 ft. deep, weighing about 10,000 lbs. each. These trusses were handled by two traveling cranes moving on the old superstructure and working only between regular trains. From four to five days were required for the erection of each new 120 ft. span. After they were erected, permanent track was laid on them and

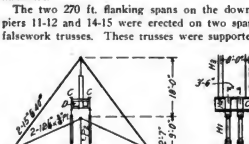
Launching Second Channel Span.

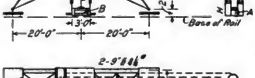
the traveling cranes first removed the down stream falsework truss in each span, after which the up stream trusses were pushed transversely under the structure to the position formerly occupied by the other trusses and were in turn removed by the cranes.

After the erection of the eighth 120 ft. span, traffic was shifted over the new superstructure, thus releasing the northerly four 240 ft. spans which were removed by traveling cranes moving on them; the steel being carefully disconnected so as to make it available for re-erection elsewhere.

The four 240 ft. spans on the down stream side between piers 7 and 11 were erected on 120 ft. falsework trusses supported on falsework towers. These trusses were erected in the northerly half of each span. The bottom chords of the new spans were assembled on them in position and riveted up complete, the section of chord which spanned between the end of the falsework and the next pier in advance having strength enough to be self-supporting for the clear distance of about 120 ft. The center panels of the new trusses were erected on the bottom chords over the center falsework tower, then one adjacent panel was erected on the bottom chords beyond the falsework tower, after which the northerly end of the span was erected over the falsework trusses and finally the erection of the span was completed from the center to the forward pier and the falsework trusses and towers removed. The maximum depth of water in which these falsework towers were built was about 18 ft. The falsework trusses for each span were erected in about one-half day and the erection of one 240 ft. span was completed by 30 men in 11 days. The field riveting was done by an additional force of 10 four-man gangs, using pneumatic hammers.

The two 270 ft. flanking spans on the down stream side of piers 11-12 and 14-15 were erected on two spans of the 120 ft. falsework trusses. These trusses were supported near the piers





Distributing Truss for Shore End of Channel Span.

on transverse trestle bents and at the center of the span on falsework towers resting on the rock bottom.

As the water under the two 408 ft. channel spans was about 40 ft. deep and it was necessary to keep the stream open for navigation, these spans could not be erected on falsework. As the location is an extremely windy one, and it was impossible to tie to the old structure in the erection of the new, due to the fact that the old spans were loaded to their allowable maximum by the traffic passing over them, erection by the cantilever method seemed inadvisable. It was therefore decided to erect each 408 ft. span on the adjacent 270 ft. flanking span with three of its nine panels overhanging the river and to launch them endwise into place.

These spans were erected by a top chord traveler moving on a track laid on the upper chords of the large trusses. When moving, it was supported on wheels and when lifting steel it was blocked up at the forward end just ahead of the wheels. The traveler was of the derrick type with a 50 ft. and a 20 ft. boom, the latter being hung in the center of a swinging "A" frame held in place by stiff back ties connected to the base of the frame by pins which could be shifted so as to keep the "A" frame vertical as the traveler moved over the curved top chord.

When a span was completely erected it was raised off the blocking and the forward end carried on a special scow on which

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was built a wooden tower. A distributing truss resting on three pairs of shoes supported the rear end over the deck truss. The total weight of one of these spans, including the traveler, was 2,730,000 lbs. The load on the scow was 1,855,000 lbs., and that on the trusses 885,000 lbs. As this load on the approach truss had to be carried by the floor system, it was necessary to distribute it over about 40 ft. of length to prevent the overloading of the stringers and floor beams. It was also necessary to support the rear end of the truss in such a manner as to allow the outer end, carried on the scow, to move slightly in a vertical and considerably in a horizontal direction. This was accomplished by the use of a disk bearing placed on the center line of the bridge, which was suspended from the top of two pairs of inclined struts hinged to sliding shoes at their lower ends. These struts were kept from spreading by tie bars attached to the lower ends of the struts and set at such an angle that the vertical component of their stresses equaled one-third of the vertical component of the stresses in the inclined struts. These tie bars were connected at their intersection to a vertical strut also hinged to a shoe. By this arrangement the total load was distributed over six shoes with a fairly equal proportion of the load on each one and considerable freedom was allowed the shoes to accommodate themselves to any unevenness of the track.

The inclined struts used in this distributing truss were composed of two 15 in. 40 lb. channels and the tie rods were made up of two 12¼ in. x ¾ in. plates. The bearing for the load was secured by a system of built up girders which were hung from the connection of the struts by hangers made up of 15 in. x ⅝ in. plates. The center post below the connection of the tie rods is made up of four 8 in., 13.75 lb. channels. The three pairs of shoes slid on two lines of four rails each, laid on the deck of the approach truss 8 ft. center to center.

The supporting scow was 200 ft. long, 37 ft. wide and 10 ft. deep, having four steel trusses running the full length with steel latticed cross frames at about 8 ft. intervals. The sides, bottom and deck were of 4 in., British Columbia fir. Heavy timber keelsons and deck stringers were placed between the longitudinal trusses. These scows were built in halves and were used for other purposes until required for launching the spans, when they were joined by bolting together the projecting ends of the longitudinal trusses. Three light wooden longitudinal bulkheads were put in to hold the water in case the scows should rock when being placed under the bridge or under water ballast. To distribute the load on the scow, four 100 ft. plate girders were used to support timber falsework with steel bracing reaching up to the under side of the trusses. Two centrifugal pumps, two valves for flooding the scows and a valve between the two halves of the scow to regulate the height of the bow and stern were provided. There was also a hoisting engine at the stern to handle the anchor lines.

The main scow supporting the truss was anchored by a 1¾ in. cable to a second scow 120 ft. long located about 500 ft. up stream. This scow in turn was anchored by 1½ in. wire cables to special anchorages. The extreme width of the river made it impossible to locate these anchorages on the shores and two of them had to be provided in the river bed. These were composed of 16 concrete blocks weighing 4½ tons each threaded on a 1½ in. plow steel cable with heavy double 6 in. pipe 12 in. long between each to allow the blocks to conform to the uneven bottom. These anchors were placed about 1,500 ft. above the bridge and in line with the two outer piers supporting the main channel spans. After the laying of these anchorages, cables were taken to the opposite piers and heavy strains put on them to set the anchorages firmly in the bottom. A third anchorage was provided on the shore, consisting of 12 in. "I"-beams grouted into the rock at the edge of the water.

The cables connecting the upper scow to the anchorages were fastened to a special stubbing post on the scow. The length of the cable to the center anchorage remained fixed, the transverse movement of the scow being secured by paying out the cable to the side anchorage, and allowing the scow to revolve about the middle anchorage as a center. This caused a movement down stream of about 70 ft., which was taken up in the cable connecting the two scows so as to prevent the scow supporting the span from moving down stream. It was found that the anchor lines worked a little unevenly, the steel cable sticking on the stubbing post and paying out by jerks, but as ample provision had been made for movement of the outer end of the span, no harm was done.

The bridge was moved by a 65 ton Lidgerwood unloader located on the deck truss just back of the rear end of the long span in the position occupied during erection. Steam was furnished to this unloader by a locomotive adjacent to it. Power was applied to the long span through girders thrusting against the two center shoes under the distributing truss, the purchase of the hauling lines being carried around sheaves in these girders, to and around sheaves placed at the outer end of the 270 ft. span. The girders carrying these sheaves butted

Deck of New Bridge Showing Track on Which Span Was Moved.

against the sliding track so as to keep the stresses developed by the frictional resistance to moving out of the approach spans and the distributing truss.

Experiments to determine the friction against sliding were made which showed about 13 per cent. Power was provided to overcome a friction of about 25 per cent., but judging by the ease with which the Lidgerwood moved the spans it looked as though 13 per cent. was about the amount which actually existed. As it was impossible for the distributing truss to act during the last 20 ft. of travel, wedges were driven between the center shoes and the end floor beam when the forward shoe of the distributing truss reached the end of the deck truss. For the remaining 20 ft. of travel the whole load was thrown on this blocking. The end panel of the floor was reinforced to carry this load.

Three hours were consumed in moving the first span and about two and one-half hours for the second, the latter being inclusive of the time required to allow eight trains to pass, to adjust the anchor and to dismantle a part of the sliding

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frame to allow it to pass the hauling sheaves during the last 20 ft. of travel. The net moving time was only 28.5 min. It was decided to operate the bridge as a double track structure during the winter in order to accommodate the heavy railway traffic at this season. Later the up stream track will be temporarily closed while the two up stream channel trusses are dismantled and the two new ones replacing them are erected in the same manner as described for the two down stream trusses.

The reconstruction of this bridge is being handled under the direction of P. B. Motley, engineer of bridges of the Canadian Pacific, and J. M. A. Fairbairn, assistant chief engineer. The superstructure was fabricated and erected by the Dominion Bridge Co., Montreal.

CONDUCTORS' AND TRAINMEN'S DEMANDS.

The committee of managers of the eastern railroads on May 1 refused to grant the increased pay asked for by the conductors and brakemen, and issued a notice declaring the case to be more important than that of the engineers and the firemen combined. Some 100,000 conductors and trainmen on forty-three roads demand an additional $17,000,000, or 20 per cent. per annum, though their wages were increased by $30,000,000 per annum in 1910.

The committee's letter to Messrs. A. B. Garrettson of the conductors, and W. G. Lee of the brakemen, was in substance as follows: The increase demanded would be equivalent to placing on these properties a lien of $425,000,000 of 4 per cent. securities, which would have preference over first mortgage bonds. If the railroads are forced to pay extravagant wages to men in train service, the burden must fall on the public, from which the roads must secure revenue.

"Already the traffic of a growing country has overtaxed the existing facilities; and the heavy burdens incurred through ill-advised legislation, such as extra crew bills—for which the Brotherhood of Railroad Trainmen is alone responsible—forcing on the railroads and consequently on the public, needless expenditures of millions of dollars annually, or the large financial outlay the roads are compelled by law to make for improvements which produce no revenue, such as the grade crossing bill of New Jersey, and the additional burden of previous wage increases, are making it impossible for many of the roads to provide those facilities which prudent foresight demands, and which the interests of the public require.

"In making demands for extravagant wages—wages entirely out of accord with the railroads' obligations as a whole—railway employees apparently act on the assumption that a strike that would tie up traffic would never be permitted by the public. They seem to think that if a strike is to be avoided, the railroads must give way—that the public will force them to give way, believing that arbitration must take place, and that in the end the splitting of differences between what they demand and the wages they receive will result in their favor. In other words, the employees have everything to gain and nothing to lose.

"The ability of the railroads to meet the recurring demands for increased wages is measured by the net results of their operations and the sum of the obligations which they must meet to maintain their solvency. The reduction of the net revenue by the constantly increasing expenses of operation have so narrowed the margin which is essential to the solvent existence of many of the roads that further increases in operating costs are viewed with grave concern. The railroads reiterate their statement made to the engineers, that this headlong movement towards financial disaster cannot proceed unchecked.

"The conductors and trainmen in the eastern district have practically uniform wages and working conditions, and the wages now paid are liberal. As positive proof of this we need only call to your attention the fact that they were fixed by E. E. Clark, former president of the Order Railway Conductors, and P. H. Morrissey, former president of the Brotherhood of Railroad Trainmen, who acted as arbitrators in the New York Central controversy in 1910. The method of settlement under which those wages and conditions were adopted was agreed to only after representatives of the employees had declined to accept mediation or arbitration under the federal law, arbitration by a board composed of members of the Public Service Commission, Second district, state of New York, or arbitration by a board composed of the presidents of the chambers of commerce of three prominent cities of the state of New York, or in fact, arbitration of any form. Therefore, to avoid suspension of traffic, and the hardships and inconveniences which would result, representatives of the New York Central offered the only method of settlement that the representatives of the employees would accept.

"To prevent strikes on their lines, practically all of the railroads in the eastern territory in 1910 accepted the Clark-Morrissey award. The wages and working conditions of the conductors and trainmen, fixed by the New York Central award, are probably more favorable than those of any other class of railway employees; and further, to quote the well-considered language of the Interstate Commerce Commission, 'railroad labor, certainly organized railroad labor, is probably as well paid, and some say better paid, than labor of other kinds upon the average.'

"As showing the increased cost to the eastern railroads of these adjustments in 1910, we need only quote the statement made by the president of the Brotherhood of Railroad Trainmen in his report to the tenth biennial convention of that organization: 'Conservatively estimating, the increase in the rates of pay of conductors, trainmen and yardmen in the East as a result of this movement will approximate $30,000,000 per annum.' No conditions of work have arisen since the application of the Clark-Morrissey award that would warrant any increase in wages or changes in working conditions.

"In view of the fact that the present rates of wages are liberal, and in many cases excessive, the committee, acting in the interest of owners of railroad securities, in the interest of all railroad employees—in the interests of the public as a whole—must decline your request."

The next day after receipt of this letter Messrs. Garrettson and W. G. Lee offered to arbitrate under the Erdman act; but that the managers declined to do, reiterating the statement that no conditions have arisen since 1910 to warrant any increase in wages or changes in working conditions. They added:

"As to arbitration under the law, it was only at the urgent request of the representatives of the government, and under the strongest protest the managers were able to voice, that, feeling that some adjustments of pay were due the firemen, they agreed to arbitrate the firemen's wage controversy under the Erdman act. At that time we put the public on notice as to the crisis that would confront them when the conductors and trainmen made similar demands.

"You have followed the example of the engineers and the firemen, and have proposed to arbitrate 'under the law,' though practically all the leaders of railway labor organizations recognize the defects of the present law by joining in an effort to have it amended."

Continuing, the letter recounts the objections to the Erdman act, and ends with a refusal to accept the brotherhoods' proposal.

The brotherhoods announced that they would proceed to take a "strike vote."

RAILWAYS IN TRIPOLI.—The Italian minister for the colonies has under consideration projects for the construction of the following railways: (1) From Tripoli to Homs and Misurata; (2) from Tripoli to Zuarah as far as the Tunisian frontier; (3) and from Tripoli to the Oasis of Ghadames.

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REPORT ON TERRE HAUTE COLLISION.

The Interstate Commerce Commission has issued a report, made by Inspector Belnap, on the rear collision of passenger trains on the Vandalia at Terre Haute, Ind., January 8, when five persons were killed and twelve were injured. Eastbound train No. 8 was standing at the station and No. 20, following, came on at uncontrolled speed and ran into the rear of the standing train. The accident occurred in the middle of the day and ordinarily the engineman of the approaching train would have seen the standing train, but steam from locomotives standing at the west end of the train shed cut off his view. There is no block system in effect through the station; and, apparently, the only rule which would limit the speed of a train coming into the station is a municipal ordinance making the limit twenty miles an hour within the city limits.

Train No. 8 is scheduled to arrive in Terre Haute at 12:45 p. m., and to stop there one hour; at 1:45 it is due to start east. Usually the cars are set off on a siding, but in this case the train arrived 46 minutes late, and it remained on the main track. Train No. 20 is due to arrive at 12:55, but on this day it was late and arrived at 1:42; and No. 8 was struck three minutes before it would have departed. The engineman of No. 20 admitted that he did not think of No. 8 and did not know what its leaving time was. No. 8 was not protected by a flag and it does not appear that any trains are thus protected at this station; and Mr. Belnap says that the direct cause of the collision was the failure of the conductor of No. 8 to protect his train, knowing that No. 20 was due. The engineman of No. 20 is also declared to have been directly at fault, for not having his train under complete control, his view into the train shed being obscured. Stationmaster Stice said there were no rules requiring flagging in the station, and he had received no instructions on the point; being a union station, where everybody stops, he held that every train should approach the station under control. Another road which crosses the Vandalia at the east end of the station has a rule requiring protection by flag when trains are standing at the station. Stationmaster Stice admitted knowledge of this rule, but said that where a trainman stood in a union station with a flag in his hand, it looked foolish to him. Since this collision the trainmaster has been instructed to enforce the flagging rule at Terre Haute union station to the same extent as at other places on the road. The inspector concludes with the statement that enginemen could be warned on approaching the station by means of a fixed signal located [at a point named] west of the station; and he says that there should also be a very material decrease in the speed at which trains are permitted to run approaching the station.

TRAFFIC THROUGH THE SAULT STE. MARIE CANAL.

The annual statistical report on lake commerce passing through the canals at Sault Ste. Marie, Mich., and Ontario during the season of 1912 has been issued by Lieut. Col. Mason M. Patrick, of the U. S. Army Corps of Engineers. The total freight traffic through both the American and Canadian canals, of 72,472,676 short tons for the season of 1912, shows an increase of 36 per cent. over the previous year. All items of freight show an increase except coal, salt, copper and building stone. The season of navigation continued for a period of 7 months and 26 days. The traffic through the American canal was 45 per cent. of the total freight and 55 per cent. of the total net registered tonnage, while the traffic through the Canadian canal was 55 per cent. of the total freight and 45 per cent. of the registered tonnage.

The following general summary shows the principal statistics of the traffic through both canals:

Total freight carried, tons	72,472,676
Total tons net register	50,736,807
Total mile-tons	60,242,843,014
Total valuation placed on freight carried	$791,357,837
Total amount paid for freight carried	$40,578,235
Total number of registered vessels using canals	853
Total number of passages by unregistered crafts carrying freight	835
Total valuation placed on registered vessels	$138,546,300
Total number of passengers transported	66,877
Average distance freight was carried, miles	831
Average cost per ton for freight transportation	$0.56
Average cost per mile per ton, mills	.67
Average value per ton of freight carried	$10.92
Time American canal was operated, days	237
Time Canadian canal was operated, days	240
Freight carried by—	
Registered vessels, tons	72,300,591
Unregistered vessels, tons	172,085
American vessels, per cent	94
Canadian vessels, per cent	6
Passengers carried by—	
American vessels, per cent	32
Canadian vessels, per cent	68
Average number of vessels passing per day—	
Through Poe lock	39
Weitzel lock	27
Canadian lock	33
Poe, Weitzel and Canadian locks	93

Of the total traffic 55,377,687 short tons was eastbound, and 17,094,989 was westbound. The transportation charges, including loading and unloading, on freight passing through both canals were:

Articles.		Quantity.	Rate per unit.	Amount.
Coal	Short tons	14,931,596	$0.30	$4,479,478.70
Flour	Barrels	8,652,153	.20	1,730,430.60
Wheat	Bushels	174,986,456	.025	4,352,161.40
Grain, other than wheat	Bushels	69,024,545	.025	1,725,613.65
Manufactured iron	Short tons	629,960	2.00	1,258,120.00
Pig iron	Short tons	25,812	1.00	25,812.00
Salt	Barrels	660,991	.10	66,099.10
Copper	Short tons	116,984	1.45	169,562.80
Iron ore	Short tons	46,303,423	.45	20,836,540.35
Lumber	M. ft. B. M.	667,542	2.65	1,768,986.30
Stone	Short tons			
Building stone	Short tons	2,282	1.50	3,423.00
General merchandise	Short tons	1,464,783	2.50	4,161,957.50
Total				$40,578,235.40

The total expenditures for operating and repairs on the American canal for the year 1912 are given in the report as follows:

Operating, $71,135.66; repairs, $81,061.68; total, $152,197.34.

The cost per freight ton was 64 mills.

The following table of yearly summaries since 1887 shows the steady increase in the volume of the traffic:

Year.	Total freight. Short tons.	Valuation of freight.	Freight charges.	Average per mile haul. Mills.	Freight charges per ton.	Value of American craft.	Value of Canadian craft.
1887	5,494,649	$79,031,757	$10,075,153	811.4	2.3	$17,684,550	$2,089,400
1888	6,411,423	82,156,019	7,883,077	806.4	1.5	20,381,100	1,514,300
1889	7,603,022	83,732,527	8,634,246	790.4	1.5	25,328,000	1,597,600
1890	9,041,213	102,214,948	9,472,214	797.2	1.3	27,857,700	1,777,800
1891	26,603,759	128,178,208	9,849,022	820.4	1.35	31,947,300	1,119,500
1892	11,214,333	135,117,267	12,072,850	832.4	1.31	36,220,100	2,108,700
1893	10,796,572	145,436,952	9,957,483	831.9	1.1	39,017,400	2,115,700
1894	13,193,860	143,114,502	10,798,310	821.1	.99	41,124,200	1,959,800
1895	15,062,580	159,575,129	14,238,758	830.0	1.14	40,858,800	2,037,000
1896	13,751,060	195,146,242	13,513,615	836.4	.99	43,006,200	2,135,300
1897	18,983,755	218,235,927	13,220,099	841.3	.83	42,375,700	2,001,400
1898	21,234,664	233,069,740	14,125,896	842.6	.79	45,199,800	2,491,900
1899	25,255,810	281,364,750	21,959,707	837.2	1.05	65,000,520	3,369,600
1900	25,643,073	267,041,959	24,953,314	825.9	1.18	66,116,583	3,618,576
1901	28,603,759	289,906,965	23,217,974	823.2	.99	57,744,200	3,311,900
1902	35,961,146	358,306,300	26,566,189	827.4	.89	67,205,000	3,792,400
1903	34,674,437	349,403,014	26,727,735	835.6	.92	68,252,800	6,384,500
1904	31,546,106	334,507,686	21,552,894	843.5	.81	63,789,300	5,377,100
1905	44,270,680	416,965,484	31,420,545	833.2	.85	73,211,300	5,429,000
1906	51,751,060	527,462,454	36,666,889	842.4	.84	88,292,000	6,140,500
1907	58,217,214	569,830,188	38,457,345	838.3	.80	102,525,500	7,918,000
1908	41,390,557	470,141,318	23,903,244	844.6	.69	101,643,000	10,054,000
1909	57,895,149	626,104,173	36,291,948	809.0	.78	116,192,000	10,707,000
1910	62,361,718	654,010,844	38,710,904	840.0	.74	123,061,300	11,673,000
1911	53,477,216	595,019,844	29,492,196	826.0	.67	109,336,800	12,211,500
1912	72,472,676	791,357,837	40,578,235	831.0	.67	125,618,800	12,927,500

PARAGUAYAN-BRAZILIAN CONNECTION.—The connecting up of Brazil and Paraguay by railway is to be further assured by running a line from the capital of Paraguay, Asuncion, northeasterly to the Paraguayan-Brazilian frontier, where it will cross the Paraná river. From that point it is proposed to connect with the Transcontinental Brazilian line, which again connects with the main Brazilian system at Itapetininga.

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PRINCIPLES OF ELECTRIC RAILROADING.*

Second Article. Formulas Developed for Calculating the Amount of the Forces of Inertia, Gravity and Friction.

By C. L. de Muralt,
Professor of Electrical Engineering, University of Michigan.

In the first article of this series (*Railway Age Gazette*, April 4, 1913), we reviewed in a general way the laws which underlie all movement of trains on tracks.

We found that to move any railroad train we must apply a force of sufficient magnitude to overcome the combined influence of what might be termed three great natural forces, namely, (1) inertia, (2) gravity, and (3) friction. We will now proceed to calculate the amount of each of these three forces.

INERTIA.

We defined inertia as the force of the mass, which tends to prevent any change in speed, be it increase or decrease. To overcome inertia we must supply a force which is proportional to the weight of the train and also to the rate at which the speed is to be changed. This may be expressed as follows:

$$f_i = 100\ W\ A, \qquad (1)$$

where W represents the weight of the train in tons, A the rate of acceleration—or retardation in the case of braking—in miles per hour during one second, and f_i the force in pounds which it takes to accelerate—or retard—the weight W at the rate A.

The mathematical proof of this equation is comparatively simple. We may start from the familiar physical relation that force equals mass times acceleration:

$$f_i = m\,a.$$

Inasmuch as mass equals weight divided by the acceleration due to gravity, we may write

$$m = \frac{w}{g},$$

and inasmuch as g has been determined to be roughly equal to 32.2, the above formula becomes:

$$f_i = \frac{w\,a}{g} = \frac{w\,a}{32.2}$$

where f_i is in pounds if w, the weight, is in pounds and a is the change of speed in feet per second per second.

If we change to the more usual units of tons and miles per hour, this equation becomes:

$$f_i = \frac{2{,}000\ W \times 5{,}280\ A}{32.2 \times 3{,}600} = 91.1\ W\ A,$$

where W is the weight of train in tons and A the rate of acceleration in miles per hour per second.

This gives us the force in pounds, which is required to overcome the inertia of the train, on the assumption, however, that the motion of the train is a motion of the train as a whole and that there is no relative motion between any of its individual parts. In reality this is not so. The wheels and axles and other similar parts have a rapid rotating motion in addition to their forward motion. They act as so many flywheels and they require the expenditure of a certain amount of additional energy to get them to turn.

The amount of this energy, or for that matter the amount of energy in any rotating body, is determined by finding the weight of the body and the position and velocity of its center of gyration. The latter is the point at which we may imagine the whole mass of the rotating body concentrated, and any given force would produce the same velocity of rotation as it does in the actual body. It is needless here to go into detail as to how the radius of gyration is determined. Suffice it to say that for car wheels it is somewhere near 0.7 of the actual radius of the wheel, for locomotive wheels about 0.8, and for the rotating part of electric motors about 0.6. In round numbers we may say without any great error that the rotative energy of these parts is on the average equal to about one-half of the energy due to their forward motion ($0.7^2 = 0.49$).

If we compare the weight of wheels, axles, etc., with the total weight of the cars and locomotives, we find that the rotative energy will add to the energy of the train as a whole, from 5 per cent. in the case of a heavily loaded train to 12 per cent. in the case of an empty train, or about 9 per cent. on the average. To take account of this rotative energy we must therefore increase the amount found above for $f_i = 91.1\ W\ A$ by about 9 per cent. This gives us the formula: $f_i = 100\ W\ A$, which was to be proven.

Thus we have the simple rule that it takes 100 lbs. to accelerate one ton at the rate of one mile per hour per second; and the total force required in any case can be readily and accurately calculated by multiplying the weight of the train in tons by the rate of change of speed in miles per hour per second and by 100.

For instance, let us take a train which weighs 400 tons, and let us assume that it is desired to bring this train up to a speed of 30 miles per hour in 60 seconds. This corresponds to an average acceleration of 0.5 miles per hour per second, and the average force which we must apply to overcome inertia during the acceleration period is:

$$f_i = 100 \times 400 \times 0.5 = 20{,}000\ \text{lbs.}$$

GRAVITY.

It is not much more difficult to calculate the force necessary to overcome gravity. Whenever a grade is encountered, we must lift the train through the vertical distance represented by the grade. Grades are nowadays generally expressed in per cent., meaning, that there is a rise of p feet for every 100 ft. horizontal length of line. If the grade should be given as x feet rise per mile, all we have to do is to divide x by 52.8 to obtain p, the rise per 100 ft. In Fig. 1 let the force OW represent the weight W of the car O. It acts vertically downward, but may be considered as resolving itself into two component forces, the force $F_x = OG$ acting parallel with the rails and tending to produce motion down the grade, and the force $F_n = ON$ acting normal to the rails and representing the pressure of the wheels on the rails. Force F_n is absorbed by the rails. Force F_x is the force which must be overcome and which we are trying to calculate. It is geometrically evident from Fig. 1 that, on account of the similarity of the triangles ABC and WOG, the force $F_x = OG$ bears the same ratio to the weight $W = OW$ that the rise BC does to the length of line AB. On any ordinary railway grade the horizontal distance AC is not sensibly different from the length measured along the surface of the rails AB. For a 3 per cent. grade, for instance, the length measured horizontally, AC, is to the length measured along the slope, AB, as 100 to 100.045. Hence it is customary

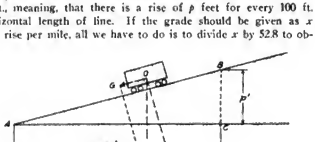

Fig. 1.

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and proper to assume $AC = AB$.* Therefore we have, approximately:

$$\frac{F_g}{W} = \frac{BC}{AC}$$

$$\text{or: } F_g = W \times \frac{BC}{AC}$$

If we let the horizontal distance $AC = 100$, and the height $BC = p$ = rate of grade or rise in per cent., then we have:

$$F_g = W \times \frac{p}{100}$$

This means that for every foot rise in 100 ft. length, and for every ton train weight, we have to exert a force equal to the one hundredth part of a ton to lift the train up the grade. Changing to the more usual unit of pounds we have:

$$f_g = 2{,}000\ F_g = 2{,}000\ W \times \frac{p}{100}$$

$$\text{or: } f_g = 20\ W\ p, \qquad (2)$$

where W represents the weight of the train in tons, p the grade in per cent. (feet rise per 100 ft. length) and f_g the force in pounds which is required to lift the weight W up the grade p.

Thus we find that, to calculate the force which it takes to lift a train up a grade, we simply multiply the weight of the train in tons by the rate of the grade in per cent. and by 20.

For instance, to take a train of 400 tons up a grade of 2 per cent., it requires to overcome the force of gravity a force:

$$f_g = 20 \times 400 \times 2 = 16{,}000 \text{ lbs.}$$

FRICTION.

To calculate the force which is necessary to overcome friction is slightly more involved. This is because the amount of this force depends on various factors which are subject to considerable variation. For instance, we all know that the friction inside a bearing is different when the bearing is hot from what it is when it is cold. We also know that the friction between wheels and rails depends on whether the rails are laid on a tangent or in a curve, and whether they are dry or moist, or covered with sleet or snow or wet leaves, etc. The friction between train and surrounding air varies according to whether it is a calm day or there is a heavy wind in favor or against the train. Then we have differences due to the effect of variations in speed, load, temperature, size and form of cars, length of train, etc. From all this it would appear that the best we can expect to do is to estimate the friction as accurately as possible for the various conditions or combinations of conditions. This has been done by a great many investigators, but it must be admitted that to this day no entirely satisfactory solution has been found which is applicable to all cases.

It seems to be pretty well established, however, that there are essentially two parts to train friction. One part increases directly in proportion with the train weight; the other part is independent of train weight, but increases with the number of cars that go to make up the train. This can be expressed in a formula as follows:

$$f_t = x\,W + y\,n,$$

where x and y are factors, the value of which has yet to be determined, W stands for the train weight in tons, and n for the number of cars in the train. Inasmuch as the number of cars is equal to the train weight divided by the average weight per car, we may write:

$$n = \frac{W}{W'},$$

where W' represents the average weight per car, and the above formula then becomes:

$$f_t = x\,W + \frac{y\,W}{W'} = W\left(x + \frac{y}{W'}\right),$$

which simply means that, instead of saying that there are two parts to train friction, one proportional to the train weight and the other to the number of cars, we may say that friction as a whole is proportional to the train weight, but a portion of it varies in direct proportion to the train weight and another portion varies inversely as the average weight of each car. The two ways of expressing it mean the same thing, and they both relate to the well recognized fact that in certain of the items which go to make up train friction we find train weight as the dominant factor, while in others the composition of the train is all-important, and the latter items are much larger if the total train weight is made up of a great number of empty cars, than if it represents a small number of heavily loaded cars. This was well recognized by the American Railway Engineering Association, when it adopted at its annual meeting in 1910 the following formula for train friction:

$$f_t = 2.22\ W + 121.6\ n.$$

This formula is based on the assumption that the friction of the train is uninfluenced by any change in speed. As a matter of fact, the association in establishing this formula, had in mind freight trains running at speeds between 7 and 35 miles per hour, and it is quite likely that within these limits the variation in the amount of friction, if any, is very small and its numerical value very hard to establish.

If we wish to have the formula applicable to higher speeds as well, then the influence of change in train speed upon train friction should have due consideration. The writer, after a careful and laborious study of all available test data, has come to the conclusion that the following simple formula represents average conditions in this respect fairly well:

$$f_t = \left(2 + \frac{V}{10}\right) W + 90\ n = W\left(2 + \frac{V}{10} + \frac{90}{W'}\right) \qquad (3)$$

where, if V represents train speed in miles per hour, W weight of train in tons, n number of cars, and W' average weight per car in tons, f_t will be the total train friction in pounds. Values established according to this formula check fairly well with values obtained according to the formula of the American Railway Engineering Association for speeds between 5 and 20 miles per hour. For higher speeds formula (3) gives more conservative values.

Whichever formula is used, it is necessary to realize that there are still some conditions which may influence the value of train friction and which are not particularly covered in either formula, such as condition of cars, condition of track, weather, etc. Variations of this sort it is impossible to determine mathematically. Any formula for train friction must be assumed to apply to cars in good average condition, track of good average first-class construction and reasonably good maintenance, and fair wind and weather. For special deviations from these assumptions special allowances must be made.

When trains are first started their friction is likely to be considerably greater than is indicated by the above formula. It may under adverse conditions run up as high as 40 lbs. per ton train weight. But trains are started by increments so that starting friction rarely becomes a limiting factor, especially not, because stops are not usually made on ruling grades.

The effect of curves, however, upon train friction is of sufficient importance to be carefully considered in this connection. In modern railway practice, curves are generally compensated by a reduction of grade so that the locomotive effort is the same on the curve as on the tangent. A compensation of 0.035 per cent. per degree of curvature seems to give the best average results. If curves are thus compensated then there is no necessity for considering any addition to train friction on their account. Curves that are not compensated are assumed to add 0.7 lbs. per ton train weight to the train friction for every degree of curvature, and the train friction as obtained by formula (3) should be increased by that amount.

Thus, for instance, a train composed of 50 cars of an average weight of 40 tons per car, running at a speed of 20 miles per hour through an uncompensated curve of 4 deg., will have a total train friction on the level of:

$$f_t = 2{,}000\left(2 + \frac{20}{10} + \frac{90}{40}\right) + 4 \times 0.7 = 18{,}100 \text{ lbs.}$$

In the following articles we will show how the above formulas are used in making comparative power calculations for steam and electric operation.

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ANNUAL MEETING OF THE AIR BRAKE ASSOCIATION.

Proceedings for First Two Days, Including Papers on Undesired Quick Action and Operation of Long Freight Trains.

The twentieth annual convention of the Air Brake Association was held in St. Louis, May 6-9, W. J. Hatch, of the Canadian Pacific, presiding. The meeting opened with a prayer by Rev. C. E. Jenney, and the association was welcomed to the city by T. H. Rogers, secretary to the mayor.

President Hatch spoke of the part the air brake played in the economical and safe operation of trains, advocating the testing of air brakes as soon as the train arrives at the terminal; he also recommended the installation of yard testing plants. Speaking of air hose failures he raised the question as to whether or not it would be practical to limit the life of a hose, rather than have it fail in service, causing train delay. The secretary's report showed 788 members and a cash balance of $2,619. About 220 members registered the first day.

An informal meeting was held Tuesday afternoon for the discussion of topics of interest not included in the program. E. F. Kearney, general superintendent of transportation of the Missouri Pacific, addressed the convention Wednesday morning. Wednesday afternoon was given over to an informal talk by Walter V. Turner of the Westinghouse Company, who spoke on topics suggested by the members in attendance.

UNDESIRED QUICK ACTION.

A paper on "Undesired Quick Action, Its Prevention and Remedy," was presented by C. N. Remfry, of the Duluth, Missabe & Northern. He told of the difficulties that had been experienced by that road, which has 7,000 ore cars and 2,000 freight cars. The ore cars do not leave the system, and are therefore under the company's observation during the entire year. They are in service during the open season of the Great Lakes, which is approximately from April 15 to November 30. At the close of the season the brakes are cleaned and lubricated. Each ore car will average one round trip of 190 miles every 24 to 36 hours, and is examined by air brake inspectors after each trip. The terminal yard at Proctor, Minn., has 97 tracks, all of which are piped with air test lines. Sufficient air capacity is provided to charge 5 trains at once to a pressure of 90 lbs. The cars are braked at 95 per cent. on a 50-lb. brake cylinder pressure.

Prior to and including the year 1906 the triple valves were cleaned on the cars by removing the triple cap and check valve case, wiping the parts as clean as possible, and oiling the slide valve and slide valve piston. This method would give satisfactory results until warm weather, when the undesired quick action would develop on nearly all trains. It was believed that the accumulation of rust in the pipes and the ore dust working into the pipes would cause the triple to stick enough to hold the pressure until it became great enough to move the piston to the emergency position. With this idea in view the triples were given a much more thorough overhauling and the pipes were hammered and blown out, but in the following year the trouble was worse than ever. Drawbars were pulled out and the equipment became more or less weakened, putting about 20 per cent. of the cars out of commission. At the end of the season, however, the triple valves seemed to be in as good condition as when the brakes were cleaned. A large number of the triple valves were then sent to the Westinghouse works at Wilmerding, Pa., for closer examination.

As a result it was decided to only blow out the air pipes, to give special attention to the cleaning of the triple valves, to use gasolene instead of kerosene in the cleaning, and to lubricate the slide valves with a high grade of fine dry graphite, and the triple piston with a good grade of grease or oil. This gave the desired result, and at the end of the 1909 season there were only six cases of the undesired quick action. In each of these six cases it was found that oil on the slide valve caused the trouble. The following table shows the effects obtained by using the dry graphite:

Year.	Trains south with loads. *	Trains north with empties. *	Emergency trains reported. **	Cause.
1907	6,878	6,672	375	
1908	4,021	3,897	4,021	
1909	5,946	5,623	6	Found lubricant on slide valve in each case.
1910	5,929	5,653	0	Mechanical defect. Wings of slide
1911	3,092	2,898	1	valve riveted too light, causing
1912	4,536	4,347	0	graduating valve to bind.

* Hill trains not included.

** Trains developed undesired quick action more than once during the trip. No record kept of the number of times undesired quick action took place. No record kept of the cars in each train. It is assumed that a large percentage of the trains contained almost the same identical cars, therefore it is safe to say that list includes trains which developed this trouble several times but on different trips.

Trouble was also experienced because of the brake cylinder lubricant becoming thinner in summer, due to the heat. This has been overcome by the use of the emery brake cylinder lubricant, which was adopted as standard after 1910.

Discussion.—This is one of the most important matters related to train operation, as the undesired quick action of the triple valve causes train detentions, a decrease in the safety of train operation and a considerable increase in the cost of equipment maintenance, due to the general weakening of the equipment, drawbars pulling out, etc. It was stated that there were no less than 42 contributary causes to undesired quick action.

Other roads using graphite on the triple valve slide valve could not report as great a reduction in the undesired quick action as did Mr. Remfrey in his paper. This was due to the fact that Mr. Remfrey's cars were always under his direct supervision and that on the ore trains no foreign cars were used. Another reason for Mr. Remfrey's success was that throughout the whole scheme of air brake maintenance the utmost care was used, his road believing that money spent in that way was well invested. Many experienced difficulties with dry graphite, on account of surplus oil in the brake cylinder working back on the slide valve and of water in the train pipe getting on the slide valve. This was shown by W. V. Turner, of the Westinghouse Company, to completely nullify the effect of the dry graphite, for, as stated, the advantage of the dry graphite was to allow the air to percolate through the graphite, thereby reducing the pressure of the valve on its seat and allowing it to start with a less difference in pressure between the auxiliary reservoir and the train pipe. It seemed to be the consensus of opinion that the utmost care must be taken in air brake maintenance and that dry graphite was a very great help in reducing the undesired quick action.

OPERATING LONG FREIGHT TRAINS.

F. B. Farmer, Westinghouse Air Brake Company, presented an interesting and instructive paper on "Starting, Running and Stopping Long Freight Trains," which included valuable instructions to engineers of freight trains. An abstract of the paper follows:

Next to safety comes the less spectacular, but very potent, argument of needed economy in cost of transportation. An editorial in the *Railway Age Gazette* of February 7, 1913, says: "From 65 to 80 per cent. of the damage to freight cars is caused by defective draft gears," basing this on a statement by a master car builder of a large road. Part of this damage is caused in train handling, and while inherently weak draft gear and gear allowed to leave terminals in a defective condition contribute to break-in-twos, yet, as good handling will, even under such adverse conditions, avoid many failures that occur, the opportunities for improvement are obvious.

Passenger train handling must not, and usually will not, be

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neglected because the errors are generally observed and complained of. This is much less true of freight train handling, yet note what authorities have to say about the earning capacity of the humble freight car. While the editor of a prominent technical paper estimates the average earning power of a freight car as $2.50 per day, J. M. Daly, general superintendent of transportation of the Illinois Central, in a committee report on "How to Secure Maximum Use of Freight Cars" (*Railway Age Gazette*, October 11, 1912), gives the following:

"The freight car today is the best asset of the railroad. It earns 75 per cent. of our gross revenue, and during the busy season is, without doubt, the best freight solicitor we have. The earning capacity of each freight car on the Illinois Central per day is $2.34. Eliminate Sundays, holidays and bad-order cars and confine it to the busy season, and its gross earning capacity is about $3.85 per day, the net revenue being about $1.15 per day. Five years ago the presidents of five of the largest systems made a thorough investigation covering the cost per day of cars. It was found at that time to be 42 cents and had for several years increased approximately two cents per day per annum. At that rate, cars today cost the owner 52 cents per day, covering interest and repairs."

On an earning value of $3.85 per day a delay of thirty minutes each day to a 60-car train would total $144 per month. This considers but one train delayed by a break-in-two or other cause, yet often others are delayed by it. This $144 is merely the loss of possible earnings. There is also the direct loss due to the damage done, time of crews, extra fuel burned, etc. Railways are run for profit, but with legislative restrictions, increased taxes and higher costs for material and labor this end is steadily becoming more difficult to attain. Hence, we who are paid to contribute to this needed result should endeavor to do our part well. Our efforts, then, should be toward keeping trains moving toward destinations without damage. That this may be done, and safely, requires, of course, some standing time for testing and repairs, but this merely emphasizes the need of avoiding unnecessary damage and delay.

Air Brake Instruction.—The instruction facilities of an air brake instruction car, including the instructor, are of value in so far as they contribute to safer, more expeditious and more economical train movement and no farther. The instructor, to succeed, must realize, and ever keep in mind, that the air brake is a *means* and *not* an *end;* that it is to promote train movement as far as is compatible with safety and economy; that this is obtained largely in train handling (starting, running and stopping), and that all instructions on train handling should be based on the fundamental and all-important fact that with draft rigging in fair to good condition no damage in train handling (not including switching) will follow if the slack is not allowed to run in or out harshly. All instruction on train handling must be based on and tied to train slack control, must teach engineers the various causes for slack running in and out, and how to use the brakes, the steam and the sand to prevent harsh slack action. If the instructor does not include the proper use of steam and sand he has left an unfinished job. The same is true if he fails to teach all concerned that slack must be pulled out to enable car inspectors to locate some draft gear defects, or if he fails to teach car men what draft gear defects are contributing unduly to break-in-twos.

The fundamental need, train slack control, is simple, but its accomplishment is not, and the instructor who can and does teach engineers how to attain the desired end is their and the company's man; he has realized the main object of his position. The instruction car work is merely the beginning, and if it is not followed up by individual instructions and observations on the road the results will be disappointing and out of proportion to the time expended. If either must be slighted it should be the car instructions.

Break-in-Two Records and Investigations.—Break-in-twos afford the best measure of the quality of train handling. Without reasonably accurate and complete records of every break-in-two officials are working largely in the dark, and accurate and complete reports are impossible without suitable forms. The importance of investigations and the necessity for suitable report forms are indicated in the following extract from a committee report made at a meeting of operating officials of the Illinois Central by J. L. East, agent of the loss and damage bureau: "The matter of rough handling of trains can be readily corrected if those connected with the transportation department holding supervisory positions will follow up closely with their superior officers any rough handling of trains coming under their observation in a sufficiently perceptive manner, to enable proper investigation of each specific case. It should be possible to surround this whole question of rough handling of trains on road, as well as in terminal yards, with such close and constant supervision through the co-operation of the entire division staff, as to make possible a thorough investigation of at least the majority of cases of rough handling occurring on any division. This is a matter of the most importance, and there is no question but that a great improvement in the way of reducing claims can be made."

The superintendent should receive a monthly tabulation of break-in-twos and should compare months on a train-mileage basis so as to note promptly and take action on any decreased efficiency. This tabulation is made up easily by the receiving clerk making entry on a suitable form as each report passes through his hands, requiring but a few minutes per day at the most, yet permitting of a tabulation ready for copying on the first of each month. A copy to the general superintendent allows him to compare months for each division and different divisions. On at least one large road the general manager takes personal interest in the monthly tabulations.

Train Handling.—Draft rigging in fair to good condition is not pulled out. It is either driven in or jerked out, both implying a severe blow. The severity cannot be judged by any shock felt by those riding trains, particularly the engineer of a heavy locomotive. Engineers who do not understand this are prone to attribute resulting failures to the condition of the draft rigging instead of to their handling. Another over-worked explanation for draft gear failures is "old defect." Many of such should be called ancient defects. Not infrequently it is an original one in an old coupler.

Records show, regarding break-in-twos with ordinary freight trains of from 1,700 to 2,400 tons, that 20 per cent. to 25 per cent. occur within five cars from the engine; about 40 per cent. between the engine and tenth car, and 60 per cent. to 65 per cent. between the engine and twentieth car, conclusive proof that it is the harsh running out or pulling out of slack at the head end that does most of the damage in train handling.

AUSTRALIAN RAILWAYS GAGE.—A conference of the chief engineers of the Commonwealth and state railway departments in Melbourne has urged the immediate adoption of a uniform 4 ft. 8½ in. gage throughout Australia. The estimated cost of carrying this into effect is $185,000,000.

TRAIN ROBBERIES IN FRANCE.—As the result of a series of recent robberies from trains on the Paris, Lyons and Mediterranean, the police of Lyons and Dijon have lately been carrying out researches, which have just led to the arrest of five men and a woman, who are now accused of complicity in an organized series of daring thefts. Their *modus operandi* is said to have been as follows: All the robberies were committed at a place between Allerey and Chalon, where the trains run at reduced speed. One or more members of the gang would board the train at this point, entering a baggage car or freight car, and throw out valuable merchandise to a waiting confederate on the line. Among the stolen property found in the houses of the arrested persons were some 600 lbs. of silks and other textile goods, and quantities of brandy and absinthe. There were also discovered lithographic presses for the production of forged postage stamps and railway tickets.

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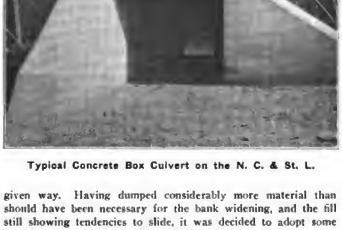
DOUBLE TRACKING ON THE NASHVILLE, CHATTANOOGA & ST. LOUIS.

During the last two seasons the work of double tracking the Chattanooga division of the Nashville, Chattanooga & St. Louis Railway between Chattanooga and Stevenson, Ala., a distance of 38 miles, has been actively pushed. The Southern railway uses the tracks of the Nashville, Chattanooga & St. Louis from Stevenson to Chattanooga and the Alabama Great Southern also uses these tracks for six miles from Wauhatchie to Chattanooga. The combined service of these three roads has amounted to considerably over 50 trains a day. During the season of 1911 several sections of double track were put in service between Chattanooga and Shellmound, and this portion of the line was otherwise improved, as described in the *Railway Age Gazette* of November 17, 1911. One of the most interesting features of this work was the cutting out of service of a single track tunnel at the summit of Raccoon mountain, which had been built to carry slides over the track. In widening banks for the double track during the season of 1911 considerable slag from nearby blast furnaces was used. In one place where the line is located on a very precipitous slope between the Tennessee river and Raccoon mountain, this slag fill could not be kept from sliding because the footing at the river bank had



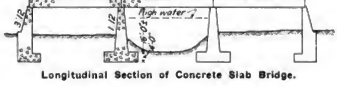
Typical Concrete Box Culvert on the N. C. & St. L.

given way. Having dumped considerably more material than should have been necessary for the bank widening, and the fill still showing tendencies to slide, it was decided to adopt some unusual measures to stop the trouble. A section of 4 in. pipe, 6 ft. long, was tapered to a 1 in. point and a number of 1 in. holes were drilled throughout its length. This pipe was then driven down through the slag. Another section of pipe was connected to its upper end and the driving was continued as long as possible, usually until the pipe had penetrated from 15 to 18 ft. When possible, the pipes were driven in vertically, but in a number of cases where it was easier to drive them on an angle, this was done. After the pipes were driven the driving cap was removed and additional joints screwed on with a 45 deg. elbow and a very thin grout was poured in from a high elevation so as to give hydraulic pressure. The grout was thus forced out through the holes in the pipe. As the pouring proceeded the pipes were withdrawn and a very solid core of cemented material was left. The fill so treated varied in height up to 50 ft., but the treatment was applied only to a strip extending entirely across the foot of the slide. Since the application of the grout, no further trouble has been experienced.

The work during the past year included double tracking and grade reduction between Stevenson and Shellmound. At Stevenson, on a section about two miles long, the southbound grade which begins at a stopping point for all trains, was reduced from 1.1 per cent. to 0.3 per cent. At Carpenter an undulating grade of 1.1 per cent. was reduced to a 0.5 per cent. grade for a distance of about three miles. Between Bridgeport and Bolivar, a new location has been made which will effect a reduction in grade and improve the alinement.

The Stevenson grade revision covering a distance of about two miles involved the lowering of the main track through two summits a maximum of 12 ft. and the raising of one sag a maximum of 10 ft., it being necessary to remove about 80,000 yds. of material. A steam shovel and 6, 8 and 12-yd. dump cars pulled by standard gage engines have been used by the contractor in handling this material. The material was principally red clay with some slate and a little solid rock.

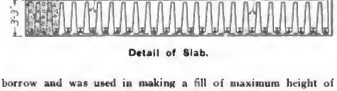
The new line between Bridgeport and Bolivar is about five



Longitudinal Section of Concrete Slab Bridge.

miles long and involved the handling of approximately 400,000 yds. of material; 50,000 of which were borrow. Two chert cuts in this section offered the only serious problem. This material could not be handled economically by a steam shovel without blasting. During the early stages of the work before the contractor had secured his supply of explosives, an attempt was made to handle it without blasting, the result being that a 70 ton shovel wore out a set of dipper teeth every day in handling about 250 cu. yds. In starting one of the deep cuts in this material an attempt was made to handle the upper portion with a team outfit in order to get the shovel in on a grade over which the cars could be handled. This failed, however, as it was impossible to plow the chert with a six mule team. It was finally necessary, in order to open up this cut, to make a light cutting with a steam shovel, wasting the material on the sides, then back out and start in again on a grade which would allow the loading of cars alongside the shovel. The cuts in this material were made about 40 ft. wide and no attempt was made to slope them, the width being sufficient to allow the sloughing which will occur. One of the reinforced concrete underpasses on this new line is shown in an accompanying cut.

The grade reduction at Carpenter required the handling of about 200,000 yds. of material, about half of which was from



Detail of Slab.

borrow and was used in making a fill of maximum height of about 24 ft. The material was handled by a steam shovel into four yard cars pulled by dinky engines.

The standard roadbed width on this work was 33 ft. in both cuts and fills, slopes being 1½ to 1 for fills and 1 to 1 for cuts. The track is laid with 85-lb. rail on oak ties, tie plated. The ballast is rock.

Concrete slab bridges have been used in a number of locations on this road which have a reinforcement not commonly used. As shown in the cross section of one of these slabs, reproduced herewith, this reinforcement consists of old 80-lb. rails spaced 12½ in. center to center with their heads down and two inches above the bottom of the slab. Around these rails is bent a continuous sheet of expanded metal 3 in. x 8 in. mesh, and below the rails is placed a flat sheet of the same reinforcing

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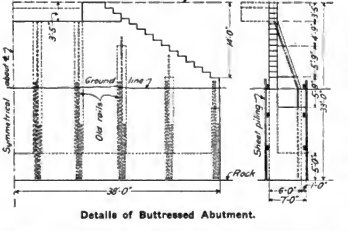
material. One of these bridges with clear spans of 31 ft. 6 in. has been built over Widow's creek, the slabs being built 33 ft. 6 in. long, allowing the use of 33 ft. rails without cutting. The depth of these slabs, 3 ft. 3 in., is somewhat less than the common practice in slabs of equal span reinforced with rods and stirrups. The three 33 ft. 6 in. slabs 26 ft. wide used on this bridge required 420 sheets of expanded metal 5 ft. x 10 ft. 8 in. weighing 0.6 lb. per sq. ft., and 75 pieces of second-hand 80-lb. rail. In one of these bridges a reinforced concrete abutment with reinforced buttresses was used, the design of which is shown in the accompanying drawing. The wall of the abutment is only 1 ft. 6 in. thick, each of the buttresses being the same thickness. Four of these buttresses are carried up to the bridge seat, the other six being of lesser heights, depending on the



Details of Buttressed Abutment.

height of the wing wall. The reinforcement consists of three rails of 40 lb. or 58 lb. weight in each buttress.

Plans have been made and the contract let for a new viaduct over Running Water creek, a short distance out of Chattanooga, which will be 120 ft. high and 1,100 ft. long. The viaduct will be for double track, with ballasted deck, and will require about 2,000 tons of steel.

The improvement work on the Nashville, Chattanooga & St. Louis is handled under the direction of Hunter McDonald, chief engineer; C. H. Johnson, engineer of construction, and R. M. Milan, resident engineer. J. L. Albus is the designing engineer.

THE PUBLIC SERVICE COMMISSION OF WEST VIRGINIA.

The act of the last legislature of West Virginia, creating a public service commission, goes into effect this month; and it is expected that the governor will appoint the commissioners within a week or two. There are to be four commissioners, with salaries of $6,000 each, and the term of service will be eight years. Not more than two shall belong to the same political party and one member must be a lawyer of ten years' experience at the bar. The act applies to all common carriers, telegraph and telephone lines, gas companies, electric light companies, hydro-electric companies, etc. The sections of the law are not so numerous as in those of New York, Missouri and other states, but its framers evidently intended to cover about everything which is included in the longer statutes referred to. Every railroad must permit track connections with industries and with other carriers. Among the powers of regulation of operation, that to require a safe number of men in the crew of a train is specifically mentioned. In the distribution of cars and in making rates, fair treatment must be accorded "tap lines," but nothing out of the main line rate is to be allowed a shipper for the use of "plant facilities."

The commission is to "collect full and complete information" of the value of all the property owned and controlled by a public service commission, once a year, and furnish the same to the Board of Public Works, for use in assessing taxes. A new tax is laid on public service corporations in the shape of a special license fee, the amount of which is to be apportioned to the value of the corporation's property; and the tax, in the aggregate, must produce a revenue of $60,000 a year, which is appropriated for the support of the commission. Any violation of the new law will make the guilty officer, agent, employee or stockholder liable to fine and imprisonment.

THE NEW YORK, WESTCHESTER & BOSTON'S TICKETS.

The New York, Westchester & Boston, running from New York City to White Plains and New Rochelle, now carries about 7,000 passengers a day, and the business is increasing.

Passengers carry their tickets with them into the cars, but the conductors make no collections and the tickets are deposited in a box on leaving the train. This ticket system, long in use in London and other European cities, has proved very satisfactory on the Westchester, and it may now be called a naturalized American institution. By a change, which was adopted on April 1, northbound tickets are made much larger than the southbound.

The passenger purchases a ticket for his destination at the ticket office and passes through a turnstile when he enters the train platform. On reaching his destination he is required to drop his ticket in the collection box in charge of the agent or station "guard," as he passes through the exit-gate. To provide against over-riding, the line of road is divided into zones and a color scheme makes it evident at once whether or not the correct ticket is being dropped in the box. Only one ticket is sold to a passenger and this ticket is good only on the date stamped on its back. A stamp of special construction is used which also cancels the ticket, showing that the passenger has passed through the turnstile to the train. Only two forms of tickets are used, a card local for single trip and a 60-ride monthly commutation form.

In the first issue, when the road was opened, the tickets were of one size, the color designating the zone into which the ticket was valid for passage. It was found, however, that there was some possibility of manipulation under this arrangement and to prevent the misuse of single tickets the two sizes were adopted. A southbound ticket is of the usual size, 2¼ in. x 1¼ in., while northbound tickets are twice that size. Each zone is also designated by two distinct colors, one for southbound and the other for northbound tickets. For example; the color designating the New York zone southbound is red and single tickets for southbound passage to stations in that zone are printed on red cardboard. The color designating New York zone northbound is white, and single tickets for northbound passage to stations in that zone are white.

In a few instances where a given fare carries the passenger over split zones the tickets are printed in two colors. This system is not complicated, and has worked out well. Passengers like it. The daily commuter also, who holds a monthly ticket which is punched when he goes through the turnstile and is shown to the guard at the exit-gate, enjoys the arrangement as the conductor does not interfere with his reading of the newspaper.

The occasional passenger who holds a short ride ticket is quickly noted and is referred to the ticket office at the destination station where he must buy a ticket representing the difference in the amount paid for the ticket which he holds and the amount due the company for the distance which he has ridden.

The distinctive colors used are red, green, gray, pink, blue, white and yellow. It is evident that if in the collection box in which red tickets only are received a white ticket is dropped, it is quickly noticed and the guard calls the passenger's attention to the error.

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Ticket agents have hand punches for the purpose of punching season tickets and for emergency use in case the punch in the stamp should get out of order. Each single-trip passenger must buy a ticket each time that he enters the train, tickets not being sold for future use. If a foreign ticket, money or other valuable article should be dropped into a ticket box, the agent drops into the box a memorandum explaining the fact, and then the person who has made the mistake can recover his property when the receiving box is opened. Agents make up a record of ticket sales every two hours. The ticket agent keeps a record in his office of the names of persons who have bought commutation tickets and the dates on which the tickets expire. This record is examined daily.

The New York, Westchester & Boston was opened May 29, 1912. Trains now run through to and from Harlem River on the New York, New Haven & Hartford, so that the lines operated aggregate about 21 miles, and over two hundred trains are run each day. The company has recently made an arrangement with the Adams Express Company for express service over its lines. The passenger trains consist usually of one or two passenger cars; but separate trains are run for express service, leaving the New York and the White Plains termini four times a day.

A large proportion of the passengers on the company's trains pay only five cents fare, this rate being the limit within the city of New York, and also within the city of Mount Vernon. Some of the higher fares have been materially reduced within the past few months, and the round trip rate from New York City to White Plains is now only fifty cents.

The company does a limited freight service, using the station of the New Haven road at the New York terminus and having stations of its own at Wykagyl, Heathcote and White Plains. Freight is moved at night, the tracks being well occupied with passenger traffic in the day time.

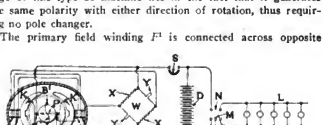
Provision is made in the passenger tariffs for taking ordinary baggage at the express stations and at all of the stations between Mount Vernon and White Plains. Baggage is not carried free and the tickets bear a notation that they are good for the passage of the passenger without baggage. The road is in the main a "commuters'" railroad, and most of the trains consist of one or two passenger cars and nothing more. But the four trains are run for express matter, as above noted, and on these baggage is accepted. The passenger fares are very low and for baggage a charge is made. A large proportion of the passengers pay only five cents for their rides, this being the limit for single fares within the city of New York, and also within the city of Mount Vernon. The minimum charge for 150 lbs. of baggage is ten cents; from Harlem river to Mount Vernon it is 20 cents; and to White Plains, 25 cents.

AXLE LIGHTING SYSTEM.

The Atchison, Topeka & Santa Fe is introducing an axle lighting system, after a test, which has been in process of development by the Electric Storage Battery Company, Philadelphia, Pa., for a number of years. It automatically adjusts the output of the dynamo to the requirements of the service, and gives the battery the slight amount of overcharge required to keep it practically full and in good condition, but no more, producing conditions of operation ideal for maximum battery life. Should the battery become discharged by a prolonged stop with the lamp load on, its charge will be rapidly restored during the subsequent run. Should the car be transferred from a daylight run to one requiring considerable artificial lighting, the output of the dynamo will increase to meet the changed conditions of service. This is all accomplished automatically without manual adjustment of any kind.

The dynamo is of the Rosenberg type, which has been used abroad in axle lighting for a number of years, but has been redesigned to operate in connection with a constant voltage regulator. Current in the primary field winding F^1 produces a small primary field flux represented by the arrow P, which induces a small electromotive force between the short circuited brushes B^1 and a flow of current through the short circuit connection C. This current, flowing through the armature winding, produces by armature reaction the secondary or principal field flux, which does not pass through the frame of the machine, but is confined to the heavy pole shoes and the armature as shown by the arrows K. This latter flux produces the electromotive force at the principal brushes B^2, which are connected to the external circuit, a series field winding F^2 in this circuit serving to balance the armature reaction due to load. An important advantage of this type of machine lies in the fact that it generates the same polarity with either direction of rotation, thus requiring no pole changer.

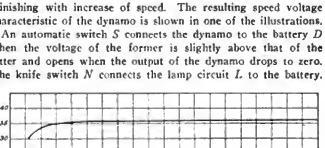
The primary field winding F^1 is connected across opposite



Wiring Diagram for E. S. B. Axle Lighting System.

junction points of the Wheatstone bridge W, the other two junction points being connected respectively to the positive and negative terminals of the machine. This bridge is designed to give the constant voltage characteristics above mentioned. It includes fixed resistances X in opposite branches and iron wire ballasts Y in the other two branches. The latter, on account of their high temperature coefficient, have a practically constant current characteristic under operating conditions. This combination of circuits produces a field excitation continually diminishing with increase of speed. The resulting speed voltage characteristic of the dynamo is shown in one of the illustrations.

An automatic switch S connects the dynamo to the battery D when the voltage of the former is slightly above that of the latter and opens when the output of the dynamo drops to zero. The knife switch N connects the lamp circuit L to the battery.



Speed-Voltage Characteristics of Axle Lighting Dynamo.

The voltage of the dynamo is fixed at a point slightly above the floating voltage of the cells, thus insuring that the battery is always fully charged. The difference between this voltage and that of the battery on discharge is, however, so small and the change from one to the other so gradual that no lamp regulator is required.

Should it ever be found necessary to give the battery a high voltage charge, this may be done during a daylight run by means of the fixed resistance R, normally short circuited by the switch H and also by the clip M on the main lamp switch. When both of these switches are open, the voltage of the dynamo is raised by an amount determined by the value of the resistance R. Whenever lights are required, the closing of the lamp switch N short circuits the resistance R, reducing the voltage to normal

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and eliminating the possibility of excessive voltage at the lamps. During five months of continuous operation of a demonstration equipment, no occasion for such a high voltage charge has arisen.

A $50,000 FREIGHT PLATFORM.

The Studebaker Corporation has lately completed at its Detroit factory a loading platform, for shipping automobiles over the Michigan Central, at which 200 freight cars may be loaded in a day, from six to eight automobiles in a car. This structure has been built at an expense of $50,000 to do away with annoying delays which were unavoidable under former conditions. The platform is about 500 ft long, and is roofed over; and there is a track on each side of it. The Michigan Central tracks having been raised to cross above transverse streets, the sidings are also maintained at the upper level, about 20 ft. above the natural surface, and automobiles are raised to the platform on elevators, which take two at a time. The location of one of the elevators is shown in the illustration.

Loading Platform—Studebaker Automobile Works, Detroit.

The Studebaker Corporation gives us the following notes:

The easy times when the railroads could take the automobile shipments from Detroit by diverting a few furniture cars from Grand Rapids are long since past. All the trunk lines have been forced to invest heavily in special box cars to handle the 300,000 automobiles now shipped from Detroit annually. Solid trains of automobile cars are of frequent occurrence in long hauls. In the spring of 1912, the Detroit manufacturers were forced to store thousands of cars, on account of the overwhelming demand for transportation facilities, and every warehouse in the city was filled. Several factories were forced to use circus tents, and police were called out to quell disturbances caused in the yards when gangs from rival factories fought over box cars.

Formerly, completed automobiles were driven up an inclined plane, under their own power. The new plan boldly abandoned this idea. The automobiles are driven to the elevators, two at a time, and lifted on the elevator to the platform at the level of the floors of the box cars. Loading is carried on day and night by large crews. During the last two months, 200 a day of the Studebaker cars have often been loaded, this in addition to the automobiles shipped from Studebaker's siding in the western part of the city, which connects with the Wabash.

One of the elevators in the new platform connects with the warehouse where parts, advertising literature and miscellaneous shipments are boxed and placed on small trucks. The trucks are elevated to the platform and the goods loaded into cars.

As a truck breaks through the platform at one point a rolling bridge, actuated by an electric motor, is used as a movable platform, being run to one side, to clear the tracks, when the switching engine has to place or withdraw cars.

Traffic Manager George Sherman, of the Studebaker Corporation, says that the advantages of the platform, direct and indirect, have been fully up to expectations. "The most helpful feature is the pleasant relation it has cemented with the railroads. They have lost no opportunity to show how they appreciate our efforts toward added freight car efficiency. We have always been able to get freight cars this spring. Sometimes they were not available for the hauls we wanted most, but we seldom ask to have any car diverted from its home route. There is sometimes a tendency for the manufacturer and the railroad to work at cross purposes. We have found that the ideal situation is one in which shipper and the railroads work in harmony, anticipating each other's wants and spending money, when needed, to smooth out the rough spots."

A "Double-Deck" Load of Automobiles.

The view showing the interior of a freight car illustrates how automobiles are loaded "double-deck" to economize room on long hauls. From six to eight automobiles, knocked down, are thus loaded into a single car. They are raised to the upper part of the freight car by means of a chain and pulley and then supported by timber framework. The wheels are taken off and packed in racks on the floor. By thus filling a car nearly or quite to its space-capacity the shipper is able in all cases to put in the weight called for by the tariffs.

RAILWAY CONSTRUCTION IN THE CONGO.—A new line which will have an important bearing on the Congo trade is that proposed between Brazzaville, the capital of French Equatorial Africa, on Stanley Pool, and Pointe Norie on the Atlantic seaboard. Sanction for its construction is now being asked and its completion could be effected in eight years. There are now 788 miles of railway open in the Congo.

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General News.

The New York State Public Service Commission, first district, has rescinded its order, issued some months since, authorizing the construction of a moving sidewalk beneath Thirty-fourth street, New York City.

The Erie Railroad estimates that full crew laws will cost it $447,180 yearly. The Erie works under such laws in New Jersey, Pennsylvania, Ohio and Indiana, and there will be one in New York after September 1.

A fire in the stock yards of the Michigan Central at Detroit, Mich., on Sunday last destroyed the stock pens, the feed houses and other property, including 250 sheep. Estimated loss $195,000. It is believed that the fire was of incendiary origin.

In the freight yard of the New York Central at Weehawken, N. J., on the evening of May 5, a fire, which is said to have been caused by defective insulation of electric wires, destroyed three lift bridges and a float loaded with freight cars, together with other property aggregating a loss of over $300,000.

Six suits charging violations of the law regulating the transportation of cattle were filed against the Chicago, Rock Island & Pacific at St. Louis last week, together with two suits against the Chicago Great Western, four against the Illinois Central, and one against the Chicago, Burlington & Quincy.

The Minneapolis, St. Paul & Sault Ste. Marie has announced a plan for the organization of a co-operative association among employees, to be open to any who have been in the service of the company for six months or longer, under which employees will be allowed to set aside a portion of their earnings to be invested in securities of the company.

J. D. Farrell, president of the Oregon-Washington Railroad & Navigation Company, has issued a circular including the following: "Absolute freedom of action in political matters is the right of every employee, and the officers, heads of departments and foremen of this company will not attempt to influence the vote or action of any employee in any election."

The Duluth & Iron Range has offered 33 litigants in the White Iron Lake fire case, a lump sum of $24,750 in settlement of their claims for damages sustained in a fire during 1910, for which the railroad was charged with responsibility. The offer was accepted, and it was announced that the attorney representing the litigants will receive $8,250, and the litigants an average of $500 apiece.

The arbitration committee of the Master Car Builders' Association held a meeting at Chicago on April 29 and 30, to consider proposed changes in the code of interchange rules submitted, at the request of the executive committee, by individuals and committees representing the various railway clubs. The final consideration of the rules was postponed to an adjourned meeting on May 8.

The attorney general of Texas, at the request of the railroad commission, has submitted an opinion as to the responsibility of tram or logging roads not incorporated under the railroad incorporation laws, but owned and operated by private individuals or corporations, when they accept freight for transportation. The road is charged with a public use, and therefore is subject to regulation by the commission.

Kansas City Southern passenger train No. 5 was held up early on the morning of May 2 by two men who boarded it as it was leaving the station at Kansas City. The robbers obtained about $1,500 in money and jewels from the passengers. Jesse E. Short, of Joplin, Mo., one of the passengers, exchanged shots with one of the robbers and was dangerously wounded. One robber was also struck by a bullet, but both escaped.

The senate of the Illinois legislature has passed, by a vote of 38 to 6, a bill prohibiting the issuance of passes for transportation within the state, except to persons who would be entitled to free transportation under the provisions of the pass section of the Interstate Commerce law. According to a press report, John G. Drennan, district attorney of the Illinois Central, "startled legislative circles" by announcing that the railways were not opposing the passage of an anti-pass bill by the house.

Railroad officers in St. Louis, following a conference held on Tuesday last, announce that they are going to circulate petitions for a referendum on the Missouri full crew law, which was passed by the last legislature. Under the constitution of Missouri, it is now practicable to secure the suspension of this law until a vote of the people can be taken, in November, 1914, if five per cent. of the voters in eleven congressional districts can be got to sign the petition for a popular vote on the question. The railroads say that the enforcement of the full crew law in that state will cost $700,000 a year.

The Chicago, Rock Island & Pacific, and the Missouri Pacific have granted an increase in wages and a reduction of working time to their shop employees, in an agreement which went into effect on May 1, following conferences with representatives of the shop craft unions. Men who have been working ten hours a day were granted a nine-hour day, and on the Rock Island were given an increase of two cents an hour. On the Missouri Pacific the increase is 1½ cents an hour. Boilermakers, machinists, blacksmiths, sheet metal workers, carmen, painters and their helpers are affected. Negotiations for an increase for the shop men employed on the Kansas City Southern and the Missouri, Kansas & Texas are pending.

Congressman Broussard of Louisiana has introduced in the House a bill designed to perpetuate and improve the commerce court. The bill proposes to give the court power to review orders of the Interstate Commerce Commission, both negative and affirmative, so that a shipper will have the same facility of appealing to the court as do the carriers at present. It is proposed that three judges of the court shall constitute a quorum and that appeals from the courts of Porto Rico, the Philippine Islands and the Canal Zone shall go to the commerce court instead of directly to the supreme court of the United States. Changes are proposed in the procedure before the court in cases where the government is the defendant.

The board of management of the Intercolonial Railway of Canada is to be dissolved forthwith, and the management of the road placed in the hands of a single commissioner, F. P. Gutelius. David Pottinger, the veteran manager at Moncton, will retire on full superannuation. The other members are A. W. Campbell, chairman; F. P. Brady (general superintendent); E. Tiffin (traffic manager); and J. B. T. Caron (general solicitor). Mr. Campbell is the deputy minister of railways and canals, and as such will continue his work at Ottawa. Mr. Gutelius was formerly superintendent of the Canadian Pacific, at Montreal, but for the past year has been engaged in an investigation of the construction of the Transcontinental Railway.

The treasurer of Polk county, Iowa, has made a demand on the Chicago, Rock Island & Pacific Railroad, an Iowa corporation, for alleged unpaid taxes for five years, together with interest at 6 per cent., aggregating $15,559,440. This demand was authorized by the county board of supervisors, who also entered into a contract with the law firm of Kistle & Wright, of Council Bluffs, to bring suit in the district court against the corporation to enforce the collection of the money. According to the contract the attorneys will receive 40 per cent. of all the money they collect. The matter was brought before the board of supervisors by the two attorneys, who appeared unexpectedly at a meeting of the board and stated that after a year's work they had secured sufficient facts and figures to show that the company had withheld from taxation property worth $160,000,000. They asked for authority to institute proceedings against the company, and submitted a contract allowing them 50 per cent. as a fee. This was finally reduced to 40 per cent. A member of the board of supervisors is quoted as saying that the board has no proof whatever that the company has failed to schedule its property.

New York Workmen's Compensation Law.

The legislature of New York, which adjourned last week, passed a law providing for the payment of compensation for injuries to workmen in the principal industries. An employer will have a choice of four methods of providing for his employees in case of accident; by a state insurance fund to which he would contribute; by insurance in casualty companies; by

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joining a mutual employers' insurance company; and by assuming the liability himself, provided he gives to the state insurance department satisfactory evidence of his financial ability. The law is in some respects like that of New Jersey, but the percentage of wages used in calculating the basis of compensation is 60 per cent. As in New Jersey, an employer who does not take action under the law is deprived of the usual defenses when sued under the common law by an injured employee. Casualty insurance men in New York City estimate that at present employers in New York State pay out annually $15,000,000 either for insurance premiums or in the shape of payments in cases which are settled under the common law; and it is believed that under the new law they will expend more than three times the sum named.

A Ten Dollar Suit in the Supreme Court.

The Missouri, Kansas & Texas Railway of Texas has appealed to the Supreme Court of the United States in a suit brought against it by L. C. Cade, a track repair laborer, the question at issue being a statute of Texas which allows attorney's fees on claims for labor which are not paid within thirty days. In Cade's case, a claim for $10, the attorney's fees amounted to about $9, whereas the costs of the court were only 50 cents. The case comes direct from the court of the Justice of Peace in Oak Cliff, Dallas county. The railroad fare of one attorney from Dallas to Washington is over $40.

The railroad company contested Cade's claim, first on the ground that it did not owe the money and second on the ground that the provision for attorney's fees conflicted with Article 14 of the federal constitution. Appeal was taken direct to the United States Supreme Court, for the reason that for cases of this kind there is no appeal in the state courts from the decision of the Justice's Court. The grounds of unconstitutionality under the federal constitution made it possible to appeal to the highest court of the land.

The Western Union on the L. & N.

The latest phase of the litigation between the Louisville & Nashville and the Western Union, which has followed the action of the L. & N. in 1911, in ordering the telegraph company to vacate its right of way, is a suit begun by the road against the Western Union in the Circuit Court at Knoxville, Tenn., demanding $600,000 as compensation. The judgment is sought for rental of the right-of-way. For forty years the Western Union leased pole and wire privileges from the Louisville & Nashville. In August, 1911, the road notified the Western Union that it would have to remove its lines at the expiration of the lease, and gave 3½ months in which to remove poles and wires. This was not done and the railroad has now brought the suit for $600,000. This is estimated as rental at the rate of $100 per mile for 4,521 miles, with a charge for renting wires to the Southern Bell Telephone Company. The alleged telephone arrangement is declared to have been entered into surreptitiously. The sum named includes also additional charges for railway stations in which Western Union operators are located. In some states through which the L. & N. extends it is provided by statute that when a tenant holds on after expiration of a lease he is liable for double the rental value. All these considerations, the railroad claims, bring the amount for which judgment should be rendered up to $600,000.

Investigation of the New Haven Road.

Commissioner Prouty continued through last week his hearings in Boston, held for the purpose of giving critics of the New York, New Haven & Hartford a chance to publicly study the statements which the commission has made up from the company's records of the past ten years, and this week, beginning on Wednesday, held another hearing at Washington. At Boston the purchasing agent of the road was questioned about contracts for coal and for cars. On Thursday President Mellen made a statement, taking about three hours, but he was not put under oath. He said that items on the records showing an apparent profit to himself in transfers of stock represented payments, approved by the directors, made by him to political campaign funds, notably $50,000 to the Republican presidential campaign in 1904. To the charge that John L. Billard made excessive profit in connection with the acquisition of the Boston & Maine, Mr. Mellen replied that Billard's transactions were not yet closed. The purchase of the New York, Westchester & Boston was decided on by others than Mr. Mellen; he, personally, was not in favor of it. He was in favor of selling steamers to C. W. Morse, but was overruled. Critics claimed that the recent sale of the company's parlor and sleeping cars to the Pullman Company was a bad bargain, but Mr. Mellen gave figures to show that it was a good one.

American and German Practices Compared.

In the discussion of Professor Cunningham's paper before the New York Railroad Club, April 18 (*Railway Age Gazette*, April 25), Arthur M. Waitt, formerly chief mechanical officer of the Lake Shore and the New York Central, declared that most of the large railways in the United States are under-officered; and that detail work is not adequately supervised. Too much detail is imposed on the heads of departments, and they are left with insufficient time for getting into close touch with the territories they manage. Mr. Waitt's observations cover 25 years' service on American roads, and 10 years since, in which he has been free from any direct alliance with them—this 10 years embracing many visits to Germany. He makes no question that in this country an insufficient force is provided to collect and collate data and to make comparisons and analysis of the results of management. Complaints and special inquiries from railroad and government officials require unusual efforts and expenditure of time to the detriment of other necessary and important routine work. There is a tendency also for higher supervising and administrative officers to interfere in matters for which they are not technically trained.

"In recent years heads of departments are too frequently made to be mere puppets, trained to jump when the strings are pulled, and they are not given that sense of personal responsibility and authority which develops strong and reliable men. This unfortunate condition is passed down the line and results in a weak organization.

"One noticeable feature to the discredit of our American railways is seen in the general character of the passenger stations in this country as compared with those in Germany. In nearly all of the large cities in Germany the railway stations are models of neatness, comfort and convenience, and even the stations at small towns and villages are neat, well constructed and ornamental to their surroundings. In fairness it must be said that in this country we have a few of the finest examples in the designs of railway stations to be found in the world. But unhappily these notable examples are the exception rather than the rule.

"A more generally satisfactory passenger service would be given in this country by the gradual introduction of classified passenger service not only in standard railway service but also in the subway and elevated service in our large cities, where the conditions of mixed classes is at frequent times almost unbearable. In America we compel the man with the small wages to accept and pay for the higher class of accommodations and furnishings that are demanded by those of more ample means. As a result the poor man feels, justly, that he is overcharged and the well-to-do man or woman feels indignant at being compelled to submit to the unsatisfactory conditions."

The Useless Railroad Valuation.

The act of Congress requiring the Interstate Commerce Commission to make a valuation of railroad property takes effect on May 1, and the leading railroad officials of the country have appointed a committee of eighteen, to devise a mode of procedure for the companies in doing their part. Five years is the time estimated as necessary for this investigation, and the cost has been estimated at $6,000,000, but that must be the cost to the government, and it will entail a great deal of expense to the railroads. That oppressed beast of burden, "the public," for whose benefit the work is supposed to be done, will have in the end to pay the entire bill and will find the benefit to be naught. It requires little imagination to form an idea of this "job," which will give extra employment to many, and entail corresponding expense, in the service of both the government and the railroads. A multitude of details about organization and financing issues of securities, expenses, gross and net earnings, etc., are to be ascertained. Many of the "elements" and factors which are to be sought for will be impossible of ascertainment, because

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records have disappeared and no account of them has been kept. As to "other elements of value," what are they? There is value for a railroad in its advantages of location, the development of the country through which it passes, the enterprise and ability of its management, the "good will" of a successful business. Are these things to be ascertained and set down for all common carriers subject to the Interstate Commerce act, with "an analysis of the methods of valuation employed and of the reasons for any differences between such value and each of the foregoing cost or present value"? If not, what is the use in requiring them to be ascertained and reported separately, with such analysis?

But suppose this herculean task to be accomplished, and suppose the result to represent a reasonable approximation to accuracy, what then? The statistics and statements would be imposing and bewildering in volume and magnitude, but would they be worth all the trouble and cost? Of what use would they be to the government? There would be no end of variations and differences in the ratio of capital to value, and much depends upon what the values were and are which are properly to be represented in capitalization. Every expert student of the subject knows that for the purpose of fixing of rates the volumes of the commission's report would be utterly useless. Other factors determining the charges which railroads are entitled to make for their service would so far outweigh anything that could be deduced from this mass of material that no account could be made of it. It would be a monument of wasted effort.—*Journal of Commerce* (*New York*).

Waiting at the Window.

It frequently happens that just when a ticket agent is busily engaged totaling up a report or doing some other important work that cannot well be interrupted for the moment a patron comes to the window. If he is not recognized at once, he becomes impatient and proceeds to get irritated. A pleasant word from the agent will often set the party at ease and retain his good will, while silence on the part of the agent may result in a loss of business, later if not then. Everybody dislikes being unnoticed. A smile and a cheery word always wins.—*Louisville & Nashville Passenger Bulletin.*

Air Brake Association Exhibits.

Following is a list of the exhibitors at the annual meeting of the Air Brake Association, which is now in session at St. Louis, Mo. The proceedings for the Tuesday and Wednesday meetings are reported on page 1033 of this issue.

Adreon Manufacturing Company, St. Louis, Mo.—Security angle cock holders and Security back-up valve. Represented by D. R. Niederlander, E. L. Adreon, Jr., and Wm. A. Vincent, Jr.

American Air Brake Company, St. Louis, Mo.—Automatic slack adjuster, "American" locomotive driver brake, and "American" locomotive truck brake. Represented by the Westinghouse representatives.

American Brake Company, Chicago.

American Piston Company, Indianapolis, Ind.—Piston rod packing, air pump packing and cab valve packing. Represented by V. D. Morrison and A. H. Schlaegel.

American Steel Foundries and the Simplex Railway Appliances Company, Chicago.—Ajax, Hercules and Vulcan brake beams. Represented by W. E. Fowler, Jr.

Ashton Valve Company, Boston.—Duplex and triplex gages, inspector's test gages, rear end protected dial gages, locomotive steam gages, dead weight testers, inspector's boiler test pump, air pump piston swabs, wheel press recording gages and locomotive safety valves. Represented by J. F. Getting.

Canadian Westinghouse Air Brake Company, Hamilton, Ont.—Represented by A. B. Brown and J. H. Reed.

Crandall Packing Company, Palmyra, N. Y.—Packings. Represented by F. E. Ransley.

Crane Company, Chicago.—Valves and air brake fittings. Represented by G. S. Turner.

Detroit Lubricator Company, Detroit, Mich.—Detroit locomotive lubricators. Represented by A. D. Homard.

Joseph Dixon Crucible Company, Jersey City, N. J.—Air brake graphite grease, air brake graphite, etc. Represented by L. H. Snyder.

Emery Pneumatic Lubricator Company, St. Louis, Mo.—Emery brake cylinder lubricant, Emery pneumatic lubricator. Represented by E. A. Emery and G. L. Janis.

Garlock Packing Company, Palmyra, N. Y.—Air pump packing. Represented by Philip Arnold, J. F. Hillerman and H. J. Renshaw.

Gold Car Heating Company, New York.—Steam couplers, filling valve, and Non-return check valve. Represented by Mr. Ivers.

Greene Tweed & Company, New York.—Palmetto packings. Represented by L. J. Van De Wall.

H. W. Johns-Manville Company, New York.—J. M. air brake expander rings, J. M. flexible metallic hose gaskets, and packings. Represented by J. E. Meek, J. Trent, G. Christianson, C. Murphy and J. C. Jacobs.

The Leslie Company, Lyndhurst, N. J.—Steam hose regulator. Represented by S. I. Leslie and J. J. Clark.

McQuay-Norris Manufacturing Company, St. Louis, Mo.—"Leak-Proof" piston rings. Represented by W. K. Norris, E. H. Hill and F. J. Goedeke.

Marvin Manufacturing Company, Franklin, Pa.—Air brake compound, anti-friction triple valve oil. Represented by C. G. Averill.

Nathan Manufacturing Company, New York.—Bullseye lubricator, Simplex and Monitor injectors. Represented by Otto Best and J. S. Seeley.

New York Air Brake Company.—Represented by Mr. LaQuade.

New York & New Jersey Lubricant Company, New York.—Non-fluid oil and air brake lubricant. Represented by J. H. Rennis.

Pyle National Electric Headlight Company, Chicago.—Model of type E turbo generator and lamp. Represented by C. P. McGinnis.

Standard Heat & Ventilation Company, New York.—Full line of steam heat equipment, including starting valves, regulator valves, train line valves, steam hose couplers, steam gages and car ventilators. Represented by George B. Culver.

United States Metallic Packing Company, Philadelphia, Pa.—King (type U. S.) air pump packing. Represented by M. B. Brewster and C. L. Mellor.

Westinghouse Air Brake Company, Pittsburgh, Pa.—Literature and chart racks. Represented by E. L. Adreon, R. E. Adreon, S. J. Kidder, F. M. Nellis, C. P. Cass, C. W. Townsend, C. H. Beck, F. B. Johnson, F. B. Farmer, H. H. Burns, S. H. Mills, A. Hartenstein, L. B. Wilcox, W. M. Sleet, E. H. Dewson, W. V. Turner, J. Wright, A. L. Berghane, R. Cunningham, J. Hume and D. M. Lewis.

Guilford S. Wood, Chicago.—Nipple end hose protector, Monogram angle cock holder and Sheafe coupler.

International Railway Fuel Association.

The fifth annual convention of the International Railway Fuel Association will be held at the Hotel Sherman, Chicago, May 21-24. On Wednesday, May 21, after addresses by the president and by R. H. Ashton, vice-president of the Chicago & North Western, and Francis S. Peabody, president of the Peabody Coal Company, there will be a paper on Standard Form of Contract Covering Purchase of Railway Fuel Coal, and one on Sub-Bituminous and Lignite Coal as Locomotive Fuel, which will be followed by discussions.

On May 22 there will be a paper and a discussion on Location, Construction, Development and Operation of a Bituminous Coal Mine, and the Report of Standing Committee on Firing Practice.

On May 23 there will be a paper and a discussion on Self-Propelled Railway Passenger Cars, and on Modern Locomotive Coaling Station: Its Design, Construction, Operation and Maintenance.

On May 24 there will be a paper, followed by a discussion on Scaling of Locomotive Boilers and Resultant Fuel Loss, the report of standing committee on Constitution and By-Laws, report of special committees, election of officers and the report of the executive committee on Selection of Subjects Presented at the Current Meeting for Discussion, with Recommendation on Subjects for Future Presentation.

A record attendance at the convention is expected, as 135 new members have been added since the convention in 1912.

Railway Storekeepers' Association.

The tenth annual convention of the Railway Storekeepers' Association will be held at the Hotel Sherman, Chicago, May 19-21. The subjects of the papers to be presented include: Reducing Inactive and Disposing of Obsolete Stock; Rolling Mills at Railroad Scrap Docks; What Effect, if Any, Has a Well Organized Stores Department on the Operating Cost of a Railroad?; Specifications for and Testing Materials and Effect on Storekeeper's Stock; Ice, Proper Method of Storage, Disbursement, Shrinkage and General Handling on Railroads; Standard Store House; Standard Stationery Store House; Standard Supply Car; Standard Scrap Dock and Reclaiming Machinery. Reports will be received from the committee on Recommended Practices, the committee on Accounting, the committee on Piece Work, the committee on Standardization of Tinware, the committee on Stationery, the committee on Uniform Grading and Inspection of Lumber, the committee on Scrap Classification, and the committee on Membership. A special committee has been appointed to prepare and submit for adoption a book of Standard Rules Governing Store Department Practices.

Convention Special to Atlantic City.

Following its usual custom for the accommodation of delegates to the conventions of the Master Mechanics' and Master Car Builders' associations at Atlantic City, the Pennsylvania Lines will provide a special train, to be known as the "Master Mechanics' Special" leaving Chicago at 3 p. m. on Monday, June 9, and reaching Atlantic City about 2 o'clock the following

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afternoon. The summer tourist fare from Chicago to Atlantic City, good to return within 30 days, will be $29.25 for the round trip.

Trade Press Convention.

The eighth annual convention of the Federation of Trade Press Associations will be held at Hotel Astor, New York, September 18-20. William H. Ukers, editor of the *Tea and Coffee Trade Journal*, has been made chairman of the committee on arrangements and is preparing a program which will provide papers and addresses on topics of interest to manufacturers, sales managers and advertising men, as well as to the trade paper editors and publishers. Two sessions will be held daily. There will be editorial, circulation, advertising and publishing symposiums.

American Society of Mechanical Engineers.

The Spring meeting of the American Society of Mechanical Engineers will be held in Baltimore, Md., May 20-23, at the invitation of the Engineers' Club of Baltimore and local members of the society. A bulletin has just been issued giving the program for the meeting and information regarding hotel accommodations and transportation.

Central Railway Club.

At the next regular meeting of the Central Railway Club, to be held at the Hotel Statler, Buffalo, N. Y., May 9, B. H. Mann of St. Louis, signal engineer of the Missouri Pacific and president of the Railway Signal Association, will present a paper dealing with the Signal Department on Railroads.

Third International Congress of Refrigeration.

The finance committee of the American Association of Refrigeration is charged with the duty of raising a guarantee fund of $100,000 for the Third International Congress of Refrigeration, to be held in Chicago in September, 1913. Contributions are asked from all companies interested.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W. Ry., Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andrecuetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Eyans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MAN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Moutreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Tuesday in Jan. and 2d Fri. in March, May, Sept., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh.

FREIGHT CLAIM ASSOCIATION.—Werren F. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. C.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Jean Jacquet, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kenuedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOCIATION.—C. J. Reed, Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-13, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, Wednesday and Thursday, June 11-12, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 14-16, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Telegr. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS AND MAINTENANCE OF WAY ASSOCIATION.—I. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3668 Park Ave., New York. Meetings with annual convention of Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & S. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—L. Wenborne, Lake Erie & Western R. R. Co., Toledo, Ohio; 1st Saturday, Toledo.

TRAFFIC CLUB OF CHICAGO.—C. C. Kidd, Rumapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—W. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—J. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting with in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

The Sunset Central Lines, International & Great Northern, Texas & Pacific, and St. Louis, Iron Mountain & Southern have announced that they will allow rates of one cent a mile for the reunion of the Confederate Veterans at Chattanooga, Tenn. The roads originally declined to make rates lower than two cents a mile.

Two hundred and fifty fruit growers of Arkansas held a meeting last week and appointed a committee to protest against the new demurrage rules of the Arkansas Railway Commission. One of the rules passed gives the railways authority to store shipments at the expense of the owners after a demurrage charge of $13 has accumulated against a car.

The Long Island Express Company will on June 1 go out of business, the Long Island Railroad having made a contract with the Adams Express Company to do the express business on the company's lines. The growth of Long Island has created a demand for through express rates and facilities which can be furnished much better by a large company; and the large number of offices maintained by the Adams in New York City will enable that company greatly to improve the local service.

Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 144, covering car balances and performances for January, 1913, says:

The miles per car per day for January decreased .1 points to 24.3, compared with December, 1912, but increased 3.9 points over January, 1912, which were 20.4.

Ton miles per car per day were 392, compared with 396 for December. This is an increase of 20.62 per cent. over the figure for January, 1912, which was 325.

The proportion of home cars on line was 51 per cent., compared with 48 per cent. in December, 1912, and 58 per cent. for January, 1912.

There is a decrease of 1.8 points to 68.5 per cent. in the percentage of loaded car mileage compared with December, 1912. The per cent. of loaded car mileage for January, 1912, was 69.2 per cent.

The average earnings per car per day of all cars on line were $2.45, compared with $2.61 in December, 1912. This is an increase of 12.90 per cent. over the earnings for January, 1912, which were $2.17.

The table on the next page gives car balance and performance in the month covered by the report, and the diagram shows car earnings and car mileage and different car performance figures monthly from July, 1907.

INTERSTATE COMMERCE COMMISSION.

Cottonseed Rate Reduced.

Louisville Cotton Seed Products Company v. Louisville & Nashville et al. Opinion by the commission:

The rate charged by the defendants for the transportation of cottonseed in carloads from Memphis, Tenn., to Louisville, Ky., was found to be unjustly discriminatory to the extent that it exceeds the rate on cottonseed oil. (26 I. C. C., 607.)

Refrigeration Charges Increased.

In re investigation and suspension of advances in refrigeration charges between points located on the Kansas City Southern Railway; the Arkansas Western Railway; and the Texarkana & Fort Smith Railway, and to and from points on connecting lines. Opinion by Commissioner Clements:

Under a rule in trans-Missouri circular I-B the carriers absorb icing charges on perishable commodities when 10,000 lbs. are offered upon payment of less-than-carload rate. The Kansas City Southern proposes in its individual tariff under suspension to withdraw from participation in that rule, which action will increase charges via its line to the basis of the carload rate as freight plus a separate charge for refrigeration. The commission decided that the proposed action was justified and the order of suspension was vacated. (26 I. C. C., 617.)

Rates on Rough Plow Handles Reduced.

G. A. Kelly Plow Company v. Texas & Pacific et al. Opinion by the commission:

The commission decided that the defendants' rates on rough plow handles from Fort Smith, Ark., to Longview, Tex., were unjust and unreasonable to the extent that they exceed by more than 3 cents per 100 lbs. the rates on hardwood lumber, and prescribed those rates for the future. Reparation was awarded. (26 I. C. C., 581.)

Rates on Asphalt and Asphaltum.

In re investigation and suspension of advance in rate by carriers for the transportation of asphalt and asphaltum, from points in Kansas to St. Louis, Mo., and other points. Opinion by Commissioner Clements:

The commission decided that the proposed advances in rates on asphalt and asphaltum from points in Kansas to St. Louis, Mo., and other points had not been justified and ordered the carriers to cancel the suspended tariffs. (26 I. C. C., 614.)

Rates on Sand to Houston, Tex.

In re investigation and suspension of advances in rates by carriers for the transportation of sand and gravel from points in the state of Louisiana to Texas points. Opinion by Commissioner Harlan:

The commission decided that the increased rates on sand and gravel from Anchorage, La., to Houston and Beaumont, Tex., and from Kinder, La., to Houston were not unreasonable, but the rate from Kinder to Beaumont was excessive. The order of suspension was vacated, but the defendants were directed to establish a reasonable rate from Kinder to Houston. (26 I. C. C., 627.)

Rates on Steel Window Sash Reduced.

Goldfield Consolidated Milling & Transportation Company v. Chicago & Erie et al. Opinion by the commission:

The commission decided that the charges for the transportation of a carload of steel window sash from Youngstown, Ohio, to Goldfield, Nev., at a combination through rate based on Sacramento, Cal., were unreasonable to the extent that the portion of the through rate from Sacramento to Goldfield exceeded the rate contemporaneously in effect from and to the same points on wooden window sash in carloads and prescribed that rate for the future. Reparation was awarded. (26 I. C. C., 605.)

Ground Iron Ore Rates Increased.

In re advances on ground iron ore from points in Alabama, Georgia, and Tennessee to Boston, New York, Philadelphia, and other points. Opinion by Commissioner Marble:

The commission decided that the withdrawal of commodity rates on ground iron ore in carloads from certain Alabama, Georgia, and Tennessee points other than Chattanooga to the north Atlantic ports, leaving in effect higher class rates, was justified, but that the proposed advance in the all-rail and rail-and-water rates on ground iron ore in carloads from Chattanooga to New York and Boston was not justified. An order was entered in accordance with this decision. (26 I. C. C., 675.)

Attempt to Close Route Frustrated.

Southwestern Missouri Millers' Club v. St. Louis & San Francisco et al. Opinion by Commissioner Prouty:

Millers at Springfield, Mo., and at various other points upon the St. Louis & San Francisco between Springfield and Bridge Junction, Ark., obtain their wheat west of Springfield, grind it in transit, and ship the product, among other distributions, to points on the Rock Island road between Bridge Junction and Little Rock, Ark. In the past rates from this originating territory to all points between Wister, Okla., and Bridge Junction have been the same and have applied either via Wister or via Bridge Junction. Upon the expressed intention of the defendants to close the route via Bridge Junction, the commission decided that the Bridge Junction route should be maintained with respect to the territory involved, except that lying south of Monett, Mo.; that is, from all territory which can be reached at practically the

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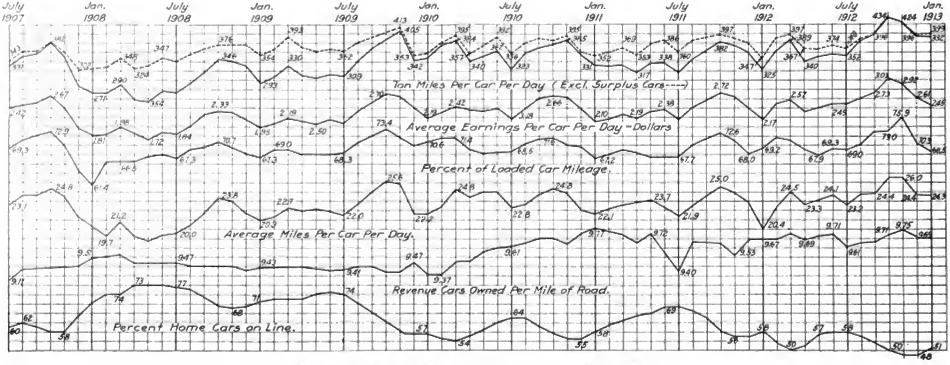
CAR BALANCE AND PERFORMANCE IN JANUARY, 1913.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., Ne. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	87,241	682,100	222,580	188,877	128,083	419,370	17,349	130,789	19,874	133,802	131,366	2,161,431
Average number of system cars on line	40,117	330,101	103,090	89,367	45,241	261,434	4,098	58,276	14,441	58,104	88,104	1,093,008
Railway-owned cars: Average foreign on line	60,514	322,025	118,814	83,526	66,469	164,432	11,613	72,559	27,524	58,411	60,871	1,046,758
Total Railway-owned cars on line	100,631	652,126	221,904	172,893	111,710	425,866	15,711	130,835	41,967	117,148	148,975	2,139,766
Excess	13,390	*29,974	*676	*15,984	*16,373	6,496	*1,638	46	22,093	*16,654	17,609	*21,665
Per cent. of cars on line to total owned:												
Home	46	48	47	48	35	63	24	45	73	44	67	51
Foreign	69	47	53	44	52	39	67	50	138	44	46	48
All railways	115	95	100	92	87	102	91	95	211	88	113	99
Private cars on line	4,158	40,275	11,224	6,268	7,369	14,795	1,351	7,641	2,642	14,069	3,409	113,201
Total, all cars on line	104,789	692,401	233,128	179,161	119,079	440,661	17,062	138,476	44,609	131,217	152,384	2,252,967
Per cent. of cars in shop	6.83	5.62	8.17	5.90	13.69	5.68	7.17	6.50	6.50	4.56	5.09	6.49
No. of freight engines owned	1,405	10,314	3,127	3,457	2,265	6,912	546	2,682	678	2,787	2,143	36,316
Average cars on line per freight engine owned	75	67	75	52	53	64	31	52	66	47	71	62
Total freight-car mileage	57,959,927	$45,700,746	162,301,071	144,962,037	96,247,058	305,980,882	23,604,017	89,511,135	30,848,464	115,735,360	106,070,064	1,678,920,761
Average mileage per car per day	17.6	25.4	22.2	26.1	26.2	22.9	45.8	22.0	22.4	28.3	22.4	24.3
Per cent. loaded mileage	71.4	64.9	68.2	66.9	74.0	69.1	76.5	71.0	63.1	70.8	73.6	68.5
Ton-miles of freight, including company freight	683,859,412	9,163,267,957	2,695,356,428	2,421,271,909	1,544,991,460	3,849,137,033	415,975,525	1,372,983,595	382,538,449	1,680,115,608	1,783,166,972	25,992,684,348
Average ton-miles, including company freight:												
Per car-mile	11.8	16.8	17.4	16.7	16.2	15.7	18.1	15.3	12.4	14.8	16.9	16.2
Per loaded car-mile	16.5	25.9	25.6	25.0	22.0	22.3	23.6	21.6	19.7	21.3	22.3	23.6
Per car per day	211	427	387	436	425	359	830	338	279	420	379	392
Gross freight earnings	$7,162,717	$50,115,412	$14,379,040	$13,689,521	$9,205,091	$31,570,203	$2,698,634	$11,462,295	$3,536,093	$16,422,323	$10,491,203	$170,733,532
Average daily earnings: Per car owned	$2.65	$2.38	$2.08	$2.34	$2.32	$2.43	$5.02	$2.73	$5.74	$3.98	$2.59	$2.55
Per railroad car on line	2.30	2.48	2.09	2.55	2.66	2.39	3.54	2.87	2.72	4.54	2.28	2.58
All cars on line	2.20	2.34	1.99	2.47	2.49	2.31	5.10	2.72	2.56	4.06	2.23	2.45

*Denotes deficiency.



Freight Car Mileage, Earnings and Performance, 1907 to 1913.

same length of haul through Bridge Junction as through Wister. No order was made but the decision will be regarded as an order. (26 I. C. C., 630.)

Reparation Awarded.

West Virginia Rail Company v. Baltimore & Ohio et al. Opinion by the commission:

Part of the traffic involved moves from points of origin in West Virginia to destinations in the same state, passing in transit about 1,500 ft. through the state of Kentucky. The commission decided that this traffic is subject to the act to regulate commerce, and that the rates for the transportation of steel rails in carloads from Huntington, W. Va., to points on the Norfolk & Western in West Virginia and Virginia were unreasonable. Reasonable rates were prescribed for the future. (26 I. C. C., 622.)

Relief from Fourth Section Denied.

Janesville Clothing Company v. Chicago & North Western et al. Opinion by the commission:

The complainant attacks as unreasonable and unjustly discriminatory the defendants' rates for the transportation of cotton piece goods from various southern producing points to Janesville, Wis., as compared with the lower rates to Madison, Wis., to which Janesville is intermediate. The commission decided that the complainant is not shown to have been damaged by a violation of sections 1, 2, or 3 of the act, as alleged. The petition was dismissed. The maintenance of lower rates for the transportation of cotton piece goods from southern producing points to Madison, Wis., than to Janesville, Wis., the intermediate point, was not justified by the carriers, and relief from the provisions of the fourth section of the act was denied. (26 I. C. C., 628.)

Joint Rates on Coal Established.

Sheridan Chamber of Commerce v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Meyer:

Complaint was made of the rates on coal from Sheridan, Wyo., to points in Nebraska and South Dakota on the line of the Chicago & North Western and the Chicago, Milwaukee & St. Paul, and to points east and west of Billings, Mont., on the line of the Northern Pacific. Comparisons are made of distances and rates from Sheridan, Hudson, and from Illinois and Indiana coal fields to points of destination on the Chicago & North Western herein involved. Similar comparisons are made of distances and rates from Sheridan, Roundup, Mont., and from Illinois coal fields to points of destination on the Chicago, Milwaukee & St. Paul herein involved. Sheridan mines are at a disadvantage of from 85 cents to $1 in competing at points on the Northern Pacific with the mines located on that railroad. The commission decided that the great discrepancy between the rates from Sheridan and from Hudson to the same points of destination on the Chicago & North Western and between rates from Sheridan and Roundup to the same points of destination on the Chicago, Milwaukee & St. Paul cannot be justified on the ground that the movement from Sheridan involves a two-line haul.

Where the physical connection between connecting carriers is as simple as in these small western towns, involving no expensive terminal service, the additional cost due to the switching movement is very small, so small in fact that it may not properly be made the basis of an additional charge for a two-line haul of substantial length.

The facts demonstrate the necessity of promulgating rates which will allow this coal to find a market in the territory described. In order to accomplish this there must be a free interchange of traffic at reasonable joint rates.

Joint rates should be established from the mines at Sheridan to certain points on the Chicago & North Western, which should in no case exceed the rate from Hudson, Wyo., to the same points of destination, except that the rate to common points of the Chicago, Burlington & Quincy and the Chicago & North Western need not be changed.

A joint rate should be established from Sheridan to Chamberlain, S. Dak., not to exceed that from Roundup to Chamberlain and this rate should be carried back as far as Okaton, S. Dak.

A differential of 25 cents is a reasonable allowance for the difference in the distance from Sheridan and from the Northern Pacific mines to certain points of destination within 500 miles of Sheridan. As the distance to points of destination increases, the differential between the rates from Sheridan and from Red Lodge should be further contracted, so as not to exceed 15 cents to points between 500 and 600 miles distant and not to exceed 5 cents to points between 600 and 700 miles distant. To points over 700 miles distant the rate from Sheridan should be the same as the rate from Red Lodge. (26 I. C. C., 638.)

STATE COMMISSIONS.

The Illinois Railroad and Warehouse Commission will hold a meeting at Chicago on May 14, for consideration of a docket of petitions for additions and changes in the Illinois commissioners' classification.

The Missouri Public Service Commission has called upon the railroads of the state to furnish it with their tariffs of passenger rates preliminary to an investigation of the reasonableness of the present rates.

The Atchison, Topeka & Santa Fe has filed an application with the Kansas Public Utilities Commission for an order increasing the minimum weight for a carload of grain from 24,000 lbs. to a figure nearer the capacity of the cars generally used.

Joseph L. Reilly, who has been secretary of the Railroad Commission of Indiana, has been appointed secretary of the new Public Utilities Commission, which succeeded the old commission on May 1. It is reported that the new commission proposes to adopt as many of the rules and methods of the Wisconsin commission as can be adapted to use in Indiana.

The Indiana Railroad Commission has issued an order in the case of the Winona College of Agriculture against the railways of the state, prescribing a schedule of distance rates on crushed limestone for use as fertilizer, effective June 15, which materially reduces the present rates. The new scale ranges from 35 cents per ton for distances under 10 miles, to $1.40 per ton for distances between 325 and 350 miles.

The Oregon Railroad Commission has issued an order calling upon the Southern Pacific, the Portland, Eugene & Eastern, the Salem, Falls City & Western, the Oregon Electric, the Oregon-Washington Railroad & Navigation Company, the Walla Walla Valley Traction Company, and the Pacific Railway & Navigation Company, to appear on May 14 and justify present regulations with relation to block signals, passing tracks, switching and the general control and operation of trains.

COURT NEWS.

Judge Reiter, of the Lake County Circuit Court of Indiana, has overruled a demurrer of the Grand Trunk in a suit brought by the railroad commission to recover $10,000 as penalty for failure to observe the order for the installation of block signals.

The Supreme Court of Wisconsin in a suit against the Minneapolis, St. Paul & Sault Ste. Marie, has dismissed the appeal of John D. Langowski from a decision by the circuit court. Three years ago the plaintiff and his family while out walking on Sunday had strolled out on a trestle over the Wisconsin river, near Stevens Point, when a passenger train came along. In their excitement Mrs. Langowski jumped and was killed upon the rocks below, and her son and husband were injured. The husband brought suit against the road to recover damages, and the circuit court dismissed the complaint.

Lands in Oregon aggregating 2,373,000 acres, held by the Southern Pacific by virtue of grants made by Congress to its predecessor, the Oregon & California, in 1866 and 1870, were declared forfeited to the United States government in a decree issued by Judge Wolverton of the United States district court, at Portland, Ore., on April 29. The decree was based on the ground that the railway company violated the terms under which the grant was made regarding the sale of lands to settlers, by not selling the lands to actual settlers at $2.50 an acre, by selling lands at a higher price than $2.50 per acre, and by selling more than 160 acres to one person. The case will be appealed to the higher courts.

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1913.

Name of road.	Average mileage operated during period.	Operating revenues — Freight.	Passenger.	Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Maintenance — Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Alabama & Vicksburg	143	$116,544	$35,717	$162,775	$25,908	$13,600	$3,391	$54,664	$5,353	$122,916	$39,859	—$289	$5,300	$34,270	$14,618
Atchison, Topeka & Santa Fe	8,242	5,080,233	2,027,345	8,104,962	1,148,403	1,349,065	178,352	2,395,921	155,771	5,227,562	2,877,400	.....	339,914	2,537,486	191,514
Atlanta & West Point	93	60,656	26,527	106,992	11,532	18,829	3,546	33,033	4,520	73,470	33,522	129	9,344	24,307	—5,107
Atlanta, Birmingham & Atlantic	645	242,622	44,788	311,447	43,823	48,293	12,725	121,213	11,020	237,076	74,371	.....	13,375	60,996	22,284
Atlantic & St. Lawrence	167	165,070	25,466	210,888	18,312	19,993	5,019	95,582	4,017	142,923	67,965	.....	16,152	51,813	43,416
Atlantic City	167	61,469	66,889	137,895	30,665	19,007	2,522	83,209	955	136,058	1,837	—4,397	9,000	—11,559	—8,477
Atlantic Coast Line	4,615	2,601,857	904,217	3,736,122	435,470	573,833	1,238,919	80,668	2,706,938	1,497,184	98,000	1,871,184	1,793,186		
Baltimore & Ohio—System	4,455	6,169,037	1,216,040	7,749,857	1,070,838	1,677,271	166,889	3,173,234	178,926	6,267,238	1,522,599	—68,961	278,476	1,175,162	—1,078,916
Baltimore & Ohio Chicago Terminal	27	.....	1,667	130,279	9,165	25,029	991	72,873	6,145	114,202	14,356	846	8,104	7,318	—13,586
Bangor & Aroostook	631	265,335	49,191	327,108	40,151	43,776	2,823	142,928	13,885	243,563	83,545	.....	10,500	73,045	—62,386
Bessemer & Lake Erie	204	462,063	27,265	500,917	84,192	137,861	8,367	149,172	9,792	389,384	111,533	.....	35,000	76,533	24,483
Boston & Maine	2,244	2,282,601	1,152,324	3,731,291	388,734	735,122	35,094	2,113,163	117,243	3,389,356	341,935	15,249	183,835	173,349	—143,902
Buffalo & Susquehanna, R. R.	265	147,364	7,932	158,820	26,564	24,672	1,286	58,661	3,988	116,472	42,348	.....	2,000	40,348	9,788
Buffalo & Susquehanna Ry.	91	44,606	7,677	54,809	11,829	10,417	483	24,680	2,474	69,883	—15,074	—6	1,700	—16,780	6,167
Buffalo, Rochester & Pittsburgh	574	720,135	87,588	832,657	83,836	178,255	10,167	303,072	19,402	595,231	236,926	—1,748	19,000	216,178	—24,090
Canadian Pacific Lines in Maine	233	143,741	45,171	206,894	14,042	26,701	6,406	78,095	4,917	130,162	76,732	.....	10,000	66,732	48,941
Carolina, Clinchfield & Ohio	210	112,246	13,694	136,254	13,710	20,620	6,866	38,090	11,404	90,730	45,524	2,276	8,000	39,800	1,276
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	12,585	1,425	14,216	1,374	81	1,002	2,965	358	5,780	8,436	.....	500	7,936	585
Central of Georgia	1,913	932,853	264,193	1,310,664	179,038	218,228	29,955	434,760	37,304	902,387	408,277	5,145	50,810	372,592	35,465
Central of New Jersey	676	1,620,720	466,566	2,133,585	253,456	370,345	26,989	706,398	42,334	1,399,532	734,053	—53,361	122,593	558,099	—542,734
Central New England	277	248,453	78,585	293,238	37,675	30,689	1,265	78,337	2,513	150,479	142,759	—187	10,000	132,572	—57,511
Charleston & Western Carolina	341	169,117	26,062	203,945	31,390	31,538	3,191	76,001	4,560	146,980	56,965	.....	5,000	51,965	—12,755
Chesapeake & Ohio Lines	2,324	2,215,441	440,495	2,980,666	212,331	644,372	51,628	1,047,921	63,332	2,119,474	771,192	5,249	127,155	649,286	—291,384
Chicago & Alton	1,026	745,551	297,770	1,134,910	199,054	282,771	43,892	534,522	35,418	1,095,652	39,253	—1,657	45,200	—7,004	291,663
Chicago & Northwestern	7,926	4,408,346	1,528,905	6,572,130	719,268	993,063	112,714	2,852,358	135,467	4,818,070	1,754,060	—5,905	293,000	1,455,155	157,063
Chicago, Burlington & Quincy	9,129	4,980,228	1,572,710	7,139,395	934,482	1,340,067	132,321	2,688,307	214,535	5,259,712	1,869,683	—5,866	279,093	1,584,724	227,836
Chicago Great Western	1,476	843,221	279,585	1,157,572	115,914	183,397	49,558	498,831	34,692	882,475	275,097	—4,825	56,000	219,182	—125,610
Chicago, Indiana & Southern	359	349,072	22,901	390,566	50,655	88,646	6,859	140,065	11,582	297,807	92,759	—68	15,282	77,409	—17,619
Chicago, Indianapolis & Louisville	513	314,403	104,310	477,951	53,790	89,395	19,850	183,125	29,914	446,004	31,947	.....	23,224	8,723	—71,330
Chicago, Milwaukee & St. Paul	10,592	5,710,014	1,290,438	7,596,899	563,125	1,182,809	150,360	3,119,343	115,732	5,131,349	2,465,550	—6,326	328,704	2,130,520	448,486
Chicago, Peoria & St. Louis	255	103,346	24,041	133,728	19,996	27,619	6,543	72,964	5,541	132,663	1,065	.....	4,300	—3,235	—16,425
Chicago, Rock Island & Gulf	477	210,704	56,057	284,505	33,922	28,649	10,817	113,784	8,460	195,632	88,872	—534	7,935	80,404	46,216
Chicago, Rock Island & Pacific	7,766	3,559,230	1,411,269	5,306,597	642,271	824,713	133,160	2,406,840	138,436	4,167,410	1,142,187	—13,942	236,483	891,762	101,574
Chicago, Sat. Paul, Minneapolis & Omaha	1,744	880,754	375,140	1,339,499	105,805	208,613	26,515	608,945	34,303	984,181	355,318	—2,151	70,102	283,065	28,151
Cincinnati, Hamilton & Dayton	1,015	586,147	160,128	778,611	130,448	161,274	16,891	342,804	18,353	669,970	8,641	.....	34,712	—26,071	—149,039
Cincinnati Northern	245	73,916	13,463	91,550	20,379	29,754	2,596	41,228	2,977	96,804	—5,344	.....	5,500	—10,844	2,793
Colorado Midland	339	94,015	12,964	119,447	16,190	36,018	5,811	56,921	5,789	123,169	—3,722	—1,269	8,000	—12,991	—59
Colorado & Southern	1,069	563,969	86,647	697,912	79,666	164,329	13,539	214,579	22,752	498,865	199,047	—960	29,175	168,912	54,805
Cumberland Valley	167	70,252	50,760	165,819	14,494	18,822	3,675	43,745	3,243	103,228	91,531	69	5,733	96,197	4,246
Delaware, Lackawanna & Western	958	1,967,584	610,583	2,789,349	365,002	543,442	70,727	1,013,022	65,272	2,057,465	731,884	34,501	165,000	601,385	—309,739
Denver & Rio Grande	2,350	1,357,940	352,612	1,786,145	240,413	370,381	41,946	608,522	55,148	1,316,410	469,735	—4,986	80,400	384,349	113,218
Denver, Northwestern & Pacific	215	48,655	10,978	63,233	14,084	18,977	2,030	30,037	5,362	70,418	—7,127	.....	3,500	—10,627	—10,466
Detroit & Mackinac	411	87,278	26,063	115,765	9,561	17,113	1,867	39,064	2,469	70,073	45,710	—188	8,379	37,143	5,674
Detroit, Grand Haven & Milwaukee	191	113,000	45,500	184,992	20,371	26,642	6,993	124,072	5,252	193,335	—8,343	15	2,953	—11,281	—16,239
Detroit River Tunnel	2	.....	.....	122,898	2,501	1,250	.....	10,169	25	13,945	106,950	.....	6,000	100,950	12,855
Duluth & Iron Range	272	73,932	2,653	104,465	38,015	47,729	922	69,904	9,239	165,815	—61,364	—3,211	5,128	—69,703	—28,195
Duluth, Missabe & Northern	356	68,249	22,824	106,899	58,053	69,691	2,025	78,349	11,572	218,690	—111,791	—936	6,225	—118,932	—121,889
Duluth, South Shore & Atlantic	627	184,273	60,622	258,727	46,682	31,727	7,220	127,374	7,523	220,476	38,301	—1,057	18,000	19,214	—20,482
El Paso & Southwestern Co	96	630,913	105,966	765,924	102,852	102,852	16,863	236,836	25,965	474,510	291,414	—1,384	35,000	255,040	37,201
Elgin, Joliet & Eastern	820	1,068,723	3	1,144,564	109,492	181,927	5,122	369,016	15,912	681,469	463,095	.....	50,220	412,875	—7,130
Erie	1,988	3,204,237	704,564	4,360,721	347,218	831,551	101,328	1,523,516	104,074	2,907,689	1,353,082	—39,357	152,835	1,160,890	66,772
Florida East Coast	647	314,923	176,107	726,988	60,514	69,377	9,182	213,569	11,837	364,429	362,559	—930	18,500	343,129	99,533
Fort Worth & Denver City	454	259,444	122,278	403,386	54,270	89,388	5,925	192,895	13,324	362,102	41,284	—1,384	9,066	30,814	—21,675
Galveston, Harrisburg & San Antonio	1,338	846,230	278,644	973,046	124,323	202,877	35,999	459,427	29,991	852,667	120,379	6,812	29,454	97,737	15,522
Grand Rapids & Indiana	574	291,845	119,962	444,114	64,561	82,169	10,901	209,768	14,827	382,236	61,878	—175	23,640	38,063	—38,343
Grand Trunk Western	347	432,000	137,000	607,913	79,483	86,222	21,846	283,161	14,124	485,041	122,872	—2,129	29,872	90,866	17,594
Great Northern	7,783	3,926,483	1,110,471	5,475,696	867,486	843,502	109,725	1,840,392	109,227	3,770,532	1,705,164	82	376,054	1,329,192	—328,456
Gulf & Ship Island	308	143,586	30,825	188,022	22,798	34,835	2,887	49,144	7,694	117,358	70,664	.....	8,749	61,915	20,971

Average mileage operated during previous period—8,201; 662; 4,527; 4,434; 628; 572; 672; 2,281; 7,951; 9,024; 9,570; 2,565; 1,075; 2,545; 358; 274; 342; 624; 902; 841; 1,995; 630; 586; 7,345. —Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Trans-portation.	General.	Total.					
Gulf, Colorado & Santa Fe	1,595*	$743,403	$218,259	$1,034,343	$187,590	$184,475	$27,627	$472,916	$34,946	$907,604	$126,739	.....	$38,407	$88,332	$32,041
Illinois Central	4,763	3,427,696	1,067,255	5,211,602	585,865	1,126,877	127,272	2,116,847	176,724	4,059,390	1,152,032	—$1,780	245,750	904,483	24,836
Kanawha & Michigan	177	202,132	27,046	234,457	37,650	56,394	2,747	71,588	6,753	175,132	59,325	—10	8,394	50,921	—4,194
Kansas City Southern	327	676,214	127,319	891,434	72,040	126,525	28,010	335,159	32,401	594,595	296,839	.....	41,142	255,757	111,824
Lake Shore & Michigan Southern	1,872*	3,214,867	982,263	4,254,601	515,928	912,035	100,549	1,750,195	106,334	3,383,056	871,545	1,111	150,000	1,220,656	—341,936
Lehigh Valley	1,452*	2,502,190	356,621	2,963,784	339,718	576,928	83,431	1,185,265	73,573	2,278,935	684,849	—21,720	118,500	544,129	—435,999
Long Island	399	277,208	495,462	807,070	129,879	112,135	15,212	414,920	31,783	703,929	103,141	10,181	61,532	51,790	—6,225
Louisville & Nashville	4,919*	3,603,145	1,016,834	4,915,451	926,785	957,872	163,299	1,764,198	121,005	3,423,159	1,052,292	4,031	161,241	895,082	—331,936
Midland Valley	373	63,982	38,179	108,582	27,498	22,872	2,679	43,165	6,270	102,436	6,146	—27	5,964	105	—24,415
Minneapolis & St. Louis	1,586	600,145	146,961	789,405	83,669	106,293	19,682	327,978	20,964	558,586	230,819	—74	32,631	198,114	72,196
Minneapolis, St. Paul & Sault Ste. Marie	3,976*	2,102,531	437,179	2,666,285	299,590	357,284	54,450	927,042	67,777	1,616,143	1,050,142	1,407	162,953	888,596	113,426
Missouri Pacific	3,928*	1,477,777	385,439	2,086,843	250,329	360,813	70,181	1,003,192	79,006	1,763,652	277,219	—5,703	95,100	178,416	119,721
Monongahela	65	145,302	2,980	159,286	14,666	14,460	394	27,850	2,282	59,652	99,654	.....	2,000	88,454	16,730
Nashville, Chattanooga & St. Louis	1,231	833,538	231,959	1,145,865	173,320	212,172	40,145	457,332	28,104	916,073	229,792	1,069	26,160	204,751	821
Nevada Northern	165	141,066	15,295	156,361	12,119	20,472	213	19,231	4,231	56,091	100,270	.....	7,053	71,528	3,833
New Orleans & North Eastern	196	252,688	53,858	331,714	39,053	63,052	9,631	131,367	11,491	254,814	76,900	—1,866	12,788	44,654	—6,642
New Orleans Great Northern	563	119,697	29,856	161,595	22,354	10,503	2,322	48,398	6,848	90,425	71,170	—59	2,314	68,777	27,239
New York Central & Hudson River	3,712*	5,585,431	2,643,272	9,204,284	1,198,588	1,838,775	197,591	3,680,417	249,095	7,154,456	2,049,828	7,638	575,111	1,482,275	—213,119
New York, Chicago & St. Louis	564*	824,622	83,085	940,086	101,654	161,226	46,063	488,222	16,985	816,150	123,936	—2,005	12,000	89,931	—170,684
New York, New Haven & Hartford	2,091	2,705,872	2,218,018	5,478,475	558,529	907,420	36,391	2,576,553	172,968	4,251,861	1,226,594	—25,820	310,000	890,774	—779,456
New York, Ontario & Western	565	575,539	58,623	692,344	95,729	140,149	13,626	274,229	16,771	541,004	151,340	—3,175	18,167	129,998	—19,344
New York, Philadelphia & Norfolk	112	240,271	37,038	296,931	24,992	37,501	4,997	139,761	13,320	239,181	57,750	.....	8,000	49,750	—3,529
Norfolk & Western	2,019*	3,102,172	355,158	3,568,830	377,770	732,421	58,224	1,139,307	64,861	2,353,583	1,215,247	1,192	122,000	1,094,439	149,102
Northern Pacific	4,*	1,899,465	560,073	2,618,996	442,803	526,220	45,894	.....	16,464	1,192,862	1,426,134	—694	172,500	1,252,940	173,191
Northern Central	472*	773,706	210,828	1,050,735	160,059	258,228	17,255	562,015	31,381	1,028,938	21,797	141	42,285	—20,347	—142,569
Northern Pacific	6,314*	4,195,391	1,092,963	5,619,874	642,485	662,125	117,966	2,018,766	90,297	3,531,639	2,088,235	576	385,134	1,703,677	48,184
Oregon Short Line	1,931*	1,181,038	359,179	1,658,780	227,915	288,802	33,364	460,856	50,700	1,055,637	603,143	—2,093	92,000	593,150	—144,272
Oregon-Washington R. R. & Nav. Co	1,919	967,248	382,115	1,473,731	150,136	166,614	45,651	542,522	53,071	1,016,995	456,733	—9,465	76,623	380,585	—78,100
Pennsylvania Co	1,751*	3,377,827	737,655	4,306,198	847,404	1,016,008	90,233	1,899,133	103,032	3,955,810	344,388	5,183	237,667	301,538	—568,240
Pennsylvania Railroad	4,025*	10,977,342	2,977,717	14,849,272	2,113,794	3,267,242	211,511	5,649,738	394,127	11,636,412	3,212,715	—188,886	584,134	2,439,696	—742,361
Philadelphia & Reading	1,015	3,188,653	534,422	3,923,597	304,122	725,830	39,212	1,450,454	58,535	2,574,153	1,349,444	25,051	86,490	1,288,005	—549,623
Philadelphia, Baltimore & Washington	713	823,264	301,399	1,199,668	199,650	321,582	34,644	477,876	51,290	1,084,042	300,452	.....	50,617	249,843	—1,257
Pittsburgh, Cincinnati, Chic. & St. Louis	1,472*	2,301,245	509,677	3,223,968	576,526	786,985	74,872	1,393,785	74,681	2,906,849	316,119	—959	137,580	177,572	—773,277
Pittsburgh, Shawmut & Northern	229*	190,155	9,000	202,179	26,015	40,753	970	70,090	4,291	141,163	61,016	.....	1,595	59,421	—9,962
Port Reading	21	110,137	.....	111,966	15,109	660	30	34,979	112	50,890	61,076	3,293	8,000	56,369	—70,932
Rutland	468	149,446	84,243	268,292	33,053	65,367	9,594	114,894	7,450	230,358	38,434	.....	17,607	20,827	—16,275
St. Louis & San Francisco	4,744*	2,439,485	898,150	3,486,277	342,602	447,987	77,986	1,287,540	101,532	2,252,647	1,231,130	.....	163,200	1,067,930	238,655
St. Louis, Iron Mountain & Southern	3,345*	1,336,429	527,659	2,072,580	351,641	396,474	67,483	912,586	89,296	1,837,462	1,035,098	—3,064	88,935	943,099	82,069
St. Louis Merchants' Bridge Terminal	9	.....	359	168,723	83,585	16,416	707	99,452	5,249	155,409	13,314	.....	5,600	7,714	—39,431
St. Louis Southwestern of Texas	703	242,296	74,442	348,599	99,454	78,793	13,738	163,146	20,138	375,268	—26,269	—176	11,229	—37,674	—23,147
San Antonio & Aransas Pass	727	235,912	101,081	359,050	74,471	49,053	6,571	176,873	12,600	319,568	39,482	.....	10,000	29,482	—7,862
Seaboard	2,076*	1,646,014	1,173,434	2,883,444	241,072	324,555	62,291	837,616	62,541	1,528,962	854,482	—172	77,099	777,310	165,511
Southern	7,037*	4,139,200	1,444,642	6,034,570	789,202	947,794	183,644	2,128,489	166,761	4,215,890	1,818,680	5,260	268,947	1,614,993	85,577
Southern Pacific	8,219*	4,747,870	2,675,652	7,442,556	781,536	1,064,864	186,868	2,198,472	214,074	4,444,158	2,998,398	114,560	342,750	2,768,208	37,307
Spokane, Portland & Seattle	556	243,615	130,092	390,755	61,174	41,596	6,354	107,297	12,583	229,004	161,751	—471	53,400	107,880	—17,888
Terminal R. R. Ass'n of St. Louis	34*	.....	288	237,854	41,740	27,028	810	99,673	6,400	175,651	62,203	11,358	25,560	48,001	—30,949
Texas & Pacific	1,855	1,004,103	363,676	1,455,894	163,309	265,791	36,792	715,688	44,510	1,226,095	229,799	2,005	54,583	177,221	108,736
Toledo, St. Louis & Western	451	290,742	71,414	399,447	44,938	42,498	5,262	207,191	8,719	310,333	100,916	.....	15,000	85,916	—5,964
Trinity & Brazos Valley	463	165,862	45,223	220,960	45,319	39,597	10,328	126,827	10,636	232,757	—11,797	.....	3,500	—15,297	—8,623
Union Pacific	3,578*	2,584,271	766,830	3,745,515	515,455	523,338	109,877	1,144,020	124,655	2,426,345	1,319,170	—8,850	168,250	1,141,970	358,824
Union R. R. of Baltimore	9	122,919	28,073	152,765	9,022	.....	1,410	5,835	2,899	19,166	133,599	.....	5,527	128,072	20,219
Union R. R. of Pennsylvania	31	.....	.....	215,541	39,455	85,766	100	154,187	4,277	284,828	33,716	481	8,500	25,697	144
Vandalia	872	535,186	169,765	787,994	129,716	195,681	27,608	344,245	21,359	718,609	69,385	.....	30,316	39,069	109,418
Vicksburg, Shreveport & Pacific	171	104,237	40,002	155,844	24,405	27,605	3,133	55,582	5,327	116,252	39,592	—522	6,900	32,170	11,036
Virginian	475*	494,211	26,174	534,834	64,068	96,337	8,163	124,427	9,034	298,029	236,805	6,252	17,669	224,657	96,102
West Jersey & Seashore	356	146,756	289,426	459,165	82,960	72,880	12,841	219,698	15,348	403,727	55,438	—5,383	27,310	22,745	23,997
Wheeling & Lake Erie	459*	396,211	37,581	464,031	96,177	126,378	8,578	180,614	25,592	437,289	26,742	1,385	28,187	—60	—182,911
Yazoo & Mississippi Valley	1,374	765,353	196,047	1,037,906	139,139	135,264	14,305	425,511	27,444	761,662	276,304	—793	37,000	239,597	97,715

Average mileage operated during previous period—* 1,597; ** 1,775; † 1,450; †† 4,722; ‡ 3,770; ‡‡ 3,915; § 3,597; §§ 562; ‖ 2,014; ‖‖ 473; ¶ 6,032; ¶¶ 1,762; # 1,760; ## 4,018; ‖ 1,467; ‖‖ 278; ¶ 4,732; ¶¶ 3,315; ** 3,070; ** 7,090; ‖ 6,212; ‖ 35; ‖ 3,537; ‖ 503; ‖ 457. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

NINE MONTHS OF FISCAL YEAR 1913.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Maintenance—Way and structures.	Of equipment.	Operating expenses—Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Alabama & Vicksburg	143	$939,078	$371,699	$1,406,270	$215,883	$259,162	$32,444	$483,162	$50,617	$1,041,268	$365,002	—$1,733	$53,686	$309,593	$45,663
Atchison, Topeka & Santa Fe	8,243	49,447,817	19,299,009	74,421,489	12,157,567	12,488,033	1,152,845	21,446,993	1,457,182	47,064,290	25,736,659	.....	3,059,181	22,697,478	2,345,749
Atlantic & St. Lawrence	167	974,890	244,628	1,331,286	226,588	196,653	41,201	682,426	35,373	1,182,241	148,545	.....	101,178	47,367	70,930
Atlanta, Birmingham & Atlantic	613[1]	1,432,739	504,162	2,494,051	401,361	392,259	136,478	1,262,680	103,238	2,018,536	475,515	.....	121,225	354,290	—49,908
Atlanta & West Point	93	495,813	372,280	959,485	116,881	170,970	48,595	309,384	44,783	690,613	268,872	1,356	57,096	213,132	—37,911
Atlantic City	167	570,678	959,993	1,632,644	267,950	127,923	24,940	850,425	12,385	1,283,623	339,021	—34,243	81,000	223,778	—82,999
Atlantic Coast Line	4,624[1]	18,454,157	6,909,650	27,353,161	3,601,764	4,106,280	469,540	9,491,618	692,700	18,361,902	8,991,259	.....	1,080,090	7,911,169	834,524
Baltimore & Ohio—System	4,453[1]	39,078,240	11,698,693	76,006,961	10,359,964	13,759,481	1,481,360	27,882,317	1,503,681	54,786,823	21,249,246	—647,568	2,164,679	18,436,979	698,980
Baltimore & Ohio Chicago Terminal	22	.....	17,893	1,334,065	173,526	216,289	6,203	625,293	42,508	1,064,319	269,746	7,885	161,026	116,605	60,167
Bangor & Aroostook	633[1]	1,234,201	477,575	2,343,768	402,292	276,675	29,874	841,853	111,704	1,685,451	658,290	.....	94,500	563,790	—300,979
Bessemer & Lake Erie	204	5,979,367	282,842	6,361,439	716,399	1,117,077	83,344	1,588,682	106,895	3,706,397	2,655,042	.....	125,000	2,530,042	292,775
Boston & Maine	2,244	21,607,583	12,214,955	36,147,411	4,317,817	5,737,960	314,124	17,582,830	926,078	28,873,531	7,742,060	136,836	1,615,499	6,263,397	—29,636
Buffalo & Susquehanna R.	265	1,251,326	75,517	1,364,587	259,121	203,713	10,891	472,495	53,032	999,252	365,335	.....	19,800	345,535	102,858
Buffalo & Susquehanna Ry.	91	378,715	84,921	485,469	102,836	52,480	4,220	205,735	21,672	388,945	96,524	.....	14,100	112,442	27,194
Buffalo, Rochester & Pittsburgh	574[2]	6,969,441	859,377	8,122,215	1,111,227	1,623,849	104,762	2,676,543	168,810	5,685,191	2,437,024	—4,975	159,000	2,273,049	103,455
Canadian Pacific Lines in Maine	233	745,815	239,308	1,088,214	248,134	156,948	53,469	461,239	46,061	966,451	121,763	.....	90,000	31,763	17,396
Carolina, Clinchfield & Ohio	238	1,647,978	136,300	1,823,433	124,382	187,246	61,363	319,446	70,682	763,619	1,059,814	2,275	72,000	990,089	196,574
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	104,936	14,775	118,272	8,303	603	9,634	23,347	4,561	46,884	71,388	.....	4,500	66,788	14,194
Central of New Jersey	676[2]	16,152,441	4,143,764	21,468,381	1,899,020	3,136,668	258,950	6,401,396	383,199	12,089,233	9,379,148	—39,563	1,116,759	8,231,826	278,001
Central of Georgia	1,153	5,882,062	2,567,109	10,992,021	1,547,039	1,443,951	312,493	3,691,674	348,729	7,834,905	3,157,116	54,717	453,780	2,658,643	—254,069
Central New England	277	2,379,442	263,415	2,777,682	375,370	255,909	70,722	774,213	31,239	1,447,643	1,330,039	—3,784	90,000	1,236,455	10,598
Charleston & Western Carolina	341	1,114,502	277,869	1,463,915	258,795	231,671	29,474	552,429	42,439	1,114,808	351,107	.....	74,000	277,107	29,211
Chesapeake & Ohio Lines	2,334[1]	21,127,559	4,400,165	26,712,847	3,058,805	5,702,578	500,724	8,536,118	589,203	18,387,428	8,325,419	14,116	994,395	7,365,140	—502,791
Chicago & Alton	1,006	7,367,147	2,191,179	11,628,245	1,784,680	2,701,519	390,493	4,385,223	309,670	9,561,985	2,066,260	—20,319	352,900	1,693,031	—755,632
Chicago & Northwestern	7,976[2]	41,447,221	15,688,610	62,937,395	7,759,232	8,900,458	1,029,716	24,527,168	1,170,981	43,387,555	19,549,840	6,759	2,717,000	16,839,599	4,103,594
Chicago, Burlington & Quincy	9,129[2]	49,235,842	16,813,629	72,501,539	7,442,014	12,007,904	1,178,716	22,862,855	1,929,758	45,421,247	27,080,292	—111,710	2,552,043	24,416,539	3,968,008
Chicago Great Western	1,496	7,432,261	2,390,625	10,623,016	1,403,903	1,512,396	419,427	4,195,236	310,284	7,628,589	2,984,427	362	318,793	2,665,996	787,044
Chicago, Indiana & Southern	359	3,006,776	1,304,945	4,531,134	425,779	544,422	72,485	2,591,991	74,991	3,541,199	989,935	3,410	94,554	863,047	274,122
Chicago, Indianapolis & Louisville	617	3,413,979	1,241,521	5,135,547	773,704	714,837	162,633	1,946,215	133,716	3,731,625	1,403,922	.....	208,575	1,195,347	—1,294
Chicago, Milwaukee & St. Paul	10,265[2]	54,274,844	13,141,447	71,707,206	7,447,410	10,382,666	1,142,822	26,292,000	1,509,198	47,708,198	23,998,808	124,580	2,800,431	22,213,169	8,277,965
Chicago, Peoria & St. Louis	255	305,383	67,196	394,026	54,531	72,259	21,064	209,272	20,068	377,214	16,862	.....	12,900	3,962	21,276
Chicago, Rock Island & Gulf	477	1,928,321	539,946	2,626,870	297,799	236,494	92,613	943,243	73,378	1,633,577	1,003,293	—5,520	54,000	943,833	—152,199
Chicago, Rock Island & Pacific	7,566[2]	34,008,194	14,620,270	51,763,349	7,450,877	7,444,270	1,409,136	20,955,412	1,244,736	38,504,453	13,272,896	—144,573	2,145,024	10,989,299	1,276,341
Cincinnati, New Orleans & Texas Pacific	1,744	8,379,234	2,810,151	13,018,850	1,737,137	1,698,949	254,862	5,220,198	293,137	9,047,553	4,031,292	—4,700	624,794	3,398,806	548,471
Cincinnati, Hamilton & Dayton	1,015	5,737,493	1,229,080	7,267,156	940,346	1,390,312	175,988	3,302,154	174,013	5,982,823	1,284,333	.....	320,238	1,464,095	—157,906
Cincinnati Northern	245	824,961	162,713	1,089,750	167,645	224,009	23,682	443,161	29,256	887,753	201,997	.....	49,362	152,635	68,764
Colorado Midland	338	1,212,212	391,440	1,690,558	184,768	268,240	64,844	381,161	55,641	954,273	736,285	—523	77,600	147,657	—34,108
Colorado & Southern	1,069[2]	5,198,850	1,068,982	6,609,540	849,076	1,489,769	97,405	1,597,582	197,452	4,631,544	2,062,996	—7,100	365,733	1,797,163	20,145
Cumberland Valley	162	1,798,762	530,811	2,619,820	465,282	316,356	39,820	871,994	74,178	1,767,630	852,190	370	54,133	798,427	14,334
Delaware, Lackawanna & Western	958	17,907,078	6,077,918	25,174,527	3,415,538	3,104,954	1,196,569	9,676,677	599,373	18,993,111	6,660,612	457,412	1,350,437	10,864,684	1,495,950
Denver & Rio Grande	2,559[2]	14,072,406	3,953,775	18,853,734	2,331,928	3,387,359	416,897	6,128,882	512,679	12,977,745	6,075,989	—863	723,700	5,351,426	1,216,658
Denver, Northwestern & Pacific	213	610,286	222,201	872,515	136,814	151,229	17,331	292,569	43,514	646,457	226,058	.....	31,500	194,558	31,165
Detroit & Mackinac	411[2]	952,425	261,530	919,441	128,614	129,132	19,912	333,356	25,868	636,882	282,567	1,076	78,340	205,253	36,410
Detroit, Grand Haven & Milwaukee	191	1,133,997	497,278	1,889,152	252,263	263,345	63,372	599,099	64,904	1,296,984	592,168	—501	26,578	565,089	—176,988
Detroit River Tunnel	2	.....	.....	945,050	20,017	25,539	.....	78,956	368	124,880	820,170	.....	43,508	776,662	—74,256
Duluth & Iron Range	27[2]	4,583,900	194,148	4,859,560	598,753	512,935	8,535	1,115,253	112,066	2,347,441	2,512,119	15,685	235,237	2,292,567	—51,985
Duluth, Missabe & Northern	156[2]	5,211,625	326,396	5,616,046	651,423	706,666	18,549	1,174,389	119,031	2,670,058	2,945,988	16,174	269,309	2,692,853	287,601
Duluth, South Shore & Atlantic	677[2]	1,635,338	717,522	2,476,129	501,837	294,190	86,172	1,004,574	92,095	1,978,868	497,261	4,283	349,624	151,920	—133,962
El Paso & Southwestern Co	982[2]	5,380,574	831,144	6,492,849	745,988	866,729	125,630	1,776,449	235,849	3,750,645	2,747,204	—17,133	732,953	2,456,118	475,016
Elgin, Joliet & Eastern	820[2]	9,167,315	57	9,900,662	1,025,703	1,502,674	44,104	2,802,240	160,299	5,536,122	4,364,440	.....	257,273	4,107,167	1,231,888
Erie	1,988[2]	30,261,991	7,072,168	40,590,615	4,387,723	7,216,624	871,273	13,589,483	799,936	26,856,039	13,734,576	—280,935	1,332,658	12,120,991	1,142,374
Florida East Coast	642[2]	1,822,956	1,515,948	3,810,171	582,537	515,685	73,333	1,356,790	107,107	2,645,452	1,164,719	—11,651	145,500	1,007,568	219,192
Fort Worth & Denver City	454	2,749,407	1,226,196	4,174,234	482,792	731,216	61,374	1,432,727	132,261	2,780,350	1,394,394	—5,585	97,468	1,291,349	27,284
Galveston, Harrisburg & San Antonio	1,338	6,392,668	3,423,151	9,998,430	926,016	1,953,551	304,937	3,721,559	277,379	7,183,392	2,115,038	—26,576	285,435	1,803,027	219,703
Grand Rapids & Indiana	578[2]	2,480,657	1,388,841	4,197,356	545,372	658,239	103,714	1,769,380	140,242	3,216,947	980,409	.....	214,142	766,272	45,397
Grand Trunk Western	347	3,488,840	1,672,009	5,506,804	629,197	767,602	194,282	2,339,348	142,395	4,072,824	1,433,980	—14,036	268,894	1,151,050	66,491
Great Northern	7,783[2]	43,706,833	11,240,553	58,766,649	7,639,660	7,092,040	892,789	16,142,740	969,863	32,742,092	26,024,557	113,661	2,994,031	23,234,187	2,550,519
Gulf & Ship Island	308	1,143,594	313,376	1,567,852	212,672	279,453	25,209	415,113	74,236	1,006,683	561,169	.....	60,704	500,465	50,545

[1] Figures shown here are for period January 1 to March 31.

Average mileage operated during previous period—[2] 8,701; [2] 662; [2] 4,527; [2] 4,434; [2] 628; [2] 572; [2] 672; [2] 2,281; [2] 9,951; [2] 9,074; [2] 1,570; [2] 7,565; [2] 1,075; [2] 2,545; [2] 358; [2] 274; [2] 342; [2] 624; [2] 902; [2] 841; [2] 1,995; [2] 630; [2] 386; [2] 7,345. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

NINE MONTHS OF FISCAL YEAR 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Operating expenses—Maintenance—Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Gulf, Colorado & Santa Fe	1,595[m]	$7,821,425	$2,318,508	$10,758,296	$1,717,109	$1,565,711	$221,904	$3,910,025	$306,552	$7,721,301	$3,036,995	.....	$358,683	$2,678,312	$681,260
Illinois Central	4,763	32,161,517	10,386,860	48,833,637	6,380,038	10,414,876	1,012,665	18,917,883	1,133,193	37,858,655	10,974,982	−$63,276	2,155,750	8,755,956	3,051,539
Kanawha & Michigan	177	2,096,715	283,538	2,435,249	329,193	457,387	21,428	703,412	58,396	1,586,007	855,242	−134	29,669	775,219	−37,549
Kansas City Southern	827	6,040,196	1,270,373	8,102,197	758,723	1,023,524	235,478	2,701,831	292,171	5,011,727	3,090,470	.....	341,914	2,748,556	787,072
Lake Shore & Michigan Southern	1,872[m]	29,352,893	9,370,838	43,150,034	5,118,286	7,485,734	751,408	14,061,067	755,898	28,172,393	15,337,641	105,423	1,381,098	14,061,966	1,155,933
Lehigh Valley	1,452[m]	27,261,283	3,614,899	31,973,908	4,297,840	5,393,636	716,246	10,478,619	627,778	21,514,139	10,459,769	−137,845	1,060,500	9,261,424	903,863
Long Island	399	2,600,582	5,471,213	8,490,329	1,148,768	976,333	129,864	1,738,213	221,122	6,214,240	2,366,089	418,167	528,970	2,155,286	27,207
Louisville & Nashville	4,919[m]	32,364,609	9,724,212	44,867,163	7,542,659	8,495,403	941,612	14,749,958	1,041,912	32,771,544	12,095,619	−3,138	1,396,175	10,696,314	−1,128,055
Midland Valley	312	1,725,943	363,261	2,149,599	281,771	194,660	32,720	907,153	934,098	2,351,613	1,828	15,863	52,705	163,236	−58,619
Minneapolis & St. Louis	1,586	5,678,603	1,438,374	7,534,377	1,191,600	1,370,200	161,483	2,905,955	188,274	5,147,598	2,381,779	−338	284,067	2,097,374	1,053,610
Minneapolis, St. Paul & Sault Ste. Marie	3,976[m]	17,860,171	5,034,355	24,136,171	2,340,692	2,920,402	482,542	7,564,746	503,319	13,811,701	10,324,470	121,412	1,302,978	9,142,904	2,374,628
Missouri Pacific	3,929[m]	15,236,264	3,900,094	21,294,453	3,195,886	3,789,782	539,195	9,024,730	617,327	17,186,910	4,207,543	−28,153	853,530	3,325,860	2,071,442
Monongahela	65	1,229,012	22,749	1,267,848	141,145	95,220	3,120	241,037	18,460	499,192	768,656	.....	20,643	748,013	230,481
Nashville, Chattanooga & St. Louis	1,231	6,977,946	2,349,458	10,015,824	1,540,859	1,781,623	356,765	3,839,183	261,299	7,779,729	2,236,095	−3,689	230,132	2,002,274	104,404
Nevada Northern	165	1,049,253	135,309	1,216,834	132,202	143,385	3,510	275,042	31,968	586,107	630,727	.....	56,359	574,368	56,581
New Orleans & North Eastern	196	2,081,809	492,715	2,788,681	296,458	535,146	88,616	1,089,662	110,077	2,119,959	668,722	−2,325	112,081	554,316	−137,499
New Orleans Great Northern	283	935,827	269,866	1,307,420	178,653	227,160	22,160	390,230	59,878	890,178	597,242	−525	19,718	486,999	110,235
New York Central & Hudson River	3,732[m]	50,965,436	25,394,497	85,243,400	11,335,831	15,800,648	1,653,122	31,112,715	2,099,098	62,001,615	23,241,785	329,436	4,668,053	18,902,168	1,476,197
New York, Chicago & St. Louis	564[m]	8,160,643	1,719,998	9,984,791	1,331,521	1,299,962	147,565	4,090,065	155,066	6,918,324	2,665,545	−15,257	297,583	2,352,705	921,157
New York, New Haven & Hartford	2,091	25,819,714	20,982,897	51,253,704	5,686,430	6,960,293	983,974	20,650,106	1,451,343	35,032,146	16,723,558	714,498	2,895,000	14,543,056	−677,996
New York, Ontario & Western	565	5,745,100	1,299,894	7,317,525	892,569	1,125,995	101,977	2,624,438	150,771	4,895,750	2,221,775	−7,626	163,500	2,050,649	374,720
New York, Philadelphia & Norfolk	112	2,125,502	377,837	2,708,521	218,722	486,912	36,952	1,185,799	114,799	2,043,184	665,337	.....	71,400	593,937	26,550
Norfolk & Western	2,010[m]	26,252,942	3,578,905	32,941,971	4,008,733	6,139,093	508,695	9,733,044	601,457	20,991,022	11,950,949	−19,443	1,086,000	10,846,562	1,953,850
Norfolk Southern	562	1,682,930	611,699	2,503,590	307,601	330,652	43,519	765,921	137,910	1,605,653	897,937	−9,917	67,588	870,432	66,528
Northern Central	472[m]	7,461,122	1,839,715	9,946,302	1,202,798	1,990,031	144,580	4,787,603	244,101	8,370,113	1,576,189	5,234	374,379	1,207,044	189,815
Northern Pacific	6,314[m]	40,154,806	11,734,309	55,187,255	6,885,969	6,241,755	947,014	17,869,995	780,753	32,723,486	22,461,769	226,644	2,935,091	19,803,322	2,540,062
Oregon Short Line	1,933[m]	8,278,962	3,674,976	17,003,109	1,724,850	1,284,357	276,850	4,274,598	898,432	14,625,786	8,377,323	4,273	1,000,000	7,381,596	976,150
Oregon-Washington R. & N. Nav. Co.	1,919	9,107,325	3,821,667	13,843,157	1,837,352	1,506,788	411,264	5,033,337	438,780	9,217,521	4,635,636	−37,727	883,439	3,724,470	423,835
Pennsylvania Co.	2,211[m]	37,874,477	7,370,414	49,430,400	6,810,623	9,118,777	1,107,482	17,966,882	1,107,482	36,111,246	13,319,154	−37,727	1,414,142	11,867,285	1,451,869
Pennsylvania *Railroad*	4,025[m]	99,249,910	27,592,941	135,836,760	17,618,587	28,762,381	1,757,266	48,869,093	3,185,660	100,192,389	35,643,771	−946,189	3,526,239	29,171,343	1,741,389
Philadelphia & Reading	1,015	30,970,993	5,282,734	38,115,928	3,312,621	6,235,028	372,172	12,241,853	546,635	22,708,309	15,407,619	307,702	776,860	14,938,441	2,327,196
Philadelphia, Baltimore & Washington	713	7,742,231	6,383,472	15,707,267	2,587,249	2,779,258	261,437	6,545,605	400,727	13,573,676	3,133,591	.....	486,645	2,646,946	−186,548
Pittsburgh, Cincinnati, Chic. & St. Louis	1,427[m]	24,086,959	6,264,233	33,135,267	5,115,871	6,666,862	642,658	12,343,646	645,726	25,414,741	7,420,519	.....	1,262,174	5,710,706	295,550
Pittsburgh, Shawmut & Northern	279[m]	1,387,355	84,729	1,495,967	234,480	324,966	10,360	476,549	35,021	1,081,376	414,591	.....	14,296	400,295	10,877
Port Reading	21	1,178,400	.....	1,201,350	91,930	3,166	272	324,766	1,354	421,488	779,862	56,055	72,000	763,917	112,889
Rutland	468	1,493,828	923,104	2,772,534	332,384	554,790	75,311	1,110,652	59,663	2,132,800	639,734	.....	129,981	509,753	−89,716
St. Louis & San Francisco	4,742[m]	22,434,808	8,388,930	33,604,487	3,928,923	4,230,581	711,671	11,691,901	910,516	21,491,942	11,564,545	.....	1,516,284	10,048,261	1,241,158
St. Louis, Iron Mountain & Southern	3,765[m]	19,348,548	4,974,084	26,173,968	4,266,589	3,792,667	508,707	8,180,614	636,879	17,390,456	8,783,512	−39,165	898,995	7,935,353	1,255,108
St. Louis Merchants' Bridge Terminal	9	9	1,282	1,605,212	321,430	85,117	11,925	202,327	55,621	1,136,257	364,749	.....	52,450	312,298	94,786
St. Louis Southwestern of Texas	703	2,624,613	874,344	3,742,361	733,738	710,862	122,192	1,495,264	178,274	3,240,330	502,031	−1,772	97,391	402,868	−51,929
San Antonio & Aransas Pass	727	2,743,594	1,072,857	4,008,577	612,086	490,224	55,200	1,505,928	97,604	2,761,072	1,247,505	.....	105,000	1,142,505	151,753
Seaboard	3,076[m]	12,517,674	4,022,499	18,364,623	2,424,994	2,525,468	571,284	6,619,332	515,917	12,656,995	5,707,628	−18,204	725,000	4,964,424	663,681
Southern	7,037[m]	34,245,711	13,861,959	52,103,002	6,861,720	8,519,904	1,539,153	12,676,488	1,499,618	36,067,311	16,071,690	54,839	1,864,787	14,261,742	654,347
Southern Pacific Co.	6,379[m]	43,018,726	24,034,946	72,133,006	7,722,508	9,896,003	1,547,882	20,134,998	1,933,934	41,234,335	30,888,671	1,273,525	3,337,870	28,824,336	2,615,567
Spokane, Portland & Seattle	556	2,452,103	1,246,316	4,025,282	464,958	349,890	66,506	986,327	115,157	1,982,838	2,042,444	1,504	480,600	1,563,348	77,373
Terminal R. R. Ass'n of St. Louis	34[m]	3,551	2,551	2,228,907	351,736	158,790	8,227	459,231	60,878	1,438,861	840,046	97,233	243,205	694,574	137,730
Texas & Pacific	1,885	9,274,536	3,506,663	14,175,554	1,743,854	2,235,228	305,983	6,431,836	415,497	11,115,255	3,060,299	−20,173	494,621	2,585,851	−535,377
Toledo, St. Louis & Western	451	2,742,757	269,901	3,203,407	408,003	420,272	114,423	1,124,802	81,752	2,149,252	1,054,155	.....	133,600	920,555	214,035
Trinity & Brazos Valley	397	1,842,911	448,272	2,381,877	396,013	303,499	92,424	1,190,072	119,442	2,992,423	1,389,454	.....	135,611	1,253,843	352,611
Union Pacific	3,578[m]	28,023,646	8,016,925	39,581,712	4,144,873	4,668,257	810,136	10,632,851	1,019,499	21,276,116	18,305,596	−33,491	1,622,748	16,649,357	2,498,590
Union R. R. of Baltimore	9	1,105,848	209,725	1,330,640	84,617	.....	8,315	48,190	24,718	165,840	1,164,800	.....	50,422	1,114,378	198,849
Union R. R. of Pennsylvania	31	.....	.....	3,385,119	268,288	774,043	1,016	1,304,232	36,169	2,383,748	1,001,371	18,609	59,750	960,230	111,465
Vandalia	827	5,878,627	1,813,456	8,537,809	1,104,824	1,691,926	229,440	3,184,149	171,624	6,381,463	2,156,346	.....	278,217	1,878,129	321,393
Vicksburg, Shreveport & Pacific	171	791,904	401,964	1,301,899	253,972	228,241	30,026	413,570	46,169	971,969	329,930	−3,949	54,535	271,446	33,949
Virginian	475[m]	4,006,660	234,798	4,355,301	549,805	810,565	47,458	1,032,594	79,493	2,519,915	1,835,386	53,679	158,300	1,730,765	441,577
West Jersey & Seashore	156	1,392,638	3,161,080	4,863,877	715,843	740,566	129,923	1,998,382	119,471	3,704,184	1,159,693	−38,310	200,825	920,558	312,582
Wheeling & Lake Erie	459[m]	3,129,405	485,364	3,945,375	785,640	1,161,959	73,312	1,933,474	156,806	4,115,195	1,830,180	22,996	271,287	1,581,904	−173,186
Yazoo & Mississippi Valley	1,324	5,868,113	2,042,064	8,510,716	1,534,870	1,315,509	135,842	3,364,095	239,710	6,489,976	2,020,740	1,276	333,000	1,689,016	295,783

Average mileage operated during previous period—[m] 1,592; [m] 1,775; [m] 1,450; [m] 4,722; [m] 3,270; [m] 3,915; [m] 3,597; [m] 562; [m] 2,014; [m] 473; [m] 6,032; [m] 1,762; [m] 1,760; [m] 4,018; [m] 1,462; [m] 278; [m] 4,732; [m] 3,315; [m] 3,070; [m] 7,090; [m] 6,212; [m] 35; [m] 3,537; [m] 603; [m] 457. — Indicates Deficits, Losses and Decreases.

Railway Officers.

Executive, Financial and Legal Officers.

L. C. Everett, general auditor of the Bangor & Aroostook at Bangor, Me., having resigned, A. W. Grindle has been appointed acting general auditor, with office at Bangor.

J. T. Ehricht has been appointed auditor of the Wichita Valley with headquarters at Wichita Falls, Tex., succeeding W. C. Logan, resigned to accept service with another company.

W. A. Colston, commerce attorney of the Louisville & Nashville, at Louisville, Ky., has been appointed general solicitor, with headquarters at Louisville, succeeding A. S. Brandies, deceased.

The officers of the Alabama, Florida & Southern are: E. L. Marbury, president; W. S. Wilson, vice-president and general manager, and W. F. Bray, auditor and traffic manager, all with offices at Malone, Fla.

The East Tennessee & Western North Carolina has taken over the Linville River Railway, and the officers are now as follows: Edgar P. Earle, president; A. Pardee, vice-president, and John S. Wise, secretary and treasurer.

Thomas J. Freeman, president of the International & Great Northern, and operating vice-president of the Texas & Pacific, has resigned as vice-president to become general counsel of the latter company, the vice-presidency of which will be assumed by E. P. Kearney, general superintendent of transportation of the Missouri Pacific at St. Louis, Mo.

Vice-president A. R. Whaley of the New York, New Haven & Hartford, and the Central New England, is now in charge of the engineering, construction and maintenance department of these companies, in addition to his duties as head of the operating department. Vice-president E. H. McHenry, who has been in charge of the engineering, construction and maintenance department, has resigned, as heretofore announced, and he retired from the service of the company May 1.

Operating Officers.

John W. Hoffman has resigned as general manager of the Missouri, Oklahoma & Gulf.

W. A. Durham, assistant general manager of the Missouri, Kansas & Texas, with headquarters at St. Louis, Mo., having resigned, the position is abolished.

John McNaughton has been appointed trainmaster of the Erie Railroad and the New Jersey & New York, with office at Jersey City, N. J., succeeding H. R. Cole, transferred.

D. Sullivan, formerly division superintendent of the Missouri, Kansas & Texas, has been appointed general superintendent of the Apalachicola & Northern, with headquarters at Port St. Joe, Fla.

D. C. Frederick, car service agent of the Chicago, Peoria & St. Louis, has been appointed superintendent of transportation, with headquarters at Springfield, Ill., succeeding W. D. Danley, resigned.

J. H. Clark, assistant superintendent of floating equipment of the Baltimore & Ohio at New York, has been appointed superintendent of floating equipment, with headquarters at Baltimore, Md., succeeding Walter Ancker, deceased.

James D. Beaver, trainmaster of the Pittsburg, Shawmut & Northern at St. Marys, Pa., has been apointed assistant superintendent, with office at St Marys, and James T. Colbert has been appointed trainmaster, with office at St. Marys Junction.

W. H. Averell, assistant general superintendent of the Baltimore & Ohio at Pittsburgh, Pa., has been transferred to a position with the same title at New York, and has also been appointed general superintendent of the Staten Island Railway Company and the Staten Island Rapid Transit Railway Company, B. & O. lines operated on Staten Island. A sketch of Mr. Averell's railway career was published in the *Railway Age Gazette* of July 26, 1912, page 181.

L. J. Ferritor, superintendent of the Scranton division of the Delaware, Lackawanna & Western at Scranton, Pa., has been appointed superintendent of the Buffalo division, with office at Buffalo, N. Y., succeeding M. H. Cahill, resigned, and P. N. Place has been appointed acting superintendent of the Scranton division, with office at Scranton, succeeding Mr. Ferritor. A portrait of Mr. Ferritor and a sketch of his railway career were published in the *Railway Age Gazette* of January 17, 1913, p. 128.

Traffic Officers.

W. K. Cundiff, assistant general passenger agent of the Union Pacific System at Omaha, Neb., has been transferred to Kansas City, Mo., in a similar capacity.

Edward Briggs, general agent of the Wheeling & Lake Erie, at Cleveland, Ohio, has been appointed assistant general freight agent, with office at Cleveland.

Harry J. Flynn has been appointed soliciting freight agent of the St. Louis Southwestern, with office at Louisville, Ky., in place of C. C. Rockenbach, transferred.

J. W. Overman has been appointed traveling freight agent of the Toledo, St. Louis & Western, with headquarters at Kansas City, Mo., in place of F. C. Ferguson, promoted.

Emil J. Bauer has been appointed manager of lighterage and foreign freight departments of the Erie, with headquarters at New York, succeeding Arthur J. Grymes, resigned.

Marshall Taylor has been appointed city ticket agent of the Chicago, Milwaukee & St. Paul, at Portland, Ore., in place of J. O. Thomas, resigned to engage in the real estate business.

W. H. Saunders, traveling traffic inspector of the Cincinnati, New Orleans & Texas Pacific at Cincinnati, Ohio, has been appointed soliciting freight agent with headquarters at Cincinnati, succeeding W. S. Logan, transferred, and C. J. Scherer succeeds Mr. Saunders.

A. B. Day, traveling passenger agent of the Delaware, Lackawanna & Western at Buffalo, N. Y., has been transferred in the same capacity to Chicago, succeeding H. C. Dickson, deceased, and F. S. Clark has been appointed traveling passenger agent at Buffalo, succeeding Mr. Day.

Owing to the resignation of George A. Blair as general traffic manager of the Chicago & Alton, until further notice C. A. King, freight traffic manager, will have charge of freight traffic, and George J. Charlton, passenger traffic manager, will have charge of passenger traffic, both with headquarters at Chicago.

George H. Clark has been appointed division freight and passenger agent of the Ottawa division of the New York Central & Hudson River extending from Tupper Lake, N. Y., to Nyando, with headquarters at Ottawa, Ont. This new division was formerly the New York & Ottawa Railway. Mr. Clark also retains the position of general freight and passenger agent of the Ottawa & New York, which is the Canadian end of the New York Central line to Ottawa.

Engineering and Rolling Stock Officers.

Arthur N. Carver has resigned as division engineer of the San Benito & Rio Grande Valley at Mission, Tex.

H. E. Myers has been appointed shop superintendent of the Lehigh Valley, with headquarters at Packerton, Pa.

Charles Boertman has been appointed superintendent of shops of the Pere Marquette at Saginaw, Mich., in place of George Hilferink.

K. A. Dunphy has been appointed resident engineer of the Canadian Pacific, District No. 2, Alberta division, with headquarters at Calgary, Alta., in place of J. Robertson.

W. W. Morrison has been appointed assistant signal engineer of the Electric Zone and the Electric division of the New York Central & Hudson River, succeeding R. C. Johnson, resigned.

T. M. Vickers, formerly master mechanic of the San Pedro, Los Angeles & Salt Lake, has been appointed general foreman of the Oregon Short Line at Pocatello, Idaho, effective May 1.

Joseph E. Crawford, bridge engineer of the Norfolk & Western at Roanoke, Va., has been appointed acting chief engineer, succeeding Charles S. Churchill, assigned to special duty.

T. J. Burke, division engineer of the Lehigh Valley at Auburn, N. Y., has been appointed division engineer on the Mahanoy & Hazleton division, with office at Hazleton, Pa., succeeding J. A. Zehner, resigned.

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K. B. Duncan, office engineer of the Atchison, Topeka & Santa Fe, at Topeka, Kan., has been appointed engineer of the Gulf, Colorado & Santa Fe, with office at Galveston, Tex., succeeding R. A. Rutledge, promoted.

B. C. Martin, resident engineer of the New York Central & Hudson River at Utica, N. Y., has been appointed assistant district engineer, Hudson division, with headquarters at Poughkeepsie; and G. F. Chisholm, resident engineer at Rome, succeeds Mr. Martin.

W. B. Willis has been appointed assistant division engineer of the Monongah division of the Baltimore & Ohio, with headquarters at Grafton, W. Va., succeeding H. F. Kloss, transferred, and D. W. Whisner has been appointed supervisor of subdivision No. 11, with headquarters at Clarksburg.

W. S. Murray, electrical engineer of the New York, New Haven & Hartford at New Haven, Conn., has resigned, and has formed a partnership with E. H. McHenry, under the firm name of McHenry & Murray, engineers. Mr. McHenry resigned as vice-president of the New Haven on May 1. (See an item in Supply Trade News.)

H. W. Wagner, principal assistant engineer Western lines of the Atchison, Topeka & Santa Fe at Amarillo, Tex., has been appointed engineer of the Western lines, Northern district, with headquarters at La Junta, Col., succeeding F. M. Bisbee, promoted, and N. R. Cullings has been appointed engineer of the Western lines, Southern district, with headquarters at Amarillo, Tex.

C. M. Nye has been appointed principal assistant engineer of the Great Northern, with headquarters at St. Paul, Minn. Oscar S. Bowen, resident engineer at Spokane, Wash., has been appointed resident engineer at Seattle, Wash., in place of R. L. Beaulieu, and will have jurisdiction over the Western district. The jurisdiction of P. S. Hervin, resident engineer at Great Falls, Mont., has been revised to cover the Montana and Butte divisions and the Central district. The positions of assistant chief engineer at St. Paul and resident engineer at Spokane are abolished. H. S. Wollan has been appointed acting resident engineer at Superior, Wis., with jurisdiction over the Lake district. The jurisdiction of H. F. Hamilton, resident engineer at St. Paul, has been revised to cover the Eastern district. The effect of the changes is to make the jurisdiction of the four resident engineers correspond with that of the general superintendents to place their headquarters at the same places.

Purchasing Officers.

C. C. Colley has been appointed purchasing agent of the Louisiana Railway & Navigation Company, with headquarters at Shreveport, La., in place of G. E. Smith, resigned.

Special Officers.

C. E. L. Bergstrom has been appointed assistant industrial commissioner of the Erie, the New York, Susquehanna & Western, the New Jersey & New York, and the Chicago & Erie, and H. M. Andrews has been appointed general land and tax agent, succeeding Harrison Williams, resigned, both with headquarters at New York.

OBITUARY.

George E. Chase, Southwestern passenger agent of the Chicago, Milwaukee & St. Paul at Kansas City, Mo., died on May 3, aged 45 years.

G. Asheton Carson, president of the Catawissa Railroad, a subsidiary of the Philadelphia & Reading, died recently at Philadelphia, Pa., at the age of 66.

Maurice Dunnean, roadmaster of the Chicago, Rock Island & Pacific, at Goodland, Kan., was killed when a work train was wrecked near Colby, Kan., on May 1.

J. C. McCabe, general freight agent of the Chicago, Rock Island & Gulf, with headquarters at Ft. Worth, Tex., died in that city on May 3, aged 61 years. He began railway work in 1876 and had been connected with the Rock Island system since 1881, successively as traveling freight agent, commercial agent and second assistant freight agent of the Chicago, Rock Island & Pacific, general freight agent of the Chicago, Rock Island & Texas, and since December, 1903, general freight agent of the Chicago, Rock Island & Gulf.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE VANDALIA has ordered 4 Pacific type locomotives from the American Locomotive Company.

THE SOUTHERN PACIFIC has ordered 5 mikado locomotives from the Baldwin Locomotive Works.

THE SEABOARD AIR LINE, mentioned in the *Railway Age Gazette* of May 2 as having ordered 40 Pacific type locomotives from the American Locomotive Company and 5 switching locomotives from the Baldwin Locomotive Works, has ordered 35 freight Pacific type locomotives and 7 passenger Pacific type locomotives from the American Locomotive Company, and 5 switching locomotives and 1 dummy motor from the Baldwin Locomotive Works.

THE ATLANTA & WEST POINT has ordered 2 Pacific type locomotives and 1 six-wheel switching locomotive from the American Locomotive Company. The Pacific type locomotives will be equipped with superheaters and will have 24 in. x 28 in. cylinders, 73 in. driving wheels, and in working order will weigh 257,000 lbs. The six-wheel switching locomotive will have 19 in. x 24 in. cylinders, 32 in. driving wheels and in working order will weigh 119,000 lbs.

THE BESSEMER & LAKE ERIE has ordered 8 consolidation locomotives and 4 Pacific type locomotives from the American Locomotive Company, and 2 consolidation locomotives from the Baldwin Locomotive Works. The eight consolidation locomotives will have 22 in. x 30 in. cylinders, 54 in. driving wheels and in working order will weigh 205,000 lbs. The Pacific type locomotives will be equipped with superheaters, will have 24 in. x 28 in. cylinders, 73 in. driving wheels and in working order will weigh 232,000 lbs.

THE NEW YORK CENTRAL LINES have ordered 35 mikado locomotives, 33 Pacific type locomotives, 23 eight-wheel switching locomotives, 20 six-wheel switching locomotives and 3 Mallet (0-8-8-0) locomotives from the American Locomotive Company, and 10 six-wheel switching locomotives from the Baldwin Locomotive Works. These locomotives will be allotted as follows: New York Central & Hudson River, 20 Pacific type locomotives; Lake Shore & Michigan Southern, 20 eight-wheel switching locomotives, 5 Pacific type locomotives and 3 Mallet locomotives; Michigan Central, 25 mikado locomotives, 20 six-wheel switching locomotives, 8 Pacific type locomotives and the 10 Baldwin switching locomotives; Cleveland, Cincinnati, Chicago & St. Louis, 10 mikado locomotives; Toledo & Ohio Central, 3 eight-wheel switching locomotives.

CAR BUILDING.

THE CHARLOTTE HARBOR & NORTHERN is in the market for 35 phosphate cars.

THE HAVANA CENTRAL has ordered 50 gondola cars from the Pressed Steel Car Company.

IRON AND STEEL.

GENERAL CONDITIONS IN STEEL.—The steel companies are receiving new business at the rate of between 75 and 80 per cent. of actual production. A further reduction in the volume of unfilled tonnage in the current month is therefore expected unless the buying movement shows a decided improvement within the next two or three weeks. As the mills are still operating at almost their full capacity, the steel manufacturers are not disposed to make any reductions in prices to stimulate the buying movement. Consumers are holding off in expectation of lower prices when a large percentage of the orders now on the books has been worked off. The orders on the books at present are sufficient to keep the mills operating at their present rate for the next five or six months. The earnings in the current quarters should be larger than in the first quarter, as the average price on steel deliveries will be slightly higher.

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Supply Trade News.

The Standard Coupler Company, 2 Rector street, New York, has moved its general offices to 30 Church street, New York.

George W. Craven, manager of the Chicago office of the C. & C. Electric Company, New York, has been made manager of the welding department of that company, with headquarters at Garwood, N. J., succeeding George A. Hills, resigned.

The firm of Burton W. Mudge & Co., railroad supplies, of Chicago, has changed its name to Mudge & Company, railroad specialties, and the general offices in Chicago have been removed from the Peoples Gas building to the Railway Exchange.

W. S. Murray has resigned as electrical engineer of the New York, New Haven & Hartford, and has formed a partnership with E. H. McHenry, who recently resigned as vice-president of the New Haven, under the firm name of McHenry & Murray, engineers. The firm will specialize in railway electrification work, including plans, estimates, construction and operation, and will handle work of this character for the New Haven.

The Davis Brake Beam Company has been formed by H. H. Weaver, of Johnstown, Pa., and his associates, and has taken over the control of the Davis Solid Truss Brake Beam Company, Wilmington, Del., maker of the Davis solid truss brake beam, pressed steel journal box lids and other railroad specialties. As soon as a suitable site is secured, the works will be brought to the Pittsburgh district, possibly some place near Johnstown. The new plant will be considerably larger than the present one. F. R. Weaver is manager.

Adolphus Bonzano, pioneer bridge builder and inventor of the Bonzano rail joint and other railroad appliances, died at his home in Philadelphia, Pa., on May 5, at the age of 83. His death was directly attributable to a serious fall sustained by him about two months ago. Mr. Bonzano was born at Ehingen, Germany, on December 5, 1830. He received a classical and engineering education, both at Ehingen and at Stuttgart, Germany. In 1850 he went to Philadelphia, Pa., to perfect himself in the study of the English language. In 1851 he went to Springfield, Mass., where for the following four years he served as apprentice, machinist and draftsman for the American Machine Works. In 1855 he went to New Orleans, La., to take charge of the erection of engines and other machinery. After a short time he went to Detroit, Mich., where he was engaged until 1860 as superintendent of the Detroit Dry Dock Engine Works, which was later transformed into the Detroit Bridge & Iron Works, one of the earliest bridge building plants in this country, of which Mr. Bonzano, was appointed superintendent of construction. In 1868 he went to Phoenixville, Pa., where with Thomas Curtis Clarke and others, he formed the firm of Kellogg, Clarke & Company, bridge builders. Mr. Bonzano was a member of this firm and also chief engineer. In 1870, the firm was succeeded by Clarke, Reeves & Company, Mr. Bonzano continuing as chief engineer. In 1884, this firm was dissolved and was succeeded by the Phoenix Bridge Company, of which Mr. Bonzano was made vice-president and chief engineer. In 1893 he resigned this position and opened an office in New York with T. C. Clarke as consulting engineers. After the death of Mr. Clarke in 1898, Mr. Bonzano retired from active business to devote himself to the invention of railroad and other appliances. Among the most prominent bridges designed by Mr. Bonzano are the Pecos viaduct on the Southern Pacific in Texas, the Kinzua viaduct on the Erie and the Chesapeake & Ohio bridge at Cincinnati.

Adolphus Bonzano.

Railway Construction.

Alabama, Florida & Southern.—This road is now in operation from Ardilla, Ga., on the Atlantic coast line south to Malone, Fla., 15 miles.

Beloit, Clinton & Delavan Interurban.—An officer writes that contracts will be let soon to build from Beloit, Wis., northeast through Shopiere, Clinton, Allen's Grove and Darien to Delavan, 22½ miles. About one-half of the right of way has been secured. There will be two steel bridges about 100 ft. long, also a power house. The company has under consideration the question of constructing a dam to secure water power. Charles F. Lathers, Beloit, may be addressed.

Benewah Valley.—An officer writes that the plans call for building from a point on the Chicago, Milwaukee & St. Paul at St. Maries, Idaho, southwest to Desmet, about 25 miles. The prospects of building the line are good, but it has not yet been decided when contracts for the work will be let. Maximum grades will be 2 1/10 per cent., and maximum curvature 16 deg. Maurite I. Parker, St. Maries, may be addressed.

Canadian Northern.—An officer writes that a 4.15-mile spur is proposed to be built for the Manitoba Gypsum Company at mile 111.89 on the Oak Point branch in Manitoba. (April 18, p. 925.)

Chicago & Alton.—Work has just been started on some heavy grade reduction between Atlanta and Lawndale, Ill. The work includes the handling of about 1,000,000 cu. yds. of earth and will be done with company forces.

Clay Line.—Incorporated in Alberta, to build a railway from sec. 2, tp. 11, range 6, northerly to sec. 2, tp. 12, range 6, west of the 4th meridian, thence to Medicine Hat, Alta. The provisional directors include: H. O. Knowles, S. G. Bannan, L. Hunt, Medicine Hat.

Dominion North Western.—The Canadian government has incorporated this company to build from Regina, Sask., west to Tuxford, on the Canadian Pacific, thence to Red Deer, Alta., with a branch through Battleford, Sask., to Fort McKay, M. J. O'Connor, Ottawa, Ont., is interested in the project. (December 20, p. 1235.)

Houston & Texas Central.—Work on the cut-off building from Stone City, Tex., southwest to Giddings, about 40 miles, it is expected will be finished and the line opened for traffic in a few weeks. (September 20, p. 559.)

Intermarine Railway & Navigation Company.—An officer writes that the prospects of building this line are good and that bids will probably be let in the spring of 1914. The projected route is from a point near the head of Lake Winnipeg, Man., northeasterly 122 miles to a junction with the Dominion government railway to Hudson bay, at mile 191 from Pas. The company expects to use both steam and electricity for the motive power, and to develop a traffic in grain, timber, fish, furs and merchandise. W. S. Boyd, acting secretary, 715 Somerset Block, Winnipeg. (April 25, page 973.)

Lehigh Valley Transit Company.—This company is planning to construct cut-offs and make other improvements to reduce the running time from Allentown, Pa., to Philadelphia. Bids have just been asked for double-tracking a 14-mile section from Lansdale north to Souderstown. Work is now under way on the construction of the $500,000 high-level concrete bridge to connect Allentown with South Allentown. It is expected that the bridge will be ready for operation some time during this coming fall.

Lorain, Ashland & Southern.—This company has given a contract to McArthur Bros. for the completion of the 65-mile line from Ashland, Ohio, to Custaloga on the Ft. Wayne line of the Pennsylvania Railroad, with a belt line 8½ miles long in Lorain. The contract is for a section of 23 miles. The remaining 42 miles is already in operation. Bonds will be issued to cover the cost of the new construction, which it is expected will be finished by October 1. Joseph Ramsey, Jr., president. (January 10, p. 87.)

Menzies Bay Railway.—This company, which is a subsidiary of the Ross McLaren Lumber Company, Vancouver, B. C., pro-

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pose to build a railway on Vancouver Island, to open up its timber lands.

NEW YORK CENTRAL & HUDSON RIVER.—An officer writes that grading work is now under way for five miles of double track on the Pennsylvania division near Lawrenceville, Pa. It is expected that the track laying will be carried out in July.

NORTHERN PACIFIC.—According to press reports surveys have been made for a line from East Grand Forks, Minn., north to Drayton, N. Dak.

OREGON ELECTRIC.—An extension of this road from Gray, Ore., west to Corvallis, 5 miles, has been opened for business.

OREGON-WASHINGTON RAILROAD & NAVIGATION COMPANY.—An officer writes that the Oregon Eastern, on which work was started some time ago, has track laid on 36.73 miles of the first section of 80 miles building from Vale, Ore., west. The Utah Construction Company, Ogden, Utah, has the contract. The plans call for building from Vale via Harper, Junctura, and Riverside to Arden, 140 miles; from Arden west to Odell (or Crescent), 147 miles additional has been located. There will be 19 steel bridges having a total length of 4,835 ft. and 72 trestles, also two tunnels to have a total length of 2,618 ft. At Harper a station is to be built. (See Oregon Short Line, January 19, 1912, p. 132.)

OREGON EASTERN.—See Oregon-Washington Railroad & Navigation Company.

PEORIA, CANTON & GALESBURG.—Incorporated in Illinois with $2,000,000 capital stock. The plans call for building from Peoria, Ill., west to Farmington, 25 miles, and thence northwest to Galesburg, an additional 25 miles. The directors include J. A. Lyon, H. Clark, W. B. Coleman, G. C. Powers and G. T. Page.

PRYOR-SALINA & EASTERN (Electric).—We are told that a line will be built from Pryor creek, Okla., east to Salina and to Locust grove, about 22 miles, but it has not yet been definitely decided when contracts will be let. There will be one steel bridge. The company expects to develop a traffic in hay, fruit, farm and dairy products. J. A. Quinn, Pryor, is the promoter. (See Oklahoma Roads, May 2, p. 1013.)

SAN ANTONIO, UVALDE & GULF.—The Pleasanton, Campbellton sub-division has been extended from Campbellton, Tex., to Whitsett, 8.2 miles. (April 11, p. 863.)

SAN LUIS CENTRAL.—An officer writes that the plans call for building from Monte Vista, Colo., north to Center, 12 miles. A grading contract has been given to A. H. Smith, Pueblo, Colo., and the work is now under way. Track has been laid on one mile. There will be about eight small bridges and several culverts. The R. E. McGregar Construction Company, Monte Vista, are the engineers. The plans include building a station and a roundhouse. The company expects to develop a traffic in sugar beets, potatoes, live stock and other farm products.

TEXAS ROADS (Electric).—Financial support is said to have been secured to build a line from Texarkana, Tex., west via New Boston and DeKalb to Clarksville, about 60 miles. F. W. Offenhauser and associates of Texarkana are back of the project.

ULSTER & DELAWARE.—The right of way of the line between Cold Brook, N. Y., and Stony Hollow, about 14 miles, having been taken by the State of New York for the New York City water supply, the line of the railroad has been relocated to the northward. The relocated line will be put in operation June 1; with the following new stations: Woodstock, 10.15 miles from Kingston Point, and Ashokan, 16.17 miles from Kingston Point. The stations abandoned are West Hurley, Olive Branch, Brown's, Brodhead's Bridge, Shokan and Boiceville.

VIRGINIA-CAROLINA.—An officer writes that contracts were to be let on May 5, and the work started at once on a 40-mile extension in addition to the 8 miles for which a contract was let in December of last year to the Callahan Construction Company, Knoxville, Tenn. The plans call for building from a point in Washington county, Va., near the mouth of Green Cove creek, southeast through Ashe county, N. C., to Jefferson, thence southwest to Todd. The company expects to develop a traffic in lumber, iron ore and fruit. (April 25, p. 974.)

VIRGINIA ROADS.—An officer of the Lyndhurst Lumber Corporation, Richmond, Va., writes that work is under way on a line from Lipscomb, Va., on the Norfolk & Western southeast via Sherando to a point beyond that place. The company is carrying out the work with its own men, and about 2.75 miles of track has been laid. G. S. Briggs, president.

WATERLOO, CEDAR FALLS & NORTHERN (Electric).—An officer writes that the company is building from Waterloo, Iowa, to Urbana in the same state, and 17 miles of this line between Waterloo and LaPorte City has already been constructed and is now in operation. The 20 miles from LaPorte City to Urbana is under construction, and the company expects to lay track on this section during July and August. R. A. Elzy, Marshalltown, has the contract for the grading work. The Gould Construction Company, Davenport, has the contracts for wooden and concrete bridges and the Sims Wet Process Concrete Company, Cedar Falls, has a contract for the fencing. The track laying is being carried out by the company's men. The first 24 miles is along the Cedar river valley; the maximum grade being .3 to 1 per cent., and on the balance of the line it will be 1 per cent. equated for curvature. The grading work involves handling about 15,000 cu. yds. a mile, about 4 miles of the line being rock work. The maximum curvature is 5 deg. There will be about 17 creosoted ballasted deck pile trestles, 20 concrete bridges and culverts, varying from small box culverts to a nine span concrete arch bridge 630 ft. long over the Cedar river. The company has finished work on a six span arch bridge 420 ft. long over the same river near Waterloo. The most important station is at LaPorte City, and other station buildings include brick structures, 22 ft. x 100 ft., containing sub-station, office, waiting and freight rooms. (November 29, p. 1064.)

RAILWAY STRUCTURES.

ALLENTOWN, PA.—See Lehigh Valley Transit Company under Railway Construction.

BLOOMINGTON, ILL.—The Chicago & Alton has appropriated $987,000 for the erection of new shops at this point. This is in connection with an extensive program of improvements at Bloomington, a part of which has already been completed. A roundhouse and additional yards have been built, a passenger station is now under construction, and additional yard tracks are contemplated.

SUDBURY JUNCTION, ONT.—An officer of the Canadian Northern Ontario writes that contracts have been given to Foley Bros., Cincinnati, Ohio, for the concrete substructures, and to the Canada Foundry Company, Toronto, Ont., for fabricating and erecting the steel superstructures of the following deck plate girder bridges: Over first crossing of Goose river, 80-ft. span, to cost $14,080; second crossing of the same river at mile 171.7 from Sudbury Junction, two 60-ft. spans, to cost $14,128; Kabinakagami river at mile 286, one 40-ft., one 50-ft., and three 70-ft. spans, to cost $37,950, and over Little Jackfish river, half-through girder, 63-ft. span, to cost $12,511. The paint used on the bridges was: Shop coat, Sherwin Williams' Metallastic brown, and field coats, Wasatch structural. (February 21, p. 374.)

TORONTO, ONT.—An officer of the Canadian Pacific writes that in connection with the grade separation work at North Toronto, the company is building a five track viaduct about three and a half miles long, including new terminals, etc. At the present time five subways are under construction by contract, and five additional subways will probably be under construction soon, also the erection of the new union station at Yonge street. The work is being carried out jointly for the Canadian Pacific and the Canadian Northern. (March 7, p. 461.)

VAN BUREN, MAINE.—Application is being made to the Canadian parliament to vest in the Van Buren Bridge Company, which has been incorporated in the state of Maine, the charter rights of the Restigouche & Western Railway (now the International Railway of New Brunswick), to build a bridge over the St. John river, between St. Leonards, New Brunswick, and Van Buren, Maine. A. E. McKenzie, Campbellton, N. B., is solicitor for the applicants. (January 24, p. 191.)

WATERLOO, IOWA.—See Waterloo, Cedar Falls & Northern under Railway Construction.

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Railway Financial News

ANN ARBOR.—J. S. Bache & Company, New York, and others have purchased $750,000 one year 6 per cent. notes dated May 1. These notes are secured by $1,250,000 5 per cent. extension and improvement bonds and by 465 steel-underframe box cars and other property. The proceeds of the notes were used to retire $600,000 notes and $23,000 equipment obligations due May 1, and the remaining $127,000 will be used for general purposes.

BOSTON & MAINE.—The directors have postponed until June any action regarding a dividend on the common stock.

CANADIAN NORTHERN.—This company and its subsidiary, the Canadian Northern Branch Lines Company, will on June 2 apply to the Canadian railway commission for a recommendation to the governor general for the sanction of the amalgamation of the two companies.

CANADIAN NORTHERN BRANCH LINES COMPANY.—See Canadian Northern.

CASSVILLE & WESTERN.—This property will be sold at auction in Cassville, Mo., on May 17; upset price $45,000. The road runs from Cassville to Exeter, Mo., 4½ miles.

DENVER & SALT LAKE.—See Denver, Northwestern & Pacific.

DENVER, LARAMIE & NORTHWESTERN.—Judge Allen in the district court on April 17 denied the petition of the Electrical Properties Company for an injunction restraining the sale of $254,000 of the company's bonds deposited as collateral. The court stated that the company may soon be solvent and the interests of the stockholders and bondholders should be protected.

DENVER, NORTHWESTERN & PACIFIC.—This property was sold to the reorganization committee for $3,000,000, the upset price, at the foreclosure sale in Denver on April 28. It has subsequently been turned over to the new company, the Denver & Salt Lake.

ERIE.—Application will soon be made for permission to issue $5,000,000 equipment certificates.

GRAND TRUNK PACIFIC.—This company recently offered in London £2,000,000 ($10,000,000) 4 per cent. debenture stock at 87 through Glyn, Mills, Currie & Company. This stock ranks on an equal basis with the £5,136,980 ($25,684,900) 4 per cent. debenture stock outstanding.

HUDSON & MANHATTAN.—Application will be made to the New York Public Service Commission, First district, for permission to make two proposed mortgages, one to the Central Trust Company, New York, as trustee, to be known as the first lien and refunding mortgage, and the other to the Guaranty Trust Company, New York, as trustee, to be known as the adjustment income mortgage. The first lien and refunding mortgage is to secure a bond issue not exceeding $65,000,000, and the adjustment income mortgage is to secure an issue of bonds not exceeding $33,574,000. All of the adjustment income bonds and $37,035,000 of the first lien bonds are to be issued at once. The proceeds will be used to acquire $67,148,000, 4½ per cent. first mortgage bonds and for general purposes.

INTERBOROUGH RAPID TRANSIT.—An extra dividend of 2 per cent. has been declared on the stock.

LARAMIE, HAINES PEAK & PACIFIC.—The bondholders protective committee, of which Alexander J. Hemphill is chairman and Lewis B. Franklin, 140 Broadway, is secretary, has issued a circular dated April 24, 1913, urging the holders of the first mortgage bonds, not to deposit such bonds with any committee at present, but to approve an issue of $315,000 receivers' certificates which shall be a first lien on the entire property. The funds which would be derived from this sale are urgently needed for current expenses, new equipment, etc. If this permission is not given, application will be made to the circuit court of appeals, which, in the opinion of the committee's counsel, has power to make these certificates a first lien ahead of all other mortgages, in spite of any objections that may be made. The circular points out that the opposition of the holders of the first mortgage bonds to this issue would only result in a delay of about one year in the issuance of the certificates. The committee will purchase the coupons for interest due January 1, 1913, on all first mortgage bonds, the holders of which consent to this issuance, and also agrees that the coupons so purchased shall be made subordinate in lien to the lien of all future maturing coupons and to the lien of the principal of the bond.

LOUISVILLE & NASHVILLE.—Brown Bros. & Company and Potter, Choate & Prentice, both of New York, have sold $6,500,000 equipment series A 5 per cent. certificates at par. These certificates are dated June 1 and will mature in semi-annual installments of $325,000 each from December 1, 1913, to June 1, 1923, inclusive. They are secured by equipment costing $7,226,420.

PENNSYLVANIA RAILROAD.—See West Jersey & Sea Shore

PERE MARQUETTE.—The U. S. circuit court of appeals for the sixth circuit on April 29 affirmed an order made by the U. S. district court at Detroit in May, 1912, authorizing an issue of $3,500,000 receivers' certificates. The sale of the certificates has not yet been arranged.

SOUTHERN PACIFIC.—See Union Pacific.

UNION PACIFIC.—The Supreme Court on May 5 extended the time in which this company was to dispose of its Southern Pacific stock from May 12 to July 1, thus only partly complying with the request of the Union Pacific attorneys for an indefinite extension of time.

WABASH.—The receivers, acting under the instruction given by Judge Adams in the federal court at St. Louis on April 26, made no provision for the principal or interest of the $5,000,000 4½ per cent. notes due May 1. The committee representing a majority of this issue calls for the deposit of the notes with May coupon attached at U. S. Mortgage & Trust Company, New York. The committee consists of John W. Platten, chairman; Otto T. Bannard and Henry R. Ickesheimer and Calvert Brewer, 65 Cedar street, New York, secretary. The committee has arranged with the depositary to advance to depositing note holders who desire it, the amount of the interest coupon due May 1, 1913.

WEST JERSEY & SEA SHORE.—The stockholders have approved the 999 year lease of the property to the Pennsylvania Railroad, that company guaranteeing 6 per cent. dividends on the outstanding stock of the West Jersey & Sea Shore. The lease will take effect July 1, 1913.

RAILWAY CONCESSIONS AND SPECULATORS IN ARGENTINA.—There will be no more railway concessions granted in Argentina to irresponsible speculators—that is to say, to that vast number of individuals who have applied for and been granted concessions for lines which they never had the remotest intention of constructing. The idea has been to put up to a fictitious value the land through which the supposed railway would pass; and therein lies the rich profit of the Argentine speculator. From first to last within the past few years the congress has, upon the recommendation of successive ministers of railways, granted over one thousand different concessions to this undesirable class of exploiter.

INDIAN RAILWAY TROUBLES.—The Indian government has been blamed for the late period of the financial year, when the sums allotted to various works are finally determined. This makes it difficult to spend the money in time as far as major orders for materials are concerned. But agents in India, through whom the orders are sent for the great variety of minor articles required on railways, complain that officers leave their orders to the last moment, and then pester the agents with complaints for late deliveries—oblivious, apparently, that their urgent commands are not the only urgent ones that have to be fulfilled by the home manufacturers. This same foresight would remove many of the complaints of car shortage from shippers. If only they would lay in a stock of coal, instead of ordering it in driblets, they would not be disappointed in their deliveries when the railways require their cars to carry wheat and other commodities which pay higher rates, and which, moreover, are perishable.

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Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$6.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 10,200 copies were printed; that of these 10,200 copies, 6,764 were mailed to regular paid subscribers and 350 were provided for counter and news companies' sales; that the total copies printed this year to date were 174,150—an average of 8,708 copies a week.

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THE maintenance of a certain device on a locomotive costs 2.6 times as much per mile on one road as it does on another in the same territory and operating under similar conditions. The design of the apparatus and the service to which it is subjected is much the same on both roads. On the one which has the low cost of maintenance the percentage of the cost charged to labor is about 80 per cent., and that to material about 20 per cent. On the other road the labor charge is approximately 35 per cent., and the material charge 65 per cent. The conclusion is obvious. The first road watches its equipment closely and adjusts or repairs the various details as soon as they show signs of wear or failure; the other road lets things go until it is almost impossible to operate the locomotives without repairing them. A superintendent of motive power was criticized because his locomotives looked so much better than those of his neighbors, the inference being that he wasted money to keep them clean. Investigation showed that his unit costs were lower than those on the other roads—apparently because in keeping the locomotives clean and neat defects were discovered and remedied before they reached a serious stage. It is a short-sighted policy that will permit a piece of equipment, known to be in defective condition, to run until it actually fails, possibly causing a tie-up on the road, and costing many times what it would to have maintained it in good condition.

A LETTER, commenting on the work of the government safety appliance inspectors, was published in our issue of February 7, 1913, page 237, in which the following statement was made:

"Recently the equipment in the yards of a western railway was inspected by a government safety appliance inspector. The inspection occupied one hour and was finished at 9 a. m. After it was completed the inspector was asked if he intended to inspect the equipment in the yards of another railway located in the same town, and about fifteen minutes' walk from the yards in which the inspection had just been made. He replied that the inspection of one yard was considered a day's work in government service, and that no inspector went over more than one yard in one day; he would, therefore, save the other yard for another day's work."

This letter was sent to us by a correspondent on a western road with the understanding that his name should not be used in connection with it. The letter was used as copy for the printer and has since been lost, or destroyed, together with other copy, which it is our practice to hold for only a week or two after the date of publication. The Interstate Commerce Commission has asked us to furnish it with the name of the writer of the letter or of the inspector referred to. This we are unable to do. We, therefore, take this opportunity of complying with the following request of the commission: "The commission feels, however, that you should either furnish the name of the writer of the article or that of the inspector, or else publish in the *Railway Age Gazette* a statement to the effect that when the commission called attention to this article and asked for the name of the writer that the party in question refused to make his name known or to furnish the name of the inspector involved, thus affording the commission no opportunity whatever of proving or disproving the charges made by him, such statement to be given the same publicity as was the article which has resulted in this correspondence."

ILLINOIS is one of the states which still have no anti-pass law. An anti-pass bill is now pending in the state legislature. Doubtless the railways of Illinois should have combined to stop the giving of state passes before this. There are two reasons why they have not done so. One is that so long as the giving is not illegal there will always be a few railway men who will be disposed to continue it in the hope that it will have some tendency to mitigate the severity of railway regulation. The second reason is that as long as the issuance of passes is legal many legislators and other public officials will insist on having them and will resort to all sorts of blackmailing devices to get them. In many cases they obtain them not only for their

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own use, but that of others. The story is told of a certain representative of the people of Illinois who a short time ago gave a card party at which the prizes were passes over different railways. The issuance of passes costs the railways a good deal of money. Of much more importance is its demoralizing influence on public affairs. There is an impression that railway officers are opposed to anti-pass legislation. This as to most railway officers is entirely erroneous. The giving of passes is far less frequently an attempt on the part of the railways at improper influence than a successful attempt on the part of those who receive them at blackmail. However, regardless of who wants to give passes or who wants to get them, their issuance for any purpose or to any class not specified in the Interstate Commerce Act ought to be prohibited by statute in every state. In fact, probably the exceptions in the Interstate Commerce Act itself are too broad and numerous. This corrupting and debasing influence ought speedily to be forever removed from our commerce and politics.

SOME extremely insignificant cases are submitted to the Interstate Commerce Commission, and yet it is its duty to treat such cases as though they were of real significance, to carefully weigh the evidence and to have the decisions printed and distributed broadcast. On another page is abstracted a decision dismissing a complaint in which the complainant sued for a refund of certain drayage charges amounting to $2.50. No precedent was involved which would have a bearing on future outlays of a similar nature, and the injustice of the complaint would be palpable to any school boy. The commission is now performing an invaluable service to the country by handing down decisions in an ever-increasing number of important cases. It is compelled to work at high pressure, and any time spent on cases such as the one above mentioned represents a total loss. The commission's time is valuable and should be jealously guarded. The common courts, through long experience, have found it necessary to protect themselves against absurd suits by charging the loser with costs, but where a complainant before the Interstate Commerce Commission retains its own counsel at an annual salary, the cost of a suit is practically nil, so there is nothing to deter him from filing a complaint, however unreasonable. The commission is essentially a free court, but it should be protected from abuse. The plan for deputy interstate commerce commissioners, outlined in the *Railway Age Gazette* of April 25, page 951, would shield the commission from all save the weightiest cases, but does not provide for the exclusion of obviously unreasonable complaints. Hitherto the number of such cases before the commission has not been large, but it is likely to grow, and the sooner this growth is checked, the better. Though it would not be desirable to make losers of bona fide cases pay the cost, there should be some provision for summarily dismissing unworthy complaints without printed reports, for printed reports in cases of this nature seem to dignify them beyond their just desert. It might also be found advisable to impose fines upon such complainants, leaving it to the commission to decide which cases should be treated in this manner.

THE state's attorney at Bridgeport, Conn., who secured the indictment of President Charles S. Mellen of the New York, New Haven & Hartford on a charge of manslaughter in connection with the derailment which occurred at Westport on that road, last October, announces that the trial will be begun May 27, and that "it will be finished in less than three weeks." Such a trial would be an outrage. The indictment itself is an outrage; but mere indictments are reported so frequently that the spectacle of innocent persons stigmatized by "true bills" has become too common to attract much notice. An indictment is an easy means by which a prosecuting officer, when worried, excited or actuated by political motives, can appease public sentiment until the public—and he, himself—can cool down. No sane magistrate or attorney expects to promote justice by prosecuting a railway president for manslaughter when an engineman makes a mistake. The "friends of the people" who are simultaneously investigating, prosecuting and persecuting Mr. Mellen could be granted all their contentions in this case—that the officers of the road ought to have provided different crossovers, or fireproof cars, or should have had a better qualified engineman, etc.—and still they would have no sufficient ground for the manslaughter charge. The connection between the accident and the causes alleged is so slight and ill-defined that no case could be made which would convince a reasonable jury; for reasonable criminal convictions are based on direct and proximate, and not on utterly indirect and remote causes. Moreover, criminal trials of this sort which have produced any good result are so hard to find that their value, even in the abstract, is very doubtful, if not entirely lacking. Even if it were admitted, for the sake of argument, that a prison sentence would be a just punishment for the railway president who does not follow the acts of his vice-president, general manager, general superintendent, division superintendent, trainmaster or roadmaster and inspector, in sufficient detail to know when a mistake was made in choosing or training a locomotive runner, or in laying tracks, or in issuing speed regulations, there would still be two important questions to answer: (1) whether courts ever impose punishments on a basis like this in other affairs, and (2) whether any useful remedial results have ever been secured by criminal prosecutions for railway disasters due to high speed. With no exceptions of importance, the answers to both would have to be in the negative. A president is, indeed, responsible for the general policy of his company, but no evidence at all has been produced to substantiate the loose claims that the Westport wreck was due to any fault of general policy—unless it be the opinion of Inspector Belnap relative to short crossovers, full stops and automatic train stops, which is without backing from any real engineering authority. The fact is that Mr. Mellen must be tried in Connecticut for causing a collision, just because the accident happened at a time when he was being blamed for problematical freight-rate sins in Rhode Island; and that is not in the interest of good government. What would be the verdict of the ordinary jury if an engineman, a member of a labor union, were tried for manslaughter in a case like this, even though the accident were directly due to failure on his part to obey the rules or orders of his superiors? Judging from the past, the sympathies of the jurymen would set him free. The present prosecution is too plainly actuated by politics, or vindictiveness, or both.

SOME DISPUTED POINTS IN RAILWAY VALUATION.

1.—Right of Way.

THE valuation of railway properties as a basis for rate regulation and taxation has come into great prominence within late years. The agitation of the matter has culminated in the recent passage by Congress of the law providing for a valuation of the railways of the entire country. This action has made the subject one of great importance. Railway officers are confident that the valuation, if fairly made, will prove a means of convincing the public that the railways as a whole are not, as so often charged, over-capitalized. At the same time great care must be taken to see that the work is properly and thoroughly done along lines which will be sustained in the courts.

In the field of the public utilities, enough valuations have been made to enable many of the underlying principles to be established, either by general agreement or by decisions of the courts. Because of the much more limited number of railway valuations that have been made there is a much wider divergence of opinion among both railway men and regulating

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authorities regarding many of the important principles and methods.

Six states, Michigan, Wisconsin, Minnesota, Washington, South Dakota and New Jersey, have completed valuations of the railways within their borders since 1900, while Nebraska and Kansas are at present making them. Massachusetts has also made a valuation of the properties of the New York, New Haven & Hartford, while Washington has made a separate valuation of the Spokane & Inland Empire System. The purpose of the valuations in Minnesota, Washington, South Dakota and Nebraska has been the regulation of rates. The New Haven valuation in Massachusetts was made to determine the reasonableness of the capitalization of that road. In Wisconsin the valuation has been used for both taxation and rate regulation. In some few cases the railways themselves, in connection with rate cases, have made valuations in a thorough manner, while in others they have made what have been little more than inventories of their physical properties.

The degree to which the purposes of the valuations have influenced the methods adopted is more or less problematical, but the fact is that wide differences of opinion exist as to the bases on which valuations should be made. One of the most important of these differences of opinion relates to the way that right of way should be appraised. Two prominent conditions have to be considered, the appreciation of railway property in common with other land, especially at terminals, and the greater expense incurred by railways than other purchasers in securing land. The railways have acquired land by gift, by purchase in the ordinary way and by condemnation. Some economists and regulating authorities take the position that the appraisal of land should be based on its original cost to the railway. The question of what weight should be given in a valuation to the increase in the value of a railway's land was raised by the Burlington in the Western rate advance case. Commissioner Lane, in the commission's opinion in that case, did not directly say that the full increase in value of the land should not be considered, but did strongly intimate that it ought not to be. In the valuation in Minnesota the state commission prepared two land appraisals, one showing what it would cost the railways to acquire property for railway purposes at the time of valuation, and the other what it would now cost to acquire it for other than railway purposes, the former being practically $32,000,000, or 1.77 times greater than the second. The commission favored the latter, or present value of the land for general commercial purposes. In New Jersey the valuation was made under an old taxation statute which stipulated that the value of the land be considered without any reference to its use, any additional value arising out of its use for railway purposes being included with intangible values. In Michigan, Washington, Wisconsin and Nebraska, comparisons of large numbers of purchases by railways and by private parties alongside railways were made and the ratios of these purchase prices were applied to the railway right of way, these ratios varying from 15 per cent. in cities in some instances to as high as 1,000 per cent. in rural districts where the value of the land for farming purposes was low. In the Minnesota rate case Judge Sanborn, of the United States Circuit Court, overruled the Minnesota commission, and held that the valuation should have been based on what it would now cost the railways to acquire the land for railway purposes.

The extent to which property held for future use should be included in an appraisal is undetermined. Nearly all roads have acquired property for future development which is at present not essential for the operation of the road, but which may be in future. In Washington all land not likely to be used for railway purposes in the near future was eliminated from consideration, and in this way property belonging to the Northern Pacific and valued at over $15,000,000 was excluded. Similarly, in Nebraska where the Union Pacific owns a right of way 400 ft. in width nearly across the state, the commission has included only a width of 200 ft. in its valuation.

How important is this question of the proper way to appraise land values is indicated by a statement regarding a single road, the Burlington, which was made by the Interstate Commerce Commission in the Western rate advance case. "Out of the difference between the original investment of $258,000,000 and the estimated present value of $530,000,000 it has been estimated that the increase in land values amounts to approximately $150,000,000." The estimated increase in land value was over $15,000 a mile for the entire property.

THE CHANGE IN PUBLIC SENTIMENT IN THE SOUTHWEST.

THERE appears to be a slow but quite real change for the better in the public relations of the railroads in the southwestern states. The most marked change is in Texas. Not only was there no anti-railroad legislation enacted in that state last year, but one bill of a good deal of importance to some of the roads in that state—the bill permitting the merger of certain roads—was passed by the legislature over the veto of the governor. In Oklahoma a full crew bill was defeated, and in Missouri the prospects are good for obtaining a referendum vote on the full crew bill that was enacted by the Missouri legislature. This attitude towards full crew bills in the southwestern states is in marked contrast to the actions of the politicians in New York and New Jersey.

Credit for this more far seeing policy towards railroads in the southwest is due first of all to the Commercial Secretaries' Association of Texas. This body, with the best interests of their state clearly before them, and firm in their conviction, have fought popular prejudice and narrow self-interest, and have today achieved results that are in a considerable measure contributory towards the remarkable present prosperity of Texas.

The daily newspapers have also helped in the work of education. This is of importance, because the newspapers both lead public thought and are a reflection of it.

There is also a certain element among the orders of railroad employees who are frankly recognizing how closely identified their own interests are with the success of their employers. This is possibly more noticeable in Kansas than in Texas, but is a distinctly hopeful sign. The situation in regard to personal injury claims in the southwest is still unqualifiedly bad. Public sentiment towards claims brought by employees against railroad companies for alleged injuries is as lawless as that of the average traveler towards United States custom house declarations. About the only thing that the railroads can do is to spend time and money in making their equipment technically, as well as practically, safe and to keep watch on chronic injury-suffering employees and weed them out of the service.

The citizens of the southwest are free spenders, they know good service and are generally willing to pay for it; their homes are well built, their hotels far above the average, and when they go to Chicago or New York they demand and are not afraid to pay for the best. The attitude of Texans towards their railroads was not so much a contradiction of this appreciation of good service, as an anarchistic disregard for vested interest. As they themselves, however, acquire wealth their respect for property rights is increasing. There is also a growing understanding of the vital connection between all other property values and railroad property values.

Texas is prosperous to an extent never before equalled. Crop prospects are good, building in the cities is active to a remarkable extent, and all classes of people are sharing to a greater or less extent in the fruits of the development of the country. If, therefore, the change in the attitude towards railroad improvement and possible future profitable operation is a lasting change it may well be that business men as well as railroad men of the southwest have this further important basis for prosperity over and above good crops and high prices.

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Letters to the Editor.

SLOVENLY WHISTLING.

Oakland, Cal., May 10, 1913.

To the Editor of the Railway Age Gazette:

I have read with interest the article on "Slovenly Whistling" in your issue of March 28. But alleviating the sufferings of the public is not the only issue. The proper use of the whistle signals as prescribed by the book of rules is also important. Their strict observance is a matter of safety, and yet less attention is paid to their frequent misuse than to any other infractions of the rules. The engineman should use judgment in sounding the whistle, taking into consideration the distance the sound is to be carried. Each blast should be as plain as print, with proper spaces between blasts; the longer the distance to be carried, the longer should be the space. The flagman whom he is calling in may be out around a curve behind a hill, and if the blasts are not properly spaced, the echo of one runs into the other, and what the flagman hears is one long blast of the whistle. If a flag is ordered out before the train comes to a stop, as frequently happens, if an unexpected stop is made, especially if on short time ahead of a superior train, the whistle signal for sending out a flag should again be clearly and distinctly sounded after the train stops. If it be a long train, or even one of moderate length, the grinding of the brakes, when applied, may prevent the flagman at the rear from hearing the first signal. If the signal is sounded before the train comes to a stop, it should always be sounded the second time. How frequently on a passenger train when the air-whistle signal has been sounded for the engineman to stop at the next station, the conductor hears one long blast, the result of improper spacing. A passenger train crew running with an engineman who habitually misuses whistle signals, might misunderstand or fail to heed a call for brakes, should such a contingency arise. There should be a vigorous campaign on the proper use of whistle signals on every railroad in the country. Use the whistle as sparingly as is consistent with safety, but use it correctly. Despatcher.

FUNDAMENTALS OF WAGE PAYMENT.

New York, April 30, 1913.

To the Editor of the Railway Age Gazette:

In your issue of April 25 the very interesting article by Mr. Milner on the "Fundamentals of Wage Payment" treats the subject in an exceedingly able manner but omits some of the important fundamentals and makes one error of considerable weight.

Mr. Milner treats the subject from the standpoint of mathematics and pure logic, while other items must be considered. One very important one is the nature of the business. A method of wage payment that would be perfectly satisfactory on work performed exclusively by hand would be entirely unsatisfactory when applied to machine operations. The equipment necessary for carrying on an industry and the resulting burden charge is of vital importance and must be considered when determining methods of wage payment.

The human element and the vagaries of the human mind must also be considered, and the method of payment must appeal to the workman so that he is stimulated to steadily increase his output up to the maximum attainable. This element is at the foundation of the bonus methods of payment and is largely responsible for their success. For some strange reason the human being is so constituted that he will go after a time record where he will take a little interest in a mere money record. A workman will brag all over a shop that he "beat a schedule," whereas one seldom mentions making a large day's pay.

The neglect of the above considerations and the lack of knowledge of "all methods of wage payments" led Mr. Milner into the error of stating: "Under no system of labor payment does cost per unit of output regularly increase with increases in output or decrease with decreases in output."

One very large plant in this country whose burden charge far overbalances the labor cost uses a piece-work method wherein the price per piece increases with the output. The rate per piece increases within regularly defined limits as follows: 10, 10.5, 11.0, 11.5, 12.0 cents per piece and upwards. This method has proved very satisfactory from the standpoint of both the company and the workmen.

A number of concerns, both in this country and abroad, use a method of bonus payment which increases the cost per piece with increased output. The method used runs about as follows (using Mr. Milner's 10-hour and 30-cent rate):

Time.	Cost.	Rate.
10 hours	$3.00	$0.30
8 hours	2.20	.40
6 hours	3.60	.60

Here again the results obtained are satisfactory from every point of view. However, such methods would not prove at all satisfactory under different conditions and, as stated before, in determining methods of wage payment *all* the elements must be considered.

C. J. Morrison,
Chief Engineer, Froggatt, Morrison & Co.

DESIGN OF UNDERFRAME FOR CARS.

Savannah, Ga., April 26, 1913.

To the Editor of the Railway Age Gazette:

Every once in a while some one attempts to show how to design a steel underframe for cars from a strictly theoretical standpoint, and to show that existing designs are too heavy and that better results with less weight can be obtained by a better, or more scientific distribution of metal.

As a matter of fact, the best designs of steel underframes have been deduced by a process of elimination and substitution based upon the repair track records. The earlier designs, produced from a strictly engineering standpoint, soon developed unexpected weaknesses, and showed a decided lack of a sufficient "factor of ignorance." The stresses which car underframes are subjected to under a severe impact do not readily yield to mathematical analysis, and it is the unfair usage of this nature that we must provide for in our design, and not the normal, measurable stresses.

The communication on page 786, of your issue of April 4, is interesting from a strictly engineering standpoint, but the design is not desirable from past experience. The metal in the center sills required for load and buckling in a vertical plane will be amply sufficient for all buckling stresses in a horizontal plane if the center sills, which are generally composed of two parallel members, have a riveted cover plate. This will not require any more material, if as much, as the diagonal bracing suggested, and involves much less labor in the assembling of the underframe. It is also much cheaper to repair in case of partial destruction in wrecks.

Referring to Fig. 5, the two diagonal compression members shown at the ends are of little or no use, other than bracing the car against a cornering blow. The buckling stresses from compression are distributed by the coupler to the draft sills, well back of the end sills in all types of well designed friction gear, unless in a collision, when the horn of the coupler may come solid on the end sill. Even under this condition, with the tying at the body bolster the center sills should be stiff enough to take a blow between end sill and body bolster that will shear the rivets in the draft sill splice, without buckling. A blow sufficient to shear the rivets at the splice is a destructive blow, and its effects should be dissipated before reaching the body bolster, the damage being confined to as small an area as possible to facilitate repairs. The diagram, to be consistent, and to provide for these conditions, should show compression struts in the panels immediately behind the body bolsters.

The best design of underframe is a matter of vital interest to all mechanical officers of railroads, as well as to car builders, and it would be of interest to have the opinion of others on this matter.

F. F. Gaines.
Superintendent Motive Power, Central of Georgia.

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MILEAGE OF RAILROAD BLOCK SIGNALED.

Government Report Showing Not Only a Large Increase in Mileage but Also Extensive Improvement in Details.

The Interstate Commerce Commission has issued its regular annual bulletin of block signal statistics showing the mileage of railroads thus operated on January 1, 1913. The length of road operated under the automatic block system was 22,218.8 miles, and under the manual system, 61,731 miles; total, both kinds, 83,949.8 miles. The details which make up these totals appear in Table No. 1, reproduced herewith.

In five cases considerable lengths of road are operated jointly by two companies, each company owning one of the two main tracks. This makes a small fictitious increase in the aggregate mileage of the country.

The Seaboard Air Line operates its manual block system by telephones, not by telegraph, as was erroneously reported a year ago.

A comparison between the figures now published by the commission and those for the same date given in our own table

TABLE 1— RAILWAYS WORKED BY THE BLOCK SYSTEM, JANUARY 1, 1913.

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and non-automatic.		Total passenger lines operated.		Per-centage block signaled, miles of track.
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Miles of track.	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Albany Southern	0.5				0.5	0.5	26.7	16.3			43.0	59.3	43.5	59.8	43.5	59.8	100.0
Ann Arbor		1.0			1.0	2.0	1.0				1.0	1.0	1.0	2.0	292.0	292.0	.3
Arizona & New Mexico	1.0				1.0	1.0							1.0	1.0	109.0	109.0	.9
Atchison, Topeka, & Santa Fe:																	
Eastern Lines	22.2	113.7			135.9	248.0	498.1	493.5			983.6	1,479.1	1,119.5	1,738.7	2,491.2	3,110.5	55.4
Western Lines		2.5			2.5	5.0	655.8	23.8			676.8	690.4	679.1	695.4	2,950.0	2,985.3	23.3
Coast Lines	74.3	53.2			127.5	186.1	4.3				4.3	4.3	131.8	184.4	1,940.4	2,134.8	8.8
Gulf, Colorado & Santa Fe	3.6				3.6	3.6							3.6	3.6	1,686.8	1,668.8	.2
Atlantic & West Point							6.0				6.0	12.0	6.0	12.0	80.0	92.0	13.0
Atlantic Coast Line	2.4	51.1			53.5	104.0	321.9	105.5			427.4	536.1	480.9	640.7	2,822.6	3,960.4	16.2
Auburn & Northern	6.5				6.5	6.5							6.5	6.5	6.5	6.5	100.0
Baltimore & Ohio	11.7	205.7	4.8	16.8	303.0	635.4	1,965.9	718.5	167.0	7.8	2,799.6	3,761.9	3,102.6	4,397.3	3,097.2	4,397.3	100.0
Baltimore & Ohio Chicago Terminal	1.2	14.3			15.5	29.2							15.5	29.2	65.5	73.2	40.4
Baltimore & Ohio Southwestern		24.9			24.9	49.7	901.4	36.5			937.8	974.4	962.8	1,024.1	962.8	1,024.1	100.0
Baltimore & Sparrow's Point							1.7	3.0			4.7	7.7	4.7	7.7	4.7	7.7	100.0
Beaumont & Lake Erie							64.4	120.0			184.4	324.4	184.4	324.4	191.0	191.0	87.2
Boston & Maine	410.4	619.7		2.1	1,032.2	1,638.2							1,032.2	1,638.2	2,219.8	2,773.4	59.8
Boston, Revere Beach & Lynn		13.8			13.8	27.6							13.8	27.6	13.8	27.6	100.0
Buffalo, Rochester & Pittsburgh	2.0	35.1			37.1	72.2	311.7	96.5			408.2	504.5	445.3	576.7	445.9	576.7	100.0
Butte, Anaconda & Pacific	7.9				7.9	7.9							7.9	7.9	26.3	31.3	25.2
Carolina & Northwestern							6.1				6.1	6.1	6.1	6.1	133.5	133.5	4.6
Central New England	13.9	17.5			31.4	49.0	11.8				11.8	11.8	43.2	60.8	276.9	311.1	16.2
Central of Georgia							66.5	7.4			73.9	81.2	73.9	81.2	1,767.2	1,774.7	4.6
Central of New Jersey	15.9	165.5	2.4	31.5	213.4	477.2							213.4	477.2	464.1	742.9	64.2
Central Vermont							296.2	6.2			302.5	608.7	302.5	608.7	608.7	608.7	100.0
Chesapeake & Ohio		454.6			454.6	909.2	1,112.2	21.2			1,133.5	1,154.7	1,588.1	2,063.9	1,612.4	2,068.9	99.3
Chesapeake & Ohio Ry. of Indiana							262.2				262.2	262.2	262.2	262.2	262.2	262.2	100.0
Chicago & Alton	420.7	184.6			605.3	789.9	141.2				141.2	141.2	746.5	931.1	1,025.2	1,209.2	72.8
Chicago & Eastern Illinois		106.2			106.2	212.4	245.9	79.2			324.2	403.4	430.4	615.6	872.4	1,057.9	58.2
Chicago & North Western	39.2	764.5	14.9	7.7	826.3	1,793.0	2,712.1	92.5			2,804.6	2,897.1	3,630.9	4,690.1	7,122.8	8,203.3	57.2
Chicago & Western Indiana		19.8			19.8	39.6		4.5	3.2		7.7	16.7	27.5	56.3	27.5	56.3	100.0
Chicago, Burlington & Quincy	44.6	43.6	4.2	5.4	97.8	189.0	665.5	694.8	14.5		5,004.9	9,328.8	5,702.7	9,894.8	7,378.9	9,170.0	100.0
Chicago Great Western	19.9	86.2			106.1	209.3	88.6				88.6	88.6	194.7	297.9	1,437.9	1,437.9	20.7
Chicago, Indianapolis & Louisville	161.9				161.9	161.9	363.0				363.0	363.0	524.9	524.9	578.0	578.0	90.9
Chicago Junction							1.2				1.2	1.2	1.2	1.2	51.6	51.6	.8
Chicago, Milwaukee & St. Paul	2.4	103.7			106.1	209.8	2,909.3	693.1			3,602.2	3,984.9	3,708.4	4,194.7	6,504.7	7,175.8	57.2
Chicago, Milwaukee & Puget Sound	363.1				363.1	363.1	1,535.1				1,535.1	1,535.1	1,898.2	1,898.2	1,953.1	1,953.1	97.1
Tacoma & Eastern							172.8				172.8	172.8	172.8	172.8	172.8	172.8	100.0
Chicago, Peoria & St. Louis Ry. of Ill.	1.3				1.3	1.3	247.2				247.2	247.2	248.5	248.5	248.8	248.8	100.0
Chicago, Rock Island & Pacific	653.3	289.1			936.4	1,219.6	977.7				977.7	977.7	1,591.1	2,197.3	5,674.1	6,952.8	31.9
Chicago, Rock Island & Gulf	32.6				32.6	32.6							32.6	32.6	466.0	466.0	7.0
St. Paul & Kansas City Short Line							112.5				112.5	112.5	112.5	112.5	117.7	117.7	95.6
Chicago, St. Paul, Minneapolis & Omaha	23.5	90.4			112.6	203.2	494.0	53.3			547.3	600.6	660.2	803.9	1,571.8	1,724.6	46.8
Chicago, Terre Haute & Southeastern	1.5				1.5	1.5							1.5	1.5	352.0	352.0	.4
Cincinnati, Hamilton & Dayton	19.2	17.1			36.3	53.4	332.7	29.5			362.2	411.7	418.5	465.1	537.6	579.5	80.3
Cincinnati, Indianapolis & Western							283.9				283.9	283.9	283.9	283.9	369.3	369.3	76.8
Colorado Midland							2.0				2.0	2.0	2.0	2.0	261.1	261.1	.8
Columbia & Puget Sound	10.8	8.9			18.9	27.8							18.9	27.8	60.2	61.2	45.4
Cornwall & Lebanon							8.3	13.7			22.0	35.7	22.0	35.7	22.0	35.7	100.0
Cumberland & Pennsylvania							4.3		3.0		7.3	13.3	7.3	13.3	31.2	37.3	35.3
Cumberland Valley	2.6	47.4			55.0	102.4	90.5				90.5	90.5	145.5	192.9	172.1	192.9	100.0
Delaware & Hudson	164.2	225.2	4.3	17.5	417.2	697.6		34.5			34.6	69.2	445.8	766.8	743.8	1,042.4	73.6
Delaware, Lackawanna & Western	224.3	449.1	59.5	10.0	734.5	1,316.2	4.3				4.3	4.3	738.8	1,320.5	980.0	1,564.6	84.4
Denver & Rio Grande							7.7				7.7	7.7	7.7	7.7	2,347.3	2,406.7	.3
Duluth & Iron Range		15.7			15.7	17.1							15.7	17.1	200.0	271.0	6.4
Durham & Southern							56.0				56.0	56.0	56.0	56.0	56.0	56.0	100.0
Elgin, Joliet & Eastern	2.0	3.0			5.0	8.0	11.0				11.0	11.0	16.0	19.0	211.2	229.1	4.1
Erie	4.5	230.9		14.8	254.2	533.5	600.9	545.7			1,046.6	1,592.3	1,300.8	2,125.8	1,794.4	2,629.4	84.4
Chicago & Erie							228.4	20.4			248.8	269.2	248.8	269.2	268.0	269.2	100.0
Columbus & Erie							12.6	9.6			22.2	31.7	22.2	31.7	22.4	31.7	100.0
Erie & Jersey		42.3			42.3	84.6							42.3	84.6	Freight Line.		
Genesee River							32.6				32.6	32.6	32.6	32.6	32.6	32.6	100.0
New Jersey & New York	12.5	10.5			23.0	33.5	13.0				13.6	13.5	36.6	47.1	51.0	62.4	73.5
New York, Susquehanna & Western and Wilkesbarre & Eastern							22.0	13.7			45.7	59.4	45.7	59.4	154.5	208.2	28.6
Grand Trunk	1.1	187.2			79.3	157.5	907.0	743.5			1,650.5	1,650.5	1,729.8	1,808.0	1,136.4	1,136.4	100.0
Great Northern	9.9	162.0			171.9	333.9	308.2				308.2	308.2	480.1	642.1	7,452.4	7,653.6	8.4
Gulf & Ship Island							138.4				138.4	138.4	138.4	138.4	326.0	326.0	42.5
Hudson & Manhattan	3.0	7.9			10.9	18.8							10.9	18.8	10.9	18.8	100.0
Illinois Central	83.6	293.3		26.3	403.2	805.4	11.0				11.0	11.0	414.2	816.4	4,332.1	5,218.5	15.8
Yazoo & Mississippi Valley	6.6				6.6	6.6		7.9			7.9	14.8	14.5	21.4	1,243.0	1,251.7	1.7
Illinois Traction	82.3	1.5			83.8	85.3							83.8	85.3	443.1	452.6	18.8
Kanawha & Michigan	1.8				1.8	2.3		2.3			2.3	4.6	4.1	6.9	163.1	163.1	.7
Kentucky & Indiana Bridge & R. R. Co						3.0	8.2				11.2	19.4	11.2	19.4	11.2	19.4	100.0
Kentwood & Eastern						3.3		3.3			3.3	6.6	3.3	6.6	30.0	30.0	11.0
Lackawanna & Wyoming Valley						1.0	2.4				3.4	5.8	3.4	5.8	22.0	43.3	13.2
Lehigh & New England		7			7	7							7	7	47.7	47.7	1.0
Lehigh Valley	14.1	165.3	34.8	24.0	519.2	1,107.1	648.4	58.8			707.2	766.0	1,226.4	1,873.1	1,215.3	1,863.0	100.9
Long Island	4.0	92.2	3.3	12.4	111.9	251.7	5.0	9.1			14.1	23.2	126.0	274.9	338.2	581.9	61.0
Louisville & Nashville	79.1	18.0			97.1	115.1	148.1	66.8			213.5	279.1	310.7	394.2	4,467.8	4,539.4	8.3
Maine Central	437.2	62.2			499.4	561.6							499.4	561.6	1,151.4	1,173.9	47.8
Portland Terminal	4.0	11.5			15.5	27.0							15.5	27.0	15.3	15.7	90.9
Minneapolis & St. Louis							11.3				11.3	11.3	11.3	11.3	1,537.4	1,547.2	.7
Minneapolis, St. Paul & Sault Ste. Marie							1,411.0	6.4			1,415.4	1,419.8	1,415.4	1,419.8	3,497.2	3,501.6	40.5

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TABLE 1.—CONTINUED.—RAILWAYS WORKED BY THE BLOCK SYSTEM.

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and nonautomatic.		Total passenger trains operated.		Per-centage block signaled, miles of track.
	Total.						Total.										
	Single track.	Double track.	Three track.	Four track.	Miles of road.	Miles of track.	Single track.	Double track.	Three track.	Four track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Missouri, Kansas & Texas	9.1	1.4			10.5	11.9	9.5				9.5	9.5	20.0	21.4	2,799.9	2,958.2	.7
Cincinnati, Chicago & St. Louis	87.8	34.1			92.3	126.3	3,501.0	14.3			3,504.7	3,693.3	3,592.6	3,741.5	5,703.1	6,191.8	98.1
St. Louis, Iron Mountain & Southern	113.8	13.2			127.0	140.3	2,638.3	169.4			2,807.6	2,977.0	2,934.6	3,117.3	3,046.0	3,260.3	94.7
Mobile & Ohio		4.7			4.7	9.4	51.9				51.9	51.9	56.6	61.3	922.3	927.0	6.9
Monongahela	.5				.5	.5							.5	.5	66.7	66.7	1.5
Munising, Marquette & Southeastern							3.7				3.7	3.7	3.7	3.7	123.6	123.6	3.0
Nashville, Chattanooga & St. Louis							109.1	11.8			120.9	132.7	120.9	132.7	1,291.1	1,341.9	10.7
Newburgh & South Shore							.1	5.5			5.3	10.5	5.3	10.5	Freight Line.		
New York & Long Branch		38.0			38.0	76.0							38.0	76.0	380.0	760.0	100.0
New York Central Lines:																	
Boston & Albany		129.4	54.1	23.6	207.1	515.5		1.4			1.4	2.8	208.5	518.3	356.5	690.1	77.5
Chicago, Indiana & Southern		5.0			5.0	10.0	144.1	59.1			203.2	262.3	208.2	272.3	393.0	367.1	74.3
Cincinnati, Cincinnati, Chicago & St. Louis	3.3	32.8			55.1	107.9	542.8	226.2			865.8	1,195.0	923.0	1,302.9	1,865.4	2,283.2	47.1
Lake Erie & Western	39.8	13.2			18.8	27.8	853.0				853.0	853.0	871.8	880.7	812.4	841.0	100.0
Lake Shore & Michigan Southern	27.8	184.0	106.9	330.3	568.9	1,717.3	1,024.2	64.0			1,088.2	1,152.2	1,657.1	2,869.5	1,567.2	3,767.1	99.6
Dunkirk, Allegheny Valley & Pittsburgh							90.5				90.5	90.5	90.5	90.5	90.5	90.5	100.0
Lake Erie & Pittsburgh							27.8				27.8	27.8	27.8	27.8	Freight Line.		
Michigan Central		271.9			271.9	543.8	965.8	15.9			921.7	981.7	1,193.6	1,461.5	1,203.4	1,461.5	100.0
New York Central & Hudson River	1.9	555.9	8.2	111.6	677.8	1,795.2	1,593.1	747.4	15.4		2,352.0	3,131.2	3,030.7	4,736.4	3,099.5	4,786.3	98.7
Peoria & Eastern							84.0	1.7			85.7	87.4	85.7	87.4	337.9	340.3	25.7
Pittsburgh & Lake Erie		106.4	1.5	49.3	157.3	414.8	2.7				2.7	2.7	160.0	417.5	166.2	426.6	97.8
New York, Chicago & St. Louis	15.4				15.4	15.4							15.4	15.4	523.0	523.0	2.9
New York, New Haven & Hartford	1.6	309.5		15.8	317.9	694.2	131.9	192.8		73.7	398.4	642.2	716.3	1,496.5	2,187.8	3,130.4	47.9
New York, Ontario & Western	38.0	150.1			188.1	294.1							188.1	294.1	512.2	814.4	36.1
New York, Philadelphia & Norfolk		8.6			8.6	17.6	36.0	47.6			83.6	131.2	92.4	148.8	112.0	168.4	88.3
Tyler Branch							9.4				9.4	9.4	9.4	9.4	9.4	9.4	99.2
Norfolk & Western	101.0	415.0			516.9	932.8	1,067.8				1,067.8	1,067.8	1,584.7	2,000.6	1,680.4	3,115.3	91.2
Northern Pacific	101.5	377.1			478.6	855.7	675.7	122.7			798.4	921.2	1,277.0	1,777.0	5,424.0	6,017.6	23.5
Northwestern Pacific	13.4	12.7			26.1	38.8							26.1	38.8	53.4	53.4	72.7
Pennsylvania	.9	85.5	6.1	247.3	339.7	1,202.2	2,084.4	633.0	27.7	146.2	2,871.9	4,011.3	3,211.6	5,213.5	9,230.0	14,853.0	100.0
Grand Rapids & Indiana							158.9	2.2			141.1	143.3	141.1	143.3	532.5	532.5	26.9
Northern Central		1.5			1.5	3.0	202.6	121.2		15.8	422.0	610.2	434.1	613.2	434.1	613.2	100.0
Pennsylvania Co.		453.5	31.5	52.7	527.7	1,187.5	536.5	183.9		10.6	774.0	968.5	1,301.7	2,156.0	1,052.0	1,745.6	100.0
Philadelphia, Baltimore & Washington		57.1	12.4	33.0	102.5	262.4	627.9	105.8		8.3	741.7	871.9	844.2	955.3	644.3	966.3	100.0
Pittsburgh, Cincinnati, Chicago & St. Louis		10.3		3.6	13.7	34.4	478.3	329.1	59.8	34.9	1,102.1	1,855.1	1,115.8	1,889.9	1,415.5	2,193.9	86.3
West Jersey & Sea Shore	86.8	6.3			93.1	106.5	185.5	35.5			221.0	256.5	316.1	453.0	316.1	453.0	100.0
Vandalia							300.7	61.1			361.8	423.0	361.8	423.0	797.1	868.4	48.7
Peoria & Pekin Union		.8			.8	1.6		6.9			6.9	6.9	7.7	8.5	15.3	15.3	52.7
Pere Marquette	9.3				9.3	9.3	26.6				26.6	26.6	35.9	35.9	1,628.9	1,667.4	21.3
Philadelphia & Reading	16.4	226.8	23.3	29.8	296.3	657.2	1,221.1	87.0			1,221.1	1,308.1	1,517.4	1,965.3	870.0	1,561.0	71.6
Atlantic City		86.8			86.8	173.6	35.9				35.9	35.9	122.7	209.5	164.0	251.9	83.2
Gettysburg & Harrisburg							24.2				24.2	24.2	24.2	24.2	21.1	21.1	57.3
Northeast Pennsylvania	3.6	3.0			4.8	6.6	1.6				1.6	1.6	4.8	6.6	27.6	39.4	16.7
Perkiomen							38.2				38.2	38.2	38.2	38.2	38.2	38.2	100.0
Philadelphia, Newtown & New York	3.8	1.7	1.6		7.1	12.0							7.1	12.0	21.7	36.6	45.1
Reading & Columbia							34.9				34.9	34.9	34.9	34.9	53.3	68.5	68.4
Quincy, Omaha & Kansas City and Iowa & St. Louis							307.8				307.8	307.8	307.8	307.8	307.8	307.8	100.0
Queen & Crescent Route:																	
Alabama & Vicksburg	16.0				16.0	16.0							16.0	16.0	139.3	139.3	11.5
Alabama Great Southern	108.1	77.4			185.5	262.9	74.1				74.1	74.1	182.6	337.0	393.5	597.7	81.4
Cincinnati, New Orleans & Texas Pacific	282.1	82.6			334.7	417.3	.7				.7	.7	335.4	418.0	333.4	418.0	100.0
New Orleans & Northeastern	60.0	15.8			108.5	124.0							108.5	124.0	105.6	211.1	59.0
Richmond, Fredericksburg & Potomac							67.6	78.7			87.7	166.4	87.7	166.4	87.7	166.4	100.0
St. Joseph & Grand Island							3				3	3	3	3	281.4	281.6	.1
St. Louis & San Francisco	726.5	34.1			760.6	794.7	108.3				108.2	108.3	868.8	903.0	5,256.0	5,291.1	16.9
Beaumont, Sour Lake & Western							84.3				84.3	84.2	84.3	84.2	118.3	118.2	71.2
New Orleans, Texas & Mexico							157.6				157.6	157.6	157.6	157.6	278.4	278.4	56.6
Orange & Northwestern							61.6				61.6	61.6	61.6	61.6	61.8	61.8	100.0
St. Louis, Brownsville & Mexico							451.1				451.1	451.1	451.1	451.1	497.0	497.0	90.8
St. Louis Merchants' Bridge Terminal		5.9			5.9	11.8		1.1			1.1	2.2	7.0	14.0	9.9	18.5	77.7
St. Louis Southwestern	.4				.4	.4							.4	.4	650.2	652.6	
San Francisco, Oakland & San Jose Consolidated		3.9			3.9	7.8							3.9	7.8	21.8	36.6	21.4
San Pedro, Los Angles & Salt Lake					3.7	7.2							3.7	7.2	1,134.8	1,134.8	0.6
Seaboard Air Line							211.1	211.1			211.1	211.1	211.1	211.1	2,920.2	2,920.2	7.4
Southern		14.7			14.7	29.4	1,303.3	331.5			1,805.8	2,137.3	1,909.5	2,166.7	4,906.2	5,137.0	42.2
Virginia & Southwestern							2.2				2.2	2.2	2.2	2.2	225.4	225.4	1.0
Southern Illinois & Missouri Bridge		4.6			4.6	9.2							4.6	9.2	4.6	9.2	100.0
Southern Pacific, Atlantic system																	
Galveston, Harrisburg & San Antonio	279.1				279.1	279.1							279.1	279.1	1,270.3	1,274.8	21.9
Louisiana Western	103.6				103.6	103.6							103.6	103.6	140.5	140.5	73.6
Morgan's Louisiana & Texas	93.3				93.3	93.3							93.3	93.3	292.9	332.1	28.5
Texas & New Orleans	109.8				109.8	109.8							109.8	109.8	438.4	441.8	24.9
Southern Pacific, Pacific system	2,227.3	254.7	2.1	3.5	2,488.8	2,737.3	37.3	28.7			66.0	94.7	2,554.0	2,832.0	6,615.5	6,988.4	41.2
Spokane & Inland Empire	.2				.2	.2							.2	.2	168.7	168.7	0.1
Spokane, Portland & Seattle	.5	6.8			7.3	14.1							7.2	14.1	306.9	315.5	3.7
Staten Island Rapid Transit		3.0		6	10.0	23.0							10.0	23.0	10.0	23.0	100.0
Staten Island		10.2			10.2	20.4	2.5				2.5	2.5	12.7	22.9	12.7	22.9	100.0
Syracuse, Lake Shore & Northern	17.3	6.8			23.8	30.3							23.8	30.3	37.1	37.1	81.6
Terminal R. R. Assn. of St. Louis	6.0				6.0	12.0		1.1			1.1	2.2	7.1	14.2	12.7	25.4	56.0
Texas & Pacific	1.0				1.0	1.0							1.0	1.0	1,985.0	1,985.0	0.1
Tidewater Power Co.							6.2				6.2	6.2	6.2	6.2	11.3	15.7	39.5
Toledo, Peoria & Western							3				3	3	3	3	220.0	220.0	
Toledo, St. Louis & Western							188.1				188.1	188.1	188.1	188.1	451.0	451.0	41.7
Ulster & Delaware	24.4				24.4	24.4							24.4	24.4	126.3	126.3	19.8
Union					6.4	12.8							7.4	14.8	7.4	14.8	17.3
Union Pacific	740.3	727.7		1.7	1,469.7	2,196.5	10.9				10.9	10.9	1,480.6	2,209.4	3,541.3	4,312.3	51.2
Oregon Washington R. R. & Navigation	416.8	19.2			436.0	455.2	1.3				1.3	1.3	437.3	456.5	1,070.7	1,094.1	42.5
Oregon Short Line	318.7	57.2			375.9	633.1							375.9	633.1	1,545.4	1,904.8	33.4
Virginia & Kentucky							6				6	6	6	6	4.8	4.8	12.5
Virginian							17.6				17.6	17.6	17.6	17.6	460.0	460.0	3.8
Wabash	39.2	19.7			58.9	78.6	1,640.9	209.9			1,849.8	2,059.7	1,908.7	2,129.3	1,997.9	2,188.4	97.2
Wabash Pittsburgh Terminal		4.1			4.1	8.2							4.1	8.2	63.2	87.4	12.3
Washington Southern		4.1		1.5	5.6	14.2		28.6			28.6	53.2	32.2	67.4	32.2	67.4	100.0
Washington, Baltimore & Annapolis	12.8				12.8	18.8							12.8	18.8	52.2	94.4	19.9
Washington Terminal					2.1	4.2							2.1	4.2	20.4	20.4	10.3
Washington Water Power Co.	22.5				22.5								22.5	22.5	22.5	22.5	100.0
Western Pacific	11.2				11.2	11.2							11.2	11.2	11.2	11.2	100.0
Total	10,128.1	10,728.7	368.0	964.0	22,218.8	36,934.1	42,851.6	4,046.9	230.4	599.6	47,728.5	51,849.8	69,946.6	88,784.0	209,992.5		

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TABLE 2—KINDS OF AUTOMATIC BLOCK SIGNALS IN USE.

Names of railroads.	Exposed disk.		Inclosed disk.		Semaphores.								Total automatic signals.		
					Electro-pneumatic.		Electric motor.		Electro-gas.		Normal clear.	Normal danger			
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of track.	Miles of track.	Miles of road.	Miles of track.	Number of block stations.
Albany Southern							0.8	0.8			0.8		0.8	0.8	2
Arizona & New Mexico							1.0	1.0			1.0		1.0	1.0	1
Atchison, Topeka & Santa Fe:															
Eastern lines							135.9	249.0			249.6		135.9	249.6	170
Western lines							5.0	5.0			5.0		5.0	5.0	7
Coast lines							127.5	180.1			180.1		127.5	180.1	149
Gulf, Colorado & Santa Fe			2.9	2.9							2.9		2.9	2.9	5
Atlantic Coast Line							83.5	104.6			104.6		83.5	104.6	111
Auburn & Northern							4.3	4.3			4.3		4.3	4.3	4
Baltimore & Ohio					14.3	46.8	195.3	401.3	55.0	187.3	634.4	583.6	308.0	635.4	727
Baltimore & Ohio Chicago Terminal			1.0	2.0			14.0	27.3			29.3		15.0	29.3	21
Baltimore & Ohio Southwestern							24.0	60.7				60.7	24.0	60.7	76
Boston & Maine			.8	1.6			1,017.7	1,629.2	6.9	17.8	1,626.1	19.4	1,027.4	1,648.6	2,120
Boston, Revere Beach & Lynn							13.8	27.6			27.6		13.8	27.6	56
Buffalo, Rochester & Pittsburgh							35.1	70.3			70.3		35.1	70.3	66
Butte, Anaconda & Pacific			7.9	7.9							7.9		7.9	7.9	8
Central New England							31.4	49.6			49.0		31.4	49.0	55
Central of New Jersey					26.7	116.0	103.1	329.2	19.4	38.9	429.3	38.0	149.2	477.1	726
Chesapeake & Ohio							454.5	909.2			909.2		454.5	909.2	831
Chicago & Alton							202.5	405.0			367.6	455.6	202.5	780.6	416
Chicago & Eastern Illinois			5.7	13.3			106.3	212.4			225.7		112.0	225.7	177
Chicago & North Western			693.6	1,493.6			183.4	297.7			1,783.5		823.1	1,783.5	1,497
Chicago & Western Indiana					1.7	3.4	17.8	36.0			39.0		19.5	39.0	69
Chicago, Burlington & Quincy			21.0	46.0			74.8	130.0			166.0		97.8	166.0	136
Chicago, Indianapolis & Louisville							203.1	308.8			308.8		203.1	308.8	273
Chicago, Indianapolis & Louisville							161.0	161.0			161.0		161.0	161.0	106
Chicago, Milwaukee & St. Paul			2.4	2.4			305.7	307.4			307.4	2.4	308.1	309.8	262
Chicago, Milwaukee & Puget Sound							365.1	365.1			365.1		365.1	365.1	253
Chicago, Peoria & St. Louis R'y of Illinois							1.8	1.8			1.8		1.8	1.8	1
Chicago, Rock Island & Pacific			6.0	12.0			920.4	1,707.5			1,717.1	2.4	926.4	1,724.3	1,294
Chicago, Rock Island & Gulf							33.0	33.0			33.0		33.0	33.0	53
Chicago, St. Paul, Minneapolis & Omaha							113.0	203.0			203.0		113.0	203.0	147
Chicago, Terre Haute & Southeastern							1.5	1.5			1.5		1.5	1.5	1
Cincinnati, Hamilton & Dayton							36.6	63.4			63.4		36.6	63.4	89
Columbia & Puget Sound							18.9	27.8			27.8		18.9	27.8	36
Cumberland Valley							55.0	109.4			109.4		55.0	109.4	114
Delaware & Hudson			29.6	59.8			19.8	38.0	361.6	660.4		697.0	411.5	697.8	1,064
Delaware, Lackawanna & Western			77.5	85.6	3.6	8.9	705.6	1,253.4			1,316.3		786.7	1,318.1	1,948
Duluth & Iron Range							16.7	17.1			17.1		16.7	17.1	7
Elgin, Joliet & Eastern							6.0	6.0			6.0		6.0	6.0	5
Erie							264.2	525.5			330.9	193.6	264.5	533.5	530
Erie & Jersey							42.8	84.8			84.8		42.8	84.8	86
New Jersey & New York							42.0	83.5			83.5	21.0	42.0	104.5	69
Grand Trunk					1.1	1.1	78.2	156.4			157.8		79.6	157.5	99
Great Northern							171.0	342.0			342.0	3.2	171.0	345.2	201
Illinois Central			28.0	108.0			300.3	355.8	174.6	343.6	424.4	381.0	403.5	868.4	836
Yazoo & Mississippi Valley							6.6	6.6			6.6		6.6	6.6	5
Illinois Traction							83.3	83.3			83.3		83.3	83.3	60
Kanawha & Michigan			1.0	1.0							1.8		1.0	1.8	1
Lehigh & New England											.7		.7	.7	1
Lehigh Valley			146.0	347.8			358.0	726.0	18.4	39.8		1,107.1	518.2	1,107.1	1,110
Long Island							111.0	251.7			251.7		111.0	251.7	400
Louisville & Nashville							97.1	116.1			116.1		97.1	116.1	213
Maine Central							490.4	561.6			561.6		490.4	561.6	548
Portland Terminal							15.8	27.0			27.0		15.8	27.0	37
Missouri, Kansas & Texas			.8	.8			10.0	13.4			13.4		10.8	14.2	17
Missouri, Pacific							92.8	126.8			126.8		92.8	126.8	113
St. Louis, Iron Mountain & Southern							137.0	140.5			140.5		137.0	140.5	140
Mobile & Ohio							4.7	9.4			9.4		4.7	9.4	6
Monongahela							.8	.8			.8		.8	.8	1
New York & Long Branch							38.0	76.0			76.0		38.0	76.0	118
New York Central Lines:															
Boston & Albany		7.0	15.8				167.9	456.4			134.8	378.7	205.7	511.5	641
Chicago, Indiana & Southern							5.0	10.0			10.0		5.0	10.0	14
Cleveland, Cincinnati, Chicago & St. Louis							55.1	107.9			107.9		55.1	107.9	104
Lake Erie & Western							14.3	27.5			27.5		14.3	27.5	36
Lake Shore & Michigan Southern							325.5	1,005.5	109.8	646.5	1,070.9	648.8	568.9	1,717.3	1,786
Michigan Central			5.3	5.3			251.8	503.6			503.6		254.4	516.1	396
New York Central & Hudson River			8.0	7.2			663.6	1,161.0	8.0	16.0	1,161.0	1,362.4	679.6	1,361.2	1,946
Pittsburgh & Lake Erie			8.0	16.0			157.7	414.8			414.8		157.7	414.8	473
New York, Chicago & St. Louis							14.4	28.8			28.8		14.4	28.8	17
New York, New Haven & Hartford	154.7	309.4	63.4	124.8			100.0	200.0			634.8		317.6	634.2	770
New York, Ontario & Western			63.5	123.8			66.0	132.0			264.1		129.5	255.8	152
New York, Philadelphia & Norfolk							6.3	17.6			17.6		6.3	17.6	9
Norfolk & Western						.7	514.4	952.1			952.1		514.4	952.8	853
Northern Pacific			1.5	1.5			476.6	853.3	.5	1.0	855.7		478.0	855.7	713
Northwestern Pacific							36.1	38.9			38.9		36.1	38.9	70
Pennsylvania			1.6	0.2	254.1	962.5	74.4	211.7			1,163.4		333.7	1,183.4	1,690
Northern Central					1.5	5.0					5.0		1.5	5.0	4
Pennsylvania Co.							527.7	1,182.5			1,182.5		527.7	1,182.5	1,516
Philadelphia, Baltimore & Washington					37.5	116.6	65.2	196.5			283.4		102.7	283.4	353
Pittsburgh, Cincinnati, Chicago & St. Louis							34.4	84.4			84.4		34.4	84.4	84
West Jersey & Sea Shore					77.5	160.0	17.5	35.6			195.5		95.1	195.5	256
Peoria & Pekin Union			.5	1.6								1.6	.5	1.6	3
Pere Marquette			.6	.0			8.4	8.4			9.3		9.3	9.3	9
Philadelphia & Reading			404.5	805.0	3.8	4.8	2.8	6.1	13.3	19.7	1.6	1.6	423.4	837.2	1,048
Atlantic City			86.8	173.6									86.8	173.6	86
Northeast Pennsylvania			4.8	6.8									4.8	6.8	5
Philadelphia, Newton & New York			7.1	12.0									7.1	12.0	17
Queen & Crescent Route:															
Alabama & Vicksburg							16.0	16.0			16.0		16.0	16.0	15
Alabama Great Southern	32.0	32.0	8.0	8.0			67.5	67.0			105.9		108.0	105.0	75
Cincinnati, New Orleans & Texas Pacific	32.5	32.5	39.2	39.2			287.7	327.2	5.8	5.8	330.0		334.7	417.2	548
New Orleans & Northeastern							108.5	124.0			124.0		108.5	124.0	102
St. Louis & San Francisco							760.0	794.7			794.7		760.0	794.7	1,364
St. Louis Merchants' Bridge Terminal							5.9	11.8			11.8		5.9	11.8	30
St. Louis Southwestern							.4	.4			.4		.4	.4	1
San Francisco, Oakland & San Jose Consolidated							3.9	7.8			7.8		3.9	7.8	76
San Pedro, Los Angeles & Salt Lake							3.7	3.7			3.7		3.7	3.7	3
Southern							14.7	29.4			29.4		14.7	29.4	31
Southern Illinois & Missouri Bridge							4.6	9.2			9.2		4.6	9.2	18
Southern Pacific-Atlantic System:															
Galveston, Harrisburg & San Antonio							278.1	279.1			279.1		278.1	279.1	204
Louisiana Western							103.6	103.6			103.6		103.6	103.6	72
Morgan's Louisiana & Texas							85.3	85.3			85.3		85.3	85.3	72
Texas & New Orleans							109.8	109.8			109.8		109.8	109.8	77
Southern Pacific-Pacific System					3.1	14.2	2,485.5	4,723.1			4,737.3		2,488.6	4,737.3	2,403

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TABLE 2—CONTINUED.

Names of railroads.	Exposed disk.		Inclosed disk.		Semaphores.						Normal clear.	Normal danger.	Total automatic signals.		
					Electro-pneumatic.		Electric motor.		Electro-gas.						
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of track.	Miles of track.	Miles of road.	Miles of track.	Number of block stations.
Spokane and Inland Empire							.3	.3				.3	.3	.3	2
Spokane, Portland & Seattle							7.3	14.1			14.1		7.3	14.1	21
Staten Island Rapid Transit			10.9	21.0							21.0		10.9	21.0	25
Staten Island			10.2	20.4							20.4		10.2	20.4	22
Syracuse, Lake Shore & Northern							23.8	30.3			30.3		23.8	30.3	31
Terminal R. R. Ass'n of St. Louis							6.0	12.0			12.0		6.0	12.0	16
Texas & Pacific							1.0	1.0			1.0		1.0	1.0	1
Ulster & Delaware							24.4	24.4			24.4		24.4	24.4	30
Union			.6	1.2							1.2		.6	1.2	2
Union Pacific			8.7	15.0			1,493.1	2,121.7	30.9	61.8	2,198.5		1,468.7	2,198.5	1,785
Oregon, Washington R. R. & Navigation Co							456.0	456.2			456.2		456.0	456.2	247
Oregon Short Line			1.3	1.8			574.6	631.8			633.1		572.9	633.1	301
Wabash							68.9	78.6			78.6		68.9	78.6	130
Wabash Pittsburgh Terminal							4.1	8.2			8.2		4.1	8.2	11
Washington, Baltimore & Annapolis							13.8	13.8			13.8		13.8	13.8	8
Washington Southern					5.6	14.2					14.2		5.6	14.2	12
Washington Terminal					7.1	20.4						20.4	7.1	20.4	13
Washington Water Power Co							22.5	22.5			22.5		22.5	22.5	29
Western Pacific							11.2	11.2			11.2		11.2	11.2	8
Total	227.1	389.7	1,705.3	3,613.2	454.6	1,472.6	18,900.3	29,424.0	901.8	1,971.5	29,923.3	6,940.7	22,196.6	36,823.0	38,963

printed December 27, page 1267, shows remarkable differences, the total length of road signaled, as shown in the table now published, being 6,000 miles greater than that in the earlier one; and yet, with the exception of a very few roads, for which we could not get accurate figures, all of the statistics in both tables are official. It will have to be assumed that a large mileage was put under the block system after December 15, when our information was gathered, and before January 15, when the reports were sent to the commission; or else that many inaccurate reports were made in one case or the other. That there has been some inaccuracy is indicated by the fact that the government statement shows for some roads a less mileage than was shown in ours.

We reprint the government statement because it contains more details than ours, and also because the government requires a good deal of collateral information, which should tend to make the whole more accurate.

The statement of the Missouri Pacific alone would account for 4,445 miles of the difference in the total mileage; but in addition to this there are large discrepancies in the statements of the Central Vermont, the Chicago, Peoria & St. Louis, the Cincinnati, Hamilton & Dayton and the St. Louis & San Francisco. Other roads on which the total now reported is considerably larger than appeared in our December report are: Atchison, Topeka & Santa Fe; Buffalo, Rochester & Pittsburgh; Chesapeake & Ohio; Chicago & Alton; Chicago, Rock Island & Pacific (St. Paul & Kansas City Short Line); Cumberland Valley; Delaware & Hudson; Louisville & Nashville; New York Central and the Wabash. The statements of the following roads show a smaller total than was shown in December: Baltimore & Ohio; Chicago & Eastern Illinois; Chicago & North Western; Chicago, Indianapolis & Louisville; Chicago, Milwaukee & St. Paul (Tacoma & Eastern 173 miles added); Copper Range; El Paso & Southwestern; Monongahela; New York, New Haven & Hartford; Pennsylvania Railroad; Queen & Crescent (Alabama Great Southern). The Minneapolis, St. Paul & Sault Ste. Marie, reporting this year 1,420 miles operated under the manual block system, reported on January 1, 1912, about 1,000 miles more than that.

The comparison of January 1, 1913, with January 1, 1912, shows a net increase of 7,540.1 miles of road block signaled, as follows:

	Jan. 1, 1913.	Jan. 1, 1912.	Increase.
Automatic, miles of road	22,218.8	20,734.9	1,483.9
Manual	61,731.0	56,074.8	5,656.2
Total miles	83,949.8	76,409.7	7,540.1

The last preceding report showed a total increase in twelve months of 5,140.6 miles.

The bulletin contains a separate list of the increases on certain roads. In this list are the names of thirteen companies on whose lines there has been a decrease in the mileage of roads worked by the manual block system. Most of these items, but not all, show that automatic signals have been installed in place of the manual.

A table is given showing the length of road on which alternaning current is used in signal operating circuits and in track circuits. A mileage considerably in excess of that reported one year ago is shown on four roads: Atchison, Topeka & Santa Fe; Cumberland Valley; Pennsylvania, and Southern Pacific. On the Pennsylvania lines east of Pittsburgh there is now a length of over two hundred miles of road (589 miles of track) on which alternating current is used for track circuits.

The list of roads, showing the mileage on each, where upper-quadrant, three-position automatic block signals are used, is considerably longer than last year. The mileage of road equipped with upper-quadrant signals has increased materially on the following 14 roads: Atchison, Topeka & Santa Fe; Buffalo, Rochester & Pittsburgh; Chicago & North Western; Chicago, Rock Island & Pacific; Chicago, St. Paul, Minneapolis & Omaha; Columbia & Puget Sound; Cumberland Valley; Delaware & Hudson; Erie; Boston & Albany; New York Central; Norfolk & Western; Pennsylvania; Michigan Central. The table showing this data seems to be imperfect, as two prominent roads which appeared a year ago as using upper-quadrant signals are now absent from the list.

The list of roads from which statements were received concerning new work proposed for the present year differs considerably from that which we published December 27. The following roads, with the mileage given, did not appear in our list: Atchison, Topeka & Santa Fe, 300; Central New England, 17; Central of New Jersey, 28; Missouri, Kansas & Texas, 105; Southern, 56; Wabash, 244. The Pennsylvania, including lines west of Pittsburgh, reports over 1,000 miles proposed new work; but from statements made in the announcement which was published in the *Railway Age Gazette*, it is to be assumed that a large part of this mileage consists, not of extensions of the block system, but of lines on which the automatic system is to be introduced in place of the manual.

The tables in the bulletin are accompanied by numerous foot notes containing explanatory matter. Most of these notes convey the same information that has been given in former years, and need not be repeated in this place. Light signals—signals which give their indications by lights of different colors and in which the engineman sees no moving part—are now in use on the Boston & Maine (in Hoosac tunnel); the Hudson & Manhattan; the Buffalo, Rochester & Pittsburgh (2 miles); the New York Central and the Pennsylvania.

A comparison of the totals shown in Table No. 2 with those

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in the same table published one year ago, shows that the length of road equipped with exposed disk signals has decreased sixteen miles; that equipped with enclosed disks, 172 miles. Electro-pneumatic block signalling has been increased by 10 miles (70 miles of track). The increase in mileage of electric motor signals is 2,082 (3,732 miles of track). The total increase in length of *tracks* equipped with automatic block signals is 3,530 miles, of which all but 34 miles is classed "normal clear." The last column in Table No. 2 should be headed "number of block sections," not block stations.

Table No. 3, not reproduced, shows that in the operation of the manual block system, the use of the telephone has been largely increased, as follows:

	1913. Miles of road.	1912. Miles of road.	
Telegraph	38,106	37,417	Inc. 689 miles
Telephone	23,062	16,544	Inc. 6,458 miles

There is an increase of 303 miles in the length of road where electric bells are used in manual block signalling, the Great Northern reporting 253 miles thus worked. The Great Northern also reports 212 miles of line worked by the controlled manual system, with no track circuits. On the New York Central the length of road worked by the controlled manual system has decreased 115 miles.

The electric train staff is now used on 508 miles of track, to which may be added five miles of the double track line in the Hoosac tunnel where the train staff is used whenever it is necessary to run trains on either track in a direction opposite to the current of traffic.

Table No. 4, not reproduced, shows 18,069 miles of road on which the manual block system is used only for the protection of trains at the rear; that is to say, in the blocking operations on single track, an operator sending a train eastward from A to B does not go through the formality of asking B to protect the section from westbound trains. The principal items making up this 18,069 miles are: Baltimore & Ohio, 1,708 miles; B. R. & P., 312; Central Vermont, 402; C. & N. W., 187; C. B. & Q., 6,315; Missouri Pacific, 7,213; Michigan Central, 922; Wabash, 835.

The table giving statistics of the use of the telegraph and the telephone in the transmission of train orders shows a total of 153,690 miles of road on which the telegraph is used, a decrease of 13,710 miles from the total of the preceding year; and that the telephone is used on 68,097 miles of road, an increase of 9,513 miles over the total of the preceding year.

SLIDE VALVE SUCCESSFULLY USED ON SUPERHEATER LOCOMOTIVES.

In 1911 the Delaware, Lackawanna & Western received 15 large consolidation locomotives from the American Locomotive Company. These were fitted with slide valves and were designed for a working steam pressure of 170 lbs. per sq. in., and a tractive effort of 51,400 lbs., thus necessitating the use of comparatively large cylinders, 26 in. x 30 in.; in spite of the fact that these and very carefully lagged to prevent heat losses the amount of condensation was considerable. To overcome such losses and effect a greater economy in operation it was decided to apply a superheater to one of the locomotives as an experiment. As the locomotives were less than two years old and the cylinders were in first class condition it seemed advisable to retain them and to try to use the slide valves, although experiments which had been made on other roads indicated that such valves could not be successfully used with superheat.

Engine 388 was selected for the test, and when the superheater was applied was equipped with gun iron valves, packing strips and balance plates. The pistons were also fitted with gun iron packing rings and the cylinders were bushed with the same material. Graphite lubricators, furnished by the National Graphite Lubricator Company, Scranton, Pa., were applied. Graphite in the stick form is used with this device and is pulverized and delivered directly to the cylinders through the oil plugs in combination with the usual hydrostatic lubrication from the cab lubricator. The graphite-oil mixture is introduced to the valve chamber over the balance plate, where it is intimately mixed with the inflowing steam and an auxiliary oil stream is applied to the bridges to direct sprays of oil against the under sides of the valve. None of the parts were redesigned. The saturated steam engines of this class have 445 tubes, while the superheated steam locomotive has 259 2 in. tubes and thirty-four 5½ in. flues. A working steam pressure of 160 lbs. is used as compared to 170 lbs. for the saturated steam locomotive. The grate area is 58 sq. ft.

The engine thus equipped was turned out of the Scranton, Pa., shops on December 13, 1912, and after being broken in was placed in service on December 16. Up to and including May 1, 1913, the following mileage has been made:

December	957	April	2,596
January	2,647	May 1	119
February	2,499		
March	2,739	Total	11,557

The locomotive has thus been in practically continuous service since the superheater was installed, and has been tried out exhaustively in slow and manifest freight service, taking its place in the pool with other engines of the same class. The degree of superheat is high, the terminal temperature ranging around 650 deg. F., as determined by the pyrometer readings. No more trouble has been experienced with the slide valve than on other engines of the same class using saturated steam.

Comparative tests of this engine made in slow freight service on the Scranton and the Morris & Essex division, as against a saturated steam engine of exactly the same design, gave the following results:

	Locomotive 388. Superheat.	Locomotive 399. Saturated Steam.
Engine miles	775	775
Ton miles	1,454,854	1,467,260
Time on road	72 hrs. 46 min.	73 hrs. 0 min.
Average speed, miles per hr.	10.63	10.6
Weight of coal used, lbs.	130,276	182,200
Coal per hour, lbs.	1,736	2,495
Coal per minute, lbs.	30	41.6
Coal per engine mile	168.3	234.7
Coal per 1,000 ton miles	89.9	124.2
Average coal per trip, lbs.	22,950	30,300

The superheated steam locomotive used 27.5 per cent. less coal per 1,000 ton miles and 28.3 per cent. less coal per engine mile. It should be noted that in addition to being equipped with the superheater it also had a brick arch, engine 399 having neither of these devices. The steam chests of the superheater engine have been removed and the valves and valve seats examined at regular intervals, but have been found at all times to be in first class condition. If the use of the graphite lubricator will make it possible to apply superheaters to old locomotives and retain the slide valves, thus cutting out the expense of providing new cylinders, the problem of converting such engines from saturated to superheated steam will be greatly simplified.

GERMAN RAILROAD CONSTRUCTION IN AFRICA.—The Germans are to extend the Usambara railroad, now at New Moschi, 196 miles inland from Tanga and at the foot of Mt. Kilimanjaro, to Mambo, German East Africa, and it will supposedly terminate finally at Lake Victoria. They are also building a railroad from Duala, on the Kamerun coast, to Bidjoka, 95 miles. This line is already open to a point on Sanga river 50 miles west of Edea. On the west coast the Germans, almost as soon as they received a portion of the French Congo as a result of the Morocco incident, considered the advisability of continuing this line to either Libenge on the Ubanghi river, at the mouth of the Lobaje, or to the Congo, at the mouth of the Sanga. It is reported that they are to build either a railroad or an automobile route between Bukoba, on Lake Victoria, and Kissenge, on Lake Kivu, which lies between German East Africa and Belgian Congo.—*Mining and Scientific Press.*

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GOVERNMENT APPRAISAL ENGINEERS.

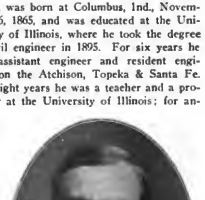
The announcement issued by the Interstate Commerce Commission giving the names of the engineers who have been engaged to make valuations of railway property in accordance with the law which went into effect on May 1, was noticed in the *Railway Age Gazette* of May 2, page 986. The country is to be divided into five districts, and each of these five engineers—R. A. Thompson, W. D. Pence, J. S. Worley, H. M. Jones and E. F. Wendt—will have direct charge of one district; and in addition each will be a member of a board to advise with the members of the Interstate Commerce Commission and with the advisory board of three engineers, which is yet to be appointed.

R. A. Thompson.

Robert Andrew Thompson, Mem. Am. Soc. C. E., was born July 11, 1869, at New Waverly, Tex., and was educated at the University of Texas, where he took his degree in 1892. He received the degree of master of arts in 1893 and of civil engineer in 1900. He was for a time instructor in civil engineering at the university. In 1895-7 he was engaged on construction work on the Kansas City Southern and other railways. For the eleven years, 1898-1908, Mr. Thompson was chief engineer of the State Railroad Commission of Texas. In January, 1909, he was appointed chief engineer of the Wichita Falls & Northwestern, in which position he remained nearly three years. While engaged in this work, he located and constructed about three hundred miles of railway in western Texas and Oklahoma, lines which are now a part of the Missouri, Kansas & Texas. Since October, 1911, Mr. Thompson has been chief engineer of the State Railroad Commission of California, where he has had charge of extensive valuation work.

W. D. Pence.

E. F. Wendt.



John S. Worley.

Edwin Frederick Wendt, Mem. Am. Soc. C. E., was born at New Brighton, Pa., and was educated at Geneva College, Beaver Falls, Pa., where he graduated with honors in 1888. In the same year he entered the service of the Pittsburgh & Lake Erie, joining the engineering corps, and he has been with that road ever since. He served continuously in the engineering department, holding different positions, until October 1, 1898, when he was appointed assistant engineer in charge of maintenance of way and construction and contract work. While he has held this position, the road has been greatly extended and in many parts reconstructed. Nearly all important structures have been rebuilt and a number of branch lines have been constructed. Mr. Wendt has for several years been on important committees of the American Railway Engineering Association and was chairman of the committee on records and accounts. In connection with this work and working in conjunction with the late Walter Berg, he made extensive studies in valuation of property. He was elected president of the American Railway Engineering Association at its annual meeting last March.

Howard M. Jones.

William David Pence, Mem. Am. Soc. C. E., was born at Columbus, Ind., November 26, 1865, and was educated at the University of Illinois, where he took the degree of civil engineer in 1895. For six years he was assistant engineer and resident engineer on the Atchison, Topeka & Santa Fe. For eight years he was a teacher and a professor at the University of Illinois; for another eight years, 1899-1906, he was professor of civil engineering at Purdue University. Since 1906 he has been professor of railway engineering at the University of Wisconsin, and also chief engineer of the Wisconsin State Railroad Commission and the State Tax Commission, where he has had extensive experience in valuation work. Professor Pence has for years been the editor of the publication of the American Railway Engineering Association, and has been a member of numerous engineering societies.

John Stephen Worley was born at Oak Grove, Mo., in 1876, and was educated at the University of Missouri and the University of Kansas. He took his bachelor's degree in engineering at the latter university in 1903 and his master's degree in 1904. Mr. Worley has had considerable railroad experience—chief engineer on the construction of the St. Louis & North

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Arkansas, chief engineer of the Kansas, Oklahoma & Southwestern and of the Fort Scott & Pittsburg—but the more important part of his career has had to do with municipal and other public service enterprises. For some time he was principal assistant engineer on municipal improvements and appraisals for the Riggs & Sherman Company, consulting engineers, Toledo, Ohio. Mr. Worley went to Kansas City in 1909, where with E. B. Black, he formed the firm of Worley & Black, consulting engineers. This firm has designed and supervised the construction of municipal improvements at many places throughout the central states, and during the past two years has appraised the property of a number of public utilities. Mr. Worley took part in an examination of the physical properties of the Central of Georgia and the Buffalo, Rochester & Pittsburgh railroads; and in 1912 was engineer in charge of an investigation of the methods of operation and accounting of the Delaware, Lackawanna & Western.

Howard Murfree Jones, Mem. Am. Soc. C. E., was born in Murfreesboro, Tenn., October 9, 1874, and was educated at Vanderbilt University, Nashville, Tenn., and at Union College, Schenectady, N. Y., graduating at Union in 1895 with the degree of bachelor of engineering. Mr. Jones has had eleven years' experience in railroad work, having entered the service of the Nashville, Chattanooga & St. Louis in October, 1895. He served in the chief engineer's office of this road at Nashville for seven years, rising to the position of assistant engineer. He left the road and for a year was with the Louisville Bridge & Iron Company as assistant bridge engineer, but he then returned to the railroad and from 1903-1907 was bridge designer and bridge engineer. He opened an office as consulting and designing engineer in Nashville in January, 1907, and during the six years since that time has designed and built a large number of bridges, including two across the Cumberland River, at Nashville, which, together, cost over a million dollars. Mr. Jones was for eight years secretary and treasurer of the Engineering Association of the South, and has been president of that association.

HEARING ON ELECTRIFICATION IN CHICAGO.

The Chicago City Council Committee on Railway Terminals held a hearing on May 12, on a proposed ordinance to require the substitution of some other power than steam locomotives for the operation of the Chicago terminals. The position of the railways toward such an ordinance was presented in a lengthy statement signed by the executive officers of the principal Chicago roads, explaining the differences in conditions in the terminals of Chicago and in those of other cities where electrification has been tried, and asking the committee to defer final action on the pending ordinance until the conclusion of the extensive investigation which has been under way for the past two years by the Chicago Association of Commerce Committee on Smoke Abatement and Electrification of Railway Terminals. The statement, which was presented for the roads by Attorney Robert Redfield, is as follows:

"Your committee have pending before you, for consideration and report, an ordinance in reference to the electrification of terminals in the city of Chicago.

"Before you act upon this proposed ordinance we think that it is due you to know the attitude of the railroad companies represented by the undersigned. We also write you because we are confident that there are considerations of importance affecting the interests of the city as a whole, concerning which we believe you would desire to be informed.

"Permit us, first, to mention briefly the attitude of our railroads toward the subject under consideration. We recognize the desirability of eliminating or reducing to a minimum the creation of smoke in the city, and particularly in the residence districts, and the congested centers of population. We have for some time been seeking a solution of the problems entering into this question.

"No further proof of our good will and sincerity in this matter is needed than reference to the fact that, at the invitation of the Association of Commerce, we joined it in the formation of a committee, upon which we had only minority representation, created for the study of the problems of smoke elimination, and the replacement of steam by other power; that the railroads have furnished all of the money to defray the expense of this investigation, for the reason that the necessary preliminary study, if conducted independently, could not be made to cover in so thorough and unbiased a way the complexities of the enormous business interchanged daily between the commercial interests through the railroads. We have turned over to this committee all the data in our possession, or desired, bearing upon this subject, consisting of plans of tracks, yards, terminals, interchange and industrial tracks, coal consumed, number and kind of locomotives in use and daily mileage thereof, as well as data upon many pertinent and technical subjects and operating conditions—the latter embracing the tonnage of freight received and forwarded, both by the carload and through freight houses, also the number of passenger trains, covering the past ten years' operations.

"It ought not to be overlooked that the Association of Commerce committee has been, for nearly two years, pursuing a thorough, systematic and uninterrupted study of this important question; that it is making marked progress in the performance of the duties entrusted to it; and that when it completes the labors of its investigations its conclusions will be entitled to that respect and confidence which the character of the committee and the thoroughness of its study of the subject will command.

"The second consideration which we desire to submit to you is that in Chicago the railroad situation is entirely different from that in any other part of the United States where electrification of terminals has been attempted. Chicago has had a phenomenal industrial growth. To keep pace with this growth the railroads have been under the necessity of laying tracks under all sorts of conditions. The demands for service have compelled junction and interchange tracks, grade crossings, elevations, inclines and depressions. The requirements of new industries located in all parts of the city have been and are so irresistible that good engineering and economic operation have been given secondary consideration. As business has increased by leaps and bounds, new tracks, cross-overs and grade crossings have become so numerous that there has grown up a net-work of steel rails in many localities so intricate and interrelated that only the oldest and most experienced employees now know all the properties of their respective lines. In other cities the railroad companies generally keep to their own properties, but in Chicago there is a peculiarly free exchange of business. The locomotives of one line are permitted to go on the rails of other lines, anywhere that business necessities demand. Coal is supplied for almost daily necessity, with dependable regularity, lumber comes in and is switched to the yards in a few hours, and distributed to the factories with the same dispatch as other and more concentrated raw materials. The orders of jobbing houses, filed one day, are on the road to the consignee the next. Daily trains of merchandise, stock, fruit and vegetables are taken to the congested centers of the city, unloaded, reshipped or sold locally, in a few hours. The commercial supremacy of Chicago has been brought about through the superiority of its transportation facilities. Unlike New York, with its hundreds of miles of docks and wharves, the merchants of Chicago depend almost entirely upon the railroads for service, and get it. Commerce and transportation are closer together in Chicago than in any other large city in the United States or in the world. It is a shorter distance from the shipping room to the carrier on an average than in any other commercial center, and the business activities radiate to greater distances by reason of such advantages. This unique and peculiar condition of freight terminals, brought about by this rapid growth and the necessity of prompt interchange between railroads, differentiates the condition here from that

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obtaining in other places where electrification of freight terminals has been proposed.

"The difference is illustrated by New York, which is Chicago's principal competitor, and which has also been frequently referred to as more progressive than Chicago in the matter of electrification. Among the important points of difference between the railroad terminals of the two cities and their approaches are these:

"First: The geography of the city of New York brings the railroad tracks into the terminals through tunnels and along comparatively straight paths, with few crossings and no interchange, whereas in Chicago the tracks converge into the city from nearly all directions, and over many crossings.

"Second: At the present time practically no freight is handled by electricity in the city of New York, and in the two instances where a comparatively small number of freight cars are handled there is no interchange. In Chicago there is an interchange of 25,000 freight cars a day, and 65,000 cars of freight are daily moved into the city. The subject of freight terminal electrification in New York City is now a matter of study, and no conclusions have been reached.

"Third: In so far as electrification has been adopted in New York City, it was necessitated by tunnel conditions and the character of the passenger terminals.

"The foregoing brings us to a suggestion, that the consequence of an erroneous determination of this complex problem, by a superficial consideration, will be most serious to the commercial and industrial interests of this city, and prudence would seem to dictate the wiser course of completing the systematic investigation now well under way by the Association of Commerce. Chicago owes her supremacy, in the competitive race, to the superiority of her facilities for moving freight by rail, and to the extent that these facilities are impaired, her supremacy will be lost to her competitors.

"We therefore respectfully request that your committee defer final action upon the pending ordinance until the committee of the Chicago Association of Commerce has completed its labors and prepared its report upon the whole subject matter.

"In the meantime, the railroads are not only co-operating with that committee, but are also co-operating with the Bureau of Smoke Prevention of the City of Chicago, and have made substantial progress in the elimination of smoke. In detail, a few of the measures adopted for the reduction of smoke are as follows:

"The organization of a staff of officers, in the city of Chicago, who inspect the operation of locomotives, and instruct the enginemen as to the reduction of smoke;

"The equipment of switching and road locomotives with air jets, superheaters and mechanical stokers;

"The use of a better grade of coal;

"The use of improved front end devices, whereby the amount of cinders and dirt carried into the open air has been more than cut in two;

"The construction of new boiler plants, with furnaces built under the recommendation of the City Smoke Department.

"The result, as shown by the official records of the Bureau of Smoke Prevention of the City of Chicago, is a reduction of smoke, from a density of 23 per cent., in 1910, to 7 per cent., in 1912, an accomplishment to which the chief inspector refers as 'a most wonderful and satisfactory improvement.'

"We beg leave to assure your committee that we shall continue to give unremitting and sincere efforts to the elimination of smoke, and to the perfection of plans for the substitution of other power in place of steam."

The statement was signed by: Chicago, Burlington & Quincy Railroad, by D. Miller, president; Chicago & North Western, by W. A. Gardner, president; Chicago, Milwaukee & St. Paul, by A. J. Earling, president; Pennsylvania Lines, by J. J. Turner, vice-president; Illinois Central, by W. L. Park, vice-president; New York Central Lines, by J. J. Bernet, vice-president; Atchison, Topeka & Santa Fe, by E. P. Ripley, president; Chicago, Rock Island & Pacific, by H. U. Mudge, president.

Howard Elting, president of the Chicago Association of Commerce, also presented a statement outlining the position of the Chicago Association of Commerce toward the investigation, and strongly urging the committee to postpone consideration of the question until the final report of the committee is issued. He said that by January 1, 1914, the committee will be in a position to report something tangible and definite as a solution of this important problem, and that if, on the other hand, the railroads should be forced suddenly to abandon steam and adopt electrification, it is altogether possible that a serious disorganization of Chicago's shipping facilities would result. He outlined the reasons which led the Chicago Association of Commerce to appoint the committee consisting of nine men named by the association, four by the mayor of Chicago, and four by the railroads, because of the necessity for a thorough scientific investigation which would make possible a report so conclusive that it must inspire the public confidence. He declared that the electrification of the railroad terminals in Chicago constitutes a problem that is unique in the United States, because the terminals of Chicago's 38 railroads are bound together by constant intercommunication into a complex network with which no other city in the world has anything to compare, a situation existing because Chicago has the most excessive railroad facilities in the world. The best interests of the city demand that the question be solved correctly for the public in question, and business interests in particular must ultimately bear the expense of hundreds of millions of dollars, and must either benefit or suffer by the effects of any changes in the operation of Chicago railway terminals. It is the part of wisdom, therefore, to inquire fully into the returns of this big investment and to make certain that it will be a good business proposition for the city of Chicago. He felt confident that the work of the association's committee during the past two years represents more actual progress toward the solution of the smoke problem than has been recorded in any other equal period of the city's history. The entire cost of the investigation, which up to the present time has been about $250,000, is being borne by the railroads, and they exercise no control over the course of the investigation other than their proportionate representation of four out of 17 members. The value of the investigation will be measured by the completeness of the information upon which its conclusions will be based, until a complete conclusions are impossible, and any results considered apart from all the other findings of the investigation are without practical value. He believed that the most direct road to the solution of Chicago's smoke problem is that followed by this investigation.

He was followed by Judge Jesse G. Holdom, chairman of the Chicago Association of Commerce committee, who outlined in detail the progress of the investigation thus far, and the work that remains to be done before a report can be rendered.

O. Monett, chief smoke inspector of the city, declared that he was familiar with the work of the committee, and that any action on the proposed ordinance at this time would be immature and ill-advised. He said that the railways were not taking advantage of the time required by the investigation to delay the abatement of the smoke nuisance, but are making every effort that can be made under present conditions to reduce the amount of smoke. The percentage of locomotive smoke density has been reduced from 23 per cent. in 1910 to 7 per cent. in 1912, and the railways are now employing more smoke inspectors than the city, and spending more money to reduce the smoke from their locomotives than the city is spending for all the smoke stacks in the city. The committee announced that a series of further hearings will be held on the subject before any conclusion is reached.

Railroads in Belgian Congo.—The Mayumbe railroad, which goes north from Boma, Belgian Congo, is now being operated for over 70 miles, and it is stated that eventually it will serve the Minduli copper mine, in French Congo. The latter is now, however, connected by a light railroad 95 miles long, with Brazzaville, a town on the French side of Stanley Pool, where connection is made at Kinshasa.—*Mining and Scientific Press.*

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ANNUAL MEETING OF THE AIR BRAKE ASSOCIATION.

Last Two Days' Proceedings—Papers on Triple Valve Operation, Air Hose Failures, and Location of Steam Heat Traps.

A report of the firts two days' sessions of the Air Brake Convention was published in the *Railway Age Gazette* of May 9; following is an account of the remainder of the convention.

WILL THE TRIPLE VALVE OPERATE AS INTENDED?

A paper on this subject was presented by S. W. **Dudley**, of the Westinghouse Air Brake Company, who outlined in the first part the various external and internal conditions that affect the operation of the triple valve. The most important feature of the paper was a report of tests made by representatives of the Pennsylvania Lines and of the Westinghouse Air Brake Company to determine, comparatively, the effect of the more common circumstances affecting the service operation of the triple valve in modern passenger train service. A primary consideration was the relative effect of 1 in., 1¼ in. and 1½ in. brake pipe on the release, the service and the emergency functions of the quick action triple valve. Other considerations were the effect of main reservoir pressure, compressor capacity, design of triple valve, kind of service brake applications, use of full release position, single and double brake equipment per car, condition of triple valve, rate of recharge of auxiliary reservoirs permitted and brake pipe leakage. An abstract follows:

The tests were made on a 12-car train test rack of double PM-1612 equipments including one complete No. 6 ET locomotive brake equipment, located out of doors at the plant of the Westinghouse Air Brake Company, Wilmerding, Pa. The apparatus was arranged so that any desired combination of conditions with regard to compressor capacity, size of brake pipe, arrangement of equipment or manipulation could be readily obtained. Standard (not extra heavy) pipe was used in all cases. The test rack duplicated, as nearly as possible, train service conditions.

The triples first used were taken from stock and had been operated on the rack, more or less, for about two weeks, and were by no means in a uniform condition. They, therefore, represented as nearly as possible, the condition which might be expected on a train equipped for service.

With a 6-lb. train pipe reduction some of the brakes failed to apply. Six tests were made with a 1 in. and 1½ in. train pipe; 74 per cent. were applied with the 1 in. pipe and 77 per cent. with the 1½ in. pipe. In the release test 16 per cent. failed to release with the 1 in. pipe and 17 per cent. with the 1½ in. pipe. It will thus be seen that there was no marked difference between the 1 in. and 1½ in. pipe under these conditions.

After the valves were put in good condition (according to the indication of a portable testing truck) not a single brake failed to apply (except on the very light 4 and 5-lb. reductions), and only a relatively small number failed to release. This shows clearly that the condition of the triple valve is an important factor in both the application and release of the brakes; that it may be the determining one; and that any improvement in the condition of the valves will assist in preventing improper operation of the brakes. Therefore, the tests referred to up to this point in which the influence of the triple valve itself was evidently the predominating factor, will not be used in comparing in detail the effect of different sizes of pipe and other factors.

As a means of comparison the rate of rise of brake pipe pressure on the last car in the train was taken as the standard, as it is directly and primarily affected by the conditions to be compared.

When releasing brakes and increasing the pressure in the brake pipe, it was found that a 1½ inch pipe produces no improvement, and on the whole is less satisfactory than a 1¼ inch pipe in this respect. The time to increase the brake pipe pressure 5 lbs. on the last car in the train is practically the same as the 1¼ inch pipe.

The effect of 1½ inch brake pipe in service applications was found to considerably delay the time of obtaining full brake cylinder pressure corresponding to the reductions made on the train as a whole, but at the same time cause a more uniform starting of the application of all the brakes. The average time to obtain maximum pressure in making a 20 lb. reduction with the 1½ in. pipe was 24.6 seconds, which is 5 seconds, or 25 per cent. longer than for the 1¼ in. pipe and 10 seconds, or 70 per cent. longer than for the 1 in. pipe.

While the use of 1½ in. pipe slightly increases the emergency brake cylinder pressure, it seriously interferes with the obtaining of serial quick action, especially with the brake (both triple valves) on the car next behind the locomotive cut out. The brake cylinder pressure in emergency is increased 6 lbs. or 7.7 per cent. above that obtained with the 1 in. pipe and 4.5 lbs. or 5.8 per cent. above that with the 1¼ in. pipe. The 1½ in. pipe offers no appreciable advantages over the 1¼ in. pipe and does introduce some distinctly undesirable features.

The record of the brakes released with the 1¼ in. brake pipe is slightly better than with the 1 in. pipe. Its advantages in this particular are so slight as to be negligible in comparison with the much more marked differences produced by the use of other means. The time to increase the brake pipe pressure 5 lbs. on the last car is, under all conditions, less with the 1¼ in. pipe than with the 1 in. pipe. This should result in a corresponding improvement in releasing brakes. The summary of the tests chosen as representing conditions where some brakes are close to the "sticking point," shows that for the 1 in. pipe out of a total of 432 possible stuck brakes 6.5 per cent. were stuck for 10 seconds and 3.7 per cent. stuck for 60 seconds. The substitution of a 1¼ in. pipe for a 1 in. pipe, other conditions remaining the same, reduced these percentages to 1.6 per cent. and 0.9 per cent. respectively. The percentages for 1½ in. pipe were 1.2 per cent. and 1.2 per cent. respectively, showing no appreciable gain over 1¼ in. pipe. However, on the whole, the difference between the effect of 1 in. and 1¼ in. pipe on the release of the brakes was not sufficient to indicate that the larger pipe would materially assist in releasing the brakes under otherwise unfavorable conditions. That is to say, the substitution of a 1¼ in. brake pipe for a 1 in. brake pipe could not be expected to produce any marked improvement under conditions which would otherwise tend to cause stuck brakes, although its tendency is unquestionably in this direction.

The effect of a 1¼ in. brake pipe in service applications is to somewhat delay the application of the brakes on the train as a whole, but at the same time produce a more uniform starting of the application of all the brakes. With a 1¼ in. brake pipe the time to start the application of the brakes on the twelfth car is practically the same as for the 1 in. pipe. The time to obtain maximum pressure in making a 20 lb. reduction is 19.6 seconds, which is 5 seconds longer than with the 1 in. pipe.

The use of the 1¼ in. pipe slightly increases the emergency brake cylinder pressure, but tends to hinder serial quick action. This interference with quick action, however, was not appreciable except under the more severe conditions; which conditions were, however, not sufficient to affect the obtaining of quick action with the 1 in. pipe. The emergency brake cylinder pressure is increased 1.5 lbs. or 2 per cent. above that with the 1 in. pipe. The time of transmission of quick action throughout the train is not appreciably affected.

The use of a 1¼ in. pipe would tend toward improvement in releasing brakes, would be a distinct economic advantage (due to having but one, instead of two standard sizes of air brake hose and fittings to be kept in stock and handled) and would not be objectionable, either on account of a slower service application or its effect on quick action except under extreme

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conditions. However, it could not be expected to entirely eliminate the troubles heretofore experienced with double equipment cars, other conditions remaining unchanged, and is of much less benefit than a number of the other factors, such as manipulation, main reservoir pressure, and so on as mentioned in this report.

As would be expected, with low main reservoir pressure and short time in full release position there is not much difference in the results with different size pipes, but with the higher (140 lbs.) main reservoir pressure the effect of large size pipe is marked. With 140 lbs. main reservoir pressure, for all reductions and times in full release position, the difference between the brake pipe pressure on car 1 and on car 12 with 1¼ in. pipe is half or less than half that with 1 in. pipe. With other conditions the same, the 1¼ in. pipe permitted the brake pipe pressure on the last car to rise to a higher point than did the 1 in. during the time the brake valve handle was in full release position.

Concerning the use of 1 in. and 1¼ in. pipe on the locomotive, it was found that there was no appreciable difference. The larger size brake pipe permits a greater amount of air loss by leakage without causing an application of the brakes.

Discussion.—P. J. Langan (D. L. & W.) stated that he had found it impossible to make 5 lb. reductions without brakes sticking. Mr. Turner explained that that was on account of the large auxiliary reservoirs used on the D. L. & W. which allow the brake to set sufficiently to cause a stuck brake, there being enough pressure in the brake cylinder to make some appreciable brake application and too much pressure in the auxiliary reservoir to permit the triple valve to go to release position when the train line was recharged. With the smaller auxiliary reservoir this difficulty would be overcome.

AIR HOSE FAILURES.

A paper on this subject was read by T. W. Dow, of the Erie. An abstract follows:

Several roads are making an accurate check of the cost of damage due to burst hose, intending to bring it before the M. C. B. Association to use as an argument for establishing a positive time limit in which to remove all hose from service. While the cost of such a practice might seem unwarranted and excessive to many, when it is compared with the cost of damage to equipment from the failure of the air hose it will be found that there will be a balance in favor of this practice. In checking several thousand 1¾ in. air hose that had failed due to bursting, during the year of 1912, the average life was found to be less than 20 months, and a small percentage of the number had been manufactured over 24 months; and it has been suggested by a number of mechanical officials that under the existing conditions it did not appear to be unreasonable to limit the service of air hose to the latter figure, or 24 months.

In making the stretching test on 1 in. sections of various inner tubes it was found that some developed noticeably large holes which at first were very small. These were due to particles of grit which were seen in the rubber before being stretched. It is believed that such conditions account for the large number of porous hose. It is maintained by many, however, that the practice of pulling hose apart is responsible for short life and it is possible that the pulling apart has a tendency to opening up the pores in the inner tube similar to the conditions developed in the stretching test.

During the soap suds test of the air hose on a large number of trains during the warm season of 1912, it was found that about 10 per cent. were porous. A large portion of this number were porous throughout the entire length of the tube, but many were noticed leaking only at the nipple end, having been made so probably by being bruised, and it is thought that this may be aggravated by the new recommended location of the angle cock, 11 in. back of the pulling face of the knuckle.

While a large number of air hose fail due to the tube blowing off the fittings, a check during the year 1912 showed a lesser number than during the year of 1911. This may have been due to a local condition rather than to any improvement in the make-up of the inner tube, or to the method of fastening, but it is thought that serious consideration should be given to both.

Failure through chafing, being burned, torn off and damaged couplings, still continues, but all such can be eliminated by proper attention to the location of the pipes and a regard for a rule that has been many years in print, but not in force, whereby all hose should be uncoupled and not pulled apart. From examination made, it would appear that air hose manufactured within the two years just passed fail more rapidly than those manufactured four or five years ago.

Discussion.—H. F. Wood (B. & M.) presented some figures on the life of air brake hose that showed that two years would be a practical limit to keep hose in service.

T. E. Hessenbruch (P. & R.) stated that out of 1,200 pieces of defective hose taken from the scrap pile and given a pressure test of 125 lbs., 54 per cent. were porous, having been in service on an average of 18 months; 24 per cent. failed on the nipple end and 11 per cent. on the coupler end; 3 per cent. were weather beaten, being in service on an average of 48 months; 1 per cent. were cut by trap; 1 per cent. were torn, and 6 per cent. had miscellaneous failures. He also stated that considerable trouble was experienced from rust collecting in the groove of the coupling which prevented the gasket from having a good bearing.

F. B. Farmer spoke of the stiffening effect extreme cold has on poor hose which greatly interferes with successful train operation, tearing the hose gaskets and increasing train pipe leakage. Other speakers mentioned similar troubles from frozen hose, and C. W. Wheeler (N. Y. C. & H. R.) has found it necessary to wire the hose together at temperatures in the neighborhood of 20 deg. below zero.

C. N. Remfry (D., M. & N.) stated that his road made a practice of limiting the life of air hose to two years—although the average life was 2 years and 2 months—and claimed a material saving when considering the damage that is done to the equipment by hose failures. He also found that the hose gave better service when the distance between the coupler knuckle and angle cock key was 11 in.

The subject was continued to next year.

LOCATION OF STEAM HEAT TRAPS.

C. W. Martin (Penna.) presented a paper on this subject. An abstract follows:

To the air brake inspector in charge of equipment, who is called on to give an explanation of the cause of removal of wheels from passenger equipment cars which have been slid flat, the disposition of the water of condensation from the steam heat trap or drip becomes a serious problem. This condition has been considerably aggravated by the introduction of the steel car, which requires the number of square feet of heating surface to be more than doubled; this increases the amount of condensation to be discharged at the traps and usually requires more traps, due to the radiators being broken up into smaller units, because of the increased length of the vehicle.

On postal and Pullman cars the number of steam traps has been increased from one or two with the wooden car, to six or seven with steel equipment, and these are located close to the truck, where the condensation drops on the rail directly in front of the wheel, or is blown back on the truck and brake rigging to freeze and add to the rigidity of the parts, preventing that portion of the truck which should be free to move in order to maintain an equal distribution of the weight of the car on the rail, from adjusting itself to the inequalities of the track. This relieves some of the wheels of their proper proportion of the weight at the time the brake is applied, and permits them to slide.

Where the traps cannot be located away from the truck or triple valve, some arrangement should be made to conduct the condensation close enough to the track to prevent flying back under the car. A sheet iron tube clamped to a trap of the verti-

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cal type conducts the water from the trap down close to the track, and where the trap is located near the center of the car, gives good satisfaction.

A guard placed around the trap on the side nearest the part to be protected, and fastened to the trap by a clamp held in place by a stove bolt or machine screw, will also be helpful. The shield may be made from heavy sheet iron stiffened by a rib of half-round iron along the edge, or by flanging it over a heavy wire. While the object of this shield is to protect the truck from water and still allow the atmosphere free access to the trap, in order that any variation in temperature may affect it promptly, it has been criticized somewhat because of the water blowing around the edges of the guard, because of it being wide and shallow.

A device made up from rubber hose, 4 in. in diameter, clamped to the trap and run as close to the track as desired has also been found satisfactory. Where it is necessary to locate the traps outside the rail, this arrangement is preferable to either of those mentioned above. This is especially true when the cars are to be run in an electrified zone, where the third rail is used, as the hose is very flexible, not easily injured by striking any obstruction, and is a non-conductor.

This matter is one which should be taken up by the car designers and builders, with a view to having these traps located at some point as far from the track as possible, and where this is not possible, to provide a suitable shield or guard to protect the brake rigging and equipment.

Discussion.—The discussion confirmed the troubles mentioned in the paper. M. Purcell (N. P.) stated that the brake rigging had in some cases been rendered inoperative by the ice from the drip.

OTHER BUSINESS.

The convention was addressed by J. F. Enright, superintendent of motive power and equipment of the Denver & Rio Grande. He spoke of the difficulties he experienced with cars received from valley roads where it was not as necessary to maintain the air brake system at such a high rate of efficiency as on mountain grades. The greatest trouble was found in lack of proper retaining valves.

The executive committee voted as the sense of the association against the formation of a supplymen's association to work in conjunction with the Air Brake Association, desiring to furnish their own entertainment at the conventions.

The following officers were elected for the ensuing year: W. J. Hatch, Canadian Pacific, president; L. H. Albers, New York Central Lines, first vice-president; J. T. Slattery, Denver, & Rio Grande, second vice-president; T. W. Dow, Erie, third vice-president; F. M. Nellis, Westinghouse Air Brake Company, secretary, and Otto Best, Nathan Manufacturing Company, treasurer.

JAPANESE LOAN FOR RAILWAY BOND REDEMPTION.—Arrangements have been practically concluded for the issue in Paris shortly of a Japanese loan of $38,500,000, of which $35,000,000 will be devoted to the redemption of railway bonds. The rate of interest will be 5 per cent.

MEASURING TRAIN SPEED IN 1832.—A locomotive steam engine, constructed by Davis and Gartner, of York, Pa., commenced her operation on the Baltimore & Ohio Railroad under the most favorable auspices on Tuesday. It started from the Pratt street depot for Ellicott's Mills, with the entire train destined for that place, consisting of 14 loaded cars, carrying, together with the engine tender, a gross weight of 50 tons. The whole went off in fine style and was soon out of sight. A gentleman present says it was out of sight of the depot in about six minutes, and the rapid gliding of the immense train was one of the most imposing and most beautiful spectacles he ever witnessed.—*Extract from the National Gazette, published in the American Railroad Journal of July 28, 1832.*

DEDICATION OF NEW BUILDINGS AT UNIVERSITY OF ILLINOIS.

The new transportation building and the new Locomotive and Mining Laboratories of the Engineering Department of the University of Illinois were dedicated with appropriate exercises at Urbana, Ill., on May 8, 9 and 10. At the opening session on May 8, J. G. Pangborn, special representative of the president of the Baltimore & Ohio, presented an address outlining the history of the various inventions which led up to the use of steam for propulsion and the development of the various types of the steam locomotive.

The program for Friday began with a railway conference in the Transportation building, at which B. A. Worthington, president of the Chicago & Alton, discussed "Modern Problems of the Steam Railway," and W. B. McKinley, president of the Illinois Traction System, "The Modern Problems of the Electric Railway." Mr. Worthington dealt with the serious situation in which the railways find themselves on account of restrictive legislation speaking in part as follows:

"In enjoying the splendid results which actually have been materialized under the conditions which have prevailed, one can scarcely believe that there possibly could be anything so seriously wrong with the railroads themselves, nor with the primary conditions under which the railroads have been operated; not that governmental control is undesirable to the railroads, for in fact it is highly desirable when properly exercised, but the sixteen billion dollar institution of the railroads, erected almost entirely by private subscription, is a national asset of far too great an economic value to be meddled with indiscriminately, or to be hampered by ill-advised legislation which caters to public prejudice and thrives upon public credulity and public passiveness. The truth of the matter is the public has not yet been brought face to face with the really serious condition of affairs that actually exists, nor to a realization of the dominant fact that the public, regardless of the actual investment of not a single dollar in American railroad properties, collectively holds the controlling interest in these railroads, and accordingly enjoys the greatest dividend returns.

"While enjoying the fruits of prosperity, the public—that is, those not directly interested in the finances of railroad properties—while depreciating the values and hampering the service of the railroads, seem to place a great abiding confidence in the stability of other values. As a matter of fact, the railroads being the chief instrumentality in creating such other values, still constitute the *real value underlying such other values.* If, for example, the railroads should be withdrawn, these artificial or contingent values would quickly collapse; and in the exact proportion that these railroads *are* withdrawn, through inefficient or inadequate service, such other values shall certainly depreciate.

"When we stop to consider the precarious situation of the railroads, the very values which underlie our government bonds themselves, the endowment values upon which have been constructed public institutions without number, the foundation and the buttress of our national strength and our national greatness, serious doubt arises.

"But the question is, how much more radical legislation will be required to convince the people that the situation is fast becoming insufferable? In plain words, how much longer are the people going to stand for this revolutionary state of affairs? Are they so blinded by prejudice that they cannot, or rather will not see the error of their way until it will be too late? Passing years will prove convincingly whether 'prudence,' indeed, has been consulted in our present legislative functions. Already indications are becoming apparent to the trained eye that *something* is wrong. Railroad securities, our letters of credit abroad and incidentally the strongest national defense that any nation ever erected, are being returned to us under protest and subject to severe discounts which we ourselves are imposing. Again I ask the question, has prudence been con-

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sulted, and is confidence protected as *you* want it protected?

"Are we not even now changing a form of government long enough established to produce a wealth of $100,000,000,000 in substantially forty years and place us in the foremost ranks of all the nations of the world? And are not these changes due to 'light and transient causes' in the intended and accepted sense of the expression? In plain words, are we not 'killing the goose that laid the golden egg'?

"A railroad plant is not totally unlike any other kind of a plant. It is an organic structure which is supposed to grow, and it thrives best under cultivation. But who would think, for instance, that he could raise more wheat to the acre by heaping upon productive fields all sorts of rubbish that prejudice could conceive, and in addition thereto, passing laws that the kernels shall be larger and the stalks shorter? This seems very much like an absurdity, but I ask you in all sincerity, is it not a pertinent analogy?"

"The Changing Character of the Problems of the Railroad" was discussed by T. H. Goodnow, president of the Western Railway Club, who outlined the progress that has been made in railway mechanical work, especially in the car department. He said that there is a lack of the right sort of young men entering the shops of the railways today and it is becoming more necessary to depend upon immigrants.

Albert Reichmann, president of the Western Society of Engineers, spoke on "The Technical Society as an Influence in Education."

"It is very evident," he said, "that an engineer in order to be successful cannot be a recluse. He must associate with his fellow engineers. He can best secure such association through the technical societies. The meeting of engineers under conditions where all are on a common footing fosters a spirit of kindly co-operation and helpfulness which binds them together and makes each of greater usefulness to the others.

"In the technical societies the various steps of mechanical development are depicted both from the practical and theoretical standpoints. They afford the engineer an opportunity to supplement his own knowledge by the experience of his fellow engineers. They afford him the opportunity to present to the world what he himself has accomplished and to receive criticisms and suggestions from his fellow men and resulting from the discussion of the various subjects which are presented the engineer learns to appreciate the benefits of co-operation; by means of which both the giver and receiver are greatly benefited."

H. G. Hetzler, president of the Chicago & Western Indiana, spoke on "Proper Aims in Training for Railway Service."

W. L. Park, vice-president of the Illinois Central, was unable to be present, but sent an address on "Vocational Education in Connection with Railroad Work." He said in part:

"The magnitude and ingenuity of the great progressive achievement of our railroads has been so wonderful and the results so beneficial and far reaching that we have, to a great extent, lost sight of the necessity of economizing; we must now take cognizance of the terrific waste and crude methods, and begin to apply the scientific methods.

"We must bring about a better system of activities before we have wasted our birthright of natural resources. This power of efficiency must come out of institutions of this character—with their equipment for experimentation and ability to explore the world for knowledge and to make it available to the student.

"I would not deprecate in any way all that is intended by these great schools of special training. There are too few of them, and those that do exist are frequently restricted in their accomplishment by lack of funds to do all that the faculty have in mind.

"I would, however, impress upon those who are responsible for the future prosperity of our railroads, the importance of maintaining a proper balance in the human equation—we must not forget the thousands in the ranks who are deprived of the very rudiments of learning, upon whom we must yet continue to place great responsibilities. The knowledge, concentrated in our educational institutions, should be made available in some degree at least to those deprived of the advantages until there comes a time of more equal opportunities; some system of education yet to be evolved that will give to those seeking knowledge of this vocation an opportunity while employed in a gainful occupation, to acquire it."

Robert Quayle, general superintendent of motive power of the Chicago & North Western, spoke on "How Can the Technical School Help in the Solution of Railway Problems?"

Samuel O. Dunn, editor of the *Railway Age Gazette*, gave a brief talk on "Research as a Factor in Railway Administration."

The formal dedicatory exercises were held on Friday afternoon in the University Auditorium. Dr. W. F. M. Goss, dean of the College of Engineering, presided, and addresses were made by Dr. E. J. James, president of the University; W. L. Abbott, president of the board of trustees; and Willard A. Smith, editor of the *Railway and Engineering Review*. A "Mining Conference" was held on Thursday and Friday.

LOCOMOTIVE BOILER INSPECTION.

The following notes are taken from a paper which was recently read before the Western Railway Club by Frank McManamy, assistant chief inspector of the Division of Locomotive Boiler Inspection of the Interstate Commerce Commission.

A statement which is frequently made to us when repairs are ordered on locomotives which do not meet the requirements of the law is, "I do not consider that dangerous." If we refer to Section 2 of the law, we find that Congress was evidently not satisfied with simply requiring that locomotives must be "safe to operate," and in such condition that they were not immediately dangerous, but they must also be "in proper condition," and the rules were provided to show what was meant by "proper condition." This is briefly but completely covered by Rule 7, which provides that "the mechanical officer in charge at all points where boiler work is done must know that *all* defects disclosed by an inspection are properly repaired before the locomotive is returned to service," and this is just what is desired by the most progressive railroad managers. No one can question the fact that defects which are apparently unimportant in themselves often cause serious accidents.

The most frequent objection that has been made to our method of inspection has been that defects are reported which are not violations of the law, resulting in mechanical officers being asked by the managers to explain why such defects were permitted. It seems to me that those who raise this objection must have done so without having given the matter much thought. The purpose of legislation of this character is to promote safety and not to collect penalties. The penalty must be provided, however; otherwise the law might be ignored, and, when necessary, proper action will be taken to enforce it. We have endeavored, however, with very gratifying success, in most instances, to obviate the necessity of bringing suits to collect penalties, by reporting all defective conditions found, so that they might be repaired before they became serious enough to cause injury, or to violate the law. This policy can only be successfully followed on roads where a sincere desire exists and an honest effort is being made to comply with the requirements of the law.

Section 6 of the law provides that the "first duty of the district inspector shall be to see that the carriers shall make inspections in accordance with the rules and regulations established or approved by the Interstate Commerce Commission, and that the carriers repair the defects which such inspections disclose before the boiler or boilers, or appurtenances pertaining thereto, are again put in service." This requirement makes the principal work of the government inspector of a supervisory character, and plainly shows that the intention of Congress was to place the burden of inspection and responsibility for the condition of locomotives upon the carriers.

The law provides that the district inspector "shall make such personal inspections of locomotive boilers under his care as may

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be necessary to fully carry out the provisions of this act, as may be consistent with his other duties," and this is being done, but where attempts are made by any railroad to shift the burden of inspection onto the government by continuing defective locomotives in service until the defects are discovered and ordered repaired by a government inspector, it will be necessary to resort to the penalties provided in Section 9 of the law, as the law did not intend nor provide sufficient force for the government to do this work alone.

I have frequently heard the statement made that a defective locomotive could be continued in service without incurring a penalty, until ordered out of service by an inspector. In our opinion, this is not the correct view. Section 9 of the law provides a penalty for three distinct acts: First, for violating the act itself; second, for violating any rule or regulation made under its provisions; and third, for violating a lawful order of an inspector. Under these provisions railroads are just as liable for the penalty if they operate a locomotive in a defective condition which has never been seen by a district inspector, as they are for operating one which has been ordered out of service by an inspector. This for the reason that Congress recognized the fact that it would be impossible for 50 inspectors to know at all times the condition of the 65,000 locomotives in service; therefore, the responsibility for making proper inspections, proper repairs and for the general condition of equipment was placed absolutely on the carriers and a penalty provided for failure to comply, regardless of whether the locomotive had been inspected by a district inspector, or not.

Among the rules which have apparently in many instances been misunderstood are the following: Rules 9 and 10 provide a maximum period between the removal of flues and also require the interior of the boiler to have the scale removed and be thoroughly cleaned and inspected whenever a sufficient number of flues are removed to allow examination. We find that the fact that the period given for the removal of flues is a maximum, is apparently overlooked, and it is assumed that the rule is being complied with if the boiler is scaled and inspected once in three years, even though flues are removed each year or oftener. This is not a proper compliance with the rule, because where water conditions are such as to make a frequent removal of flues necessary, it is reasonable to assume that the same conditions make it important that the interior of the boiler be thoroughly cleaned and inspected in accordance with the rules.

Rule 19 is another one that quite frequently is not fully complied with. It requires that at the time of applying a hydrostatic test the boiler must be thoroughly examined while under pressure. We find the practice to be more or less common of failing to hold the pressure while this examination is made; therefore, defective conditions which could possibly have been discovered while the pressure was on may remain undetected. The practice of screwing down safety valves when applying hydrostatic test could be improved upon, although it is not specifically prohibited by the rules. We have found cases where valves were damaged in this way and they frequently leak, resulting in water running down over the boiler, making it impossible to determine whether the water is coming from the safety valves or from some defective seam or rivet, or from a crack in the boiler shell.

Rules 45 to 48, governing the washing of boilers, are in many instances not properly observed. Some roads have been following the plan of removing all washout plugs and washing boilers thoroughly only once in 30 days, which is recorded as the government washout, and although water conditions were such as to require numerous other washouts during the month, all plugs are not removed and only a partial washout is given, which is recorded as the railroad company's wash, or a short wash or some similar term. This is not in accordance with the rules. Rule 45 requires boilers "to be thoroughly washed as often as water conditions require, but not less frequently than once each month," and Rule 46 provides that when boilers are washed *all* washout, arch and water bar plugs must be removed.

This does not apply to a water change when only the washout plugs in the water-legs are removed to facilitate emptying the boiler, but where a hose is used to wash sediment out of the boiler, and, perhaps, other washout plugs are removed and the crown sheet rinsed, or the barrel of the boiler partially washed.

Rule 50 is another which apparently has not been fully understood, or at least properly complied with by many carriers. It provides "that all steam valves, cocks and joints, studs, bolts and seams shall be kept in such repair that they will not emit steam in front of the enginemen so as to obscure their vision," and, we believe, covers every point where steam leaks occur. It was intended to insure a reasonably clear view of the track and signals for the enginemen, yet we find many instances where no inspection is made while the locomotive is under steam, which is the only time such leaks can be located, yet a report is certified to stating that all steam leaks have been repaired. Inasmuch as the United States statutes provide a very severe penalty for a wrongful certification on a report of this kind, this places the railroad inspector in a very unpleasant position. The law requires a sworn report of each inspection and of the repairs made as a result of the inspection, and as the inspector is responsible, under the law, for the correctness of the statements to which he certifies, the report should show conditions exactly as he finds them.

Another point, the importance of which is not fully realized, is the responsibility of the man who signs reports as officer in charge. Rule 7 provides that "the mechanical officer in charge at each point where boiler work is done will be held responsible for the inspection and repair of all locomotive boilers and their appurtenances under his jurisdiction. He must *know* that all defects disclosed by any inspection are properly repaired before the locomotive is returned to service." The officer in charge is required to sign the following certification: "I hereby certify that to the best of my knowledge and belief the above report is correct." The rule above quoted, which requires him to know that *all* defects disclosed by any inspection are repaired before the locomotive is returned to service and the certification which he signs places even greater responsibility on him than on the inspector, because, in addition to knowing that the inspection and repairs have been made, he must know that the report is correct. For this reason the officer in charge at points where inspections are made should give more of his time and attention to this work than is frequently done at present.

Proper care and adjustment of safety valves is another matter that does not always receive the attention that it should. Rule 34 provides that "every boiler shall be equipped with at least two safety valves, the capacity of which shall be sufficient to prevent, under any conditions of service, an accumulation of pressure more than 5 per cent. above the allowed steam pressure." This rule does not mean that the government shall design the safety valves, say what make they shall be, or anything of that kind. It simply fixes a minimum capacity below which you shall not go. When we have demonstrated by test that the boiler can generate steam faster than the safety valves can take care of it, we have asked and will insist that the capacity of the safety valves be increased to meet the requirements of the rule. Of the first 300 locomotives on which safety valve tests were made, 58 per cent. had valves which would not relieve the pressure in accordance with Rule 34. Immediate steps were taken, however, to remedy this condition and a material improvement has resulted, but there is need for a further improvement in this direction.

Our policy has been to freely and frankly discuss matters of this kind with railroad officers in order to bring about a better understanding of what we believe the law requires, to the end that the desired improvement may be brought about without the necessity of threshing such matters out in the courts. In this we have been wonderfully successful, due largely to the co-operation we have received from a large majority of the railroad officers of the country.

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RAILWAYS OF THE UNION OF SOUTH AFRICA.*

System of 9,050 Miles Owned and Operated by Government—Organization, Engineering, Operating and Financial Features.

By E. R. Lewis,
Assistant to General Manager, Duluth, South Shore & Atlantic.

The birth of the Union of South Africa on May 31, 1910, brought under one management the railway systems formerly owned and operated by the governments of the four separate colonies combined in this South African federation. These are the south coast colonies of the Cape of Good Hope and Natal, and the former Boer colonies which adjoin them on the north, known as the Transvaal and the Orange Free State; or the Orange River Colony, as it was called after the British occupation.

At the time of union, the railway systems of these states included 7,207 miles of single track in operation, while approximately 800 miles were under construction. There were authorized in 1911 an additional 527 miles of extensions, now nearly all in operation so that today the government-owned railways of the Union total some 8,500 miles, exclusive of 545 miles of leased and operated lines. This system of nearly 9,050 miles of railways serves an area more than ten times the size of the state of New York, or 500,000 square miles, with a population of about six millions of people.

The conditions under which this system is operated with conspicuous success are unique. The South African colonies had each its responsible government before the consummation of the present Union, which resulted in the amalgamation of the four governments and their different departments, including those of public works and crown lands. The Department of Public Works and Crown Lands is presided over by a minister of the Union government. That division of the department relating to railways and harbors is under one general manager who reports directly to the minister. Thus the policies of railway construction, maintenance and operation are the policies of the government of the country; the results of parliamentary debate, of political expediency and of ministerial decision. With the union of the four colonies, their dissimilar railway equipments and properties, each born of the necessities of that locality which it had formerly served, were pooled under the new ownership and combined under one management. The heavy traffic of the mining districts of the Transvaal, and of the coal fields of northern Natal had been carried in cars and by locomotives of much greater average capacity than those which transported the live stock and forage of the more pastoral Orange Free State and Colony of the Cape of Good Hope.

THE "AMERICAN" UNIT SYSTEM OF ORGANIZATION.

With this new spirit of combination came the decision to adopt for the Union Railways a form of management somewhat similar, or at least based upon, the unit system of some of our most extensive railways, which came to be known in South Africa as the American system.

That this Americo-African unit system, successor to four highly departmentalized colonial railway managements of many years standing, is quite dissimilar from any American railway management, is not surprising nor indicative of failure.

The retraining of four such lusty orphans, suddenly bereaved, with dispositions ever inclined to disagree in small ways with their next neighbors, now members of the same family, could not be accomplished without some more or less stifled strife and bickering. That so little of bitterness resulted, is a triumph possible only to a nation worthy of those leaders who have guided this republic of the antipodes to its present place among the world powers.

Though at present it presents evidence of being an uncomfortably long step in the right direction, this change should ultimately effect many desired economies. The new railway management was designed primarily to promote efficiency through decentralization. With this end in view, eight divisions of the Union Railways were established. On each division an officer termed a divisional superintendent was put in complete control of operation, engineering, passenger and freight traffic and other details of the running of approximately 1,000 miles of main line.

Furthermore there were appointed three assistant general managers, with jurisdiction over two or three of the eight divisions. Both the divisional superintendents and the assistant general managers are residents of their respective territories, the assistant general managers reporting directly to the general managers at Johannesburg, where are located the headquarters offices.

The assistant general manager at Capetown has jurisdiction over System A, comprising two divisions, with divisional superintendents at Capetown and Kimberley. The assistant general manager at Bloemfontein controls System B, made up of three divisions; while the assistant general manager at Johannesburg has three divisions under his management.

The intention underlying the whole organization was that wide powers of initiative and control should be vested primarily in the man on the spot. Thus, the divisional superintendent is given command of the operating, mechanical, traffic and engineer officers within the limits of his territory. The assistant general managers are intended, of course, to control their several territories in much the same manner as would be done by a general manager of a smaller railway, without interfering in those details of working over which the superintendents exercise executive powers. Thus the general manager is to a great extent relieved of executive matters, and able, therefore, to give his time largely to the larger problems of administration.

All matters pertaining to construction of new lines are under the control of the engineer-in-chief. The survey and construction staff of engineers is extensive, as is necessary in a country of such great area, and a government organization required to investigate the many propositions for new branches which are put before the houses of parliament.

The control of the engineering work on lines under operation being in the hands of the divisional superintendents, the chief engineer is in some measure free to give his attention to consultations, and to act in an advisory capacity to the general manager.

The principles of this organization sound familiar, and are indeed, nearly identical with similar railway organizations of America. The underlying principle is to combat the tendency of all large organizations toward the centralization of control, with the consequent delays owing to lack of authority of resident officers, the multiplication of accounts and the expense and general annoyance of what is commonly called "red tape."

Undoubtedly the results desired in South Africa will be obtained sooner or later if the officers in authority stand by their guns. It is not an easy matter to uproot a bureaucracy of forty years' growth in a government service, much less in four combined government services. That it is being done, however, with advantage to these railways is demonstrable. The difficulties which must be overcome can only be estimated by those familiar with governmental organizations.

Legislative expediency is responsible for the network of wandering branch railway lines which have from time to time been constructed to develop sparsely populated districts of South

*The author of this article acquired most of his information regarding the railways of the Union of South Africa while serving as assistant to their engineer-in-chief.

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Africa, sometimes of seeming small future possibilities. Dividends and early returns on capital expended not being so necessary as in the case of privately-owned lines, however, the results of these governmental policies have proved wise, as evidenced by the favorable returns obtained from some of the most arid regions in a few years time.

OPERATION AND OPERATING RESULTS.

Railway operation, or "transportation," in South Africa is distinctly English in method and results. Less than 5 per cent. of the local passenger trains run as much as five minutes off schedule time. Only 23 per cent. of the freight trains run as much as five minutes late per trip. It is safe to say that few railways in America can show such annual records, and these results are obtained in South Africa under conditions unfavorable in many respects, compared with those under which American railways are operated.

The average cost of maintenance per mile per annum of the South African railways is $840, or about 24 cents per train mile. Maintenance of equipment averages 10 cents per engine mile for engines; 13 cents per passenger train mile for coaches, and 11 cents per freight train mile for freight cars. "Running" expenses average about 32 cents per train mile.

For the past ten years gross expenditure has averaged about 62 per cent. of gross earnings, the mileage has about doubled, passenger traffic has increased from 29,000,000 to over 37,000,000 passengers carried annually, and gross freight tonnage has increased from 670,000,000 to 1,110,000,000 tons revenue freight.

The adjustment of freight rates after the consummation of Union of the colonies occupied the attention of government officials for a considerable time, and much of the deliberation had to do with the advisability or otherwise of adopting the basing point system of freight rate making which obtains on the railroads of the southeastern states of the United States. This system was finally and rightly rejected as unsuitable to South African ratings. Both freight and passenger tariffs in that country are influenced largely by the isolated positions of the colonies and by the peculiar topography of the subcontinent.

ENGINEERING CONDITIONS.

The interior of the country is a vast tableland, averaging some 4,000 ft. above mean sea level. The ascent from the coast to the karoo of the hinterland is everywhere abrupt. Each of the few negotiable mountain passes presents serious obstacles to railroad location. The coast divisions of these railways include tunnels, viaducts, rock cuts, heavy grades and sharp curves. The "Cape gage" of 3 ft. 6 in., now the standard gage of the Union Railways, is largely the result of these conditions on the mountain divisions, which were first built without reference to possible extensions into comparatively easy country.

The South African rivers are raging torrents during the short seasons of rain, and dry beds of sand and stone during the remainder of the year when their flow is largely underground. The climate of the karoo is generally delightful, with winters like the crisp October days of our middle states, with once in two or three years a light snow fall. The summers bring hot weather at midday with occasional heavy showers. The nights are very cool. The direct rays of the summer sun are so intense that cross ties are buried in ballast to the railheads to prevent tie checking, and excessive expansion of rails.

These climatic conditions are due to altitude, to latitude, and to the effects of the cold Antarctic ocean current, which follows northward close to the west coast; as well as to the warm Indian ocean current which laves the southeast coast from Zululand to the Cape Peninsula. Frost is left out of reckoning in railway work. Water tanks are open topped. Water pipes may with impunity be laid on top of the ground. Heaving track is an unknown condition. A snow storm is a rarity even in the mountain districts. The sun shines during more days of the year than in almost any other country in the world. The vegetation is luxuriant and subtropical, but a large percentage of the soil is lost to agriculture, because of inability to conserve water for irrigation. Evaporation is excessive, and dams conserving locomotive water supplies are only located aeross deep and narrow gulches.

Built gradually inland by tortuous routes through the mountain passes from the coast ports of Capetown, Port Elizabeth, Durban, and, in Portuguese territory, Lorenco Marques, four separate lines of railway, since 1873, have been extended, branched and finally connected in the vicinity of the gold mines of Johannesburg. Most of these railway extensions were made in advance of the settlement of the districts they traverse. They have enjoyed almost from their inception the financial potency of government ownership and control. They were built on a permanent basis, even though they were development lines. The number of wooden bridges on the South African railways today may probably be counted on the fingers of one hand. Even water openings as small as 6 and 9 ft. across were originally spanned by plate girders on masonry abutments. Owing to the ravages of wood devouring ants and to the difficulty of obtaining native timber fence posts, telegraph poles and, to a certain extent, eross-ties are made of iron and steel. Old rails play an important part in maintenance repairs, being used as posts and girders in buildings, and in concrete as reinforcement.

The capital expenditure on these railways at the end of 1910 was approximately $380,000,000. The general manager of railways and harbors in his report for that year voiced the governmental policy in part as follows:

"The development of the natural resources of a large area of this vast territory, equal to nearly four times the size of the United Kingdom, is as yet only in the early stages, and, in the interests of the country generally, it is incumbent upon the administration to pursue the policy best suited to aid expansion. . . . South Africa has now become a producer of almost every product necessary for its sustenance, although not yet to such an extent as to make it self-supporting. South Africa differs from most other countries. Its natural means of production require the aid of science to promote development in the initial stages. The presence of great mineral wealth and the markets opened up thereby should, however, provide the resources required, and compensate for the greater natural advantages of other countries."

REVENUES DERIVED BY GOVERNMENT FROM RAILWAYS.

As a matter of fact, the railways have for years been important sources of revenue to the colonial governments. In 1910 the net income of the railways of the Union amounted to an equivalent of $26,500,000, or over 45.5 per cent. of the gross earnings. Nor was this an abnormal year. It must be understood that a large percentage of the freight and passenger traffic is through business. Passenger rates are three times as great as the 2 cent fares of the United States. Freight rates are comparatively even higher than passenger fares. There is no competition except as between the different coast terminals of the system itself. On the other hand, these results are obtained in spite of narrow gage tracks, climbing grades as steep as 3 per cent. around curves as sharp as 20 deg. on the mountain divisions. Locomotive water of acceptable quality and in sufficient quantity is the reverse of plentiful and water softening plants have in some cases been installed.

The equipment of these railways includes 1,450 locomotives, many of American manufacture, and a few of the Mallet compound type; 2,072 passenger coaches and 2,300 freight cars. Approximately $225,000 is annually expended on purchase and repair of tarpaulins used for covering freight loaded in gondola cars. Only 10 per cent. of the freight cars are enclosed. Even stock is transported in high sided gondola cars covered with netting of light rope. The passenger coaches compare favorably with the equipment of the best railways of Europe. South African trains de luxe are all that the name implies, even to compartment sleepers, observation cars and shower baths.

These railways have some 50,000 employees, of whom 26,500 are white, the remainder being Hindus and negroes of the vari-

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ous African tribes. The section laborers are almost all negroes, while a large percentage of the foremen are half breeds or negroes. A pension system to which the employees contribute monthly is successfully maintained and self-supporting. It is in fact, a civil service, to which belong regular employees of the railway and other governmental departments, as the public works and post office departments.

The railways obtain a net annual revenue of $110,000 from the catering department, the gross earnings of which are $1,300,000. In addition to the dining car service this department includes railway restaurants, hotels and bars at many of the principal stations and terminals.

All railway news stands are likewise owned and operated to advantage by the Department of Publicity. This department carries on the usual railway advertising, controls the leasing of advertising rights on railway property and goes extensively into photography as a means of educating the world at large as to the products and scenery of South Africa, the opportunities for the immigrant and the traveler.

We note in this connection that "In conjunction with the various municipalities the publicity branch will also, as opportunity offers, thoroughly bioscope South African scenery and industries. The films will be sent to England and sold to bioscope distributing firms."

Betterment work has been steadily proceeded with year by year as on American railways. Surveys for diversions and reductions of grades were under way on a large scale in Cape Colony and the Transvaal in 1903, since which time many extensive betterments in alinement have been carried out. Bridges have been strengthened or replaced to allow of the purchase of heavier equipment, and new track with 80-lb. rail, tie plates and new ties has been laid on the western and other lines of the system. The most thorough renewals have been made within the past two years between Capetown and the Kimberley diamond mines.

COST OF CONSTRUCTION.

Measured by American standards South Africa railway construction is expensive and maintenance is cheap. These conditions are partially the result of cheap unskilled labor, of expensive skilled labor and of the expense of importing machinery; but cheap cost of maintenance is a natural result of exceptionally well-constructed, well-drained roadbed, permanent bridges and good track. The idea that developing lines must be cheap in first cost has been proved wrong through all the years of experience in railway building, but American capital seems never to have learned the lesson. The estimated cost of 526 miles of single line built by the Union in 1911 averaged $23,000 per mile. In this estimate the cost of grading looms very large. Nearly all of the actual construction of the earthworks is performed by negro labor with pick, shovel and wheelbarrow at a wage of scarcely $1.00 per day. South African railway contracts are most often let to large contracting firms, who obligate themselves to turn over the railway complete, for a certain lump sum, after the government has for a certain length of time operated over the track on approval. Such a bargain is usually made only after exhaustive examination by the bidders of soundings for bridges and excavations. The bid is based on the government engineers' approximate estimates made from the located lines and contour maps, which are most exact. All items appearing on these maps and profiles are considered as within the scope of the lump sum bid. All others are extra and are paid for by the force account method. The vexatious questions of classification of materials and overhaul are thus eliminated, while the location and construction of buildings, water tanks, station grounds and side tracks, fences, crossings and cattle guards are worked out in advance of construction and included in the contract.

The rails used are of European and American manufacture; the American rail being easier to procure on short notice, while the English rail is favored as better wearing in addition to being a "home" product. The cross ties in use on these railways are of hardwood and pressed steel. The pressed steel inverted trough "sleeper" has not proved economical. It makes bad track when mixed with wooden ties. Derailments are disastrous to the section of steel ties. Once they are bent, it is very difficult to repair and regage them. Cinders and moisture cause them to rust and deteriorate rapidly.

Steel trough sleepers are most in favor in dry desert districts where the loose sand will not pack under wooden ties and where the white ants make short work of wood fiber. Here the inverted trough sleeper confines the sand under its surface where it solidifies or cakes. In such regions track surfacing is done only during rainy weather. The wooden ties in use on the Union railways are the D'jatti from Java, the Jarrah and Eucalyptus from Australia, and the yellow wood of the Knysna forest of Cape Colony. Here the government operates a creosoting factory.

Nine railway tie plantations are maintained by these government railways, where are grown trees of the different varieties of Eucalyptus, pine, cedar and cypress. Of the nine forest farms under cultivation eight are in the colony of the Cape of Good Hope and one is in the Transvaal. The total acreage in trees is 7,341, while nearly 30,000 acres in all are reserved for this purpose.

The use of concrete is very general for bridge piers and abutments, culverts and foundations of all descriptions. Corrugated, galvanized iron is very largely used for roofing, fencing and siding. Water tanks are of 4 ft. sq., cast iron plates framed and calked, imported knocked down from England. Brick and concrete are the usual building materials. Many government buildings have roofs of slate or tile.

PROVISION FOR GOOD OF EMPLOYEES.

The government railways house most of their employees and officers at nominal rentals in comfortable quarters, and further assist them by transporting free of charge all goods ordered from railway co-operative or government contractors' stores, at 10 per cent. less than retail prices at coast ports. These supplies accompany the monthly pay trains, and payment therefor is deducted from monthly wage disbursements.

Schools are built, furnished and maintained for the education of the children of the railway employees. Railway physicians are stationed at convenient points, and free dispensaries are at the disposal of the families of the railway staff, as well as the services of the railway surgeon who has a private hospital car in which he makes regular trips over his district to treat those who cannot come to him.

Railway missions have been established and missionaries have coaches where necessary to hold services at way stations where other quarters are not available.

In short, the management of these railways meets the needs of the country, and anticipates and provides for the wants and comforts of its employees and their families. The lines, so curious to the American mind in many ways, have been, and are the great civilizers of South Africa. In this land of perfect climate, of wonderful flora and more wonderful mines, of savage peoples and arid plains, of luxuriant valleys and sterile mountains, the same problems of civilization and progress are being solved as in our own country, largely by means of representative systems of rapid transit, chief among which is the steam railway.

PROPOSED RAILROAD IMPROVEMENTS IN BELGIAN CONGO.—The main artery of trade between Congo seaports and not only the upper Belgian Congo, but the French Congo as well, is the Lower Congo railroad from Matadi to Leopoldville, 250 miles. Recently this road has somewhat reduced its freight tariffs. The double-tracking of this line is still under consideration as a possibility, as is the reduction of its curves and grades, and the widening of its gage. The problem of its electrification has recently been studied.—*Mining and Scientific Press.*

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CAR WHEELS.

At the meeting of the New England Railroad Club on Tuesday evening, May 13, two papers were presented—one on cast iron wheels by A. A. Hale, of the Griffin Wheel Company, and the other on steel wheels by M. D. Hayes, of the Midvale Steel Company.

Mr. Hale first reviewed the history of the development of the cast iron wheel and then took up its physical properties. He presented a chart showing that the coefficient of friction between the chilled iron wheel and the brake shoe, whether the latter was of the insert type or plain cast iron, was about 20 per cent. more than with the steel wheel, and stated that a great many types of brake shoes which are used on chilled iron wheels cannot be used on steel wheels because of the injury to the tread; therefore, plain shoes having a lower coefficient of friction are essential to steel wheel service; and further the comparative metal worn from brake shoes under like conditions indicates that the life of the shoes is increased from 20 to 25 per cent. where chilled iron wheels are used—a statement that is also borne out by laboratory work.

The real service performed by a wheel is the amount of work that it does. Available data shows that in freight service the performance of the chilled wheel will approximate 375,000 ton miles per wheel, for ½ in. radial wear. Based on a life of from 10 to 12 years and an average mileage of 26 miles per day, it was estimated that the average mileage of a chilled wheel under freight equipment in the United States was from 100,000 to 110,000 miles. Under the present guarantees of 6 years for a 625-lb. wheel, 5 years for a 675-lb. and 4 years for a 725-lb., under cars of 60,000, 80,000 and 100 000 lbs. capacity, respectively, the average chilled iron wheel costs the railroad company 29 cents per year, or $2.32 per car, and the wheel records of the leading railroads of the United States show that 97 per cent. of all freight cars, including 100,000 lbs. capacity cars, are equipped with chilled iron wheels, and, on this basis, it was estimated that there are 2,219,563 chilled iron wheels in use, whose first cost was about $167,600,000.

The trouble is that excessive work is demanded from wheels in proportion to their increase in work as compared with other parts of the running gear, and yet, with nearly 700,000 wheels under 100,000 lbs. capacity cars, replacements have amounted to but 0.9 per cent., and most of these wheels weigh but 700 lbs. They are also being extensively used in passenger service, and by actual count, during a day in the Chicago terminals, out of 49,560 wheels entering there were 15,992 of cast iron.

During the past three years a number of special types of cast wheels have been marketed and they have been widely adopted for both passenger and freight service.

As for carrying capacity, special chilled wheels 33 in. in diameter and weighing 925 lbs. have been placed under engine tenders having a capacity of 9,500 gallons of water and 16 tons of coal, each wheel carrying 27,000 lbs., or a total load of 216,000 lbs. Wheels of the same diameter weighing 840 lbs. are in use under ore cars of 60 tons capacity, operating in a mountainous district, and are working satisfactorily. In fact, chilled iron is the only metal which will stand up under extremely heavy loads without flowing.

The causes for which wheels are removed depend largely on the care which is given them, so that the defects which cause sharp flanges, flat spots, brake burns, etc., can be practically eliminated if sufficient forethought is given to the subject.

Take sharp flanges, for example. One of the first essentials to the prevention of worn flanges is to have wheels of the same circumference mounted on the same axle, also the trucks should be in proper alinement. If a flat spot is formed on a chilled wheel it sounds a warning that attention is needed. In the case of the steel wheel the large flat spots are often rolled out so that the noise is eliminated, but the wheel remains out of round, and there is an increasing burden put on the track and rolling stock.

Like the flat spot, the shelled out spot is caused by skidding. The high temperature thus produced causes a violent local expansion and almost as rapid a contraction, while the balance of the wheel is cool, and this causes the metal to become disintegrated and tear apart, after which the blows which are received in subsequent service cause small pieces to drop out of the surface which has been so weakened, and it takes only a short time for the typical shell-out to appear. If the wheel were examined immediately after skidding took place, the fine network of hair lines could be easily detected.

It would seem that both wheels on an axle should be equally affected, but this need not be the case, because of the sometimes uneven distribution of the load. In brake-burned wheels the tread is broken up in fine hair lines running parallel to each other across the tread. They are developed in greatest numbers in freight service in sections where the grades are most frequent and severe.

Mr. Hayes divided his paper on the steel wheel into two parts, the steel tired and solid steel wheel. He gave a general description of the several types of steel tired wheels which are and have been made, and entered in some detail into the methods of rolling tires.

As for the rolled steel wheel there are four manufacturers now in the market, each producing essentially the same article, but by quite different methods. For example, No. 1 casts a long rectilinear ingot, rolls it into a round bloom, cuts it into short cylinders and then presses and rolls the wheel. No. 2 casts a small conical ingot and presses and rolls this direct into the wheel. No. 3 casts a long cylindrical ingot, cuts it cold, in a lathe into short cylinders and then presses and rolls it. No. 4 casts a long rectilinear ingot, rolls it into a flat slab, cuts square blanks from the slab and then presses out the wheel. The average properties of the rolled steel wheel may be taken, as thus made, as:

Chemical Properties.	
Carbon	.68 to .85
Manganese	.60 to .65
Silicon	.15 to .30
Phosphorus, not to exceed	.06
Sulphur, not to exceed	.05

Physical Properties.	
Tensile strength	125,000 lbs.
Elastic limit	72,000 lbs.
Extension	10 per cent.
Contraction	15 per cent.

Thus the solid steel wheel has the same high qualities as the steel tire.

The method of fabrication used by the Midvale Steel Company is to pour cylindrical ingots from the bottom. These ingots are about 6 ft. long and 20 in. in diameter. They are poured in groups of four from a common riser. After cooling, they are stripped and cut into short cylinders in a lathe, two tools being used entering from opposite sides. They are not cut quite off, but a central portion about 3 in. diameter is left. This is broken and its fracture serves to indicate in a way, the quality of the metal. The top cylinder only, which is about 15 per cent. of the ingot, is discarded and a wheel is made from each of the other sections. Any segregation that may have occurred on the center line of the ingot is punched out in the forming of the wheel seat in the hub.

This section of the ingot is first heated and then subjected to two pressing operations, in which an embryo of a hub and flange is formed. It is then reheated and rolled. Two driving rolls grip it on the web and roll it out, increasing the diameter of the piece until the wheel is formed, a back roll bearing against the outer edge meanwhile to form the tread and flange.

The discussion turned to a great extent on brake shoe action. On this there is comparatively little information, but it appears that the same brake shoe when applied on steel wheels shows a greater wear than when applied on chilled wheels, but as for the effect on the wheels it is almost impossible to segregate the wear of wheels due to operating conditions from the wear by the brake shoe, and yet in a laboratory steel wheel on which more than 10,000 brake applications have been made, varying

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from 3,000 to 20,000 lbs. in pressure, there is no appreciable wear.

The importance of keeping brake rigging in good condition was emphasized and attention was called to the great injury that could come to wheels where the hangers were at improper angles.

One speaker in calling attention to the good work that had been done in the past by the cast iron wheel, expressed the belief, though he had no data to substantiate it, that from a metallurgical standpoint the cast iron wheel improved by use. That is to say, the jar and vibration to which it was subjected tended to permit the molecules of the metal to readjust themselves, and thus relieve the initial internal stresses to which the metal was subjected.

THE SIGNAL DEPARTMENT.*

"Jim Cheevers," the bright creation of the editor of *Locomotive Engineering*, was made foreman of a small outlying railroad shop, and found the machinery being run by an unnecessarily large slow speed engine, discarded from the big shops elsewhere, and noticed that a much used path from the yard outside to the enginehouse was through the engine-room; and that a man who had been, on entering, in somewhat of a hurry, which was rare, generally was slowed down as he emerged from the engine-room on the other side. After some study and a campaign of correspondence with the master mechanic, he obtained a small high speed engine and substituted it for the big slow speed type. In a few days Jim was pleased to note a material change in his small force by a quickening of the men's gait, particularly upon passing through the engine-room.

So it is with signals. The present day checking which enforces proper respect for certain of the operating rules is such as to brace up the entire train movement. No longer, without others knowing, can the zealous local freight crew, anxious for a record, make one more last switch on the main track in advance of an approaching superior train. No longer can the inferior train make a too close run for a meeting point. On the other hand, a train, instead of taking siding upon some arbitrary order of the despatcher to wait ten, twenty, and perhaps thirty minutes for a following train to pass, rather can, on signal track, run until, as passing out of any block, the signal seen behind standing at stop marks the entrance of the following train into block limits in the rear, and gives notice to clear the main track at the next siding, with a total delay possibly of not more than five or ten minutes. A train entering a clear block proceeds with certainty at a maximum speed even though it may know that it is following another quite closely. The increase in capacity of a road is due largely to the possible increase in number of trains which may pass a given point in a given time, particularly in those periods of "bunching" which are so apt to occur.

In Tennessee, a heavy single track operating division of 150 miles required three sets of despatchers. The signal engineer designed and installed a controlled manual signal system to give superiority to trains "over the mountain" a distance of nine miles. The number of train orders was reduced thereby 34 per cent. and one set of train despatchers withdrawn.

At a certain junction of single and double track, it is necessary for orders to be put out for all trains in one direction, requiring very close application to the key by the telegraph operator, and a second man is continuously required to handle the interlocking machine. The installation of a system providing for handling trains by signals to the next telegraph office on single track, allows the transfer of most of the orders to this latter station, relieving the first station to such an extent that, for each twenty-four hours, two of the three extra men on the switches are eliminated, with a monthly saving of $110 by an original outlay of $1,500 and a merely nominal increase in monthly expense.

*Extracts from a paper read before the Central Railway Club, Buffalo, N. Y., May 9, by B. H. Manny, signal engineer of the Missouri Pacific, and president of the Railway Signal Association.

A good signal repairman may make up in moulds the concrete foundation blocks and put on them a good smooth surface. He may make a pretty fair looking bend or offset in a piece of 1¼ in. round steel and put up a smooth even weld in that cross-section of metal. He may cut and thread 1 in. gas pipe and measure and punch the rivet holes for the lengths so as to accurately fit up the connecting line. He may adjust a compensator so as to properly take up the variation due to temperature change. He may either sharpen a chisel or temper it, or grind a twist drill and lay out and drill a set of holes in a steel tie plate so that the track shall remain correctly at gage. He may either file and set a saw and cut a fair miter in lumber for wire trunking, or renew a leather on the piston of an air valve and pack a stuffing box. He knows the sort of lubrication to apply to a mechanical locking bed and to a switch movement, to an air cylinder and to a gasoline engine. He can test out a simple electrical circuit and repair the fault, renew the wire trunking lumber, either over or underground, and apply the pitch, when necessary. He must intelligently handle the expensive 30 per cent. rubber compound wire and properly make and insulate a splice, or may have occasion to do linemen's work and must be able to use the spurs to climb a pole. He may either set a pole, apply a cross-arm to the pole, put on the braces, pins and glasses, tie the wire to the glass, or do odd jobs of painting. If every fifteen mile section of road does not have a man who can do either or all of the things required, it means that a man must travel from some neighboring section to do the required work.

Except the traffic be very dense and fast, a repairman can reach any part of a fifteen mile district in about an hour, by velocipede or motor car. Being on the spot quickly after an accident is of great advantage both as to prevention of unnecessary damage to apparatus and as to check on the working conditions. Modern interlocking plants with their simple checks and counterchecks, such as the facing point lock, the bolt lock, the mechanical locking and the time lock, are about as near foolproof, when rightly maintained, as it is possible to make them. I speak of this for the reason that in every new art there comes a time when there is, through ignorance, a suspicion of some unknown failing against which a man cannot protect himself.

On a lightly signaled division, the repair force may spend as much as six hours in travel for every hour of work. Where this is the case, there is an incentive to provide other duties for the signal force, so as to reduce, to as great an extent as practicable, the waste time on the road. In one case this was done by assigning to the signal men all miscellaneous blacksmith work on the division, all light repairs such as window glass setting, and odd painting. A crew of three men under this assignment would regularly start at one end of the division, and, moving forward a few miles daily, would keep up all light repairs on track tools, switches, switch stands, frogs, crossings, buildings and signals, with but very little time spent in travel.

SPEED OF LOCOMOTIVES IN 1832.—Extract from a report of John Randel, Esq., engineer in chief of the New Castle and Frenchtown Railroad Company, to the board of directors, dated New Castle, July 4, 1832, relative to the performance of the locomotive "Delaware." This engine is one of Stephenson's make, with Booth's patent boiler, and the performance detailed is the first effort made with her. "Yesterday and today I made a trial of this engine between this place and Frenchtown, and have the satisfaction of being able to say that it worked well. The large radii of our curves (the least being 10,000 ft.) will enable us to pass through them without abating its velocity. In going yesterday to Frenchtown we passed through the fifth curve (radius 20,000 ft.) with a velocity of 15 miles an hour. Returning to New Castle we passed through it with a velocity of upwards of 20 miles per hour."—*Extract from the National Gazette, published in the American Railroad Journal of July 14, 1832.*

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Maintenance of Way Section.

THE recommendations adopted by the Safety Committee of the Chicago & North Western, which appear in another column in this issue, may impress some as enjoining conduct the desirability of which is self-evident, but it is accidents that result from failing to do what is obviously the right thing to do that are most numerous. If employees can be impressed with the inadvisability of doing things in a way which they know involves risk, or "taking a chance," a large proportion of the accidents will be eliminated. The fact that conditions giving rise to these recommendations have been found to exist on a road with the standards of maintenance of the North Western is a strong indication that these same conditions can be found on many other roads.

IN our issue of November 15, 1912, we described a method used on the Pittsburgh & Lake Erie to equate the work on various track sections as a basis for allotting labor forces for these sections. In this issue E. R. Lewis describes a similar method used on another line and gives the values assigned to the principal items of maintenance work on one large division. These studies are particularly encouraging as showing the attention which is being paid on certain roads to the economic supervision of expenditures for maintenance of way and their distribution to secure the best results. They are especially instructive in view of the general practice of distributing forces arbitrarily to the various sections, and allotting the same number of men to each gang, regardless of the local conditions on the different sections. A study of actual performances and of local conditions is essential to a proper distribution of forces. As Mr. Lewis says, "No employer of labor can accurately distribute his laborers until he knows how much work each one has to do."

WHILE the suggestion made in another column that 6 ft. is a sufficient length for a guard rail will undoubtedly appear radical to many men, this length is nevertheless in line with the trend in guard rail development. Two general conditions govern the length of a guard rail, first (and most important), the service required, and second, the economical use of material. It is for the latter reason that 15 ft. and 16 ft. 6 in. guard rails are commonly used now, one rail thus making two guard rails. With reference to the service required from a guard rail, it is not many years since it was considered necessary that it should be at least 18 or 20 ft. long to properly guide wheels past the point of a frog and to have sufficient rigidity to remain in its proper position. The recent tendency has been materially to reduce the length of the guard rail, as it has been felt that the shorter rails carry the wheels past the point of a frog as safely as the longer rails, the protection opposite the frog being exactly the same, and less material is required. With the modern spacing blocks and rail braces, the short rail can also be held in its correct position as rigidly as the longer rail with its old fastenings could be held a few years ago.

A CLAUSE in a contract recently executed between a railway and a boarding camp contractor stipulating that no meals shall be furnished free to employees of the railway calls attention to a minor but very common abuse. On many roads it is customary for the officers and engineers to stop at the nearest camp for dinner, and it is generally understood that no payments for their meals is expected. In many instances such a camp is the only accessible place to eat and the engineer can also frequently discuss details of the work with the contractor and foremen at this time. The objectionable feature is not in eating at the contractor's camp, but in failing to pay for it—which practice really degenerates into a petty form of graft. Another objectionable practice of a similar nature which is found on many roads and sometimes even specified in the contracts, is the provision for free board and lodging for the foreman. As practically the entire income of a boarding contractor is derived from the payments of the men for board, the laborers in the gang are thus in reality paying the foremen's board, although less able to pay it than the foremen. The placing of the boarding concession on this road upon a sound business basis, where every employee pays for what he gets, is simply applied common sense and common honesty, and its influence upon all concerned should be beneficial, showing, as it does, the attitude of the company towards the various forms of petty graft and irregularity.

THE importance attached to a systematic inspection of frogs and switches varies widely on different roads. On some the engineer maintenance of way or the division engineer personally inspects all main line switches with the supervisors and foremen, noting their condition, giving directions regarding their maintenance and advising regarding repairs or renewals. On others no such inspection is made, the maintenance of switches being left to the supervisors, and in some instances almost entirely to the foremen. This latter practice does not seem consistent with the attention paid to other details of maintenance. Every switch in a main track is a source of weakness and danger, even though small, and therefore precautions to insure the highest standard of maintenance of turnouts are important. The number of accidents resulting from broken or worn switch parts is far from negligible, and in not a few cases the defects giving rise to them would have been discovered by proper inspection. The increasing number of derailments due to worn switch points, especially in combination with worn wheel flanges, has been the cause of considerable concern on a number of roads recently. The action of the American Railway Engineering Association in assigning to one of its committees the study of the relation between worn flanges and worn switch points with a view to decreasing the number of derailments due to them should result beneficially. At the same time it emphasizes the importance of the entire subject of switch maintenance.

THE practice as to setting ballast stakes preparatory to ballasting old tracks varies widely on different roads, and on different divisions of the same roads. In many cases stakes are carefully set before the ballast is unloaded, and the track is then raised to the stakes. In other cases the practice is to raise the track a uniform amount depending on the quantity of ballast unloaded and the judgment of the foreman, without reference to stakes. While extensively followed, this latter practice is open to several objections. The grade line of an old track tends to depart considerably from that originally laid out owing to settlement of banks and other natural conditions. Again, if left to himself, the average track man will raise his track on all occasions, when in fact many times he should dig down to avoid disturbing the grade line. Also rather than compensating each other, successive raises of ballast nearly always tend to aggravate these discrepancies. If these conditions are allowed to continue through successive ballasting, the variations between the actual and theoretical grade lines, while short and perhaps unimportant in themselves, may be sufficient to interfere seriously with tonnage trains and may ultimately result in a reduction in tonnage. On an undulating grade below the maximum these variations may be unimportant, but if on the maximum grade they assume considerable importance. It is very common to find upon theoretical ruling grades of .5 per cent., short stretches of 1 per cent. or even higher grades, due to these causes. Another point which should be considered in setting ballast stakes is that of adapting the raise to the amount of ballast required. With a uniform raise the high points are lifted with the low, although in most

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cases the fact that they remain high indicates that less ballast is actually required. If properly set ballast stakes should not only remove many of the minor irregularities in grade, but should also adapt the raise to the needs of the track, in this way conserving the ballast. An inch of ballast saved per mile will pay the cost of setting the stakes several times. Either the maintaining of a uniform grade line or the saving of ballast should be sufficiently important to justify the setting of grade stakes, for the cost of setting these stakes is almost negligible as compared with the amount expended in ballasting.

PROBABLY the most conspicuous inconsistency existing in maintenanee work dies in the manner in which ties are handled after being treated with preservatives. The treatment of ties has become so general that a discussion of its merits at this time is superfluous, even though it may add from 10 to 25 cents to the cost of the tie. But precautions to protect the tie frequently end at the treating plant. After it has been left the ties are handled in the same way as previously. One still frequently sees section forces dragging them into place with picks which have been driven into the wood until they have penetrated almost, if not entirely, through the treated portion, giving the moisture direct access to the unprotected timber. Although not as prevalent as formerly, this practice is still followed on a number of roads in spite of the fact that tie tongs can be purchased at a nominal cost, or can be made at the company shops. A cause of much more serious damage is the adzing of ties after treatment. While the adzing of hewn ties is usually necessary to provide a full bearing for the rail, this can be done before treatment as well as after. Not only is the load on the tie concentrated under the rail, but moisture itself is retained here longer than on exposed portions of the tie. Under these conditions nothing can tend to decrease the life of the tie to a greater extent than to remove part of the protected coating on this heavily loaded portion. A beam designed to perform the work of a tie would be especially strengthened at the point of application of the loads, but on the contrary, the resistance of the tie is usually decreased at this point. The adzing of ties before treatment would appear to be consistent with the practice of treating itself, and it is becoming more generally adopted as it is brought to the attention of railway men. It is entirely probable that the thorough preparation of the ties before treatment to reduce the mutilation after treatment to the minimum, will become the general practice before many years.

OPPORTUNITIES FOR MAINTENANCE MEN.

THE comment is frequently heard from engineers and supervisors that there is little opportunity for advancement for officers in the maintenance of way department, the line of promotion being confined closely to those coming up through the operating department. This situation is true on many roads, but is far from universally true. A brief study of the Biographical Directory of Railway Officials just issued, shows that out of 35 presidents of prominent roads selected at random, six came up through the maintenance department, while the number of operating vice-presidents who came up through the same channel is considerably larger. Among the presidents may be mentioned L. F. Loree, of the Delaware & Hudson, who advanced through the engineering department to general manager of the Pennsylvania Lines West; Samuel Rea, of the Pennsylvania, who rose through the engineering department of this road as did his predecessors, James McCrea and A. J. Cassatt; H. U. Mudge, of the Rock Island, who advanced from section hand to the positions of roadmaster and superintendent; S. M. Felton, of the Chicago Great Western, who started as an engineer on the Pennsylvania; B. F. Bush, of the Missouri Pacific, who advanced through the engineering department, and W. J. Harahan, of the Seaboard Air Line, who was roadmaster, engineer of maintenance of way and chief engineer. Among the operating vice-presidents may be mentioned E. J. Pearson, of the Missouri Pacific; A. T. Hardin, of the New York Central & Hudson River; W. B. Storey, Jr., of the Atchison, Topeka & Santa Fe; George T. Slade, of the Northern Pacific, and A. W. Thompson, of the Baltimore & Ohio. These lists might be lengthened by mention of many other prominent railway men, such as J. Kruttschnitt, chairman of the Southern Pacific. The recent increase in the appointments of engineering and maintenance of way officers to prominent executive positions, including W. J. Harahan, of the Seaboard Air Line; A .T. Hardin, of the New York Central; E. P. Bracken, general manager of the Burlington, as well as the promotion of others to superintendents and similar positions, should be a source of gratification to maintenance men. When the demand is for men who can handle men, and at the same time have a knowledge of the value of labor and materials, it would seem that the maintenance man should be well qualified for promotion, and the increase in the number of them who are being promoted indicates that this fact is constantly becoming better appreciated.

SYSTEMATIC TRAINING OF FOREMEN.

IT is a universal complaint that we do not have the same quality of track foremen we had a few years ago and that they are not capable of doing any work which may be assigned to them outside of their routine duties. It must be admitted that this is to a large measure true. Many track supervisors have only one or two foremen upon whom they can rely properly to lay a switch in a main line. Bridge supervisors likewise complain that they can trust but few of their foremen to operate a pile driver or to build falsework under a main track. This is largely due to two conditions. In the first place, the larger maintenance organizations naturally cause a greater tendeney towards specialization, with the result that less attention is paid by the supervisors to instrueting the foremen with regard to other than the duties immediately before them. Secondly, with the more permanent nature of the present roadbed and bridge construction, the frequency of emergencies requiring wide experience is less than formerly. It is natural that a man who becomes efficient in any one kind of work should be kept at this and each man should be encouraged to become a specialist in some one line. However, men should seldom be allowed to specialize in one line of work to the exclusion of other lines, for the time is very apt to come when they will be called on to handle other duties. Few things are more disheartening to a construction superintendent than to attempt to carry on track changes or other work of similar nature with foremen who have never done other than routine maintenance work. Their attempts to cut, throw and connect up track in a limited time between trains would often be amusing but for the seriousness of the matter. A versatile foreman is not only valuable in such emergencies as the recent floods, but also in many smaller local emergencies which are encountered from time to time. It is largely because of his versatility and wide knowledge of various problems that the "hobo" is an efficient laborer, and it is not unusual for a "hobo" to be more adept in handling a certain problem than the foreman himself. If the supervisor in any department will make it a point to instruct his foreman regarding the more special problems as opportunity offers and give them an opportunity to handle special work from time to time, he will soon develop a set of men whom he can rely on to handle any class of work he may suddenly desire to call upon them for and greatly widen the field of their usefulness as well as lessen his trials. The gradual narrowing of the range of activities of the foremen is not due entirely to a decrease in the ability of these men, for they themselves are victims of the larger and more specialized organizations built up by the supervisors. The need of personal attention and instruction of the foremen by the supervisor is becoming increasingly important from year to year because of the changing conditions under which they work.

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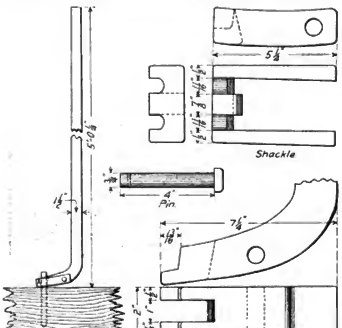
Letters to the Editor.

A SHACKLE BAR.

St. Augustine, Fla., March 10, 1913.

To the Editor of the Railway Age Gazette:

In the issue of the *Railway Age Gazette* for February 21, 1913, there was an article entitled, "A Bolt Puller," by H. C. Swartz, master of bridges and buildings of the Grand Trunk, St. Thomas, Ont. The accompanying blue print shows a similar device which has been used on the Florida East Coast for a number of years. This device is the result of many years



Shackle Bar and Details.

experience and development, and is shown herewith in its final form. While at first glance it would appear to be more complicated than the bar described by Mr. Swartz, it has stood the test of time and is so constructed that it will pull either round or square bolts or drifts of any size commonly used. We make these bars in our own shops and find them very useful and reliable.

A. H. Stead,
Assistant Engineer, Florida East Coast.

INSPECTION BY AUTOMOBILE.

Chicago, May 5, 1913.

To the Editor of the Railway Age Gazette:

With reference to the article published in your issue of December 20, on the cost of automobiles for inspection, the following data on their employment during the construction of the Southern New England Railway may be of interest. In the execution of this work, automobiles were found to be not only desirable but absolutely necessary both for the engineering force employed by the railroad and for the contractors. In this connection, it is interesting to note that the contractors in making claims for the rent of idle plant, present bills to the railway company for their automobiles the same as for steam shovels, boilers, steam drills, derricks and other equipment.

During the construction of the line between Palmer, Mass., and Providence, R. I., the officers of the Southern New England used two machines, one being a seven passenger Alco, and the other a five passenger R-C-H. The contractors used five machines, including two seven passenger Pierce-Arrows, one seven passenger Locomobile, one seven passenger Palmer-Singer, and one Buick runabout. This equipment, however, was found to be inadequate, and additional machines were frequently hired.

The cost of the R-C-H machine used by the engineering department of the railway for a service of about 5,000 miles between September 1, 1912, and March 1, 1913, amounted to $308.73, covering gasoline, oil, tires, repairs and garage charges. This is at the rate of a little less than 6.2 cents per mile. When it is considered that the machines usually carry from four to five passengers, the economy for the service is self-evident. The railway company, however, charges off $600 for depreciation on the machine originally valued at $950. This charge is undoubtedly too heavy, as $300 would probably be sufficient, but accepting figures as they are, they show the total cost of operation of 18 cents per mile.

The advantage of the machines in making trips where frequent short stops are necessary for inspection purposes is clearly indicated in the accompanying table covering a trip from Palmer to Providence in July, 1912:

		Traveling Time.
Leave Power House (1 mile from Palmer)..	5:00 A. M.	
Arrive West Brimfield Trestle	5:07	:07
Leave West Brimfield Trestle	5:16	
Arrive Worcester	6:40	1:24
Leave Worcester	6:51	
Arrive Uxbridge	7:48	:57
Arrive Millville	8:00	:12
Arrive Woonsocket	8:16	:16
Leave Woonsocket	9:00	
Arrive Providence Depot	10:00	1:00
Total time traveling		3:56
Dead time		1:04
Total time		5:00

As the distance is about 80 miles, this record shows an average speed of 20.34 miles per hour. No trouble of any kind was experienced with the machine. On another trip the run straight through from Palmer to Providence was made in 3 hours and 37 minutes. On this occasion a seven passenger Packard was employed. The same distance is covered by train on the New York, New Haven & Hartford in 3 hours and 6 minutes.

H. C. Estep.

GRAND TRUNK STAFF MEETING.

The first of a series of staff meetings which are intended to be held periodically for the discussion of technical, practical and accounting features connected with railway construction, maintenance and operation on the Grand Trunk, was held in Toronto on April 19. This meeting was largely attended by the higher officers of the construction, maintenance and operating departments with their chief assistants, division officers and other assistants. The purpose of these meetings is to discuss improved methods, standard practice, economics of construction and maintenance, etc. At this first meeting revised standard specifications covering various classes of work, together with standard forms for reports and accounting in connection with such work, were discussed and adopted, and will go into effect at once. This meeting was presided over by H. R. Safford, chief engineer, although the discussions were entirely informal and position and rank were disregarded.

Among the benefits outlined by Mr. Safford in opening the meeting, were; first: those arising from the personal acquaintance of a large and widely scattered organization; second; increased co-operation between various portions of the same department and between different departments; four departments being represented at this conference. The frequency of these meetings has not been determined, but it is believed that conferences of this nature will not only insure greater standardization and economy of work, but also the formulation of better standards due to the opportunity for a free exchange of ideas.

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SANTA FE ROUNDHOUSE AT RIVERBANK, CAL.

The Unit System of Concrete Construction Was Adopted in This Structure. Details of the Design, Casting and Erection.

The Atchison, Topeka & Santa Fe has recently built at Riverbank, Cal., a 50-ft., 15-stall roundhouse entirely of reinforced concrete, where the concrete was cast on the ground in wooden molds arranged in a casting yard adjoining the building site, instead of being poured in place. The reinforcing steel was locked in place in these molds, which were carefully inspected before concrete was placed. After the concrete had set, the members or "units" were lifted from the molds by a crane and set in the building much as if they had been of structural steel. The molds or forms were made with great care, and considerable attention was given to the details and finish, the result being a particularly smooth and attractive concrete surface. The wall slabs were cast flat and the exposed face finished to a fine granulated surface with a cork float.

Fig. 1—Roundhouse Site Showing Foundations and Slab Yard.

Fig. 2—Stiff Leg Derrick for Erecting Units of Roundhouse.

The forms were bedded solidly on timbers laid on the earth and lined up perfectly true and out of wind. The casting yard was about 50 ft. x 250 ft. A stiff leg derrick mounted on trucks which ran on two rails spaced about 30 ft. apart was used to handle the units in the yard. As soon as the units were sufficiently set, they were removed from the forms by this derrick and placed in storage piles to season before being placed in the building.

The parts were erected by a 10-ton stiff leg derrick, with 70-ft. trussed boom and 12-ft. bull wheel, mounted on a triangular tower about 25 ft. high; this tower being mounted on trucks the same as the yard derrick and operated on two rails. As erection progressed, these trucks were moved around on a circular line following the contour of the building. As units were required for erection, they were lifted from storage piles and placed on a truck which was pushed by hand to a point where they could be lifted by the erecting derrick and placed in the building.

Fig. 3—Interior View of Completed Roundhouse.

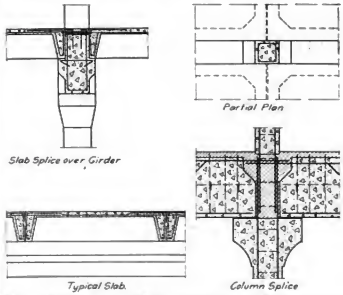

Fig. 4—Details of "Unit-Bilt" Construction of Engine House at Riverbank, Cal.

The foundations of the building, including the engine pits, were poured in the usual manner, except that the column foot-

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ings were cast with a socket in which the unit columns were set, and the intermediate retaining walls were cast so as to engage in slots in the columns. The columns were placed in position, plumbed, and then the space under and around the bottoms of the columns was poured full of a 1:2 grout. After this grout had hardened, the wall slabs were placed in position, then the girders were set on the column brackets, and after that the roof slabs were set on the ledges of the girders, as will be seen.

Typical connections between columns and girders and between girders and roof slabs are shown in the accompanying cuts. The arrangement of the main reinforcement for the girders follows usual practice, some of the bars being bent up and carried over the supports. These bent up bars project from the ends of the units and lap over similar bars from the abutting girders. The length of lap is sufficient to develop the requisite stresses in these bars. When the grout is poured, these girders become as truly continuous as in ordinary monolithic construction.

The bars projecting from the tops of the columns into this grout give rigidity, and necessary knee brace action. The roof slabs rest for their full width on the girder ledge; projecting bars extend into the grout space over the girder. The stirrups in the girders also project from the unit girder into this same space, and after this space on top of the girder and between the ends of the slabs has been filled with grout, the strength of the girder is greatly increased on the compression side through the T-beam action resulting. Exhaustive tests have been made, a number of girders being tested to failure, both before and after this grouting had been done. Before grouting, the girder failed in compression, while the girders tested after grouting failed in tension after sustaining approximately double the load sustained by the girders tested without this grouting. The slab beams and a portion of the slab acted in compression with the girder.

The general layout of the building is in conformity with the Santa Fe standard low type roundhouse. The completed building is a true monolith; with the added advantage that the method of construction insures accuracy of design and a quality of workmanship and strength seldom obtained by ordinary reinforced concrete methods. The windows in the rear wall are about 15 ft. wide, and extend from a point about 3 ft. above the floor to the bottom of the eave strut. There are heavy pilasters at the sides of the windows, while the panel below the window is made of very light construction, so that an engine pushing through the wall would not in any way damage the structural part of the building, and would cause only slight inconvenience and expense in replacing the windows and panel beneath. At the end of the house, provision is made for further extension by making the end wall slabs so that they may be easily removed without damage and by providing special roof connections.

This method of putting up buildings, while new as applied to roundhouses, has been in general use for several years in various parts of the country in connection with the construction of factories, warehouses and grain elevators. The method is known as the "Unit-Bilt," and is patented by the Unit Construction Company, St. Louis, Mo.

An incident during the construction of this roundhouse furnished an excellent example of one of the advantages offered by "Unit-Bilt" methods. By mistake, the contractor received a quantity of sand containing considerable mica, which weakened the concrete. The first roof slab containing this sand broke as it was being lifted from the mold, after which all units containing that kind of sand, were tested on the ground with double the required load, and where any failure occurred, the unit was destroyed. With this method of construction it is possible not only closely to inspect each unit before placing it in building, but if desirable, each unit can be tested. Had the building been constructed by ordinary methods the defect would not have been discovered until the centering was removed, when the building would have collapsed. This roundhouse was erected by the Van-Sant Houghton Company of San Francisco, Pacific coast representatives of the Unit Construction Company.

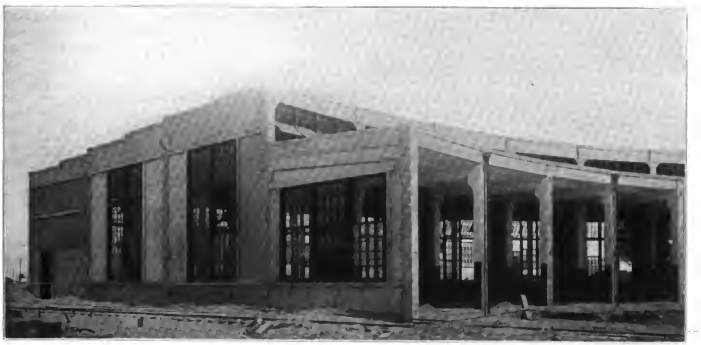

Fig. 5.—Exterior of Santa Fe Roundhouse at Riverbank, Cal.

COPPER IN RAILS.

The Chicago, Milwaukee & St. Paul is having 10,000 tons of rail rolled this year containing 0.5 per cent. copper. This follows an order of 5,000 tons of the same composition rolled last year, which went through the past winter without a single broken rail.

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THE COST AND HOW TO COUNT IT.

By E. R. Lewis,
Assistant to General Manager, Duluth, South Shore & Atlantic, Duluth, Minn.

The world of transportation is vitally interested in reducing to a truly economic minimum the cost of maintaining railway properties. Chief among these properties is the permanent way. A factor of its upkeep is labor. It is possible only by strict, accurate and continuous accounting to know the cost of maintenance of any railway system. In so far as the labor costs are concerned, this accounting must depend on data furnished by foremen in direct charge of the laborers who perform maintenance work.

Objections are urged that these foremen are overburdened with accounts in addition to the manual labor they have to perform; that their hours of labor are long enough; that the foremen should be allowed to rest instead of keeping books on Sundays and out of hours; and that many of the otherwise best foremen are not versed in mathematics or accounting. That there is a regrettable tendency to multiply railway reports, there is no doubt. This tendency is the result of thoughtlessness, or ignorance, or both. There is no sufficient reason why railway accounting should be increasingly cumbersome.

The best answer to these objections lies, however, in the growing tendency to employ foremen competent to keep accounts, and in the recognition by railway managements of the value of foremen of trained brain rather than of untrained brawn. One extra laborer will more than replace the manual effort of the foreman, whose mental effort, directed to overseeing his men, to the study of improving methods of maintenance, and to the accurate keeping of accounts, will far outweigh the loss to the company of the work he might do with pick or shovel.

The time is past when unskilled direction of unskilled labor is considered desirable. Unskilled labor is of most value to a railway when directly supervised by skilled foremen who keep as constant and careful watch over their books as over their laborers. The cost to a railway of foremen educated to the keeping of accounts often means no more than periodical trips over the different divisions by a clerk or clerks well versed in the desired forms of accounting, and capable of making the matters plain to the foremen.

If it is worth while for the railways to keep accounts, it is surely worth while to base them on accurate data. It must be borne in mind that the keeping of accurate accounts is a matter of education which must begin with the officer highest up. He must learn to recognize the benefits and must provide for the expenditures necessary for such true economies as the accounting will create. This education must reach all members of the staff, down to the man lowest down; for he is the working unit, and the accounting of his labor is the foundation of the economics of railway maintenance.

The generally accepted unit of maintenance values is one mile of single main track. Considering this as 100 per cent., the value of the maintenance of other track units, as one mile of industrial track, one turnout, or one railway crossing may be comparatively stated or equated.

It is, of course, true that circumstances of climate, soil, drainage, materials of construction and maintenance, methods of procedure, management and supply of materials and tools may be of such diverse nature as to exert pronounced influences on any results obtainable for comparative use. Nevertheless, it is practicable to collect and tabulate accurate figures which will give satisfactory average results over zones of several hundred miles extent. Good judgment must govern the division of such territory, to avoid diverse conditions within any one zone. In order to obtain proper results, the accounts for each zone, when considered, should cover a period of one or more complete years, thus accounting for the labor performed during all seasons.

An accounting has recently been completed covering a period of 12 months on a division of 300 miles of single main track and nearly 500 miles of branch tracks and sidings. Several section foremen in charge of large yards, others in charge of country sections of main line and others in charge of industrial tracks, were required to keep strict hourly accounts of labor performed for the maintenance of the several units of the permanent way. The accounts were kept in especially prepared time books under the various prescribed headings. Little instruction of foremen was necessary beyond the initial letter which accompanied the time book and a verbal explanation by the roadmaster.

Preliminary questioning brought out the fact that section foremen are in general prejudiced in favor of caring for main line tracks, rather than for turnouts, sidings, yard tracks, industrial tracks or crossings. They point out the difficulties of keeping tracks clear of cars and consequent loss of time; of the trouble of transporting track materials to their destinations; of the inferior drainage; of the comparatively poor ballast and materials of which these tracks are constructed. While there is much merit in these claims, the actual results show that these difficulties are magnified in the minds of the foremen because they must be to a degree surmounted through the personal efforts of the foremen themselves. Many of them prefer harder straight away work where they are free from worry.

The equated results of 12 months' accounting over the one division referred to are as follows:

PERCENTAGES OF LABOR EXPENDED ON MAINTENANCE UNITS IN TERMS OF ONE MILE OF MAIN TRACK.

1 mile of single main track, Class "B"	100	per cent.
1 mile of single branch track	65	per cent.
1 mile of passing track	46	per cent.
1 mile of yard track	32.4	per cent.
1 mile of industrial track	24.0	per cent.
1 main track turnout	3.4	per cent.
1 side track turnout	1.4	per cent.
1 railroad crossing (1 track crossing only)	3.1	per cent.
1 highway crossing (highway over 1 track)	2.0	per cent.
1 mile of fence (5,280 ft. only)	2.7	per cent.
1 mile of right-of-way (100 ft. wide)	4.2	per cent.
1 farm crossing (over 1 track only)	0.4	per cent.

Though these percentages represent actual performance in maintenance, it does not follow that the maintenance is ideal or that the percentages are of unvarying ratio, applicable to all cases and to calculations on all railways. They will in fact vary from year to year on the same territory. But continuous similar records covering longer periods of time are valuable references and guide the railway officer in manning his territory. They make possible a just distribution of maintenance forces. Without some such actual basis of calculation, scientific management is not possible. No employer of labor can accurately distribute his laborers unless he knows how much work each one has to do.

THE FOREMAN PROBLEM.*

By J. D. Archibald,
Assistant Supervisor, Northern Central, Baltimore, Md.

Young men and sons of our present day foremen are not seeking positions as future track foremen for several reasons, which I think are as follows: First: To become a foreman it is necessary to begin as a laborer. This is distasteful to most young men. Second: The children of our present day foremen have had a chance to obtain a better education than did their fathers, and they are in a position to command better positions. Third: A track foreman must be within call at all hours. Many young men like to stop work when the whistle blows and not resume work until the following day. Fourth: Many railways are not paying wages that are attractive. Other departments pay better wages, thus attracting young men. Fifth: The promotion from laborer to foreman is slow.

The first reason above will always be at the bottom of the problem. Most of our present day laborers are from southern Europe and have a poor education. Some, however, are willing to be taught, and it is the duty of each roadmaster to study such laborers. As good men are spotted, they should be placed where they have a chance to learn good track work under a good foreman who will take enough interest to instruct them. The very best way to develop good foremen is by actual work upon the tracks.

*Received in the contest on The Foreman Problem which closed March 25, 1912.

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COMPARATIVE ECONOMY OF TREATED TIES.

The Relative Savings of Treated and Untreated Ties, with and without Tie Plates and with Cut and Screw Spikes.

By R. J. Parker,
General Superintendent, Atchison, Topeka & Santa Fe.

Economy in track maintenance resulting from the use of treated ties is not alone measured by greater longevity through the increased resistance of the tie to decay, for a feature that enters in no little degree is that of mechanical wear. We might say that the conditions to which we must give special heed are longevity, mechanical wear and holding power of spikes.

While the latter may be considered under the general head of "mechanical wear," it is really a condition in itself and may with profit be given individual consideration.

Wood is subject to deterioration because of the attack of enemies of both the animal and vegetable kingdoms, and decay may begin within or without. The chief cause of deterioration of ties aside from mechanical wear is due to the penetration of the wood by vegetable spores which feed upon and cause the destruction of the wood cells. Many inquiries as to the cause of cross tie failure develop that 75 per cent. fail because of decay, and 25 per cent. because of rail cutting. The active introduction of preservative processes during the past few years has proven the practicability of tie treatment and our ability to resist the attack of fungi. However, I doubt if there is a railroad in the United States that has sufficient data to determine positively what may be expected and the information furnished will, therefore, be largely personal opinions expressed by various men based on their observation. My idea as to the values of different ties and the life we may expect of them may be briefly stated as follows:

Untreated pine in our territory in general will not last to exceed four years and in a considerable portion of our territory in the South it will not last to exceed two years. On the other hand, heart pine ties in our arid districts will give us ten to 12 years' service, for we have many ties on our Pecos Valley lines that have given this service already.

The average pine tie that gives us approximately four years' life untreated will give nine years' life if treated with creosote when used without tie plates. If plates are installed when the tie is new, the ties will without question give at least 12 years' life.

Untreated red oak ties will not average over four years' life, and while we have not been treating this timber long enough to be able to give a definite estimate of its life, some examined recently, that have been in the track for six years look approximately as good as when they were put in. We believe that 12 years is a low estimate on red oak ties treated with creosote if they are sound when treated.

Untreated white oak ties are generally estimated to last eight years, but an investigation made recently led me to believe that this was too high, and that we will do well if we get from six to seven years out of such ties. I know of numerous cases where white oak ties have been taken out in the last year that have not been in over four years. We have been treating white oak ties only a year, so that we have no idea yet what life we will get from the treated white oak, but reasoning from the service we are getting from red oak, I see no reason why we cannot expect at least two and a half times the service out of the treated tie that we will get from the untreated tie.

It is only in the last five or six years that gum was considered fit for tie timber, and many mistakes have been made in the preparation of this timber for treatment with the result that there has been a large loss of ties by decay before treatment, and also many gum ties were treated that were not fit. However, the gum ties that we have had the longest show up excellently, and I believe that if this timber is treated before it has a chance to decay we will get more spike holding power and resistance to rail wear than out of any other tie unless it be the creosoted white oak.

Different authorities say that the average life of untreated cross ties in the United States is about seven years. It has been demonstrated that decay can be prevented for a period of 25 years or more, but of what advantage is it to so lengthen the life of a tie if it must be removed in considerably less time from mechanical wear? Mechanical wear by rail cutting and by the destruction of the fibres by spikes opens up the interior of the wood to the attacks of fungi causing decay. Decay, of course, breaks down the structure of the wood and weakens it to withstand mechanical wear.

Obviously the variance in cost of maintenance in the use of treated ties as against untreated ties is greater: when no tie plates are used; when cut spikes are used as compared with screw spikes; when tie plates are not used, and with light rail as compared with heavy rail with wider base.

All of these are conditions that produce mechanical wear. With the opening up of the interior of the wood through the destruction of its fibres, we hasten the process of decay, for the fungi will more quickly attack untreated wood than treated. As longevity is the governing element in the ultimate cost of tie renewals, by shortening the life of the untreated tie, we thus place a greater distance between the final aggregate cost of track maintenance with the treated tie as compared with the untreated tie in favor of the treated tie, for we should consider not alone the initial cost of the tie and its insertion, but also the indeterminate sums of money spent in restoring the track to standard conditions, to which we might properly add the interest charges which will accrue in connection with that portion of the expenditures for ties.

For one mile of track with untreated ties, assuming 3,000 ties to the mile at a cost of $0.62 for hewn white oak and $0.12 for placing in gravel ballast we have

3,000 untreated ties at $0.62	$1,860
3,000 ties inserted at $0.12	360
Total	$2,220

Using treated ties of the same kind and under identical track conditions we have

3,000 treated ties at $0.82	$2,460
3,000 ties inserted at $0.12	360
Total	$2,820
Difference in initial cost in favor of untreated tie	600

However, assuming the life of the untreated ties at seven years and treated ties at 14 years, our final reckoning would show for the mile of track at the end of 14 years

Untreated	$4,440
Treated	2,820
Difference in favor of the treated	$1,620

which amount of money with the use of treated ties would have been available for seven years. At 4 per cent. compounded, the interest would amount to $511.78. So much for the interest charges which in defense of the untreated tie might rightfully lead us to the consideration of means of getting out of the untreated tie its maximum life. In doing so there would come to us first of all the following conditions on which the economical use of ties depends: Their preservation; their proper manufacture or shaping; the introduction in the case of heavy traffic lines of adequate tie plates to transmit the load from the comparative narrow rail base to the wood; and a form of fastening which will hold the rail closely to the bearing surface upon which it is to rest. Unless these conditions are observed the wave

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motion of the rail together with the intermittent depression and lifting of the ties and the sliding back and forth of the rails will speedily result in their destruction. Again when it becomes necessary at periods ranging from a few months up to seven or eight years to renew rails, we are confronted with these problems: Usually the rail is of heavier section than that it replaces; the ties were already cut by rails having narrower base or even if the rail is of the same section the ties are cut and before the new rails can be placed it is indispensable that the ties should be adzed; labor is usually unskilled and is becoming more so every year; the adzes speedily become dull. Some ties are practically uncut, others are cut by varying degrees up to perhaps one or two inches. The result is that they are mutilated; depressions are formed which gather and hold moisture, the old spike holes plugged or unplugged are covered or partially covered by the base of the rail, spikes are driven into place and the ties are left in such condition that they are peculiarly receptive to moisture and germs that cause decay; therefore, this is another strong argument in favor of the treated tie because of the germ resisting qualities.

Tie plugs play an important part in the life of a tie. Ties fail quite as much from spike cutting as from rail cutting. This is especially true where the curvature is heavy and it is necessary to reline and regage track at frequent intervals; again the roadbed of a railroad is more or less elastic. All ties do not have the same bearing, so even in the most perfect track only approximately stable conditions exist. Because of the wave motion under passing trains, there are comparatively few spikes that are in contact with the rails, and while these spikes are redriven from time to time, it eventually becomes necessary to draw them and drive them in a new place. It is false economy to redrive a spike without immediately plugging the hole it formerly occupied.

The boring of the tie previous to treatment makes it practicable to thoroughly impregnate it with a preservative against decay at the point where it is most vulnerable, namely, where the spikes are inserted and where the wearing action of the tie plates and the rails occurs.

I have dwelt on the economy in the use of ties to illustrate how maximum service may be gotten out of untreated ties, but with all precaution taken, I do not believe that the average life of the untreated tie taken the country over will exceed seven years. It is true that in arid sections untreated ties will average ten to 12 years. The Santa Fe has a record of a large number of Arizona pine ties that have been in track on a secondary line 15 to 18 years, and are still good for one or two more years. It would seem that under such conditions, especially where the traffic and wheel loads are light, full tie plating or the use of screw spikes is unwarranted. Where these conditions prevail in one section of country, the opposite is true in other sections, where the average life of untreated pine ties is as low as two and three years. While this extremely short life of the tie might be increased through practical means of preventing decay that is hastened by mechanical wear, still the wisdom of resorting to such expensive methods to lengthen the life of a tie which without treatment can at best withstand the destructive effects of the fungi only a year or two longer, is questionable.

If 25 per cent. of the tie failures is due to mechanical wear, what part of that wear and tear is overcome by the use of tie plates, screw spikes and dowels? Some authorities say that if these remedies are adopted the average life of ties would be raised from seven years to 21 years or made to last three times as long. However, getting down to a more conservative basis, the great majority of maintenance men will agree that ties unprotected from rail wear and spike destruction will suffer a deterioration of at least 25 per cent., as previously mentioned. Therefore, let us assume that tie plates and screw spikes will entirely eliminate mechanical wear, as I confidently believe they will, and lengthen the life of ties just that much through their application. Let us see, then, what this amounts to in dollars and cents, taking the average maximum life of untreated ties to be seven years and treated ties 21 years, or three times greater, which experimental tests would seem to justify.

One mile of track with untreated ties, cut spikes and no tie plates.

3,000 ties at $0.62	$1,860.00
12,000 spikes at $1.55 per cwt.	99.20
3,000 ties inserted at $0.12	360.00
Total	$2,319.20

One mile of track with untreated ties, screw spikes and tie plates.

3,000 ties at $0.62	$1,860.60
12,000 screw spikes at $0.0336 each	403.20
6,000 tie plates at $0.1475 each	885.00
Boring ties for screw spikes	30.00
3,000 ties inserted at $0.15	450.00
Total	$3,628.20
Cost for 7 years	$3,628.20
Cost for 5.25 years	2,319.20
Difference in favor unprotected tie	1,309.00

On this basis in 21 years, ties with tie plates and screw spikes would have to be renewed three times, and ties with cut spikes and without tie plates, four times. Assuming that the screw spikes and tie plates will wear out three ties or have a life of 21 years, and that we can use the cut spikes the second time, the cost for one mile of track would be, in 21 years:

UNTREATED TIES, CUT SPIKES AND NO TIE PLATES.	
12,000 ties at $0.62	$7,440.00
24,000 spikes at $1.55 per cwt.	198.40
12,000 ties inserted at $0.12	1,440.00
Total	$9,078.40
UNTREATED TIES, SCREW SPIKES AND TIE PLATES.	
9,000 ties at $0.62	$5,580.00
12,000 screw spikes at $0.0336 each	403.20
6,000 tie plates at $0.1475 each for screw spikes	885.00
Boring 9,000 ties for screw spikes	90.00
9,000 ties inserted at $0.15	1,350.00
Total	$8,308.20
	9,078.40
Difference	$770.20

This shows a difference of $770.20 in favor of construction with screw spikes and tie plates in the place of cut spikes without tie plates, and merely covers the mechanical wear. When due consideration is given to the saving in maintenance expense by reason of frequent redriving of spikes, in the case of cut spikes, and the cost of restoring track to standard condition subsequent to tie renewals four times in 21 years in the one case as against three times in the other, I believe the argument in favor of screw spikes and tie plates has considerably the best of it. Coupled with this is the fact that disintegration caused by decay is hastened by mechanical wear in the case of the unprotected tie, which in itself would far more than offset the difference that the initial expense in the construction would bring about.

These are approximate figures at best, but are sufficiently accurate to command respectful attention. Still further comparison can be drawn by placing the untreated tie with cut spikes and without tie plates against the treated tie with screw spikes and tie plates, thus:

UNTREATED TIES, CUT SPIKES AND NO TIE PLATES.	
12,000 ties at $0.62	$7,440.00
24,000 spikes at $1.55 per cwt.	198.40
12,000 ties inserted at $0.12	1,440.00
Total	$9,078.40
TREATED TIES, SCREW SPIKES AND TIE PLATES.	
3,000 ties at $0.82	$2,460.00
12,000 screw spikes at $0.0336 each	403.20
6,000 tie plates at $0.1475 each	885.00
Boring 3,000 ties for screw spikes	30.00
Total	$3,778.20

The foregoing tabulation is based on untreated ties, unprotected from mechanical wear, as having an average life of 5.25 years, which is allowing seven years as the average life of tie less 25 per cent. for mechanical wear, as compared with treated ties fully protected from mechanical wear with screw spikes and tie plates which experience indicates last two and a half to three times longer than an untreated tie unprotected from mechanical wear. It will be noticed that there is a difference of $5,300.20 in favor of the treated tie protected from mechanical

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wear, simply taking into consideration the cost of material and the work of inserting the ties. When we add to this the saving in interest charges and the indeterminate cost of rehabilitating the track after each disturbance caused by tie renewal and the difference in running maintenance expense caused by redriving spikes due to the frequent relining and regaging necessary with the cut spikes, especially where no tie plates are used, we have shown in dollars and cents the best possible argument in favor of the treated tie fully protected from mechanical wear. These figures are all based on current prices, although there is every reason to believe that instead of the price of ties remaining the same it will steadily advance to such an extent that within 15 or 20 years we will be paying at least twice as much for ties as we are today. Another strong argument in favor of inserting the chemically treated tie is that their length of life will be increased and a correspondingly smaller number of ties will have to be bought from now on.

In figuring on the use of screw spikes in the foregoing tabulation I have not taken into consideration the use of dowels. Some railroads prefer the use of dowels at the initial insertion, and the A., T. & S. F. has experimented with them, but has found that the screw spikes hold equally well and have perhaps equal lasting qualities when the tie is simply bored to receive the screw spike and thoroughly treated after boring. If it is desired to consider the dowels with the initial insertion, we might add to the figures I have shown the cost of the dowels, which averages about 1¾c. each; the cost of boring ties and inserting dowels would scarcely be any more than the cost of boring ties to receive the screw spike. Some railroads use eight spikes to the tie; others six, but the figures I have given contemplate using four. Another argument in favor of the screw spike is the fact that it is in itself a rail anchor as well as a spike.

In conclusion it might be well to say that any method of inserting ties in track that overcomes unnecessary and deep abrasion should receive highest commendation, whether it be with treated ties or untreated ties, because it is due to decay that fully 75 per cent. of ties fail. Any method of handling that will prevent an unnecessary opening into the interior of the tie and which will prevent moisture from creeping in, is worth while. Tie tongs should displace the track pick in performing the function for which they are intended.

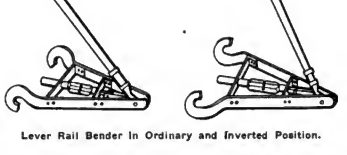
CURVING RAIL WITH A LEVER BENDER.

By L. J. Evans,
Western Pacific, Stockton, Cal.

In the issue of the *Railway Age Gazette* of November 15, 1912, there appeared an article entitled "Jim-Crow Lever Bender vs. Roller Bender for Curving Rails." In my opinion the lever eccentric bender is one of the most efficient track tools to be had today if properly handled, and if it receives the same attention it will compare favorably with a steam curving machine for curving rails. Several years ago I had charge of track laying on an extension up a mountain side to a smelter site. For almost the entire length the track was a series of curves ranging from 8 to 16 deg. As no steam curving machine was available a lever bender was used. After this had been working two days it was found that the track laying was being seriously retarded by the output of the rail curver, 40 to 45 rails per day being as many as could be turned out by moving the curver along the rail and lowering the plunger every 14 to 16 in.

It occurred to us that by allowing the lever and all working parts to remain in the same position as we had been using them and inverting the arms of the bender, we could use it with greater economy and despatch. We therefore built a platform of ties and 4 in. planks on which we fastened the curver securely. Having available a number of stationary rollers which had been used on a steam curver the previous year, we placed them up so as to allow the plunger of the curver to press against the web of the rail. As the flange of the rail was wider than the clearance in the arms of the bender, two short pieces of iron ¾ in. x 2½ in. x 7 in., with one end turned outward 1½ in., were placed between the arms of the bender and the web of the rail, thus clearing the flange and preventing the rail from tilting.

A foreman and eight men had been employed on the bender up to this time. It required 4½ hours of their time to make the change in the bender and build the platform. With the new arrangement the gang was reorganized with four men working the lever and two men on each end of the rail with tongs, leading the rail on the rollers through the curver. While 40 to 45 rails was considered a good day's work with the bender as first used, a careful count kept for 12 days following the



Lever Rail Bender in Ordinary and Inverted Position.

change showed an average of 73 rails per day. With a force of one foreman at $3.50 per day, and eight men at $1.60 per day, this cost $0.2233 per rail.

The previous year the average number of rails curved by the steam curver was 115 per day of 10 hours. With a crew composed of one engineer at $4.25 per day, one foreman at $4 per day, and 10 laborers at $2 each per day, this cost was $0.237 per rail, or $0.0137 more than with the lever eccentric curver. The above is simply a comparison of labor charges and does not include the depreciation of machine, interest on money invested, fuel, oil and other incidentals, which, if considered would give the lever bender a still more favorable comparison.

PORTABLE TELEPHONES FOR EXTRA GANGS.

When an extra gang is working on a line that is equipped with telephones for train despatching it is a great convenience and a means of saving considerable time for the gang and for trains using the road if the timekeeper is equipped with a portable telephone set which he can cut in on the line wherever the gang is working. By the use of such a set he can keep posted on all train movements either by asking the despatcher where a given train is, or simply by listening to the orders that are going over the wire. When trains are running late or extras are frequent it is common for a rail or ballast gang to hold up trains until the track can be closed or a run-off finished. On the other hand, the foreman may plan the gang's work so as to have the track ready for service at the time a regular train is due, but such a train may be late enough to cause considerable loss of time to the gang. If the foreman knows exactly when trains are coming he can plan the work of the gang so as to eliminate delay both to traffic and to the men. A telephone is also very convenient in making reports and calling aid in case of emergencies. P. J. McAndrews, roadmaster, Chicago & North Western, at Belle Plaine, Ia., has been using a set made by the Western Electric Company, shown in the accompanying cuts. The box contains the complete mechanism, and the jointed pole for making the line connection is the only

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other equipment required. A line wire about 150 ft. long is supplied which allows the timekeeper to arrange the connection at the most convenient point. The instrument may be kept in a bunk car, although when possible the foreman's car is provided with a permanent telephone. The connecting pole has two hooks on the upper end, one of which is attached rigidly to the pole, and the other is carried on the end of a wire which can be pulled out for several feet from the upper end of the pole. To make a connection with the line wires the hook connected to the movable wire on the pole is dropped over one of

Telephone and Rod in Shape for Carrying. Telephone in Use Showing Connection to Line Wires.

the line wires, the pole is pulled down enough to draw out this wire for a distance of several feet, and the hook attached to the pole is then dropped over the other line wire. In this position the hook serves both as an electric connection and a means of supporting the pole. The cost of the instrument is about $25, and the saving in the time of a gang can easily be made to amount to many times this figure in a season's work.

TIME CLOCKS FOR TRACK WALKERS.

The Pennsylvania Railroad has recently supplied the track walkers on certain districts with time clocks to insure that the required inspections of the track are being made. Previous to the installation of these time clocks a card system was generally used. While this was the most satisfactory method which had been developed up to that time, it was not entirely reliable, as it was necessary for the operators at the various stations to mark the track walker's cards and collusion between the track walker and operator sometimes resulted.

The time clock system can be so arranged that the track walker's beat may include the entire track foreman's subdivision or it may cover only a limited portion of it. Patrol boxes containing keys each having a different number or letter are located at points where it is desired to secure the records. The boxes are so equipped that they may be placed on telegraph poles, mile posts, or any other permanent structure. Each patrolman carries a time or registering clock. As he makes his rounds he unlocks the metal patrol box with his master key and takes from the box the key for that station, which is attached to the box by a substantial chain. He operates the clock with this key, registering the time and the number or letter of the station on a paper dial in the clock. He then proceeds to the next box, where he repeats the operation. In this way he makes an accurate record of his patrol.

The keys are so made that it is impossible for the patrolman to substitute false keys. It is also impossible for him to remain at any one station and record for the entire patrol without detection, as the keys for the various stations are of different designs. When the track walker has completed his work he delivers his clock to the section foreman who removes the paper dial and sends it to the supervisor for permanent record.

CONTINUOUS RENEWAL OF TIES.

The following from an English contemporary describes the method of renewal of ties to face rather than singly, and is of interest to track men in this country, because of the recent discussions of this subject.

Experience from the past has evolved a system of making the necessary renewal of the sleepers, which are an important part of the equipment, in a way best suited to the general circumstances of this country, and it may be laid down, as an almost universal rule, that sleepers are renewed in bulk with the renewal of the rails. Here and there it may be necessary to renew any single sleeper which has deteriorated more rapidly than the others, but such cases are exceptional, and generally the renewal of the sleepers is carried out with the renewal of the rails. This will occur, under normal conditions, in about 15 years, but must be largely determined by the service on the track, and local conditions.

After such a period the sleepers will not, of course, all be in a uniform condition, so that it is necessary to grade them, usually, into three classes. Those in the best condition would be used on small branch lines with a light train service or in sidings; others in less good condition might be used whole as they are, or cut up as required, for posts or supports or any other of the many purposes demanded by railway work, other than in the track bed; and the last of the three qualities is classified as firewood and only used for that purpose.

The track renewals are in this country mostly carried out on Sunday when the train service is considerably less than on week days, but as much as possible is prepared beforehand so as to have the minimum interference with the running of trains and to reduce Sunday labor.

As the space for handling the material is often very limited, the new sleepers, already prepared by having the chairs affixed to them, to be put in the track are brought out in bulk from the nearest depot, and the old material is removed in a similar manner. The old rails, sleepers, etc., are removed from the track as soon as possession of the line is obtained by the engineering department, and loaded up into the ballast train as soon as possible for despatch to the depot. Meanwhile the new equipment is put in its place so that the traffic can be resumed over the section of newly-laid track at the end of the day's work. A length of about a mile is dealt with at a time, and the interruption to the traffic is only for a period of about 12 hours at a time when it causes the least inconvenience.

Although hardwood sleepers, uncreosoted, have been used to a small extent, the usual timber employed is the Scotch pine from the forests on the Baltic Sea. The sleepers are generally creosoted under pressure before being put into service.

Proposed Line for French Congo.—The French have under consideration the building of a railroad from Libreville, on the French Congo coast, to Nouvelle Anvers, on the Congo river. The first two sections of the line, N'Jole to Makakou, a distance of 300 miles, have already been surveyed.—*Mining and Scientific Press.*

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EFFICIENCY OF MAINTENANCE OF WAY LABOR.

A Discussion of the Problems of Section and Extra Gang Organization and Methods of Removing Some of the Defects.

By H. C. Landon,
General Manager, Watauga and Yadkin Valley Railroad, North Wilkesboro, N. C.

The items upon which the efficiency of maintenance of way track labor depend, are the character of the men forming the gangs, character of the foreman, the tools and appliances, daily reports and supervision. The basis of the maintenance of way track labor organization is the section gang. The floating or extra gang is an auxiliary to the section gang and performs work which cannot be done by the section gang during the busy season. It is upon the organization of these gangs that the best results depend; it is also in these gangs, particularly the extra gangs, that much valuable time is wasted during the working season.

CHARACTER OF GANGS.

Ordinarily, the section gang consists of only two or three men, or even less in winter, but it may be increased to six, eight, ten or more in the summer season. With the smaller gangs the greatest efficiency is secured, as a better class of men, frequently native laborers, is secured. If a gang of three men is maintained during the winter and the summer gang is only six men, at least 50 per cent. of the gang is composed of experienced men who know what to do under proper direction. This, however, is not the case where on our trunk lines only one or two men are employed on a section during the winter, and six or more during the summer, or two-thirds of the time. If the men are of any value whatever, they are picked up by contractors and others, leaving only old and inefficient men to be hired either in winter or summer. In the spring, therefore, the important unit of the maintenance of way organization often starts out with all new men unacquainted with the work, and we expect of them the full efficiency of the old-time section gang. By proper handling and careful instructions the men are improved gradually, but we generally find that the work is not progressing as it should, and as additional men are put on the expenses are accordingly increased. Careful training by experienced foremen, and supervisors or road-masters can in time make an ineffective gang somewhat effective, but it takes time and therefore money.

The remedies for the ineffective gang are sufficiently numerous. It is the common practice to shut off all work in winter, and to cut the section gang to the minimum in hours and men. This is a source of loss, as much efficient work can be done in the winter season, at least in the middle states. This work is necessary and should be done where track conditions are often such as to cause criticism. The gage of many of our roads, especially those with much curvature, can receive attention, missing and cut spikes can be replaced, rails can be rolled by adzing the ties, fences repaired, drainage improved, etc. Of course, there are short periods where gangs or men can be laid off to advantage, and if short no bad results will follow. If we can keep small gangs during the winter we then have a good nucleus for the larger gangs during the summer, there will be much less work to perform, much less labor will be required to perform it, and economy is effected.

Wages that will attract better men should be paid, so that the effect of the winter lay off will be counteracted. Railroad managers invariably argue that only the lowest wages should be paid to section men. While the proposition might seem radical, it is believed that for the men who are worth it, an increase in the price of section labor would decrease the cost of maintenance. Graduated pay of men is also important and necessary to get results. There is no question but that a minimum rate can be established for green men and a higher rate per hour for others with two years' experience, or who can pass certain tests designated by the proper officer, and a still higher rate per hour for natives with three years' experience. An attractive rate should be paid for firstmen, who may be promoted to foremen. I believe it would work to advantage also to have a higher salary for natives than for green foreign laborers, and that there are many other inducements to improve the class of labor, and therefore increase the efficiency.

It is in the extra or floating gangs that the greatest waste of labor and money prevails. Twenty-five per cent. efficiency would probably be large for many of these gangs. On most roads they are made up of foreign laborers furnished by labor agencies of various kinds, who of course always furnish the best they have. These gangs are composed of men who do not speak our language, and who are not familiar with our ways. Their manner of living does not provide the sturdy bodies necessary to active and productive labor. For our extra gangs there does not seem to be any other source of labor, and so probably we must use the foreign laborers.

The first thing which should be done is to cull out the old, young and weak, for the very weakest material offered is for extra gangs. The very moment we begin to cut out and clean out the weak and inefficient, we encounter another difficulty which is not always considered, but is generally a reality. The foreign labor is clannish, and the gangs we secure seem to be composed of relations. If you remove one the whole gang may go and the work stops. Occasionally a good gang is secured. The remedy to apply to improve the efficiency is to continually keep after the labor agents to supply good laborers and get rid of the poor laborers at once. Provide fairly good quarters for that class of foremen who will carefully instruct and work their men, and have efficient assistant foremen who are workers, who will see that men while working do not get in each other's way, and who will determine what is a good day's work. Establish a piece work system and pay the men for what they do. This latter plan can in many cases be established.

Cheap labor is always expensive. To illustrate the economy of good labor, although a high price may be paid, I will cite a case where a telegraph line was being built in connection with a new railroad in New York. The railroad company furnished a foreman and a gang to dig the holes and raise the poles and to help string the wires. The work was begun late in September, and was carried on into the winter. In October the cost of the finished line was $1.43 per pole, working all foreign laborers. In December, however, the cost had run up to $2.40 per pole, on account of bad digging and bad weather. The wages paid were $1.40 per day for common laborers. Native labor was plentiful at $2 per day, and it was resolved to experiment with part native labor and part foreign labor. The cost was at once reduced to about $1.85 per pole. The following month all native laborers were employed, and with worse digging, much of it being in rock, and in the middle of the winter the cost per pole was reduced to less than $1.40, and kept down to about these figures until the work was completed. If we can accomplish these results on the construction of a telegraph line, we can do the same on the maintenance of track. On some of our lines extra gangs are employed for a short time during the summer. If the gang is any good, it is only just beginning to be efficient when it is laid off and the men scatter to find work elsewhere, or return to their foreign homes. The conclusion generally is that we could have done the same work better with half of the laborers, had there been a better class of laborers engaged. I do not believe we should

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encourage a higher price for the class of laborers now furnished on extra gangs, but rather should draw a better class of extra gang laborers by a higher rate if necessary.

THE FOREMAN.

The section foreman is the man who should and who can advance the efficiency in labor, and who is at fault if the labor is not efficient. On many of our railroads he is well paid, so that we should get better foremen, and therefore better results from our laborers than we do. Our foremen are not carefully trained, and they in turn are too careless in their instructions to the men, and both they and the men are indifferent to the value of labor. The foremen do not understand the value of materials, and while economy has been preached to them in many different ways, it has not appealed to them. The company pays the bills, and the cost of tools and materials has not been explained in a way to impress upon them their value. The training has only been general and desultory. The supervisor has discussed with them in a general way the tamping of ties, loose bolts, drainage, etc. Systematic arrangement of work has also been discussed in a way. These are the average foremen.

Foremen should be trained to become money savers and labor savers. The average foreman is not the only cause of our inefficiency, but he so often allows the bad conditions found on our railroads that we wonder why more serious accidents do not occur. To increase the efficiency of foremen radical methods must be pursued. On each section there should be at least one man who can successfully fill the job as section foreman, known as a firstman or assistant foreman. When the hours are cut in the winter, or the gang is laid off temporarily, this man should be kept at work. If this is not done, the firstman who has had some training, is picked up by some other road or industry, the result being that when one wants a good man he has to go to some other road to get a man who will then require some additional training before he is satisfactory. To carefully guard your interest the foreman should be interested and enthusiastic, and should believe in the future of the road as though he was the highest official. He will then watch the material and labor to see that no money is wasted, the bunching of men will be avoided and a certain specified amount of labor will be accomplished daily. He will so plan his work that he will know exactly what is going to be done the following day or the following week. There will be no mis-strokes, and every move will count for something. Six men will not be carelessly sent to remove a tie when two or three men can do it. All work will be carefully planned, and when the work is started all tools necessary to do the work properly will be at hand. The division officials will be out on the ground enough to see that the work is being properly looked after and effective work recognized.

In order also to make the foreman and assistant foreman understand the importance of their work, all foremen and assistants on the division should be called together at some convenient time for general instructions. It is believed that when the foremen are duly impressed with their responsibilities such improvement will follow. That he is not enthusiastic and is not familiar with his four or six miles of section is a familiar fact. It is rare he can tell you much about the curvature, gage or elevation, and if you check him up, you will find him more often wrong than right. If he is unobserving in these things one can be assured that he gives the saving of labor or material very little attention. It is true that he is anxious for good track, but he wants much help and money to get it. The real remedy, therefore, is the careful selection and education of the foreman and to have the foreman know what he is getting for the labor and material that he uses, and the cost of the tools and supplies that he uses.

TOOLS.

On some of our lines the efficiency is decidedly lessened by the lack of proper tools or tools not properly taken care of. It is not uncommon to see a large gang of men laying track with only one or two adzes, and these about as sharp as a garden hoe, chewing the tie surface instead of cutting it. The fact that grind stones were lying idle in the tool houses has not occurred to any one. It is not uncommon to see gangs working partly equipped with tools, which is a mistaken policy. It is better to have too many tools than not enough.

Care in the use of tools is equally important. On a short line with which I was connected, it was difficult to get sharpened tools until an appeal was made to the proper official to establish a division blacksmith shop in the supervisor's headquarters to take care of our own tools and hand cars. The efficiency of the work was then decidedly increased. While the mechanical department aimed to repair tools promptly, it was difficult to get them to and from the shop quickly and properly repaired. The hand car, which is the most important tool or appliance on the section is rarely ever given proper attention. I have seen repeated cases where men walked to and from their work, all on account of the need of a $25 hand car which the management failed to furnish, the hand cars originally having not been properly taken care of, due to carelessness on the part of the foreman and lack of proper instructions. On one road 50 per cent. of the cars were unfit to use, and the men were unfit to work after they had succeeded in getting the cars to their destination. The cars were sent to the shops for repairs, and when returned were about as serviceable as before they were sent to the shop. With the maintenance of way blacksmith shop it was demonstrated that these hand cars could be satisfactorily repaired, and instead of only 50 per cent. of the cars being available, at least 97 per cent. were in running condition, and all were available. It is believed that the efficiency was increased, at least one man to each gang, due to the easy running cars with which they were furnished.

REPORTS.

If the section foreman is aware that the amount of work he accomplishes daily is carefully and intelligently watched, he is anxious to make as much progress as possible. As the supervisor or roadmaster passes over the section from time to time he gets a fair impression of what is being done and spurs on the laggards to greater effort. There is, however, in this method no way of comparing the work of the various sections and gangs. This can only be accomplished by daily reports, showing the work done and the amount of material used. The reports should be sent to the supervisor daily, who in turn completes them and forwards them to the division engineer not later than the second day after the work is performed. The division engineer or other officer to whom these reports are sent knows exactly how much money is spent daily, the total for the month up to date, and also the progress of each section gang. The very fact that these reports spur each man who is anxious to put forth his best efforts leads him to perform the greatest amount of labor possible, and to eliminate the waste of the time of his men in useless puttering around.

SUPERVISION.

The desired supervision of the various gangs rests with the supervisor or roadmaster who will insist upon having intelligent and ambitious foremen. He will organize the gangs and secure men if possible, who will make good foremen and will take measures to train them. He will see that the work progresses systematically over the sections, beginning at one end of the section and completing the work as it progresses, and will see that the gangs are not moving uselessly about from one end of the section to the other. As a general proposition hand cars will only be used in the going and returning from work morning and night. A hand car moving over the track at any other time should be subject to investigation.

The supervisor or roadmaster will see that proper tools and materials are at all times provided, and will especially see that tools are taken care of and kept in condition to do the work properly, only sharp tools being permitted to be used. It is

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necessary for the supervisor or roadmaster to be with the men as much as possible and to point out to them the necessity of avoiding unnecessary and wasted efforts, and keep them intelligently informed as to just what is expected. If the results expected are clearly outlined, the work will move with the least possible labor loss.

CREEPING OF RAILS.

By PAUL M. LA BACH.
Assistant Engineer, Chicago, Rock Island & Pacific, Chicago.

The term creeping is used to denote the sliding of the track or its component parts in the direction of the axis of the permanent way. There are few causes of creeping found in the track itself, such as those due to temperature changes, the creeping of sufficient magnitude to cause track disturbances being, except in very rare cases, the result of forces generated by the rolling load. A large variety of subdivisions may be made but the following will include all those ordinarily found: Creeping due to the tractive power of the locomotive; creeping due to the friction of locked wheels; creeping due to the wave motion in the track; and creeping due to the discontinuity of the track structure.

CREEPING DUE TO THE TRACTIVE POWER OF THE LOCOMOTIVE.

The force acting at the circumference of the drivers tends to move the rail in a direction contrary to that of the locomotive. If we assume that the force due to the steam pressure is constant we will have the following equation:

$$F = P \times \frac{r}{R} \frac{\sin (X + B)}{\cos B} \text{ where}$$

P = Steam pressure.
r = Radius of the crank.
R = Radius of the driver.
X = Angle of crank.
B = Angle connecting rod makes with axis of cylinder.
+ = Angle below center.
− = Angle above center.

It will be seen that F changes continually in steam engines and has been found to vary from 20 per cent. below to 20 per cent. above the average in trials made. As this force also decreases as the speed increases, the reader is referred to the curves shown in the article by C. L. de Muralt in the *Railway Age Gazette* of January 17, 1913, referring to both steam and electric motive power. It has been found in practice that the force exerted in this manner is always exceeded, on the steam roads at least, by the forces due to the mass and velocity of the train. Where motors are placed on all axles, different results might be expected, but published accounts of them are not at hand. For those cases in which trains are hauled this action may be regarded as favorable, as it counteracts greater forces which will be spoken of later.

CREEPING DUE TO LOCKED WHEELS.

As long as the wheels continue to revolve upon their axes, without sliding, the friction on the rail is static, but when they become locked and begin to slide the friction becomes dynamic. The following coefficients are in common use for the different speeds, although 1/7 is considered a fair average by some.

DYNAMIC FRICTION BETWEEN WHEEL AND RAIL.*

Just coming to rest....	0.242	34 1 m. p. h.....	.065
6.8 m. p. h.....	.088	40.9 m. p. h.....	.057
13.6 m. p. h.....	.072	47.7 m. p. h.....	.040
27.3 m. p. h.....	.070	54.5 m. p. h.....	.038

When the brakes are applied the velocity of the train gradually decreases to the point where the brake-shoe friction equals the dynamic friction of the wheel and rail. When this point is reached the dynamic friction of the brake-shoe and wheel rises owing to the reduced speed of rotation and locks the wheel while it slips over the rails because the static friction between wheels and rail has become dynamic friction and is thus reduced from 0.24 to about 0.09. As the speed is reduced, in sliding, the dynamic friction is increased and brings the train to rest. The maximum effect of creeping will therefore be found where stops are made and will be in the direction of running.

*Henderson, Locomotive Operation, page 204.

CREEPING DUE TO WAVE MOTION.

The creeping of the rails has been thought by many to be the direct result of the wave motion in the track under rolling loads. Prof. Johnson advanced the theory that the movement was similar to that of oscillating fluids. That liquids do creep is undoubted and can be calculated but the height of the wave is

Fig. 1.

much greater in proportion to its length than in the case of the rail.

When a single wheel rolls along a track we have a depression under it and an elevation in the front and rear.

Mr. Collard made the following record from experiments* performed in June, 1903: "When the first wheel of the engine is at 6 meters (19.68 ft.) the movement of the cross-tie, from low to

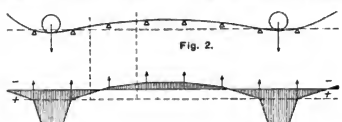

Fig. 2.

Figs. 2 and 3—Upper Part of Diagram Shows Deflection Under Two Wheels of Equal Weight and the Lower One the Corresponding Bending Moments.

high, begins. When the first wheel of the engine is at 3 meters (9.84 ft.) the displacement is maximum. When the first wheel of the engine is at 2 meters (6.56 ft.) the movement from high

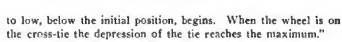

Fig. 4—Rail Depression as Ordinarily Found Under Engine and Tender.

to low, below the initial position, begins. When the wheel is on the cross-tie the depression of the tie reaches the maximum."

This motion is further illustrated by Figures 2, 3 and 4.

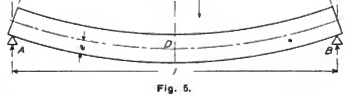

Fig. 5.

Dr. H. Zimmermann has made a mathematical investigation of the subject by the use of calculus which is too long to re-

*Track Deformations by Cuénot, translation by W. C. Cushing. *Railroad Gazette*, 1907.

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produce here. His conclusions will be understood by referring to Fig. 5.

G = Wheel load.
I = Moment of inertia.
E = Coefficient of elasticity.
x = Distance of load from axis Y passing through center of beam.

As the load is a rolling one it will increase from O to G and the lower side of the beam increases in length over the upper side. The total sliding may be expressed by the following formula:

$$W = (x + l)e = \frac{Ge}{2EI} \cdot (l^2 - x^2)$$

This will only occur where the least resistance is to be overcome. In the figure shown this would be at the point A as at the instant shown A has the smaller reaction and therefore the least friction. If we move the load in the opposite direction, that is from A to B, then the slipping will occur at B. When $x = o$ we will have the maximum value.

$$W = \frac{Gel^2}{2EI} \qquad (I)$$

When the load continues to advance beyond the center of the beam towards the right support, the beam under the left support begins to move towards B, as that reaction becomes the largest. The whole beam moves in the direction of motion of the load. This movement will be measured by W. Zimmermann represents the work of friction developed by this movement for a beam supported on two points as

$$A_1 = \frac{G^2 \cdot efl^2}{6EI} \qquad (II)$$

For a beam fastened at one support to prevent creeping this would become

$$A_2 = \frac{G^2 \cdot efl^2}{6EI} \qquad (III)$$

In the above formulae

G is the rolling load.
f is the coefficient of friction of the beam on its supports.
l is the distance apart of the points of supports.
E is the modulus of elasticity.
I is the moment of inertia.
e is the distance of neutral fibre from outer fibre.

From (I) and (II)

$$A_2 = GWf$$

If we wish to know the mean force P which performs the work A we will have

$$PW = GWf$$

Whence

$$P = Gf$$

That is to say that the force which moves the rail in the direction of its length is nearly equal to the friction of the wheel on the rail. In order to get the magnitude of this force we will assume the following values:

G = 14,000 lbs.
e = 2.65 in.
l = 20 in.
E = 29,000,000
I = 41.30

From formula I

$$W = \frac{14,000 \times 2.65 \times 20 \times 20}{2 \times 29,000,000 \times 41.30} = \frac{7,000 \times 2.65}{72,590 \times 41.30} = \frac{18,550}{2,994,250}$$

$$= .0062 \text{ in.} = \frac{1}{160} \text{ in.} = \text{sliding.}$$

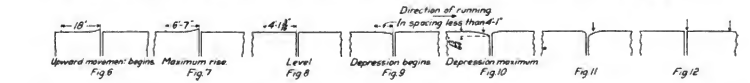
$A_2 = GWf = 14,000 \times 13.33 \times 0.15$
$= 28,000$ ft. lbs. = work of friction.
$P = Gf = 14,000 \times 0.15 = 2,100$ lbs. = reaction due to the work.

The sliding which would otherwise take place will be prevented by the rail attachments and the butting of the rails themselves. The general law expressed by the foregoing is that creeping due to wave motion increases directly as the load and the square of the tie spacing and inversely as the stiffness of the rail.

It will follow as a corollary that this kind of creeping will increase with the speed, the stress in the rails and the traffic.

CREEPING DUE TO THE DISCONTINUITY OF THE TRACK STRUCTURE.

A great many experiments have been made abroad in order to find out just what happens in the rail joint, the principal ones being those of Zimmermann, Flamanche, Couard, Cuenot, Ast and Wasintynski. For present purposes it will not be necessary to go into the question, as they did, for while following the same principles, our joint fixtures are not the same in detail. As a graphical illustration, the following from the experiments of Mr. Ast has been selected. The joint has no filling.



These diagrams show in a general way what happens to the first wheel of an engine when running if the action of the fish plates is nil. There will always be an upward step in front of the wheel, and consequently a blow delivered which is proportional to its height. By referring to Figs. 2 and 3 it will be seen that there is a tendency to rise between the first and second wheels so that the influence of the first wheel is felt in an upward direction, until the second wheel passes the joint. This will increase the upward step. The remedy which we apply is an attempt at continuity. If a perfect fishing could be devised, without any play, and which did not wear, our troubles would cease and we would only have the difference in height of the

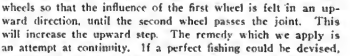


Fig. 13.

rails, due to the wear of the rolls. This may amount to 3/64 of an inch.

In case there is any play between the parts we will have the situation shown in Fig. 13. A plain fish plate is shown for clearness in drawing. When the load is equally divided the ends will be level, but with the load on the left side of the joint there will be an upward tendency on the right hand side due to the forward wheel passing far enough beyond the joint to cause a negative bending in the rail which will be enough to counterbalance the downward pressure at 3 transmitted by the fish plate itself. When the plate is badly worn we will have little pressure between the rail and the plate at either the top or bottom.

It must be borne in mind also that if the load is on the left of the joint that the downward pressure is greater than that

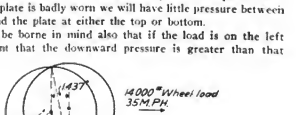


Fig. 14.

transmitted through the fish plate to the right hand side, even under the best of circumstances. When there is a notch worn at 2 so that the rail bends under its load without producing very much pressure on the plate we will have the step up at its maximum.

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If we assume that there is 1/64 in. play and that two rails of the + and — inequalities (1/32 + 1/64) found in practice are all in conjunction, then the difference in elevation is 1/16 of an inch, and the wheel delivers a blow of considerable magnitude. If we use the method of Professor Moore, *Railway Age Gazette*, November 15, 1912, the horizontal component of the force will be 54,000 lbs. for the wheels of our heaviest cars, which will, however, be diminished, as the ends are rounded off with wear.

The conclusion we would come to in view of the foregoing figures is that the hammering on the ends of the rails is largely responsible for the creeping. It increases with the speed, load and flexibility of the rail. As the creeping due to wave action and to hammering of the ends is in the same direction it would be difficult to separate them without very careful measuring apparatus. One seldom realizes the force of creeping until he tries to stop it, and he then usually discovers that the first remedies applied are generally inadequate.

ABSTRACT OF ENGINEERING ARTICLES SINCE APRIL 18, 1913.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since April 18, 1913:

New D. L. & W. Line North of Scranton, Pa.—The Delaware, Lackawanna & Western has under construction a new three-track line between Clark's Summit, Pa., and Hallstead, 41 miles, which involves much heavy construction work and several large structures, one of which will be the largest concrete railway structure built up to this time. A comparison of the grades, curvature and other physical characteristics of the old and new lines was given in the issue of April 25, page 841.

New Delaware River Bridge of the P. & R.—The Philadelphia & Reading is now completing the construction of a double track concrete arch bridge 1,445 ft. long across the Delaware river near Yardley, Pa. The construction of this bridge and the contractor's plant layout are described and illustrated in detail by Edwin Chamberlain, assistant engineer, in the issue of April 25, page 944.

C. M. & St. P. Electrification Through the Rocky Mountains.—Further details of the electrification of the C. M. & St. P. between Harlowton, Mont., and Avery, Idaho, originally announced in the *Railway Age Gazette* of January 10, 1913, were given with a map and profile, in the issue of May 2, page 985.

Government Valuation of Railways.—The Interstate Commerce Commission has given out a statement outlining in a general way the manner in which this valuation work will be done. This announcement, together with the names of the five engineers appointed to form a commission in charge of this work, appears in the *Railway Age Gazette* of May 2, page 986. An editorial discussing the need for concerted action on the part of the railways in defining fundamental principles upon which this valuation should be made, was published in the same issue, page 978.

Weighing Methods on an Eastern Trunk Line.—The methods in use for installing, maintaining and operating track scales on a prominent eastern line were described in the *Railway Age Gazette* of May 2, page 992.

Weldon Viaduct Over the Roanoke River.—The Atlantic Coast Line has recently completed a large steel viaduct crossing the Roanoke river at Weldon, N. C. This viaduct was described and illustrated in the *Railway Age Gazette* of May 2, page 998.

New Freight Pier at Communipaw, N. J.—The Central R. R. of New Jersey completed last year a new covered freight pier for export business at Communipaw, N. J. This pier represents a modern type of construction for such structures and was described and illustrated in the issue of May 9, page 1023.

Erecting the St. Lawrence River Bridge.—In constructing a new bridge over the St. Lawrence river in the suburbs of Montreal, the Canadian Pacific erected two 408 ft. channel spans upon the adjacent approach spans and moved them into place by supporting one end upon barges and the other upon trucks moving on the approach spans. These spans were each moved into position in less than three hours total time, the net moving time being only 28.5 min. The method used to accomplish this was described and illustrated in the issue of May 9, page 1027.

Double Tracking on the Nashville, Chattanooga & St. Louis.—The N. C. & St. L. has been building second track north from Chattanooga during the past two years. This work has involved a number of interesting problems which, with their solutions, were described in the issue of May 9, page 1035.

A $50,000 Freight Platform.—The Studebaker Corporation has recently completed a loading platform for handling automobiles at Detroit. The interesting features of this platform and the methods of loading automobiles were described and illustrated in the issue of May 9, page 1038.

TIE RENEWALS AND BALLASTING.*

BY ENGINEER.

It is important that new ties should be put in the track as early in the season as possible, for this is certain to disturb the track more or less, and ample time should be allowed to ballast and surface the track so that it may become well settled before hot weather arrives and track gangs begin to shrink in size. At points where the rail is to be relaid this should be finished before the ties are renewed, tie renewal and surfacing gangs following as fast as the rail laying is finished.

On main lines with heavy and fast traffic ties should be renewed freely, and it may even be economical to take out ties which can be used again in second or third grade tracks, in order to insure perfect safety on heavy traffic lines. On side tracks and unimportant branches ties should not be renewed until their full life is insured.

Second-hand and smaller ties can be used to advantage in the little used tracks, while only the largest in size and the best in quality should be allowed on main lines.

A very wide field for economy is presented in the selection of the different qualities of ties and kinds of timber which can be used to advantage on the different portions of a large system. Different varieties of ties are most suited for use in the arid regions of the West, in the damp climate of the South and the cold winters and hot summers of the northern part of the country. Different kinds of timber and different methods of treatment are being studied by some roads in relation to their life and service in various localities. The tie map of the C. R. I. & P. described in the *Railway Age Gazette* of June 21, 1912, is a suggestion along this line. The selection and distribution of ties can be watched closely to advantage by all front general manager to section men. The heads of the maintenance departments should see that the allotment is properly made as to amount and kind. The superintendent and roadmaster should further distribute by quality and size to the various points needed, and the section man can also further differentiate to the various parts of the track, the best ties to the joints and softer places and the poorer to the places of lesser wear. On a large road this question is worthy of the sole attention of a competent man. On a system of 8,000 miles using an average of 300 ties per mile per year on renewals, the ties costing 80 cents each in the track, a saving of ten ties per mile per year would amount to a saving of $64,000, while an average increase of life one year by proper distribution of ties that are now lasting ten years would amount to an annual saving of $174,720. By proper supervision these amounts may be multiplied several times. For the year ending June 30, 1912, one western road spent $3,201,865 on the maintenance of 2,600 miles of track, of which $850,901, or over 26½ per cent., was for ties. This was at the rate of $327 per mile and is quoted to show the large relative cost of this one item of track maintenance, and the opportunity for saving by competent supervision instead of leaving the entire question to the section foreman or supervisor, as is done in so many cases.

The usual way of handling tie renewals is with regular section gangs to which extra men have been added. Light surfacing is also done in the same manner, while heavy surfacing and heavy ballasting is frequently done by extra gangs. The surfacing after rail renewal should follow the rail and tie surfacing gangs very closely in order that the rail may not be bent or damaged in any manner by the traffic before the track has been properly surfaced. There is a standing order on one Western road that tie spacing and surfacing shall follow rail laying within a mile.

Where there is plenty of good ballast under the track the surfacing should only be enough to take out the inequalities.

*The fourth of a series of articles on timely maintenance topics. The first appeared on page 351 of the issue of February 21, the second appeared on page 498 of the issue of March 14, and the third on page 805 of the issue of April 18.

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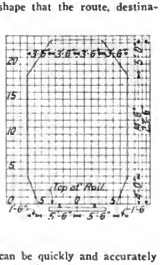
The bed of the ties should not be disturbed more than enough to make an even bearing, as any unnecessary disturbance of the bed is injurious and requires time to restore it. Where more than the necessary amount of ballast is put in it is also a waste of money, for an inch of additional ballast per mile of track amounts to 163 cubic yards of ballast, costing on an average about 60 cents per cubic yard, or approximately $100 per mile. However, where ballast is thin or where there is poor ballast under the track, additional ballast should be put in. It is the custom to surface track by making a light raise of two to four inches. This method is advisable where there is some ballast, but where an additional thickness of ballast would be of advantage in distributing the loads over the roadbed. Where there is a new roadbed or track with little or no ballast under it, it becomes a question of adding the proper amount of ballast and making the amount of raise accordingly. Wherever it is necessary to put in over three or four inches of ballast the track should generally be surfaced more than once, as the higher the raise the harder it is for track men to bring the ties to an even bearing. The tamping is likely to be more or less uneven, and the roadbed may settle more in one place than another. Where a thick bed of ballast is put under the track some roads make the raise in several successive lifts of 3 or 4 inches each and some roads make the entire raise in one lift, using large and heavy jacks. This has been done with very good results even under heavy traffic. The main necessity is to keep a long and gradual run off well tamped where the raise begins. It is not good results may be obtained. The best way to do surfacing and ballasting is with ordinary section gangs. Additional men should be added to them until the extra work is finished.

As soon as the harvest begins and the hot weather is at hand it is hard to keep the forces up to normal. Consequently wisdom demands that the coming month be used to clear up all of this work as far as is possible to do so, and extra men should be employed so that as far as possible the only work left to be done after the first of July will be the regular maintenance work.

A RECORD OF MAXIMUM CLEARANCES.

By Jas. G. Wishart,
Chief Draftsman, Chicago, Rock Island & Pacific, Chicago.

One of the most important records of a railroad, both from a safety and efficiency standpoint, is that of the minimum clearances on its lines. While most railroads make an effort to keep such a record, many of them are more or less unsatisfactory. While the data compiled may be accurate enough, it is in a great many cases put together in too general a form, making necessary reference to other records, and in cases where a doubt arises as to the clearance of a shipment, the reference of the matter to the division officers for a ruling, thus losing valuable time which may result in the loss of the business. The importance of having a strictly up-to-date clearance record, accurately compiled and in such shape that the route, destina-



Standard Blank for Recording Clearance of Each Obstruction.

as necessary to tamp ties solidly as it is to tamp them evenly, so that when they settle they will all settle alike.

Another reason which probably has rendered it customary to make a two to four-inch lift of the track every few years, is that the weight of rolling stock and the amount of traffic has increased gradually on most of our roads, and this method has added to the amount of ballast under the ties in a similar ratio. There is much track in the country which is not yet even reasonably ballasted, and there is very little track which has a fully adequate amount of ballast under it to properly distribute the weight to the roadbed, and to properly drain the water from the track. The proper thickness depends to a great extent on the quality and kind of material in the roadbed, as well as the quality and kind of ballast. A solid, well drained roadbed will not need nearly so much ballast as a soft, wet one.

The gangs for ballasting and surfacing need not necessarily be as large as those for laying rail. From 25 to 40 men with two foremen or one foreman and one assistant is ordinarily enough. With too many men in the gang or too many men under the control of each foreman the work can not be properly watched and track will not be raised as true to grade, nor the ties tamped as evenly. In rail laying gangs, native or hobo labor is ordinarily the best, while the surfacing gangs are frequently composed of foreigners. Where gangs are working near each other or at similar work, by creating a spirit of rivalry between the gangs or between different portions of the same gang, very

tion and clearance of a shipment can be quickly and accurately ascertained, is realized on those roads where the acceptance or rejection of shipments of unusual or large dimensions is referred to the department keeping the clearance record, which is, of course, usually the engineering department. In addition to the fact that large and profitable shipments may be lost by railroads whose clearance records are not in such shape that a definite decision can be given in a short time, there may also be cases where shipments accepted on the basis of an improperly compiled clearance diagram, fail to clear some bridge or other structure along the line, and thus cause loss and damage to the railroad company's property, loss of life, inconvenience to the shipper and loss of future business due to the dissatisfaction of the shipper.

A clearance record consisting of a series of tables and diagrams, shown in the accompanying illustrations, will fully meet all the requirements and will enable one to decide within a few minutes on the acceptance or rejection, as far as clearance is concerned, of shipments which may mean the gain or loss of hundreds of dollars in revenue to the company.

Blank forms similar to that shown should first be made up on tracing cloth and a supply of blue line prints sent to each engineer who is to perform the field work. Instructions should also be issued to them that every obstruction that comes within 7 ft. of the center of the track, measured horizontally, and every structure projecting over the track, is to be accurately

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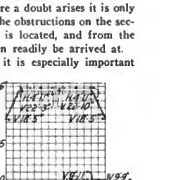
measured and platted on one of these blanks. A separate blank is to be used for each obstruction, all dimensions needed for its location being entered as well as a complete description as called for in the table at the upper right hand corner of the blank. The heavy solid line represents the standard clearance diagram, and can be shown simply to bring out at a glance any structure which does not conform to the standard. The dimensions shown are not intended to represent a recommended standard, but are simply those now in use on some roads.

The information when completed for a division and platted

numbers in the column headed "Page," refer to the page carrying the diagrams covered by the figures in that line. At the bottom of the columns or at the end of each division, a summary is shown giving the minimum clearance over the entire division. In most cases the clearance of a shipment may be determined directly from the table. Where a doubt arises it is only necessary to turn to the page showing the obstructions on the section of line where the doubtful point is located, and from the description on that page a decision can readily be arrived at.

In compiling the permanent record it is especially important



——— Obstruction at M P 302.8 Kent, Ia. Depot platform brick with concrete curb north side of main track. Track alignment tangent.
- - - - - - - - - - Obstruction at M.P. 304 I near Kent, Ia Highway bridge overhead. Track alignment tangent.
——·——·—— Obstruction at M.P. 308.7 Jacks, Ia. Mail crane. North side of main track. Track alignment tangent.
——·——·——·—— Obstruction at M.P. 313.9 Werth Ia. Mail crane. North side of main track. Track alignment 1°00' curve rail superelevation 2.7
—— —— —— —— Obstruction at M.P. 313.9 Werth Ia. Depot platform. Brick. North side of main track. Track alignment tangent.
Note: Coal chute, north of passing track, 6'-10" from center of track M.P. 313.9 Track alignment tangent.
×—×—× Obstruction at M.P. 315.5 near Werth Ia. Truss bridge over Skunk river Track alignment tangent
—•—•—•— Obstruction at M.P. 322.9 Lowe, Ia. Depot platform, brick with concrete curb. South side of main track. Track alignment tangent.

Note: Diagram shows all obstructions within 7 ft. of center of track. Where passing or other tracks are parallel and on 13 ft. ctrs, the maximum clearance line is fixed at 6½ ft. from center of track.

Typical Office Form Showing a Number of Obstructions.

on the blanks is forwarded to the office of record, usually that of the chief engineer, where the permanent record is compiled. This permanent record is made up on tracing cloth, for blue printing, on sheets 11 in. long by 17 in. wide and bound in book form. The information from six or seven of the blanks returned from the field is platted on one sheet, a distinctive style of line being used for each obstruction shown on the sheet. A full description of each obstruction is also shown on the sheet, being arranged according to mile post location. that the track alinement be entered correctly at each obstruction. This information is necessary when shipments of extraordinary length are offered, and they are routed over lines where obstructions are encountered on curves.

In order to keep this record up to date, it is necessary to have the hearty co-operation of the division forces. Blue prints of the diagrams for the respective divisions should be furnished to all operating and engineering officers. They should then be instructed to make special reports of any changes, in

Div's		Page	Maximum widths at heights shown- heights above top of rail. 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	Max'm Width	Max'm Height	Remarks.
First	Kansas City Mo to Termt. St. Mo	1	0-0 0-0 6-1 0-0 8-2 12-1 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2	17-5	12-1	2nd St Viaduct & Pts. etc
	Termt. St. Mo to Ales. Mo	2	10-3 0-0 6-1 0-0 11-8 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2 12-2	20-1	12-2	Track Centers 13'-6" & 15'-0"
	Ales. Mo to Norman Mo.	3	10-0 0-0 7-1 12-1 8-3 0-0 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3 13-3	13-3	NL	No overhead obstructions
		*	* * *	*		*
	Lenox, Mo to Sand. Mo.	7	0-0 0-0 11-2 11-8 11-8 13-0 13-0 =	23-0	13-0	
	Sand. Mo. to Coal Chute, Kas.	8	0-2 10-6 11-8 = = 11-8 =	23-6	13-0	
	Coal Chute, Kas to Elk, Kas	9	8 10-2 11-2 12-3 13-0 13-0 =	25-1	13-0	
	Max clearance ML First Div.		8 10 10 10 11 11 11 11 11 12-1 12-1 12-1 12-1 12-1 12-1 12-1 12-1 12-1 12-1 12-1 12-1 12-1 12-1 12-1 12-1	25-1	12-1	
	Elk, Kas to Summit, Kas.	15	9-4 10-2 10-8 11-3 11-8 11-8 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0	NL	13-0	Bridge over Swamp River
		*	* * *	*		*
	York, Kas. to Key, Kas	22	9-4 10-4 12-8 13-0 13-0 13-0 =	24-8	13-0	Bridge Pier & Tunnel
	Key, Kas to Salina, Kas.	23	8-8 10-0 13-0 =	26-8	13-0	L.P. Pt overhead
		*	* * *	*		*
Second	Perth, S.D. to Linesville, N.D.	31	10-0 =	20-8	13-0	
	Linesville, N.D. to Orchard, D	32	6-0 10-10 12-4 =	21-0	12-4	
	Orchard, N.D. to Ilion, N.D.	33	10-0 10-7 11-0 11-6 11-11 12-5 =	23-0	13-4	Bridge over Canal Dr.
	Max. clearance ML 2nd Div.		6-0 10-2 12-8 11-3 11-8 11-8 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0	17-4	12-8	
Third	Hunt, Ia to Lave, Ia.	58	9-3 13-0 13-0 13-0 13-0 13-0 =	26-3	13-0	
	Lave, Ia to Quarry, Ia	57	9-4 =	20-8	12-4	Spout
	Quarry, Ia to Plum, Ia	56	9-4 =	20-8	NL	13-0
	Plum, Ia to Sand Pit, Ia.	54	9-4 11-9 12-5 =	21-11	12-5	
		*	* * *	*		*
	Tower, Ia to High Bridge, Ia	66	9-2 10-4 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0 13-0	26-8	13-0	Spout
	High Br. to Union Depot Ia	67	10-2 11-2 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0 12-0	24-9	12-0	Truss Br. over Track Centers
	Max clearance ML 3rd Div.		8-4 10-4 =	26-8	13-0	

Note:-Dimensions shown are measurements from center of track & top of rail to obstructions.

Typical Maximum Clearance Table.

Two examples of these sheets are shown herewith, one for a single track road and the other for a double track road. The data from these sheets is then compiled in tabular form, as shown in the accompanying table, giving the minimum horizontal clearances at heights varying by one foot, from the top of rail to as high as it is thought advisable to carry them. These clearances are shown for consecutive sections of the line, the territory covered by a section being varied according to the number and distance apart of the obstructions. The structures which affect the clearance record, to the office of record, which then revises the diagrams and tables and furnishes new prints to all concerned.

While this method of keeping a clearance record requires a great deal of time and expense in compiling, the benefits derived by being able to accept one large shipment, which otherwise might have been lost, will offset a large amount of the cost of the record. The time also saved by the use of this form will in a short time more than pay for its compilation.

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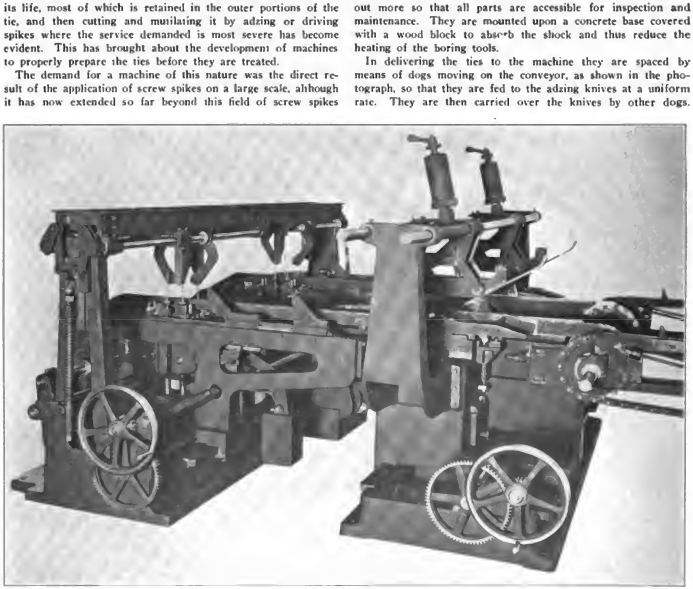
TIE ADZING AND BORING MACHINES.

The adzing and boring of ties before treatment has been practiced to quite an extent in Europe for some time, but it is only within the last two or three years that this subject has received serious attention in this country. With the greatly increased study which has been given recently to the protection of ties the inconsistency of spending from 25 to 50 per cent. of the first cost of a tie in injecting a preservative to increase its life, most of which is retained in the outer portions of the tie, and then cutting and mutilating it by adzing or driving spikes where the service demanded is most severe has become evident. This has brought about the development of machines to properly prepare the ties before they are treated.

The demand for a machine of this nature was the direct result of the application of screw spikes on a large scale, although it has now extended so far beyond this field of screw spikes that two-thirds of the ties adzed and bored before treatment last year were for use with cut spikes. When the Santa Fe first considered the extensive application of screw spikes it became evident that the boring of the ties by hand in the track was slow and expensive, and a machine was therefore devised to bore them before they were installed. The first machine for this purpose was brought out by Greenlee Brothers & Company, Rockford, Ill., late in 1910, and was installed at the Somerville treating plant of the Santa Fe in January, 1911. As it was thought at that time that it would probably be desirable to move this machine from place to place, it was mounted in a car. The second machine of this same type was built the same year for the Santa Fe, while others were built for the Northern Pacific and the Panama Railroad; the latter machine not being mounted on a car. Since that time additional machines have been built until nine are now in operation and almost an equal number will be installed this year. The latest machine completed is one which has just been shipped to the Delaware, Lackawanna & Western for installation in the treating plant at Paterson, N. J., and is shown in the accompanying photograph.

While the machines built in 1911 were made as compact as possible, so as to be placed on a car, it became evident that these machines would practically all be permanently located at treating plants. In later designs, therefore, the mounting in cars has been discontinued and they have been allowed to spread out more so that all parts are accessible for inspection and maintenance. They are mounted upon a concrete base covered with a wood block to absorb the shock and thus reduce the heating of the boring tools.

In delivering the ties to the machine they are spaced by means of dogs moving on the conveyor, as shown in the photograph, so that they are fed to the adzing knives at a uniform rate. They are then carried over the knives by other dogs.



New Combined Tie Adzing and Boring Machine.

An important improvement incorporated in the Lackawanna machine is an adjustable device for adzing irregularly hewn ties uniformly so that the finished surfaces are not only parallel, but the ties are adzed to a sufficient depth to provide full bearing for the rail, which was not necessarily the case when the knives moved in a rigid frame and the depth of cutting was limited by the high points of the ties.

The ties are carried from the adzing knives directly to the boring spindles—eight in number, which work upward. Another improvement in this machine permits the boring spindles to be inclined to enable spikes to be driven at an angle, as may be desired under certain conditions. Likewise, the spindles are adjustable for gage so that this may be varied if necessary. The bits may be readily replaced if broken, with a delay of but a few seconds.

The ties pass from the boring spindles to a stamping unit,

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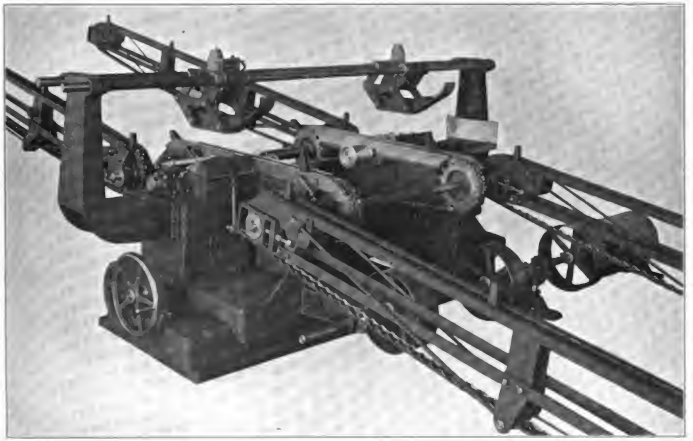
not shown in the photograph, where any desired mark can be placed upon the ends by means of an air hammer. On the Lackawanna the weight of rail for which they are bored and whether hard or soft wood is marked, while at the Port Reading plant, owned jointly by the Philadelphia & Reading and the Central Railroad of New Jersey, the ownership and weight of rail is marked. All shavings and sawdust are collected in a pit under the machine and are withdrawn by air.

Another attachment first installed on a machine for the Philadelphia & Reading and since adopted on a new machine now being built for the Santa Fe, is the cutoff saws which are arranged to remove a small amount from the ends of the ties to detect unsound ties which show no surface defects and thus pass the inspectors. The experience gained from this first machine would indicate that these saws are a justifiable precaution. This attachment is mounted as a separate unit and is placed between the conveyor and the adzing knives.

All the various operations of the machine are synchronized so they act uniformly. The rate of operating depends directly upon the length of travel and the speed of rotation of the bits; the boring operation governing the speed of the entire machine. The Lackawanna machine is timed to pass 6.5 pine ties per min., harder woods, of course, reducing the output. The Santa Fe has passed as many as 4,200 ties through one of its machines in ten hours, although this is considerably above the average rate. A power plant generating 50 h. p. is required to operate this machine. If cutoff saws are installed, more power is required; 75 h. p. being used at Port Reading. The entire machine is under the control of one man; the only other labor required for its operation being that necessary to unload the ties from the tram onto the conveyor and to receive them onto trams after passing through the machine.

Where boring is not required, another machine has been designed by the same company, for adzing only, as shown in an accompanying photograph.



Independent Tie Adzing Machine.

THE IMPORTANCE OF DETAILS.*

By O. B. Cook,
Section Foreman, Chiengo & North Western, Parkersburg, Ia.

It is a singular fact that since the "Safety First" movement has been inaugurated, the old things and the little things have been the ones that have claimed our attention. While we find the foreigners employed in track work today fairly intelligent, many section foremen choose the wrong methods to educate them and are often prejudiced and inclined to look upon them as "cattle," good only for what can be gotten out of them. We should first gain their confidence and respect, and then if we see a man do a careless or dangerous thing, it will be easy to correct it.

The proper use of tools and handling of material should be shown to them. It is not necessary to go into detail and enumerate the things that are dangerous to do, as we all know them. However, there is one thing of importance—the handling of hand cars—that deserves special emphasis. They should be kept in the best possible condition. A little shimming up of the wheels to make them run true and safely on the rail, the shimming up of a tight box or other sundry repairs will take less time than the making out of an accident report and will prevent many of these accidents. When several hand cars are used in extra gang work, it is almost impossible to keep the foreign laborers from overloading the best car, with the danger of one or more men falling off and getting killed or badly injured. I do not know of any better way to make section foremen see these things in the proper light than to have them attend the division safety committee meetings. This will broaden their views and will make them see some of the "little old" things with the dangers attached to them, that the section foreman would not think of otherwise.

*Received in the Safety contest which closed October 25, 1912.

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GUARD RAIL DESIGN.

By F. W. Rizer,
Assistant Engineer, Chicago, Burlington & Quincy, Chicago.

Although many of our track appliances, as frogs, switches, crossings, switch stands, etc., have been improved from time to time to meet the requirements of heavier traffic and to obtain greater efficiency, so far as general practice is concerned, the guard rail remains as it was a number of years ago and the only improvements have been in the attachments that secure it in place.

The sole function of the turnout guard rail is to prevent wheel flanges from fouling the frog point when approaching it from the toe end. Slight variations in the gage and surface of the track cause a lateral movement of the trucks which increases as the speed of the train increases and wherever there is a break in the continuity of the rail, as at the frog point, a guard rail is necessary to insure the safe passage of the wheels over the break in the rail.

The average length of the main track turnout guard rails in service at the present time is about 15 ft., of which a certain length at each end is flared or at an angle with the main track and the middle part parallel to the main rail, the object being to guide the wheel flange into the flangeway as smoothly as possible, where the lateral movement is restrained while the wheels pass over the frog.

In designing a guard rail to fulfil the requirements it would

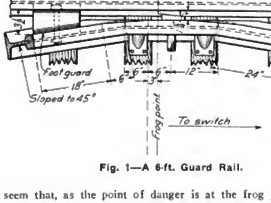

Fig. 1—A 6-ft. Guard Rail.

seem that, as the point of danger is at the frog point only, a few inches or a foot of rail parallel to the main rail, with diverging ends would accomplish the purpose as efficiently as the long guard rail and materially reduce the cost. The angle of the diverging ends should be small and may be determined from a series of practical tests or from the analogous case of the heel riser or raising rail used in frogs and crossings where there is a divergence in the vertical plane. The present practice is to plane these raising rails one-half inch in 6 or 10 in. The former gives an angle of 4 deg. 46 min., and the latter 2 deg. 52 min., and as these rails are subject to practically the same conditions as the guard rail, where the forces act in a horizontal plane the angle of the diverging ends of the guard rail may be established at about 4 deg. The end of the guard rail should be at such a distance from the gage side of the rail as will provide proper clearance for wheel flanges, considering the free movement in the journal boxes, and the wear and variations in the trucks and wheels. A distance of 3½ in., which is twice the width of the standard flangeway, provides ample clearance. Subtracting the flangeway (1¼ in.) from this distance and dividing the difference by the sine of 4 deg. gives a length of 25 in. for the diverging end, or the length may be established at 2 ft., making the angle 4 deg. 11 min.

A further easement in the diverging end may be effected by planing off the side of the rail head for 6 in. on each side of the bent point as shown in Fig. 1. This shows a short guard rail as described above. It will be noticed that the ends, instead of being vertical, make an angle of 45 deg. with the horizontal, to prevent dragging brake rigging or other parts from fouling on them. This is an important feature and should be included in specifications, especially as the additional cost would be but a few cents.

It has been the practice for many years to secure the guard rail in proper position by two or more cast iron blocks placed between the webs of the main and guard rails. Bolts extending through both webs and the block hold the guard rail in position and rail braces of various design are applied against the outer surface of the guard rail to resist the thrust of the wheel flanges. There are two defects in the above arrangement: first, as the inside surface of the guard rail head is worn away, the width of the flangeway increases and no means is provided by

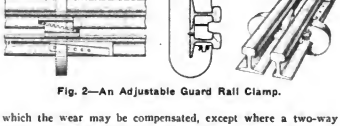

Fig. 2—An Adjustable Guard Rail Clamp.

which the wear may be compensated, except where a two-way block is used in which case one adjustment may be made; second, the lateral thrust of the moving wheel flanges tends to overturn the guard rail, and in a short time results in an increase in the width of the flangeway. Several arrangements of plates and braces have been designed to eliminate the latter defect with but partial success. There is a device known as a guard rail clamp which reduces the defects mentioned above to a minimum. This device has been used extensively in the East, where it has given good service. It comprises a heavy forged or cast steel yoke formed to fit the contour of the rails, a two-piece adjustable block by means of which the guard rail may be brought nearer the main rail to compensate for wear, or the flangeway may be increased when the gage is widened on curves, and a wedge shaped piece which holds the parts securely together. Fig. 2 shows this device in detail.

Rail braces of approved design should be applied near the bends in the guard rail as shown in Fig. 1, and by shearing the flange of the guard rail clearance is provided so that both

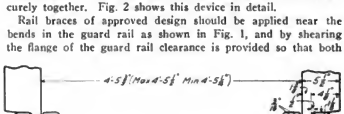

Fig. 3—Standard Guard Rail Spacing of Master Car Builders' Association.

rails may be spiked. When it is necessary to adjust the guard rail on account of wear, tie plugs should be inserted in the old spike holes and the spikes redriven.

Opinion varies as to the use of foot guards. Most of the designs now in service, both metal and wood, are satisfactory, but it is essential that the foot guard be attached to the guard rail in the shop so that when the guard rail is installed no connection with the main line rail is necessary to hold the foot guard in place. The foot guard shown in Fig. 1 is a solid hard wood block.

The details described above cover the essential features of an efficient guard rail, and although to many the short length may seem radical, there are others who think that in the long guard rail there are several feet of rail from which no service is obtained. Some trackmen may contend that a short guard rail

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would not be safe if placed opposite a main line spring frog on account of the movement of the spring rail, which is held in proper position by a spring. This rail is free to move outward a maximum distance of 1¼ in. at the frog point, the movement decreasing toward the toe end of the frog where there is no movement. However, as stated above, the real point of danger is at the frog point and should the spring rail open, the short guard rail would arrest the excess lateral movement before the flanges could foul the frog point, which is all that is desired.

In connection with the installation of guard rails there are two details which must be observed: the main rails must be spiked to proper gage, 4 ft. 8½ in. for tangents, and increased when the curvature is sharper than 3 or 4 deg.; and the gage of the guard rails must in all cases be 4 ft. 5 in. This dimension never varies. If the track gage is 4 ft. 8¼ in., the width of the flangeways is one-half the difference of 4 ft. 8¼ in., and 4 ft. 5 in., or 1⅜ in. The following table shows the correct flangeway for track gages from 4 ft. 8½ in. to 4 ft. 9½ in:

Gage of track.	Width of flangeway.	Guard rail gage.
4 ft. 8½ in.	1¼ in.	4 ft. 5 in.
4 ft. 8⅝ in.	1 13/16 in.	4 ft. 5 in.
4 ft. 8¾ in.	1⅜ in.	4 ft. 5 in.
4 ft. 8⅞ in.	1 15/16 in.	4 ft. 5 in.
4 ft. 9 in.	2 in.	4 ft. 5 in.
4 ft. 9⅛ in.	2 1/16 in.	4 ft. 5 in.
4 ft. 9¼ in.	2⅛ in.	4 ft. 5 in.
4 ft. 9⅜ in.	2 3/16 in.	4 ft. 5 in.
4 ft. 9½ in.	2¼ in.	4 ft. 5 in.

This guard rail gage of 4 ft. 5 in. has been established by the Master Car Builders' Association, and as the clearance and distance between wheel flanges is based on 4 ft. 5 in., it is important that the guard rail gage be maintained at this distance. Fig. 3 is an elevation showing the M. C. B. standard car wheel and the relative position of the guard rails.

SAFETY FIRST.*

By Richard Brooke,
Assistant Division Engineer, Baltimore & Ohio, Pittsburgh, Pa.

In dealing with the "safety" problem in the maintenance of way department it must be remembered that the majority of the men in this department, the track laborers, are of a lower grade of intelligence than those of any other department of the railroad, and it is, therefore, more difficult to make each individual undertsand the importance of the movement and to get him interested. A large percentage of fatalities are caused by trains or engines striking men who are standing, walking or working on the track and in a great many cases, where there are two or more tracks, the men get out of the way of one train and step in front of another coming from the opposite direction. Quite a number of men are also killed or injured by trains striking the hand cars or the motor cars on which the men are riding.

To avoid accidents of this kind and any injuries that are liable to result from tools that are not in proper condition, material handled carelessly, etc., the men, if possible, and especially the foreman and assistant foremen, must be made to understand that the company is trying with the co-operation of each individual to do everything possible for their personal safety. This can be accomplished largely through the influence of the supervisors and foremen.

Supervisors should call meetings of their foremen and assistant foremen and try to impress on them the importance of "Safety First" and what they can do to promote it. They should understand that they are, to a certain extent, responsible for the safety of their men, and that in most cases, accidents can be avoided if the safety rules of the company are strictly enforced and by careful vigilance on their part. If dangerous conditions exist on their sections, they should be reported to the division safety committee, with suggestions as to how they can be remedied.

In case of an accident on the division the supervisor should make a thorough investigation and post bulletins at all tool houses, outlining the cause and how it could have been avoided. The fact that a supervisor and section foreman are on the safety committee will add greatly to the interest taken by the men.

*Received in the Safety contest which closed October 25, 1913.

A WELL EQUIPPED BOARDING CAMP.

In the reconstruction of the clearing yard near Chicago, plans for which were described in the *Railway Age Gazette* of March 21, about 400 "hobos" are employed in track gangs. In addition to the good rate of pay which is offered and the fact that the work is located near Chicago, one of the most important factors in securing and holding a good grade of native labor is the treatment which the men receive in the camp. This is all the more important this year because of the large amount of work under way. The Chicago & Western Indiana in conjunction with the Consolidated Boarding & Supply Company, Chicago, which has the contract for boarding the men, have given careful attention to the equipment and management of the camp.

The railway company furnished the cars necessary for the

View in Laborers' Dining Car.

camp, remodeling them from old refrigerator cars for this job. They were sealed, covered with a new roof of tar paper, and painted inside and out. Each camp provides for 200 men and foremen. There are 23 cars in a camp; 12 bunk cars, six diners, one store, one commissary, one kitchen, one foremen's diner and one foremen's bunk. The general arrangement of the camp is shown in the accompanying panorama. All the cars, with the exception of the two foremen's cars are on one track, being divided into three groups as a precaution in case of fire. The bunk cars are separated into two groups of six each, located at the ends of the string. The row of six diners is divided in the middle by the kitchen car, the company and store cars completing the center group of nine. The foremen's diner is directly opposite the kitchen car on an adjacent track, and is

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reached by a gangway between the doors. The foremen's bunk car adjoins this diner.

The bunk cars are each equipped with 16 bunks, fitted with a straw tick, a pair of blankets and a pillow covered with a colored slip. The cars have side doors and six windows, two in each side and one in each end. Provision is made for the men to wash in all of the bunk cars. The foremen's bunk car is fitted with steel bunks and iron beds, having a capacity of about 10 men. One man is employed to care for all of the bunk cars.

Each dining car seats 33 men, the appearance of the interior of one of these cars being shown in one of the accompanying illustrations. The table is covered with white oil cloth. Heavy hotel chinaware is used with the single exception of the soup bowls, which are of white graniteware. The kitchen car is 33 ft. long and has two large ranges, having a total length of about 11 ft. These are equipped with all the necessary cooking utensils. The car is manned by a cook, a second cook and a pot washer. A flunky is provided for each dining car to set the tables and place the food on the table. The store car is provided with a refrigerator holding one ton of ice and a large supply of meat. The commissary car is in charge of a clerk who has supervision of the entire camp. The charges for these commissary supplies as well as for board are handled through the railway company, the commissary clerk having access to the timekeeper's books at frequent intervals for checking his payroll.

The food served the men is of good quality throughout. Meats are secured directly from a packing house and are shipped two or three times a week so as to insure a fresh supply at all times. Beef, pork, mutton, sausage and bacon are the staple meats; eggs being provided on Friday, and roast pork and dressing for Sunday dinner. All kinds of vegetables are provided in season and all kinds of canned goods are kept in stock. A baker is employed who works at nights baking all the bread, cakes, cookies and pies that are needed. Either pie, cake or pudding is provided for every dinner and supper. The foremen's dining car is supplied with practically the same food that the men receive, the principal difference being in the service. In addition to the 10 foremen who are boarded here continually, about 30 men from the railway company's office at Clearing are fed at noons in this foremen's car. In the laborer's dining cars the meat is put on the table on big platters and the vegetables in large dishes. The men help themselves as often as they like, the dishes being refilled when they are empty. The camp requires about one ton of meat and 2,500 lbs. of potatoes a week. The daily requirement of sugar is about 100 lbs., and of flour close to one barrel. The water supply for drinking and cooking purposes is secured from artesian wells alongside the camp.

This camp is under the general supervision of M. D. Crawley, general manager of the Consolidated Boarding & Supply Company, to whom we are indebted for courtesies in securing this information.

View of Boarding Camp—Bunk Cars at Each End and Dining Cars in Center.

CONSERVING LIVE STOCK.

J. C. Nelson, engineer maintenance of way of the Seaboard Air Line Railway, writes to the *Wall Street Journal:*

"During the period of harsh criticism and strict government regulation, smiles appear seldom on the average railroad man's face and laughs are still more infrequent. However, we do once in a while run up against something that will bring these results and as an illustration, I attach herewith a verbatim copy of a letter received a few days ago. I may add that we have as yet reached no decision as to this proposition. We are holding the papers hoping that a time may come some day when we can reach a decision which will be equitable and just to all concerned."

The letter follows:

"I wish you would have the culbert cut two feet deepr so my ditch will have moare fall so it will wash out the san and it wont stop in ditch. I hase the ditch most finished so it will do the work O. K. and I will be ready for a settle and will give bond for it to stay fix for year or longer and I want to make a trade with you to make a rat trap that will catch all the rats on your division. I will do this with you, send the rats to you dcd or live ten cts each and will take it in passes for my family & self and as long as thare is any rats to be caught you give me a milage pass and charge it to the rat acct, and if any of us rides any more than the rat acct pays for will get ticket or you give me a pass on your division and the hides of all the stocks that the R. R. kills and when only one or two legs are broken I will by them give ½ price or will deliver them to Richland. I could fix a light thing to load a cow on a trane in 5 minutes and if trane should cut a young mars foot off only one I would by her then to rase mules with. Thare is thousand of stock killed that the trane hit, no need of it. I hase saved severald that had thare leg broke. Last Monday I was at Charles and they had a cow that the trane had broke one of her legs and about 2 inch of the bone was sticking out. The foman sayed he was going to have her killed. I told him to take the cow at 250 cts & I would fix the leg O K and pay for the feed if cow dyed and if live he pay me for my surgical opperation. I sawed two inched of the bone off and put the other bone in and I think in a few weeks the cow will be O K and lots of time it would save the Sixion foman ½ day work going seeing after the cows that is killed & when I skin one I will drag it off the rightoway and the busards will eat it up before it begin to smell bad much and that will save the Foman of buyin stock—and if you will have the suer that covered up in san doing no good dug up and put under the R. R. to controle the water that comes down on the left of the St going up town that would stop all the rane from runing in track and having so much slop, the ditch I cut controles all the water that comes down on other side. let me no what day you will come and I will meet you."

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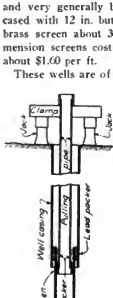
"SANDING IN" WELL SCREENS, CASING AND PIPES.

By L. J. PUTNAM,
Division Engineer, Chicago & North Western, Boone, Ia.

The railways as well as many of the smaller towns and cities throughout Iowa and the neighboring states depend for their water supply on cased wells from 60 to 200 ft. deep. The water-bearing material encountered lies usually immediately over rock which is in all cases limestone. Resort to these shallow wells is had on account of the water being much better for boiler use than the deeper artesian waters encountered below or in the limestone. The well used by the Chicago and North Western, and very generally by other roads and cities is a drilled well cased with 12 in. butt jointed, steel drive casing with a tubular brass screen about 30 ft. long at the bottom. These large dimension screens cost about $350 each, and the well casing costs about $1.60 per ft.

These wells are of short life, as there is a gradual choking up, not so much from clogging of the screen as from the gradual drawing in around the screen of fine material which shuts off the flow of water to a large extent and makes it necessary to sink other wells. From one to four years is about the range in life of wells of this character. When new wells are put down the casing is necessarily sunk to the bottom of the water bearing vein. The screen is then lowered and the casing is jacked up slightly less than the length of the screen, so as to bare the screen for the whole of its perforated length. After this operation, the top of the screen, which is provided with a lead packing ring, is swaged out with a special tool to seal the top of the screen against the casing. For a larger portion of the distance sunk the material encountered is clay which develops a very high skin friction on the casing, making it very difficult to withdraw the casing to bare the screen, and frequently it is necessary to pull the casing partially from the inside near the bottom to relieve the strain on the threaded joints occasioned by outside top pulling, and thus prevent pulling the casing in two and losing the screen, the casing and the labor expended.



Method of "Sanding In" Well Casings.

The withdrawal of the casing to bare the screen as well as the removal for re-use of the casing and screen is a problem which has been very successfully solved by what is locally termed "sanding in" of an inside pulling arrangement. Where the pulling of the casing for uncovering the screen develops more of a strain than the threaded joints will safely bear a 10 in. casing is firmly coupled up and lowered into the well. The lower end of this inside casing bears an ordinary coupling, or if the coupling does not fit the outer casing closely, a special coupling is provided so that it forms a close, but not a driving fit inside the 12 in. casing. This special coupling is lowered to about one-half the depth of the well and "sanded in," which consists simply in dropping a shovelful of sand between the inner and outer casing. Jacks can now be applied to the inner casing as well as the outer, only as much strain being put on the top of the outer casing as it can safely stand. The first strain of the jacks on the inner casing produces a wedging effect in the "sand packer" between the inner and outer casing and clamps the two firmly together. When the casing has been withdrawn sufficiently, a few turns of the inner casing after dropping it a little to loosen the sand will cause the sand to sift through, freeing the inner casing for removal. If the pulling strain is too great for the combined strength of the two casings, a rod can be inserted to engage the bottom of the inner casing and other jacks used on this.

In the case of removal of screens and casings, the method of procedure is obvious. The brass screens as furnished by the factory usually have a bail at the bottom, intended for use in lowering the screen. Our practice is to take this out entirely and close the bottom with a shovelful of cement mortar after the screen is in. The dropping of cylinders, drop pipes, or rods into wells during the operation of placing pumps is not an infrequent occurrence. With concrete bottom, no harm is done; while with the factory made bottom a weight dropped on it is apt to lower the screen so as to pull it down below the casing, resulting usually in complete loss of screen and well. If the screen is not lowered by such an accident, the chances are that it will be pulled in two with the same net result—loss of screen and well. Even if the factory made bottom were free from this objection, the bail would be useless for removing the screen from an abandoned well for two reasons: first, it would be covered with fine sand during the operation of the well and second, if not so covered, a strain on it sufficient to slip the top lead packer in the casing would collapse the screen, which is too fragile for such strains. Our method is to "sand in" a coupling as above described at the top of the screen, where it is solid. No trouble is then experienced in pulling the screen without damage to it. After the screen is removed, if the casing starts unduly hard, an inner casing is sanded in near the bottom and both casings removed together.

The above method is in general use by us with the best success. The pulling is necessarily slow for part of the distance, but we have just recovered for re-use material worth $600 by an outlay of $50 for labor, an instance of what can usually be expected. Aside from the saving of material from abandoned wells, this method makes it possible to raise casings to bare screens when skin friction is so great that wells of this nature would be impossible without this expedient.

The same method might be successfully used in other than well work, as for instance anchoring guy wires or lines to holes drilled in rock where a temporary arrangement easily removed is desired. In fact the ordinary reader will recall many places where such a method can be used to great advantage. The accompanying cuts illustrates the application to the removal of a well screen.

"SAFETY" RECOMMENDATIONS.

In the report of the general safety committee of the Chicago & North Western for the years 1911 and 1912, just issued, figures are given showing that during the two years ending December 31, 1912, 10 fewer track men and two fewer bridge men were killed and 927 fewer track men and 141 fewer bridge men were injured than in the two years immediately preceding. The report also contains a large number of general recommendations made by the local safety committees and approved by the central safety committee, of which the following are of interest to maintenance of way men:

Foremen of extra gangs should be provided with a whistle to notify men to get off the track when trains are approaching.

Gearing of hand cars should have shields over them.

Instructions should be issued to stop the practice of burning ties on right of way near bridges.

The use of guy wires on top of outfit cars provided with stoves should be prohibited and standard way car jacks ordered to be used instead.

Gas pipes should be adopted for use of handles on hand cars instead of wooden handles.

Bunk cars occupied by B. & B. and track forces should be protected at night by blue lights and during the day by blue flags, placed one on each side of the car and at diagonal corners.

All gasolene hand cars should be covered so there will be no

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danger of anybody getting hurt by the engine while it is in motion.

Wherever possible loading of scrap iron in stock cars should be avoided.

Flagmen of section or extra gangs should be provided with torpedoes in addition to a flag.

Division superintendents should issue instructions prohibiting section men from going under cars when it rains or for any other reason.

Before bunk cars are moved, the side steps should be removed and placed inside of the car.

FLOOD RECONSTRUCTION ON THE PITTSBURGH & LAKE ERIE.

The Pittsburgh & Lake Erie suffered an actual damage to track and structures of about $100,000 as a result of the flood of March 26. The Beaver and Mahoning rivers rose to a height five feet greater than previously known, cutting off railway communication on all lines. In spite of the amount of damage done, through business on this line was restored with an interruption of only four days. That the delay was so small was due in a large measure to the completeness of the organization immediately improvised to handle the work.

As soon as the flood arrived, all machinery including wrecking

Picking 500 Ft. of Track out of the River with a Wrecking Outfit.

outfits and pile drivers was gotten under steam. Forces were divided into day and night shifts so arranged that no person would work over 16 hours, and were maintained in this manner for 10 days until the damage was practically repaired, although both freight and passenger traffic were resumed within 36 hours after the water had left the rails. During the first 24 hours after the line was opened, even though only single track was in service at several points, 38 freight trains of coal, coke and general merchandise were handled.

One interesting method used in this emergency work is that illustrated in the accompanying photograph. Between Fallston and Beaver Falls the current in the Beaver river was so great as to wash out the embankment under both main tracks. Before the track next to the hill was entirely undermined it was shifted further into the hill onto a solid embankment. The track on the river side was completely undermined and 500 ft. of it went into the river. A wrecking train working on the track next to the bank succeeded in lifting this second track out of the river and pulling it onto a solid embankment at a cost of about $100, as compared with fully $500 to save the track in any other way. If the wrecker had not been utilized it would have been necessary to tear the track apart, and if this had been done some of the ties and rails would have been lost, while with the method adopted, no material of any kind was lost. We are indebted to E. F. Wendt, assistant engineer, for the photograph and information.

THE FOREMAN PROBLEM.*

By F. H. Carpenter,
Roadmaster, Atchison, Topeka & Santa Fe, Hutchinson, Kan.

The question of a supply of section foremen is simply a matter of dollars and cents. The wages paid are not attractive enough to hold the best foremen, or to induce young men to learn track work with the view of becoming foremen. The following methods are suggested for training young men for these positions:

First. Allow the roadmaster to pay a graduated scale of wages to a few men, placing them with the best foremen.

Second. Pay section laborers the prevailing scale of wages paid by other employers.

Third. Organize classes under competent men to work as extra gangs, with a graduated wage scale.

If the roadmaster should be permitted to hire a few bright, energetic young fellows and place them with his best foremen, at wages beginning at, say, $1.25 a day and increasing, at intervals of a few months, up to $1.75, he could rely upon these apprentices being taught to do the work as he wants it done, but a man who understands the work and is a good hand sometimes makes a poor foreman. This could be discovered by giving him a tryout even before he has worked long enough to be considered competent for a section.

The prospects are poor for making good section foremen of the Mexicans with whom we have been furnished during the last five or six years. They are incompetent and after they have worked about six or eight months they want to go home, and that is the last of them. The natives that we are able to hire for $1.25 a day, are, with very few exceptions, a shiftless and incompetent class of men, and are poor material from which to draw foremen.

I am also in favor of paying the wages for track labor paid by other employers of labor, about $1.75 a day. This would give us plenty of good material from which to select, and a class of men that would do more work than an equal number of foreigners, but I doubt very much if any western road, under present conditions, would feel justified in raising the wages of so large a class of men. It is more important, however, to have a good class of foremen than to have a good class of laborers, and a dollar invested in foremen will bring better results than one invested in laborers.

The third method is objectionable on the ground that men working in extra gangs do not learn the real business of maintaining track. Their work has more to do with construction than maintenance. They would probably be a division gang, not under the control of any one roadmaster. The place to learn the duties of a section foreman is on a section with a good foreman.

*Received in the contest on The Foreman Problem, which closed March 25, 1912.

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General News.

The Boston & Maine has discontinued a number of passenger trains on the Fitchburg and the Southern divisions and has discharged some of the men in the engineering and bridge departments.

The federal grand jury at Chicago has returned an indictment against the Illinois Central charging that the road permitted the shipment of cattle out of quarantined areas in Mississippi in 1912 without properly designating the character of the shipment, in violation of the rules of the Department of Agriculture.

The Lehigh Valley now has telephones in use for train despatching throughout the whole of its lines. The company expects to follow this improvement with the installation of telephone wires for messages where necessary, and the officers are looking forward to the time when telegraph instruments will be thrown out of use entirely.

Harry T. Wilkins, formerly chief clerk in the office of Theodore N. Ely, has been appointed Special Agent of the Traffic Department of the Pennsylvania Railroad, with office in Broad Street Station, Philadelphia, to take charge of the preparation, installation and display of the Pennsylvania's exhibit at the Panama-Pacific Exposition to be held in San Francisco in 1915.

Thirteen complaints alleging violations of the law regulating the transportation of livestock were filed in the United States district court at Chicago on May 6, against the Chicago, Rock Island & Pacific; three against the Chicago & North Western; one against the Illinois Central; three against the Chicago, Milwaukee & St. Paul; one against the Pere Marquette; one against the Wabash; and three against the Chicago, Burlington & Quincy.

The committee on territories of the Lower House of Congress is preparing to report a bill providing for the construction of government railroads in Alaska, in accordance with the general plan which was laid before Congress some months since by President Taft. The committee has held a number of hearings and has taken testimony of representatives of commercial interests in Alaska, both for and against the construction of railroads by the government.

The "Katy Office Efficiency Association" is to be organized on the Missouri, Kansas & Texas at a meeting on May 22, for the purpose of studying and discussing subjects that pertain to the efficiency of office work on the system. Membership in the new organization will consist of the chief clerk, assistant chief clerk, accountants and timekeepers in the office of each division superintendent, the chief clerk, assistant chief clerk, accountant and chief timekeeper in the office of the superintendent of motive power, assistant superintendent of motive power and master car builders, traveling and division storekeeper and chief clerk to the general storekeeper and chief clerks, assistant chief clerks and heads of all departments in the general office at Dallas, Denison, Parsons and St. Louis.

The Boston & Maine announces that its new direct route from Boston to Springfield, about the same length as the parallel Boston & Albany, will be opened for business June 23. This route is made possible by the construction of the Hampden Railroad from Bondville, Mass., to Springfield, 16 miles, the work on which has just been finished. President Mellen, answering, before the Interstate Commerce Commission, at Boston, the criticisms alleging extravagance in making the large expenditures necessary to build the Hampden Railroad, said that he expected the new link would furnish enough additional traffic for the Central Massachusetts division of the road to make that division a paying property. On June 23 also, the Boston & Maine will put in use its new line from South Vernon, Vt., northward, 11 miles, to Brattleboro, on the New Hampshire side of the Connecticut river. With this length completed the Boston & Maine can run trains on its own rails from Springfield, Mass., northward to Windsor, Vt., and the New York-White Mountain trains will use Central Vermont tracks only from Windsor to White River Junction, 14 miles.

Unfilled Tonnage of the Steel Corporation.

The report of the United States Steel Corporation shows that the unfilled tonnage on April 30 was 6,978,762 tons, compared with 7,468,956 tons at the end of the previous month, a decrease of 490,194 tons. It had been estimated that the decrease would not exceed 300,000 tons. The figures show that during April orders were booked at the rate of 7,860,000 tons a year, comparing with shipments at the rate of approximately 13,500,000 tons a year. The unfilled tonnage on the books of the Steel Corporation is now smaller than it has been since October 31, 1912, when it was 7,594,381 tons. The shrinkage in April of this year was the largest reported in any month since June, 1910, when it was 1,145,000 tons.

Substitute for the Car Repairers' Blue Flag.

The railway commissioners of Canada, following an investigation of certain complaints, have recommended to the railways of the Dominion that a metal or wooden disk be used as a signal for the protection of cars which are being repaired, instead of the flag, which is "subject to the caprices of the wind." The commissioners recommend the use of a disk the shape of a semaphore arm, to be hung on the ladder at the end of a car and so fixed as to project 18 inches ont beyond the side of the car. In this position it would be visible the length of an ordinary train. The horizontal arm would be fastened to a short vertical board, fitted with hooks by which it could be supported on the rounds of the ladder. At night a blue lantern could be hung from the projecting arm. The railways are requested to send to the commission their views on this suggestion.

Soo Line Co-operative Association.

As noted in last week's issue, the Minneapolis, St. Paul & Sault Ste. Marie is organizing an association to be known as the Soo Line Co-operative Club, or Association, for the purpose of providing a means for the investment of small savings by the employees, as well as to promote interest in the welfare of the company. It is proposed to incorporate the association and to issue shares of $1 each. Any employee who has been in the company's service for six months will be eligible, and may acquire one share; the $1 to be repaid to him in case he leaves the company's service. Employees are asked to sign a card addressed to the comptroller, giving authority to pay into the treasury of the association for his account the $1 for membership stock certificate, and a certain sum each month, to be deducted from his wages. The small savings of the many employees as they come to the club's treasurer, are to be invested in securities of the Soo Line or subsidiary companies. At the end of each year the earnings from the investment will be distributed so that each member should begin at the end of the first year to receive a small income from whatever amount he shall have saved during the year. Already a considerable number of employees have signed the membership cards.

Illinois Central Employees Ask to Aid Company.

Officers of the Illinois Central were greatly surprised last week to receive a communication signed by a large number of clerks, engineers, conductors and other employees, requesting that they be permitted to give one or more days' pay to aid the company in making repairs rendered necessary by the recent floods in the South. The employees also sought permission to solicit contributions from all employees on the payroll of the company by means of the following statement: "We feel as railroad employees that we should deeply deplore these unfortunate conditions, and to the end that the Illinois Central may have our assistance, co-operation and support in rebuilding and repairing its bridges, track and equipment, we hereby appeal to you to join us in the contribution of the equivalent of one or more days' pay to that end."

In declining the offer Vice-President W. L. Park said, in part: "In all my railroad experience, in the ranks and as an officer, I never have encountered so unselfish and loyal an offer. That these men should voluntarily tender their mite to assist their company (and I use the word 'their' advisedly, for such men are really partners in the institution) is an evidence of such patriotic loyalty and self-abnegation that I am inclined to the belief that it is unparalleled in railroad history."

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Death of John Saxby.

There has just died at Hayward Heath, forty miles south of London, an Englishman whose name is known to railroad men throughout the United States; John Saxby, of the firm of Saxby & Farmer. He died, at the age of 92, on Wednesday, April 23, and his portrait was printed in the *Railway Gazette* (London) of May 2. The first patent bearing Saxby's name was taken out in 1854, for a signal lamp with a movable inner case which changed the color of the light as the signal arm moved up or down. This was the joint invention of Saxby and W. V. Greenwood. Saxby's first interlocking patent—the invention which has made his name a household word among signal men all over the world—was taken out in June, 1856. His first installation was an interlocking of eight signals and six switches at Bricklayers' Arms Junction where, fifteen years before, the semaphore designed by Gregory had been first introduced. In 1860, Austin Chambers patented an improvement on Saxby's idea, but a few months later Saxby made still further improvements, and thereafter kept the lead over all his competitors. His patent for preliminary latch locking was taken out in March, 1867. The firm of Saxby & Farmer was established about 1860. Both of the partners had been connected with the London, Brighton & South Coast Railway. Mr. Saxby for many years lived in France attending to the continental business of his firm.

Prompt Settlement of Freight Claims.

J. H. Reich, superintendent of car service of the Frisco lines in Texas, has issued an order having for its object the satisfaction of patrons by speedy payment of their claims and obviating much red tape. New rules, just issued to agents, contain the following provisions:

"Agents at all stations are authorized to pay by draft claims for visible loss (not concealed) or damage to carload and less than carload freight to the limit of $25. Agents at New Orleans, Houston, Beaumont, Victoria and Brownsville, $50.

"Agents must not pay claims for damage to perishable freight, alleged loss of grain or coal from carload or less than carload shipments, damage to live stock, nor for damage to sewer pipe, drain tile and kindred articles. All such claims should be promptly forwarded to the head office.

"No claim for shortage must be adjusted under this authority until twenty (20) days after shortage is noted.

"Before paying claims, agent must satisfy himself of the invoice value and also satisfy himself that proper credit is given for the salvage or insist upon such salvage being turned over to the company." . . .

"Safety First" on the New York Central.

Marcus A. Dow, general safety agent of the New York Central Lines, is planning to hold meetings at prominent points on the company's lines at least as often as two each week. There was one at Toledo, O., on Wednesday of this week, and the next two are to follow at Watertown, N. Y., and Utica, N. Y. During the past five weeks meetings have been held at Erie, Rochester, Albany, Oswego, Syracuse, Corning, Buffalo, Detroit and Cleveland. Attendance has been voluntary, but the numbers present have ranged from 300 to about 1,000, and the officers of the road have been much pleased at the intelligent interest in the subject which has been taken by the employees in general. Some of the superintendents report interesting cases of the good results of the meetings. On the morning following one of the recent lectures, an engineman, who had been present at the meeting, was found spending an hour in teaching a new employee how to get on and off an engine or car safely. In another case a conductor, the day following a meeting, called the superintendent's attention to a man who had persisted in standing between the rails of the track and getting on the foot board of the engine as it moved toward him. The conductor had tried to correct this man's practice by giving him a friendly warning; but the dangerous practice was persisted in, so the conductor very properly reported the case to the superior officer.

"Safety First" with Variations.

"Safety First" on the Pennsylvania Railroad now includes moving picture exhibitions; and in connection with the last safety-first meeting in New York City, there was a lecture on "First Aid to the Injured" by the medical examiner of the Manhattan division of the road; and these two matters of utility were supplemented by some moving pictures illustrating humorous subjects, together with music by an orchestra led by the supervisor of signals.

This meeting, which was held on the evening of Thursday, May 8, in the auditorium of the Young Men's Christian Association in the Pennsylvania station, was attended by over 600 employees of the Manhattan division.

One of the moving picture films depicted a man being taught the proper way to handle tools; another scene showed a shopman learning how to operate safety appliances; and another was that of a mechanic working underneath a freight car and courting injury. Seeing the repairmen the foreman quickly informs him of his jeopardy and then demonstrates how to work under a car without fear of accident. Still another view illustrates how a car is thrown off the track through failure of the engineman to observe signals.

Following the moving pictures 63 lantern slides were shown, illustrating the usual subjects dealt with in lectures of this kind; and all of the slides were of a character to come "close home," being taken from scenes on the Manhattan division. Following the picture five-minute talks were given by enginemen, conductors, foremen and others, including a signal maintainer. The medical examiner, in his lecture on "First Aid," cautioned workmen against hurrying just before closing time. Many accidents occur just before the luncheon or dinner hour.

Safety First on the Chicago Great Western.

The Chicago Great Western is pursuing a vigorous "Safety First" campaign with a view to arousing such active interest as will secure the co-operation of every man in the service. The entire system is now organized and good work is being done by all divisions and departments. An innovation that appears to be original with the Great Western is the setting aside of a day to celebrate the inauguration of the safety movement. The management has designated Saturday, May 24, as "Safety Day," and arrangements have been made to celebrate the day in a fitting manner at Oelwein, Ia. Special trains will be run over each division, arriving at Oelwein about 3:00 p. m. Athletic sports will be provided in the afternoon, and a "Safety Rally" will be held in the evening. The meeting will be attended by many general officers. It is expected that about 2,500 persons will attend.

The Great Western has also started a campaign of education among the public school children in all schools adjacent to its line, and has arranged to present banners and buttons to all classes and pupils in an attempt to inculcate in their minds the lesson it is desired to teach. The banners are arranged to hang upon the wall of the school room, and have a red cross on a white center and blue field with the words "Safety First" above the cross and "Safety Always" below the cross in white letters. The buttons have a red cross on a white background and a blue band with the words "Safety First, Safety Always" in white. These banners and buttons will be presented to the respective classes by speakers who will explain their significance. It is hoped that such an impression will be made on the minds of the school children as to cause them to recognize the danger of trespassing on railroad property as well as of unnecessary exposure to other risks.

The New Haven Investigation.

The attorney general at Washington announces that he is going to appoint a special attorney to investigate the New York, New Haven & Hartford Railroad; but first there will be careful study of the facts which have been brought out by the Interstate Commerce Commission, and by the proceedings before the grand jury, last year, when the New Haven and the Grand Trunk were accused of conspiracy.

At the hearing before the Interstate Commerce Commission at Washington last week the attorneys for the New York, New Haven & Hartford presented the following points:

The freight service between Boston and New York is the best in the world—eight to ten hours for 230 miles. The Boston & Maine, as a railroad machine, is overloaded. The reinstatement of 3,500 men in the fall of 1912 has improved service, but the road will not earn fixed charges this year. There was never

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a more honest effort to treat fairly a subsidiary than has been made by President Mellen, in reference to the Boston & Maine. Except for the New Haven, the crisis on the Boston & Maine would have come earlier than it did. Improvement in rail service has decreased steamship revenues; there has been no suppression of boat traffic. In the complaint against the investment in and management of interurban railways, Brandeis is a minority of one. Connecticut and Rhode Island approve them. Public demand in Massachusetts now is that the New Haven build electric roads in connection with the Berkshire Street Railway. The New York, Westchester & Boston is built for the future.

The *Wall Street Journal*, summarizing the Boston hearings, says:

"Mr. Mellen stood upon his feet for five hours last week before Commissioner Prouty, and he fired such a broadside against the Brandeis charges that New England newspapers have not had time to digest it. It will take weeks for people to get a clear conception concerning the fallacies which Mr. Brandeis has so skillfully injected into the New England railroad situation. While the Validation Commission of the State of Massachusetts more than a year ago marked the Rhode Island trolleys down from their cost of $20,000,000 to about $6,000,000 and said their value was yet to be determined, and while Brandeis and his fellow agitators have been harping on this waste and extravagance for the upbuilding of transportation in New England, Mr. Mellen showed that the Rhode Island trolleys were earning 3 per cent. on a $24,000,000 cost; the New Haven following the same line of development it did with the Central New England, putting in more money to raise the efficiency and bring about profitable results in the end.

"Mr. Mellen believes that not only will the Rhode Island trolleys in a short time be returning 4 per cent. on their cost, but he has the figures to show that his New Haven investments, outside of the Boston & Maine, are now earning their cost to the New Haven on a 4 per cent. basis; in other words, the New Haven has the control of the Central New England, many trolley lines feeding the steam lines, and steamships co-operating therewith, all at probably no cost to the New Haven road so far as the money has been borrowed at 4 per cent. No other interest than the New Haven could have been found to raise money at 4 per cent. and put it into the development of transportation in New England."

Association of Railway Telegraph Superintendents.

The annual convention of the Association of Railway Telegraph Superintendents will be held at the Planters Hotel, St. Louis, Mo., May 20-23. On May 20, papers will be presented on Some Facts Concerning Telephone Transmission, by Elam Miller and Charles A. Robinson, both of the American Telephone & Telegraph Company, New York; Use of Telephone by Railroads for Despatching Trains, Handling Messages, etc., by J. C. Johnson, superintendent of telegraph, Pennsylvania Railroad; Inductive Disturbances as Affecting Telegraph and Telephone Circuits, by F. J. Howe, Western Union Telegraph Company.

On May 21, the papers will comprise Protection Against Lighting and High Currents for Telegraph and Telephone Equipment, by M. H. Clapp, superintendent of telegraph, Northern Pacific; Main Line Power for Selective Circuits, Including Transmission and Signaling, by Richard F. Spamer, Western Electric Company; Full Use of Wires, by H. D. Teed, superintendent of telegraph, St. Louis & San Francisco; Organization for Maintenance of Lines, by M. C. Allen, Western Union Telegraph Company.

On May 22, there will be a paper on Organization for Wire Chiefs and Telephone Inspectors, by J. B. Sheldon, superintendent of telegraph, Union Pacific.

Association of Railroad Chief Surgeons.

Plans for obtaining better sanitary conditions on railways were discussed at the annual meeting of the Association of Railroad Chief Surgeons held at the Hotel Sherman, Chicago, on May 5. A committee was appointed to co-operate with the committee of the American Medical Association assigned to the promotion of public health and railway sanitation. It was also decided to seek the co-operation of state boards of health and health officers in the various localities, with a view to obtaining supplies of pure water and ice for use on railway trains. Officers were elected as follows: President, Dr. W. H. Bohart, chief surgeon, Chicago & Eastern Illinois; vice-president, Dr. G. G. Dowdall, chief surgeon, Illinois Central; secretary, Dr. L. J. Mitchell, editor of the *Railway Surgical Journal*.

Utah Society of Engineers.

The Utah Society of Engineers at a recent annual meeting elected the following officers for the ensuing year: President, A. S. Peters, Mountain States Telephone & Telegraph Company, Salt Lake City, Utah; first vice-president, E. H. Beckstrand, University of Utah, Salt Lake City, Utah; second vice-president, H. D. Randall, General Electric Company, Salt Lake City, Utah; secretary, F. D. Ulmer, Oregon Short Line Railroad, Salt Lake City, Utah; treasurer, L. H. Krebs, No. 968 West Third South street, Salt Lake City, Utah.

Railway Development Association.

At the annual meeting of the Railway Development Association, held in Nashville, Tenn., on May 7, the following officers were elected: President, W. W. Wood, general industrial agent of the Baltimore & Ohio; vice-president, Rutledge Smith, of Nashville, Tenn.; secretary, W. H. Labaume, Roanoke, Va.; treasurer, L. L. Lawrence, of Laurel, Miss.

Cleveland Engineering Society.

At the regular meeting of the Cleveland Engineering Society on May 13, J. H. Stratton, of the Wellman Seaver Morgan Company, Cleveland, Ohio, presented an illustrated paper on the Development of Ore Unloading on the Great Lakes. An informal meeting of the society will be held on May 20, at which W. A. Faber, of the American Steel & Wire Company, Cleveland, will present a paper on Boiler Furnace Efficiency.

New York Railroad Club.

At the next regular meeting of the New York Railroad Club, to be held May 16, Frederick C. Syze will present a paper on Thoughts on Discipline.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—E. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W. Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andrucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

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BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 3d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., 3d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren K. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—J. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. D. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Assoc. Ry. Elec. Engrs. Meeting.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 14-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, Wednesday and Thursday, June 11-12, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. Lum, 2544 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W. Ry., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The Texas railways have filed tariffs with the Interstate Commerce Commission, effective June 2, providing that they will cease paying loading charges on carload freight handled across the Galveston wharves.

Effective May 11, trains 7 and 8 on the Chicago & Alton, known as the "Midnight Special," leaving Chicago and St. Louis at 12:01 a. m., were made through non-stop trains between those points. They will not carry any mail or express and will be exclusively for Chicago-St. Louis passengers.

J. M. Belleville, president of the National Industrial Traffic League, has issued a call for a meeting of the league, to be held at the Iroquois hotel, Buffalo, on May 23 and 24, for the purpose of receiving reports of various committees and of discussing an extensive docket on various topics relating to the relation between railways and shippers.

A complaint has been filed with the Interstate Commerce Commission by Anderson, Clayton & Coat, Oklahoma City, asking a reduction in the rates on gin-compressed round bales of cotton below the rates charged for cotton when shipped in square bales. It is stated in the complaint that while four 36-ft. cars would be required to carry 50,000 lbs. of flat cotton, and two cars to carry the same weight of cotton in flat bales, a single 36 ft. car loaded with round bale cotton will carry 50,000 lbs., and yet the same freight rate is charged on 100 lbs. in a round bale as in the flat, or compressed only in square bales. A reduction of 33 1/3 per cent. is asked.

Prof. F. R. Stevens, the agricultural specialist employed by the Lehigh Valley to travel around among the farmers in the territory adjacent to that road, has added to the wealth of the farmers an amount equal to "scores of times the money paid to him." This is stated on the authority of L. W. Lighty, a farmer whose letter has been printed in an agricultural journal, and republished by the railroad company. Mr. Lighty says of Mr. Stevens: "He is conservative and always advises caution in new and untried moves. His rule is not to attempt to help a farmer until the farmer asks to be helped. At first not many asked, but now the requests come so fast and thick that he is able to reach only about a fourth of those who ask for assistance." Mr. Lighty's estimate of value is made on the authority of the farmers, who have observed the work done by the specialist during the past three years. And he adds: "Why do other large railroad systems follow this good example? Why does not our commonwealth join hands and assist in this excellent work?"

Proposed General Increase in Freight Rates.

The application of the Eastern Trunk lines for authority to make a general increase of 5 per cent. in freight rates was presented to the Interstate Commerce Commission at Washington on Wednesday of this week, the spokesmen for the railways being George F. Brownell, vice-president of the Erie; George S. Patterson, general counsel of the Pennsylvania; Clyde Brown, general solicitor of the New York Central, and Hugh Bond, general counsel of the Baltimore & Ohio, representing the fifty-two lines east of the Mississippi and north of the Ohio and Potomac.

The petition recited the efforts of the eastern lines three years ago to obtain permission to increase their freight rates. The commission at that time indicated a willingness to reconsider its conclusions in the light of future developments in the operation of the carriers. The petition declares that the carriers are prepared to show that the cost of conducting the business has been, and is being, steadily increased by increases in capital charges, increases in wages, increases in taxes, increased burdens imposed by legislative enactment, elimination of grade crossings and in various other respects, and that existing rates are insufficient to afford just and reasonable compensation and return to the carriers, and are unreasonably low in view of the value of the service afforded.

The commission promised to take up the subject at an early date, but gave no assurance that even if the case were reopened it would be able to conduct the necessary public hearings before the summer recess.

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There has been much speculation as to the extent to which actual and formal expression will be made before the commission of the opposition to an advance in rates, which opposition has been voiced in the newspapers by numerous spokesmen for shippers. Some railroad officers say that they have tangible evidence that shippers are much less inclined to oppose an advance than they were in 1910.

Samuel Rea, president of the Pennsylvania Railroad, in a published statement gives reasons for an increase in freight rates as follows:

"The annual revenue from freight in the territory concerned is about $800,000,000. Five per cent. of this is $40,000,000. There are about 40,000,000 people in this portion of the country. The proposed increase, therefore, means an average of $1 per year per head of population—8 cents a month.

"Everybody knows that the railroads have been put to greatly increased expense in recent years. On the Pennsylvania lines east of Pittsburgh the added cost of new legislation from August, 1906, to December, 1912, was nearly $11,000,000. Recently many more laws have been enacted. The New Jersey grade crossing bill alone involves a cost to this company of more than $60,000,000. Extra crew laws, drinking water laws, railroad valuation laws are all adding to the cost of operation.

"Now, if the public through constituted authority, demands certain measures of safety, certain improvements, such measures of safety and comfort must be paid for by somebody. As a matter of fact, there are nearly 100,000 persons interested as investors in the stock of the different companies of the Pennsylvania Railroad system. It is likely that holders of this company's bonds number 200,000. Strike at the investors in railroad securities and you hurt depositors of savings banks, policyholders in life insurance companies, women investors and many others least able to cope with the situation.

"As Mr. Prouty said, 'The United States is trying an experiment which has never been successfully worked out yet in the history of the world. It is trying to build, develop and operate its railroads by private capital under rates and regulations fixed, not by the owners of that capital, but by the public. The question is, Can you obtain under this system the new capital necessary to develop our present railroad systems and to build our new railroad systems?'

"Are the people willing to pay the railroads sufficient freight rates to enable them to render the service which the people demand and should have? The country is growing; unless its growth is to be stultified, its railroads must grow. It is impossible to continue this building and developing of railroads of the country without more capital. To obtain that capital, the railroads must have credit—credit that will withstand the scrutiny of the banker of Lombard street, as well as appeal to the investor in Philadelphia. That credit cannot be assured and maintained unless the railroads are permitted to earn sufficient revenue to have left over at the end of the year a surplus out of which to make the necessary improvements which do not add to the earning power of the company and which yet assure the investor of the productive value, both new and prospective, of the enterprise in which he proposes to put his money."

At Pittsburgh May 5 Mr. Rea said that the Pennsylvania earned last year only 4.83 per cent. on its investment. Explaining this he says:

"Reference in this case was to the earnings of $35,776,669 in 1912 for *railroad* business alone—approximately 4.83 per cent.—upon the $741,120,877 which had been actually expended upon the transportation property of the Pennsylvania Railroad Company. The cost of bonds and stocks of other companies held by this company is not included in this $741,120,877, nor is the income derived therefrom embraced in the earnings of $35,776,669.

"This sum of $741,120,877 was in part provided out of capital stock and bonds and in part out of surplus earnings, and is made up by adding to the cost of road and equipment, as shown in the annual reports, the amounts also therein reported of appropriations from surplus for improvements. A liberal portion of the surplus earnings, instead of being paid out as dividends, has been expended on additions and betterments which have largely improved the facilities at the disposal of the public—facilities which have enabled the railroad to give better service. If the investors in the stock and bonds of the Pennsylvania Railroad had supplied directly all the money which has been invested in the transportation property of this company—after the fashion in vogue in England—and if they received the entire annual net earnings from the operations of such property, they would today be getting only 4.83 per cent. on their actual cash outlay."

Car Location.

The accompanying table, which is taken from Car Location bulletin No. 5-A of the American Railway Association, gives a summary of the location of freight car equipment by groups on April 15, together with surpluses and shortages on the same date.

CAR LOCATION ON APRIL 15, 1913.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Colo., Neb., Okla.	Kans., Colo., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	89,240	673,303	281,867	203,400	170,599	472,806	16,929	149,005	33,179	112,055	131,273	2,333,656
Home Cars on Home Roads	42,324	367,953	93,233	108,296	79,252	256,918	4,605	74,109	15,274	65,274	81,905	1,228,252
Home Cars on Foreign Roads	47,016	305,350	188,634	95,105	91,347	176,778	12,324	74,896	17,805	46,781	49,368	1,105,404
Foreign Cars on Home Roads	55,656	295,407	210,093	94,529	84,470	186,133	10,855	65,129	21,976	42,514	57,088	1,117,762
Total Cars on Line	97,880	663,360	303,238	202,824	163,722	476,161	15,460	139,238	37,350	107,788	138,993	2,346,014
Excess or Deficiency	8,640	*9,943	21,371	*576	*6,877	3,355	*1,469	*9,767	4,171	*4,267	7,720	12,358
Surplus	1,391	13,481	2,230	7,519	740	9,340	5,534	6,397	4,136	18,192	1,755	70,715
Shortage	171	1,057	1,891	3,150	1,447	649	50	1,310	43	390	3,059	13,217
Shop Cars—												
Home Cars in Home Shops	4,281	30,351	16,107	9,706	11,836	20,511	636	8,562	1,972	4,055	3,271	111,788
Foreign Cars in Home Shops	1,266	8,378	6,554	2,304	2,298	4,945	607	2,088	761	1,904	825	31,930
Total Cars in Shops	5,547	38,729	22,661	12,010	14,134	25,456	1,243	10,650	2,733	5,959	4,596	143,718
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	47.32	54.65	33.08	53.24	46.46	62.61	27.20	49.74	46.34	58.25	62.39	52.63
Total Cars on Line	106.98	98.52	107.46	99.72	95.97	100.71	91.32	91.59	112.57	96.19	105.88	100.53
Home Cars in Home Shops	4.80	4.51	5.71	4.77	6.94	4.64	3.76	5.75	5.94	3.62	2.87	4.85
Foreign Cars in Home Shops	1.07	1.24	2.33	1.13	1.34	1.12	3.58	1.32	2.30	1.70	.63	1.39
Total	5.87	5.75	8.04	5.90	8.28	5.76	7.34	7.07	8.24	5.32	3.50	6.24

*Denotes deficiency.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association in presenting statistical bulletin No. 143, giving a summary of car surpluses and shortages by groups from January 31, 1912, to May 1, 1913, says:

"The total surplus on May 1 was 53,977 cars; on April 15, 70,715 cars; and on May 9, 1912, 136,776 cars. Compared with the preceding period; there is a decrease in the total surplus of 16,738 cars, of which 4,394 is in box, 908 in flat, 9,602 in coal and 1,834 in miscellaneous cars. The decrease in box car surplus is in all groups, except 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 9 (Texas, Louisiana and New Mexico), and 11 (Canadian Lines). The decrease in flat car surplus is in all groups, except 1 (New England Lines), and 5 (as above). The decrease in coal car surplus is in all groups, except 4 (the Virginias and Carolinas), and 5 (as above). The decrease in miscellaneous car surplus is in groups 1 (as above), 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 4 (as above), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona).

The total shortage on May 1 was 14,178 cars; on April 15,

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13,217 cars; and on May 9, 1912, 6,678 cars. Compared with the preceding period; there is an increase in the total shortage of 961 cars, of which 81 is in flat, 1,537 in coal, and a decrease of 27 in box and 630 in miscellaneous cars. The decrease in box car shortage is in groups 2 (as above), 3 (Ohio, Indiana, Michigan and western Pennsylvania), 4, 7, 8 and 11 (as above). The increase in flat car shortage is in groups 1, 5 (as above), 6 (Iowa, Illinois, Wisconsin and Minnesota), and 8 (as above). The increase in coal car shortage is in all groups, except 6, 7, 8, 9, 10 and 11 (as above). The decrease in miscellaneous car shortage is in groups 3, 4, 5, 8 and 11 (as above).

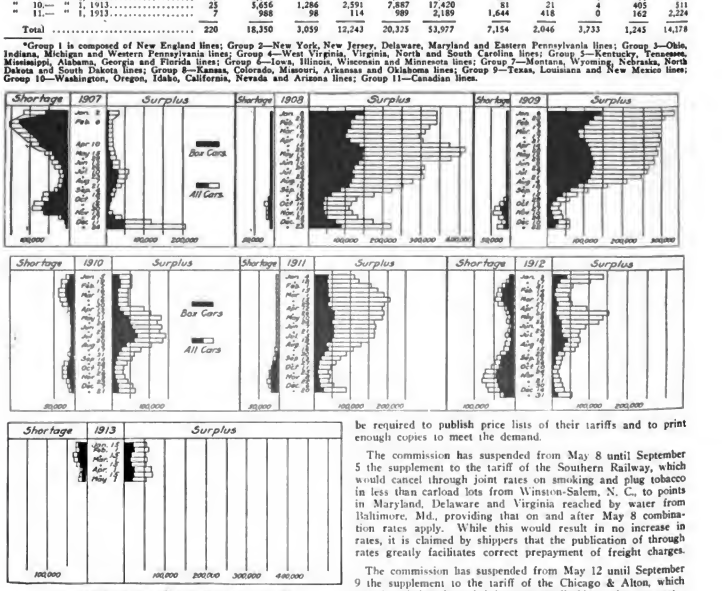
Compared with the same date of 1912, there is a decrease in the total surplus of 82,799 cars, of which 2,276 is in box, 202 in flat, 71,269 in coal and 9,052 in miscellaneous. There is an increase in the total shortage of 7,500 cars, of which 3,860 is in box, 592 in flat, 2,500 in coal and 548 in miscellaneous cars.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report, and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—May 1, 1913	7	491	668	75	22	1,256	259	224	150	1	634
" 2.— " 1, 1913	35	421	36	4,036	115	4,608	70	0	451	0	521
" 3.— " 1, 1913	33	464	339	230	1,479	2,512	968	131	1,340	234	2,673
" 4.— " 1, 1913	11	3,783	7	279	955	5,524	1,171	432	1,369	26	2,998
" 5.— " 1, 1913	28	129	27	222	584	962	1,281	549	295	20	2,145
" 6.— " 1, 1913	32	2,762	180	1,519	3,742	8,203	1,162	244	35	16	1,457
" 7.— " 1, 1913	3	228	44	592	600	1,464	0	0	0	0	0
" 8.— " 1, 1913	20	1,287	238	1,788	2,415	5,728	268	27	89	371	755
" 9.— " 1, 1913	17	2,141	136	297	1,537	4,111	250	0	0	10	260
" 10.— " 1, 1913	25	5,656	1,286	2,591	7,887	17,420	81	21	4	405	511
" 11.— " 1, 1913	7	988	98	114	989	2,189	1,644	418	0	162	2,224
Total	220	18,350	3,059	12,243	20,325	53,977	7,154	2,046	3,733	1,245	14,178

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

INTERSTATE COMMERCE COMMISSION.

The ruling of the commission in conference on April 8 that the term "families," as contained in the pass provisions, does not include nurses who may be in attendance upon and traveling with a railway employee who is entitled to free transportation, has been rescinded by the commission.

The commission has ruled that carriers shall be permitted to charge for copies of their tariffs, such charges not to exceed the cost of the paper, of the extra printing and of mailing. It is discriminatory to furnish certain shippers with copies of the tariffs and to deny such copies to other shippers. The carriers will be required to publish price lists of their tariffs and to print enough copies to meet the demand.

The commission has suspended from May 8 until September 5 the supplement to the tariff of the Southern Railway, which would cancel through joint rates on smoking and plug tobacco in less than carload lots from Winston-Salem, N. C., to points in Maryland, Delaware and Virginia reached by water from Baltimore, Md., providing that on and after May 8 combination rates apply. While this would result in no increase in rates, it is claimed by shippers that the publication of through rates greatly facilitates correct prepayment of freight charges.

The commission has suspended from May 12 until September 9 the supplement to the tariff of the Chicago & Alton, which cancels existing through joint rates applicable to the transporta-

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tion of bituminous coal, in carloads, from the following mines located on the line of the Toledo, St. Louis & Western in Illinois: Coffeen, Edwardsville, Panama and Sorento, on traffic destined to points located on the Chicago, Milwaukee & St. Paul in Wisconsin, Minnesota and other states. Such cancellation would result in substantial increases by the application of combination rates.

The commission has suspended from May 11 until September 8 the items in a supplement to Agent F. A. Leland's tariff, which contain exceptions to the Western classification and affect the rating on iron and steel window sash (glazed), C. L., and iron and steel window frames when shipped with sash from interstate points to points in Texas, Louisiana and Mexico. Under the present provisions, glazed sash are rated fifth class and may be shipped at that rating in carloads mixed with window frames. The proposed provisions rate sash at fourth class and frames at fifth class ratings, C. L., and will not permit of mixing at the lower rating.

The commission has suspended from May 5 until September 2 tariff of the Chicago & North Western, and from May 10 until September 2 certain schedules contained in supplements to the tariff of the Chicago Great Western. The first mentioned tariff contains a schedule increasing from 13 cents to 16 cents per 100 lbs. the rate applicable to the transportation of cement in carloads from Mason City, Ia., to International Falls, Minn. Schedules suspended in the above-mentioned issues of the Chicago Great Western cancel existing joint rates between same points as well as the rates to intermediate points on the lines of the Northern Pacific, Minnesota & International and Big Fork & International, including Bemidji and Pequot, Minn., providing in lieu thereof for the application of combination rates, which results in advances; for example, the present rate to Bemidji is 13 cents and the proposed rate is 20 cents per 100 lbs.

Complaint Dismissed.

Scott Paper Company v. Pennsylvania Railroad. Opinion by the commission:

The commission decided that the rates on toilet paper from Philadelphia, Pa., to points in central freight association territory were not unreasonable or unjustly discriminatory as compared with rates from Albany, N. Y. (26 I. C. C., 601.)

Kellogg Food Company v. Grand Trunk Railway Company of Canada et al. Opinion by Commissioner Meyer:

The commission decided that the classification of food products known as Protose, Nutose, and Nuttolene under third class in official classification was not unjustly discriminatory. (26 I. C. C., 611.)

Rates on Excelsior and Flax Tow.

In re investigation and suspension of advances in rates by carriers for the transportation of excelsior from St. Paul, Minn., and other points to Chicago, Ill., and other points.

In re investigation and suspension of advances in rates by carriers for the transportation of flax tow, flax moss, and flax fiber, between St. Paul, Minn., Winona, Minn., and other points and Chicago, Ill., Peoria, Ill., Kansas City Mo., and other points. Opinion by the commission:

The commission decided that the proposed advances in the rates on flax tow and excelsior from St. Paul to Chicago were justified. The proposed advances in the rates on flax tow and excelsior from St. Paul to Des Moines, Omaha, Kansas City and other points were found not to have been justified. The carriers, however, are not precluded from undertaking reasonable adjustments of the rates to the latter points. (26 I. C. C., 689.)

Cement Rate Increased.

In re investigation and suspension of cement rates from Pennsylvania to New Jersey points. Opinion by Commissioner Marble:

The commission will not, for the purpose of indirectly influencing intrastate rates, prevent increase of an interstate rate on which no tonnage moves to a basis in harmony with like rates in the same region. The commission decided that the proposed advance in the joint rate on cement, Nazareth, Pa., group to Phillipsburg, N. J., was justified. The order of suspension will be vacated. (26 I. C. C., 687.)

Panhandle Not the Pennsylvania Company.

Duhlmeier Brothers v. Pennsylvania Company et al. Opinion by the commission:

A car of lumber reached Chicago via the line of the Pennsylvania Company. The complainant sent instructions for delivery of the car to agents of the Pittsburgh, Cincinnati, Chicago & St. Louis, which did not handle the shipment. Owing to delay in receipt of delivery instructions by the Pennsylvania Company demurrage charges accrued, which the complainant seeks to recover. Although the Pittsburgh, Cincinnati, Chicago & St. Louis is one of a group of roads comprising the Pennsylvania system, that line and the lines of the Pennsylvania Company are separately operated, file separate reports and tariffs, and are shown in railroad publications as distinct railway companies. The commission decided that notice to the Pittsburgh, Cincinnati, Chicago & St. Louis was not notice to the Pennsylvania Company and that demurrage charges were properly collected. The complaint was dismissed. (27 I. C. C., 4.)

Damages of $2.50 Denied.

Joseph F. Maxey v. Baltimore & Ohio Southwestern. Opinion by the commission:

A shipment of household goods was billed from Atlanta, Ga., to Newport, Ky. The defendant has no warehouse facilities of its own at Newport, but uses the Louisville & Nashville depot for making deliveries. Newport is regarded as a part of the Cincinnati terminals, so far as freight charges and deliveries are concerned. On the arrival of the shipment at Cincinnati, Ohio, the consignee was notified that the shipment would be forwarded to Newport or could be called for at Cincinnati. The consignee called for the goods at Cincinnati, and the cost of the drayage amounted to $2.50. The complainant contends that as the shipment was billed to Newport, the cost of the drayage should be refunded by the defendant. The commission decided that as the consignee was given the option of receiving the freight at either Newport or Cincinnati, and as it had not been shown that to have secured proper delivery by rail would have involved an unreasonable delay, the complaint should be dismissed. (26 I. C. C., 506.)

Protection of Potato Shipments in Winter.

In re investigation and suspension of new rules governing the allowance for stoves and lining of cars transporting potatoes from points in Minnesota and Wisconsin to points west of the Mississippi river. Opinion by Commissioner Harlan:

Hitherto when shipments of potatoes have been made in winter, shippers have lined the cars and provided stoves and attendants to protect the shipments from the cold. The carriers have exacted no charge for the transportation of the attendants, the stoves or the lining, either to the destination or for the return trip. Although this has been the practice in the region in question, the tariffs of the carriers did not provide specifically for this practice. The tariffs under suspension provide rules governing such shipments, and include changes from the previous practice. One of the new rules is that the carriers refuse to accept shipments of potatoes during the period from November 1 to April 15, unless the shipper at his own expense provides for protection against the cold. The carrier also reserves the right of accepting such shipments when in its judgment the weather conditions permit. The complainant contends that the carrier should provide protection against freezing in transit. The commission decided that as the potato traffic from the points of origin in question was large, and as carriers in other parts of the country furnished protection against freezing, and as section 1 of the Act requires carriers to provide all services of ventilation, refrigeration or icing, storage and handling of property transported, the carriers should be required by law to provide the service asked for by the shippers. The commission also decided that as, under the present rules, the shippers were responsible for damage by freezing, the carriers could not reserve the right of refusing shipments on account of weather conditions. No order was entered, but the commission urged that a conference be held between the shippers and carriers, so that mutually satisfactory regulations could be determined upon. The case will be held open for a future order in case the result of the conference is not satisfactory. (26 I. C. C., 681.)

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses					Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and Of structures.	Maintenance: equipment.	Traffic.	Transportation.	General.	Total.				
Alabama Great Southern	309	$303,461	$87,859	$431,043	$55,516	$100,820	$13,930	$152,531	$8,842	$331,139	$99,904	—$652	$14,476	$84,776	—$13,807
Ann Arbor	292	122,905	36,813	170,809	25,156	24,448	3,784	62,973	6,936	124,297	46,512	8	13,930	32,590	—16,623
Arizona Eastern	366	187,543	40,213	236,201	18,388	23,813	3,196	62,071	8,808	136,296	101,905	385	11,800	90,490	13,661
Belt Ry. Co. of Chicago	21	.....	.....	299,367	14,824	36,941	472	115,797	5,012	173,046	94,521	.....	7,927	86,594	9,633
Butte, Anaconda & Pacific	46	92,711	8,755	111,104	8,073	16,876	614	56,928	2,597	87,088	24,016	.....	2,000	22,016	7,966
Central Vermont	411	226,941	68,427	323,390	32,138	53,543	7,675	174,931	6,616	274,903	48,487	—134	16,927	31,426	—39,977
Chicago & Eastern Illinois	1,275	959,382	212,713	1,265,362	115,829	309,928	28,540	385,941	37,527	1,022,618	242,744	—308	45,000	200,461	—145,598
Chicago & Erie	270	342,629	47,741	433,232	79,465	106,220	21,071	166,776	11,815	485,347	—52,115	1,856	13,133	—63,592	—54,640
Chicago Junction	13	.....	.....	166,411	13,198	5,679	1,168	90,017	4,246	114,308	46,103	.....	2,470	43,633	—13,877
Cincinnati, New Orleans & Texas Pacific	317	653,449	138,934	939,206	78,222	200,359	23,841	297,809	15,992	596,461	342,745	—1,224	25,000	242,521	—7,107
Cleveland, Cincinnati, Chic. & St. Louis.	2,014	1,798,362	536,672	2,551,495	285,245	560,648	74,419	1,129,849	53,184	2,103,345	448,150	—2,118	103,900	342,232	—296,987
Delaware & Hudson Co. R. R. Dept.	854	1,640,883	196,451	1,908,762	143,190	294,884	22,007	730,839	61,347	1,252,267	656,495	—6,251	49,700	600,544	56,677
Detroit & Toledo Shore Line	79	115,783	.....	116,166	8,520	6,502	1,369	37,838	2,482	56,711	59,455	.....	7,237	52,218	—2,659
Detroit, Toledo & Ironton	441	92,767	9,501	111,991	35,943	23,539	2,460	45,625	4,918	132,486	—20,587	.....	5,000	—25,587	—48,221
Georgia	307	201,697	69,722	291,118	28,381	45,190	11,273	131,058	8,347	224,249	66,869	.....	2,950	63,919	3,541
Georgia, Southern & Florida	395	148,332	69,136	247,508	27,259	40,229	8,261	98,284	9,010	183,043	64,465	—126	10,107	54,232	16,096
Hocking Valley	458	377,446	60,553	478,469	55,992	128,569	8,806	163,142	14,220	370,979	107,540	.....	37,500	70,040	—145,331
Houston, East & West Texas	191	93,955	29,652	131,015	21,882	10,421	2,012	48,449	3,893	86,657	44,358	.....	3,833	40,525	12,154
Houston & Texas Central	789	364,383	149,777	558,397	96,055	100,635	19,746	246,945	16,291	479,672	78,725	—248	19,957	58,520	62,190
Indiana Harbor Belt	105	.....	.....	477,978	46,423	29,029	969	141,093	7,757	225,101	52,877	129	5,500	47,506	—3,748
International & Great Northern	1,160	573,318	163,947	800,443	116,569	118,557	25,401	401,301	30,597	692,425	108,018	—1,274	30,000	76,744	7,247
Lake Erie & Western	906	360,504	60,348	444,881	72,203	95,289	10,937	180,755	12,429	371,613	73,268	.....	29,000	53,268	—42,016
Lehigh & Hudson	39	129,892	3,591	140,229	12,472	23,532	1,362	55,305	3,809	96,540	43,689	.....	4,000	39,689	—23,903
Louisiana & Arkansas	253	140,229	18,359	164,108	23,859	23,473	2,389	37,310	5,048	92,079	72,029	.....	4,500	67,529	13,343
Louisiana Ry. & Navigation	351	118,137	20,166	148,617	23,998	21,627	6,090	63,225	8,573	123,313	25,104	.....	4,500	20,604	—6,625
Louisiana Western	208	142,923	60,757	212,314	24,795	49,691	8,941	64,991	5,620	154,038	58,276	705	7,260	51,721	5,464
Louisville, Henderson & St. Louis	277	66,522	18,280	101,163	21,276	13,919	4,179	43,480	3,016	87,870	13,293	1,000	1,000	10,514	—11,959
Maine Central	1,006	681,627	248,428	981,249	82,361	167,301	7,615	416,518	28,693	702,488	278,761	—4,762	46,736	227,263	—5,580
Michigan Central	1,817	2,019,883	647,853	2,972,193	344,000	466,209	66,438	1,311,170	55,858	2,243,675	728,518	—6,418	116,000	606,100	—124,175
Minneapolis, St. Paul & Sault Ste. Marie	2,817	2,374,591	722,334	3,469,433	399,772	310,512	61,050	1,604,610	88,281	3,086,225	383,208	—8,696	102,844	450,660	—259,818
Mobile & Ohio	814	897,989	112,985	1,081,109	132,596	191,834	41,059	386,408	36,655	788,552	292,557	—1,781	30,141	260,635	42,128
Morgan's La. & Tex. R. R. & S. S. Co.	404	262,607	99,570	388,821	69,889	55,238	16,822	189,084	11,912	342,949	45,872	—1,821	18,250	25,801	—32,917
New Orleans, Mobile & Chicago	547	179,965	27,583	217,338	28,750	24,762	3,903	96,723	8,051	162,189	55,149	—128	7,407	47,615	23,574
New Orleans, Texas & Mexico	281	100,937	16,370	125,289	19,109	12,523	3,604	65,136	5,147	106,584	18,705	.....	1,441	17,260	—3,494
New York, Susquehanna & Western	154	174,697	43,800	252,939	17,740	31,207	1,913	103,404	5,442	159,706	93,233	—3,418	14,673	75,142	3,701
Northwestern Pacific	401	98,763	138,882	259,527	39,503	55,602	3,182	107,157	12,759	218,203	41,324	.....	13,050	28,274	18,232
Pecos & Northern Texas	479	138,209	37,028	187,764	23,114	49,202	4,458	67,285	6,305	150,364	37,400	.....	6,325	30,875	—2,572
Peoria & Eastern	352	207,388	49,247	272,748	31,611	59,839	4,847	116,464	5,480	218,241	54,507	.....	10,400	44,107	—30,026
Pere Marquette	2,330	1,011,358	272,227	1,395,394	190,531	199,715	31,123	611,867	31,855	1,064,911	330,483	25,264	52,857	322,890	289,611
Pittsburgh & Lake Erie	227	1,401,782	133,461	1,595,555	163,888	262,662	12,361	345,343	9,679	857,400	738,154	—163	30,000	708,291	56,505
Richmond, Fredericksburg & Potomac	88	134,707	115,357	281,114	26,302	29,213	2,785	96,386	6,374	161,060	120,054	—230	721	119,103	56,498
St. Joseph & Grand Island	319	70,472	26,906	108,306	26,226	21,042	4,757	63,489	5,686	121,200	—12,894	674	6,244	—18,464	9,801
St. Louis, Brownsville & Mexico	518	157,498	79,117	259,718	35,893	24,619	4,577	122,584	10,149	197,822	61,896	.....	5,500	56,396	15,065
St. Louis, San Francisco & Texas	244	80,416	24,598	115,154	17,781	14,912	2,799	56,679	5,010	109,971	5,283	.....	1,225	4,058	—6,274
St. Louis Southwestern	906	582,101	110,833	730,351	70,257	98,833	30,089	174,278	27,943	401,400	328,951	—618	26,796	301,537	79,846
San Pedro, Los Angeles & Salt Lake	1,135	476,683	254,551	787,561	78,577	148,931	32,793	273,298	18,468	552,067	235,494	—2,084	42,557	190,853	88,089
Southern in Mississippi	231	46,901	25,720	79,634	10,210	9,591	2,542	43,874	4,155	90,872	—11,238	.....	8,080	—19,318	—8,033
Southern Kansas of Texas	171	91,922	15,908	112,350	8,421	27,945	2,641	39,075	2,831	81,813	30,537	.....	2,278	28,259	345
Tennessee Central	294	102,371	32,668	142,756	23,301	14,713	5,390	49,079	7,307	99,690	43,066	.....	4,265	38,801	20,050
Texas & New Orleans	456	257,273	76,808	364,909	115,107	60,366	9,351	152,944	12,009	349,757	15,152	808	13,604	2,498	—7,720
Toledo & Ohio Central	443	304,325	41,002	357,778	78,869	83,226	6,823	146,875	9,330	325,123	32,655	—915	21,604	10,136	—90,856
Toledo, Peoria & Western	248	59,439	16,040	101,796	16,870	27,916	2,597	40,338	3,649	91,370	10,426	.....	5,900	4,526	—6,831
Ulster & Delaware	129	49,404	16,656	69,843	8,733	14,028	854	36,979	2,876	63,472	6,371	26	3,300	3,077	—8,038
Virginia & Southwestern	240	126,768	13,410	145,699	20,133	34,572	2,182	40,216	3,431	100,735	44,964	.....	7,232	37,732	—11,506
Wabash	2,515	1,716,533	499,904	2,439,766	301,584	427,531	51,748	1,150,910	61,728	2,023,501	416,265	—1,774	84,283	330,208	89,984
Washington Southern	36	39,623	57,640	127,747	13,858	13,237	1,075	50,579	2,501	81,550	46,197	—165	3,390	42,742	8,977
Western Maryland	543	346,331	64,282	629,128	73,902	83,095	15,352	298,556	12,050	482,955	146,173	.....	20,000	126,173	79,435
Western Pacific	937	350,054	108,932	474,360	68,884	47,109	28,023	158,584	24,799	367,449	106,911	—1,408	26,461	79,058	109,271
Western Ry. of Alabama	133	77,011	39,441	128,616	19,689	22,119	6,858	34,688	5,911	89,265	39,351	—2	4,929	34,420	7,392

Average mileage operated during previous period—[1] 2,012; [2] 852; [3] 353; [4] 886; [5] 1,204; [6] 1,399; [7] 277; [8] 152; [9] 215; [10] 83; [11] 510; [12] 843; [13] 1,116. — Indicates Deficits, Losses and Decreases.

Texas City Wharfage Charges Reduced.

In re wharfage charges of the Galveston Wharf Company, at Galveston, Tex. Opinion by Commissioner Harlan:

In the original case, 23 I. C. C., 533, the commission found that the railway companies were discriminating against Galveston and the Galveston Wharf Company in favor of Texas City and the Texas City Terminal Company by paying to the latter company excessive divisions out of the rates to that port. As the record was not broad enough to justify a definite order fixing the division for the future, the carriers were directed to confer with representatives of the two wharf companies and to submit a new schedule of divisions with the Terminal company. Conferences were held, but the parties failed to agree. The commission was, therefore, asked to fix the division. The commission decided that the Texas City Terminal Company, in compensation for its services and the use of its facilities, is entitled to a switching allowance of $3.50 per loaded car. Any allowance to that company in excess of that amount will be an unjust discrimination against the Galveston Wharf Company. Settlement between the Texas City Terminal Company and its trunk line connections may be made on the basis here stated for services rendered since August 1, 1912. The Galveston Commercial Association pointed out that the Texas City interests were offering to the American Steel & Wire Company and other large shippers warehousing services on their wharves at Texas City at less than cost, and that they are able to do this only because of the large divisions out of the rates that the Terminal company was formerly receiving and will be able to continue to do it only in the event that the commission fixes the allowance of the Texas City Terminal Company on an excessive basis. The commission was not prepared to express any view as to the legality of these arrangements, but will look into them further and take such steps as may be required. No order was deemed necessary. (26 I. C. C., 695.)

STATE COMMISSIONS.

The Board of Railway Commissioners for Canada has passed an order, requiring the Grand Trunk to renew the rails on its Barrie division, between miles 22 and 26; and directing that, until the completion of the work, trains between Trout Creek and Powassan shall not run faster than 15 miles an hour.

The Pennsylvania State Railroad Commission has dismissed the case of the teamsters of Philadelphia who asked for an order requiring the Pennsylvania and the Reading railroads, at their freight houses in Philadelphia, to truck goods to the door, so that teamsters could load packages on to their wagons with the least possible labor. The commission holds that to order the roads to change their practice in the way desired would not hasten delivery of freight.

COURT NEWS.

The Supreme Court of Texas has rendered a decision sustaining an injunction issued by the district court of Anderson county, restraining the International & Great Northern from moving its machine shops and roundhouse from Palestine, Tex., to Houston.

The Supreme Court of the United States has declared unconstitutional the reciprocal demurrage law of Oregon, which was passed in 1907. The decision of the court is based on the same grounds as those laid down in the Minnesota case—that the law in its operation interfered with interstate commerce.

In the United States district court at Boston, May 8, the New York Central & Hudson River was convicted by a jury on eight charges of working trainmen unlawfully more than sixteen hours consecutively. On twenty other charges the road was acquitted, the delays having been found excusable under the terms of the law.

The Supreme Court of the United States has handed down a decision sustaining the employers' liability law of Indiana. The decision is in the suit of Hackett against the Chicago, Indianapolis & Louisville. Hackett was a yard switchman and sustained the loss of both legs through the fault of the yard foreman.

The Colorado & Southern, the Chicago, Burlington & Quincy, and the Union Pacific have filed an appeal in the United States district court at Denver from the decision of the Colorado Railroad Commission ordering reductions in freight rates on coal from the northern Colorado fields to Denver. The appeal follows the refusal of the commission to grant a re-hearing of the case.

The Supreme Court of the United States has affirmed the decision of the Supreme Court of Appeals of Virginia in a case against the Norfolk & Western for damages on a shipment of tobacco shipped from a point on that road to Texas on a through bill of lading, the damage having occurred while the property was in the hands of the Old Dominion Steamship Company. The decision simply sustains the Interstate Commerce law, as amended, which makes the carrier issuing a bill of lading responsible for safe carriage through to destination.

The Maryland Court of Appeals holds that the Public Service Commission of the state has no authority to regulate the issuance of securities by the Baltimore & Ohio Railroad beyond passing on the question whether they are issued in proper form and in good faith. Suit had been instituted to sustain the authority of the commission to determine the aggregate amount of capital stock which might be issued and also the aggregate of bonded indebtedness; also the price at which stock or bonds should be sold and what disposition should be made of the proceeds.

The Supreme Court of the United States has refused a rehearing in the Minehill Corporation tax case, in which it was decided that a corporation engaged only in leasing its property and investing its funds was not "doing business," and therefore was not liable for the tax. The decision exempted hundreds of railroad companies from paying the tax, as well as telegraph and other corporations. Attorney General McReynolds had asked a rehearing on the ground that the decision was in conflict with previous corporation tax decisions of the court and would lead to inequality in the operation of the law. He declared the result would be that any corporation might avoid the tax simply by leasing its plant.

The United States circuit court of appeals at New Orleans has rendered a decision in the case of the United States vs. the Houston Belt & Terminal Company, which holds that the hours-of-service law, regulating the working time of telegraphers, applies to the service of certain towermen. It was charged that the company was working its towermen in 12-hour daily shifts, where the law makes a limit of nine hours; and the railway in defense claimed that the act did not apply to the tower men, because they did not handle train orders. Judge Foster, in delivering the court's opinion, held that the signals or communications transmitted by tower men were to be deemed train orders. "To say that the tower men only used the telephones for giving information not covered by the statute would be the merest sophistry," he said. "It is difficult to perceive how anything could be a more imperative order affecting train movements than for one of the tower men at Houston to notify another that he had started a train and at the same time telling him to hold all traffic in the opposite direction over the same track."

By a decision by Judge W. I. Grubb, of the United States district court for the middle district of Alabama, issued on May 5, the Louisville & Nashville loses its suit to have the Alabama State Railroad Commission declared in contempt of court for ordering a reduction in passenger rates in that state notwithstanding the action of the federal court some months ago, which held a former reduction illegal. The present suit followed the action of the commission in ordering the road to reduce all passenger rates, March 6, to 2½ cents a mile. Judge Grubb says that the railroad company's remedy, if it has one, lies in independent proceedings in the state or federal court, where it can ask for an injunction against the railroad commission. Under the law of the state, the commission has the power to make and enforce railroad rates independent of any legislative act, or any injunction against a legislative act. The rate which the court had declared illegal was 2½ cents a mile, prescribed specifically by a legislative act. The court held that so low a rate would be confiscatory and on the issuance of the decision the road increased fares to the basis of three cents a mile.

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Railway Officers.

Executive, Financial and Legal Officers.

Robert E. Strahorn has resigned as vice-president of the Oregon-Washington Railroad & Navigation Company.

E. J. Dedman, general manager of the Gainesville & Northwestern, has been elected also vice-president, with office at Gainesville, Ga.

Edward Chambers, assistant freight traffic manager of the Atchison, Topeka & Santa Fe Coast Lines, has been elected vice-president, in charge of traffic, with headquarters at Chicago, succeeding George T. Nicholson, deceased. Mr. Chambers was born February 16, 1859, at Waukegan, Ill., and was educated in the public schools. His entire railway service has been with the Atchison, Topeka & Santa Fe system, with which road he began work in November, 1878, as a freight handler on the platform at Pueblo, Colo. He remained at that place until 1885, successively as check clerk, foreman of transfer platform, and cashier. He was then transferred to San Diego, Cal., as local agent, and in 1887 became local agent at Los Angeles, Cal. Seven years later he was promoted to assistant general freight agent at that point; from 1894 to 1896 he was general freight agent, with headquarters at the same place, and then until March, 1905, he was freight traffic manager of the Coast Lines, with office at San Francisco, Cal. He relinquishes the duties of the latter position June 1 to become vice-president of the Santa Fe system, in charge of traffic, as above noted.

E. Chambers.

William V. S. Thorne, director of purchases of the Union Pacific, with office at New York, has been elected vice-president of the Union Pacific, the Oregon Short Line and the Oregon-Washington Railroad & Navigation Company, with headquarters at New York. He was born on March 22, 1865, at Millbrook, N. Y., and graduated from Sheffield Scientific School of Yale University in the class of 1885. The same year he began railway work with the St. Paul, Minneapolis & Manitoba, now a part of the Great Northern, and at various times during the following nine and a half years he was stationed in Minnesota, in South Dakota, in Wisconsin and in Montana, with the engineering department on location and construction work. He was then transferred to the operating department as clerk to the general manager, and subsequently was promoted to assistant purchasing agent, and then to superintendent of the St. Cloud, Minn., shops. His next position was assistant superintendent of the Breckenridge division, and he was later made superintendent of the Eastern Railway of Minnesota division. In 1895 he was elected vice-president and general manager of the Pennsylvania Coal Company, and vice-president of the Erie & Wyoming Valley Railroad, one of its subsidiaries, with headquarters at New York, and soon afterwards was elected president of the Delaware Valley & Kingston Railway, a company which was formed to build a railroad along the route of the old Delaware & Hudson canal from Hawley, Pa., to Kingston, N. Y. These three properties were sold to the Erie Railroad in 1900. In the summer of 1902 he was appointed assistant to E. H. Harriman, of the Southern Pacific and Union Pacific systems, and the following year was made director of purchases of both systems. In consequence of the order of the Supreme Court, separating the Union Pacific and the Southern Pacific, he resigned on January 31, 1913, as director of purchases of the Southern Pacific, remaining with the Union Pacific.

W. V. S. Thorne.

John M. Metheany has been elected secretary and auditor of the Grand Rapids & Indiana, with headquarters at Grand Rapids, Mich., succeeding R. R. Metheany, deceased.

Daniel Breck has been appointed vice-president of the Missouri, Oklahoma & Gulf, in charge of the operating department and traffic, with headquarters at Muskogee, Okla., succeeding J. W. Hoffman.

C. C. Barry, auditor of Morgan's Louisiana & Texas Railroad & Steamship Company and the Iberia & Vermillion, secretary and auditor of the Lake Charles & Northern, and auditor and assistant secretary of the Louisiana Western with headquarters at New Orleans, La., has been appointed assistant comptroller of the Southern Pacific Company with headquarters at New York, and H. S. Walker succeeds Mr. Barry with headquarters at New Orleans.

Operating Officers.

J. M. Boyd, assistant general air brake inspector of the Northern Pacific, has been appointed trainmaster of the Fargo division, with office at Dilworth, Minn.

H. W. Stanley, assistant general manager of the Seaboard Air Line, with office at Portsmouth, Va., has been appointed general manager, effective May 15.

F. M. Smith, roadmaster of the Seattle division of the Northern Pacific, has been appointed assistant trainmaster of the Seattle division on line north of Seattle, with office at Seattle, Wash.

F. C. Noessel, chief despatcher of the Kansas City, Mexico & Orient of Texas, at San Angelo, Tex., has been appointed trainmaster, with headquarters at San Angelo, and A. J. Cleary succeeds Mr. Noessel.

G. L. Hickey, assistant division superintendent of the Southern Pacific at Tucson, Ariz., has been appointed assistant superintendent of the Montana division of the Oregon Short Line, with headquarters at Pocatello, Idaho, succeeding George Baker, assigned to other duties.

A change in the organization of the New York, New Haven & Hartford and the Central New England went into effect on May 1, and C. L. Bardo, general manager, is now in charge of all matters pertaining to transportation, maintenance of equipment, power stations, high tension lines, track signals, bridges and buildings. The engineer of maintenance of way, the general superintendent, the mechanical superintendent, the electrical superintendent, the signal engineer, the superintendent of telegraph, the contract agent and the superintendent of dining cars will report to the general manager. H. Gilliam, electric superintendent of the New York, New Haven & Hartford at Stamford, Conn., will have charge of and be responsible for the maintenance, distribution and control of all electrical apparatus and high tension wires from the crossarms outside of the switchhouse to the shoes of the locomotives, which includes the high tension primaries of all transformers and switches connected to the distributing system. On all matters pertaining to operation he will report to the division superintendent. He will also act in an advisory capacity for all high tension lines heretofore maintained by the signal engineer, including direct current line between Providence and Fall River, Warreen and Bristol, Nantasket Junction and Pemberton.

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George F. Dickson, whose appointment as superintendent of the Georgia & Florida, with headquarters at Douglas, Ga., has been announced in these columns, was born on December 1, 1872, at Lake Waccamaw, N. C., and was educated in the common schools. He began railway work in July, 1891, with the Plant System of railways as a telegraph operator, and in 1896 was promoted to train despatcher, becoming chief despatcher in 1901. He remained in the service of that system and its successor, the Atlantic Coast Line, until 1905, and then became trainmaster on the Atlanta, Birmingham & Atlantic. In April, 1912, he went to the Georgia & Florida, as trainmaster, which position he held at the time of his appointment on April 15, as superintendent of the same road, with headquarters at Douglas, Ga., as above noted.

G. F. Dickson.

Traffic Officers.

L. G. Paul, traveling passenger agent of the Baltimore & Ohio Southwestern, with headquarters at St. Louis, Mo., has been appointed division passenger agent at Chillicothe, Ohio, succeeding L. B. Jay.

Harry V. Wilmot has been appointed district passenger agent of the Northern Pacific at Milwaukee, Wis., in place of M. E. Harlan, who has been promoted to a position in the traffic department at St. Paul, Minn.

W. E. Phillips has been appointed traveling freight agent of the Toledo, St. Louis & Western, succeeding K. W. Curtis, resigned, and H. R. Mason has been appointed traveling freight agent, both with offices at Pittsburgh, Pa.

F. R. Clark, traveling freight agent in the office of the division freight agent of the Grand Trunk at Toronto, Ont., has been promoted to traveling freight agent in the office of the assistant foreign freight agent, with headquarters at Toronto, and F. G. Gould succeeds Mr. Clark.

H. C. Stevenson, traveling passenger and freight agent of the Baltimore & Ohio Southwestern, with headquarters at Denver, Colo., has been appointed southwestern passenger agent, with office at Dallas, Tex., succeeding W. F. Geisert, who takes Mr. Stevenson's place at Denver.

L. B. Jay, division passenger agent of the Baltimore & Ohio Southwestern at Chillicothe, Ohio, has been appointed district passenger agent of the Cincinnati, Hamilton & Dayton, with office at Indianapolis, Ind., in place of H. G. Alexander, who takes service with the Chicago, Indianapolis & Louisville.

G. W. Housley having resigned as general agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern at Hot Springs, Ark., all matters pertaining to freight traffic will be handled by R. M. McWilliams, assistant general freight agent, and that regarding passenger business by F. E. Schroeder, assistant general passenger agent, whose headquarters are at Little Rock, Ark.

H. J. Booth, formerly general coal and ore agent of the Wheeling & Lake Erie, has been appointed special agent in connection with the traffic department of that road and traffic manager of the Lorain & West Virginia, with headquarters at Cleveland, Ohio. Mr. Booth recently was granted a leave of absence. R. F. Smith, commercial agent of the former road at Cleveland, Ohio, has been appointed commercial agent; A. O. Ellis, traveling passenger agent, with headquarters at Canton, Ohio, is appointed traveling freight agent also; Charles Schoch has been appointed contracting freight agent, and E. D. Shenk has been appointed commercial agent at Cleveland.

Engineering and Rolling Stock Officers.

B. H. Allmain has been appointed roadmaster of the Seattle division of the Northern Pacific, with headquarters at Seattle, Wash., succeeding F. M. Smith, promoted.

H. F. Grewe, general foreman of the mechanical department of the Wabash-Pittsburgh Terminal and the West Side Belt, at Carnegie, Pa., has been appointed master mechanic in charge of locomotive and car departments of both companies, with headquarters at Rook (Carnegie, Pa.).

P. Alquist, chief inspector of the car department of the Pere Marquette at Detroit, Mich., has been appointed superintendent of the car department of the Missouri, Kansas & Texas, with headquarters at Sedalia, Mo., succeeding W. A. Mitchell, whose title was master car builder, and which office has been abolished.

T. R. Stewart, who has been appointed master mechanic of the Baltimore & Ohio, at Cumberland, Md., as has been announced in these columns, began railway work with the Baltimore & Ohio in September, 1886. He was consecutively boilermaker, foreman, roundhouse foreman and general foreman until February, 1904, when he was appointed master mechanic, and is now transferred in the same capacity from the Riverside shops, Baltimore, Md., to Cumberland, as above noted.

F. H. Hanson, supervisor of materials of the Lake Shore & Michigan Southern, and the Chicago, Indiana & Southern, at Cleveland, Ohio, has been appointed assistant master car builder of the Lake Shore division of the Lake Shore & Michigan Southern and the Dunkirk, Allegheny Valley & Pittsburgh, with headquarters at Collinwood shops, Ohio, and H. W. Gardner has been appointed supervisor of materials of the Lake Shore & Michigan Southern, with headquarters at Cleveland, succeeding Mr. Hanson.

P. Coniff, who has been appointed superintendent of shops of the Baltimore & Ohio, at Mount Clare, Baltimore, Md., as has been announced in these columns, began railroad work in 1888. He was a machinist on the Pittsburgh & Lake Erie, the Pittsburgh, Fort Wayne & Chicago and the St. Louis, Iron Mountain & Southern railroads until December, 1902, when he entered the service of the Baltimore & Ohio as a roundhouse foreman. He later became general shop foreman, and was promoted to master mechanic at Cumberland, Md., on May 1, 1911, which position he held at the time of his recent promotion as superintendent of shops of the same road, as above noted.

J. Kirkpatrick, who has been appointed master mechanic of the Baltimore & Ohio, at the Riverside shops, Baltimore, Md., as has been announced in these columns, served his machinist apprenticeship with the Kingston (Ontario) Locomotive Works from 1878 to 1882, and was later connected with the Canadian Pacific, the South Eastern and the Grand Trunk railways. He entered the service of the Baltimore & Ohio in March, 1903, and was promoted to master mechanic in the New Castle, Pa., shops in August, 1903, remaining in that position until 1905, when he was transferred to Cumberland in the same capacity. In February, 1907, he went to the Newark, Ohio, shops as master mechanic, and goes to the Riverside shops of the same road.

J. Kirkpatrick.

J. F. Bowden, who becomes master mechanic of the Baltimore & Ohio at Newark, Ohio, as has been announced in these columns, served his apprenticeship in the Baltimore & Ohio shops at Keyser, W. Va., starting in March, 1885. He became roundhouse foreman at Grafton in September, 1895, and general fore-

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man at Washington, D. C., November 1, 1898. He was then general foreman at Cumberland, Md., and at Benwood, W. Va., and was appointed master mechanic at Parkersburg, W. Va., in September, 1907. He was transferred in the same capacity to Garrett, Ind., on December 1, 1908, and now becomes master mechanic of the same road at Newark, Ohio, as above noted.

F. W. Rhuark, whose appointment as master mechanic of the Baltimore & Ohio, at Garrett, Ind., has been announced in these columns, began railway work as a water boy with the Baltimore & Ohio in June, 1879. He was then a machinist with the Lake Shore, the Toledo & Ohio Central and the Chicago & Alton railroads. In 1893 he became road foreman of engines of the Baltimore & Ohio, and was later in the service of the Big Four, the Erie and the St. Louis & San Francisco railroads. He was appointed machine shop foreman of the Baltimore & Ohio in January, 1906, and then was successively general foreman and motive power inspector until December 1, 1910, when he was appointed master mechanic at Lorain, Ohio, and is now transferred in the same capacity to Garrett, Ind.

R. A. Rutledge, whose appointment as chief engineer of eastern lines of the Atchison, Topeka & Santa Fe has already been announced, was born December 13, 1863, at Jamestown, Pa. He attended the University of Kansas from 1884 to 1891, and began railway work August 1, 1892, with the Gulf, Colorado & Santa Fe. From 1894 to 1896 he was city engineer at Florence, Colo., and county supervisor of Fremont County, Colo., and was then until June 15, 1897, surveyor U. S. Department of Mines at Cripple Creek District, Colo. He returned to railway service on the latter date as instrumentman for the Gulf, Colorado & Santa Fe. On December 1 of the following year he was made assistant engineer, and from October, 1904, to January, 1910, was resident engineer of the same road. He was then promoted to assistant chief engineer of that road, with headquarters at Galveston, Tex., which position he held until he was appointed chief engineer of the eastern lines of the Santa Fe, with office at Topeka, Kan., as above noted.

F. M. Bisbee, who recently was appointed chief engineer of the Western Lines of the Atchison, Topeka & Santa Fe, with headquarters at Amarillo, Tex., was born September 27, 1855, at Brunswick, Me. He was educated at the University of Maine, and began railway work in 1878 with the Atchison, Topeka & Santa Fe as rodman. Later he was transitman, and subsequently went to the Mexican Central as superintendent of construction, afterwards returning to the Santa Fe as superintendent of tracklaying. He was then made superintendent of track, bridges and buildings of the Gulf, Colorado & Santa Fe, and later until October, 1896, was superintendent of track, bridges and buildings of the St. Louis & San Francisco. From October, 1896, to July, 1900, Mr. Bisbee was general manager and chief engineer of the Tennessee Central, and from January, 1901, to July, 1903 he was general manager of the Los Angeles Land & Water Company. He was then until 1904 engineer for B. Lantry & Sons, railroad contractors, at Ft. Madison, Iowa. In July, 1904, he became engineer of the Western lines of the Atchison, Topeka & Santa Fe at La Junta, Colo., which position he held until he was promoted to chief engineer of those lines, as above noted.

The authority of G. W. Wildin, mechanical superintendent of the New York, New Haven & Hartford, with office at New Haven, Conn., has been extended over the Central New England; and (on the New Haven) he has been put in charge of the maintenance of electric locomotives or multiple unit cars, and the operation and maintenance of power stations up to and including the lines at the crossarms outside of the switch house. George O. Hammond has been appointed assistant mechanical superintendent of the New York, New Haven & Hartford, and the position of assistant to the mechanical superintendent has been abolished. H. C. Ovitt, general inspector at New Haven, has been appointed assistant mechanical superintendent, and the position of general inspector has been abolished. J. L. Crouse has been appointed superintendent of shops, Electric division, reporting to the mechanical superintendent, with headquarters at Van Nest, N. Y. Joseph McCabe, division master mechanic at Waterbury, Conn., has been appointed master mechanic of the Shore Line division, with office at Harlem River, N. Y., to have jurisdiction over matters west of New Haven. C. H. Reid, general road foreman of engines, has been appointed master mechanic of the Western division, with office at Waterbury, Conn., succeeding Mr. McCabe, and F. W. Nelson, road foreman of engines, Western division, has been appointed general road foreman of engines, with office at New Haven, succeeding Mr. Reid.

The following changes in organization on the New York, New Haven & Hartford, and the Central New England were made effective May 1: E. Gagel, chief engineer, has been given charge of the engineering department and will have jurisdiction over all matters pertaining to construction and standards. The authority of W. J. Backes, engineer of maintenance of way of the New York, New Haven & Hartford, with office at New Haven, Conn., has been extended over the Central New England. He will have charge of tracks, bridges, buildings and signals. Division superintendents will report to the engineer of maintenance of way, on all matters coming within his jurisdiction. Division engineers will report to and receive instructions from the division superintendents. They will have charge of and be responsible for the safe maintenance of tracks, bridges, buildings and signals, and will take over such men as may be assigned from the bridge, building and signal departments. They will report to the engineer of maintenance of way, on matters pertaining to inspection of physical property, construction and standards of maintenance, other than signal standards, on which they will report to the signal engineer. G. A. Rodman, inspector of bridges and buildings at New Haven, Conn., has been appointed general supervisor of bridges and buildings, in charge of the inspection of all bridge and building work to be done by the maintenance of way department, with office at New Haven. He will report to the engineer of maintenance of way. The office of superintendent of bridges and buildings has been abolished, and the duties heretofore performed by the superintendent of bridges and buildings are assigned to division engineers. I. D. Waterman, engineer of construction at New Haven, has been appointed construction engineer in general charge of construction work. A. S. Tuttle, division engineer of construction at Boston, Mass., has been appointed construction engineer in charge of grade crossing eliminations in the state of Massachusetts, and such other work as may be assigned to him. C. W. Lard has been appointed office engineer at New Haven, in general charge of office drafting department, and such other matters as may be assigned to him. W. H. Moore, engineer of bridges at New Haven, has been appointed engineer of structures, and will have charge of the design of all bridges and structures. L. J. Carmalt, assistant chief engineer of the Central New England, at Hartford, has been appointed construction engineer in charge of work on the Central New England, and will perform such other duties as may be assigned to him. The office of assistant chief engineer of the Central New England has been abolished.

OBITUARY.

Peter E. Bowman, formerly superintendent of the New York division of the New York, New Haven & Hartford, died on May 9, at his home in New Haven, Conn., at the age of 65.

Clarence Deming, for 15 years, until 1912, an editorial writer on the *Railway Age Gazette*, died at his home in New Haven, Conn., May 8, at the age of 65. Mr. Deming was born at Litchfield, Conn., and was graduated from Yale College in 1872. He had been a journalist throughout his active life, and as such had traveled in many countries for the New York *Evening Post*. He was for several years an editorial writer on that paper. He was a man of broad culture and looked at railroad and economic topics, as at all other affairs, from a high plane of moral integrity. His personality was perennially pleasant, so that his acquaintances—all who really knew him—esteemed him for his lovable qualities as well as for his ability as an investigator and his courage as an upholder of righteousness in public affairs. Mr. Deming is survived by his wife, one son and two daughters.

LOAN FOR BOLIVIAN RAILWAY.—The Bolivian government has received information from its agent in Paris that he has placed a loan for $7,500,000 for the construction of the railway from Quiaca to Tupiza which would join up at the former station with the Central Northern system.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE CHARLOTTE HARBOR & NORTHERN has ordered 2 consolidation locomotives from the American Locomotive Company. The dimensions of the cylinders will be 20 in. x 26 in., and the diameter of the driving wheels will be 54 in.

THE AMAGA RAILROAD, Colombia, has ordered 2 prairie type locomotives from the American Locomotive Company. The dimensions of the cylinders will be 12 in. x 16 in.; the diameter of the driving wheels will be 33 in., and the total weight in working order will be 62,000 lbs.

THE CHICAGO, ROCK ISLAND & PACIFIC has ordered 2 mountain type passenger locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 28 in. x 28 in. cylinders, 69 in. driving wheels, and in working order will weigh 328,000 lbs.

THE ALUMINUM COMPANY OF AMERICA has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 20 in x 26 in.; the diameter of the driving wheels will be 50 in., and the total weight in working order will be 144,000 lbs.

THE SOLVAY PROCESS COMPANY, Syracuse, N. Y., has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 24 in.; the diameter of the driving wheels will be 51 in., and the total weight in working order will be 122,000 lbs.

CAR BUILDING.

THE ERIE is considering the purchase of 5,000 freight cars.

THE BALTIMORE & OHIO has ordered 500 gondola cars from the Cambria Steel Company; 40 baggage cars from the American Car & Foundry Company; and 5 seventy-foot combination baggage and mail cars, 7 fifty-foot combination passenger and baggage cars, 25 seventy-foot coaches, 15 sixty-foot smoking cars and 4 seventy-three-foot dining cars from the Pullman Company.

IRON AND STEEL.

THE BALTIMORE & OHIO has ordered 1,300 tons of rails from the Maryland Steel Company.

GENERAL CONDITIONS IN STEEL.—There has been but little change in the steel industry during the past week. The mills continue to operate at as near their full capacity as possible and the volume of new orders is still very light. Manufacturers feel that consumers will be forced to place large orders before very long, and consequently are not contemplating any price reduction. If the crops are successful, and present indications suggest that they will be, there will be a decided improvement in the buying movement. During April the average volume of new business placed daily was not much over 26,000 tons, comparing with more than 40,000 tons in March and between 45,000 and 50,000 tons a day in the corresponding period of last year.

SIGNALING.

The Chicago, Lake Shore & South Bend is to install automatic block signals throughout the length of its line—70 miles. This is an electric line from South Bend, Ind., westward toward Chicago. The company had been ordered by the Indiana Railroad Commission to install signals on 12 miles of its line, but has concluded that the whole road should have this improvement. The plans provide for the use of "light" signals.

PLANS FOR BRAZILIAN RAILWAY APPROVED.—The President of Brazil has signed a decree approving definite plans and estimates amounting to $1,100,000 for the railway line between kilometer 0 to 105 of the Coroata to Tocatins Railway.

Supply Trade News.

Charles R. Westcott has been elected secretary and treasurer of the M-C-B Company, Chicago.

The E. D. E. Company, Chicago, Ill., has moved its offices from 1449 to 1402-1404 Railway Exchange building.

The Railway Utility Company has removed its office from the Monadnock building to 226 South LaSalle street, Chicago.

The Baldwin Locomotive Works is preparing to begin construction on the first unit of its new plant at East Chicago, Ind., for which approximately 370 acres of land was purchased last year.

The Hall Switch & Signal Company, New York, has acquired the patent rights formerly owned by the General Railway Equipment Company, the United States Electric Company and the Sandwich Electric Company, and will hereafter make and sell Gill selectors, Sandwich selectors and other apparatus and equipment formerly handled by those companies.

The White Enamel Refrigerator Company, St. Paul, Minn., has closed a contract with the Grand Trunk for 32 large refrigerators to be installed in the new $2,000,000 Fort Gary Hotel at Winnipeg. The contract amounts to approximately $30,000. This company also furnished the refrigerator equipment for the Chateau Laurier and the Central Union station at Ottawa, Ont.

The Power Specialty Company, New York, is building a new erecting shop, at its works at Dansville, N. Y., to handle the increasing demand for Foster superheaters. This shop will be 300 ft. x 96 ft., and will be completed in about two months. This company has recently received orders for Foster superheaters from the Jones & Laughlin Steel Company, Pittsburgh, Pa.; the Brier Hill Steel Company, Youngstown, Ohio; the Rhode Island Company, Providence, R. I., and the Havana Electric Railway Light & Power Company, Havana, Cuba.

The Railroad Supply Company, Chicago, has announced a reorganization of its signal department, under which J. M. Fitz Gerald, now engineer maintenance of signals of the New York Central & Hudson River, becomes general manager of the signal department, effective on May 20, with headquarters in the Bedford building, Chicago. Mr. Fitz Gerald entered the motive power department of the Boston & Albany in June, 1902, and later became mechanical engineer and signal engineer of that road. In March, 1910, he was appointed assistant signal engineer of the New York Central, and on April 1, 1911, engineer maintenance of signals.

Willis E. Holloway and Paul W. Holstein have resigned their positions with the Jeffrey Manufacturing Company, Columbus, Ohio, to go to the Roberts & Schaefer Company, Chicago. Mr. Holloway has been with the Jeffrey company for nine years. He will have charge of the marketing of the new Marcus combination screen and picking conveyor which the Roberts & Schaefer Company has recently acquired. Mr. Holstein has been associated with the Jeffrey company for the past 21 years. During a large portion of this time he was contracting engineer on coal tipple and coal washing plant construction. He will have charge of this branch of the Roberts & Schaefer Company's business, principally in the West Virginia field.

P. G. Jenks has been made assistant to the president of the Standard Steel Car Company, Pittsburgh, Pa., with office at Chicago. Mr. Jenks started in the office of the Schoen Pressed Steel Company at Pittsburgh in 1899, and in 1902 was made treasurer of its successor, the Pressed Steel Car Company, Pittsburgh, Pa. From 1902 to 1909 he was manager of the Western Steel Car & Foundry Company, Chicago, with office in that city. From 1909 to May 1, 1913, he was a partner in the steel and pig iron firm of Banning, Cooper & Company, Ltd., Pittsburgh, Pa., which position he has resigned to go to the Standard Steel Car Company, as mentioned above. Mr. Jenks is a brother of C. D. Jenks, vice-president of E. S. Woods & Co., Chicago.

The General Electric Company, Schenectady, N. Y., has received among recent orders the following: Six 200 h. p., four-

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motor, locomotive equipments, twenty 140 h. p., four-motor car equipments, and fifty-two 60 h. p. railway motors for the St. Louis, Springfield & Peoria; one 1,325 k. v. a. motor generator set and switchboard apparatus for the Northwestern Pacific for installation at its Alto power house, near Sausalito, Cal.; nine 150 k. v. a. transformers, six 200 k. v. a. reactances, two 200 k. w. induction motor driven exciters and switchboard apparatus for the Rhode Island Company, Providence, R. I.; two 100 h. p four-motor car equipments, and three Sprague General Electric multiple unit trailer car equipments for the Norfolk Southern; and thirty-six 60 h. p., two-motor car equipments for the Southern Pacific. M. F. Westover, Schenectady, and I. S. Keeler and C. P. Moore, both of New York, have been elected directors of this company.

Robert Roberts Bishop, for the past 25 years representative of L. C. Chase & Co., Boston, Mass., maker of Chase goat brand mohair car plushes, died at Mount Clemens, Mich., on May 5, at the age of 55. At the time of his death his office was at Detroit, Mich. Mr. Bishop was born at Holliston, Mass., in 1858. He prepared for college at a Boston private school, and was graduated from Harvard University with the class of 1880, among his classmates being Theodore Roosevelt and Robert Bacon. In 1888 he went to L. C. Chase & Co., as a representative in the sales department. He retained this position until the time of his death. While his unusual zeal, conscientious thoroughness and business ability were generally recognized, his fine qualities as a man stood out in even higher degree. He had many friends in the railway and supply business.

Robert R. Bishop.

W. P. Hawley, whose election to the vice-presidency of the United States Light & Heating Company, New York, has been announced in these columns, was born in Chatham, N. Y., August 1, 1883. He received a high school education at that place, and after graduation worked in the state bank for five years. In September, 1904, he left Chatham and came to New York. He entered the service of the Manhattan Lighterage Transportation Company, which was sold to the Central Railroad of New Jersey on January 1, 1905. On that date Mr. Hawley took a position with the United States Light & Heating Company of New Jersey. Upon the consolidation of the United States Light & Heating Company of New Jersey, the Bliss Car Lighting Company, Milwaukee, Wis., and the National Battery Company, Buffalo, N. Y., under the name of the United States Light & Heating Company, of Maine, Mr. Hawley was made manager of the New York office, which position he still holds in addition to his duties as vice-president.

W. P. Hawley.

C. A. Seley, formerly mechanical engineer of the Chicago, Rock Island & Pacific, announces the organization this week in Pittsburgh of the American Flexible Bolt Company. It will manufacture locomotive staybolts and other bolts, embodying a new method of construction invented and developed by Ethan I. Dodds, formerly connected with the Erie Railroad, Pullman Company, etc. The preliminary tests and experiments have resulted so satisfactorily that the company organization has been effected and will actively enter the commercial field. The general offices are in the Union Bank building, Fourth and Wood streets, Pittsburgh, Pa. The shops are at Zelienople, Pa., thirty-two miles west of Pittsburgh, on the main lines of the B. & O., B. R. & P., and the Harmony Trolley Line, an excellent shipping and manufacturing point. Machinery for a very considerable production has been installed and is in operation, and the property of the company will permit convenient expansion as the business is developed. The officers are: C. A. Seley, president; J. A. Frauenheim, vice-president and general manager; H. T. Frauenheim, secretary and treasurer; Ethan I. Dodds, chief engineer.

TRADE PUBLICATIONS.

Unions.—The Jefferson Union Company, Lexington, Mass., has devoted a small illustrated folder to a brief historical sketch of Benjamin Franklin and to the efficiency of Jefferson unions.

Hydraulic Speed Gears.—The Waterbury Tool Company, Waterbury, Conn., has published an illustrated booklet entitled The Waterbury Hydraulic Speed Gear, furnishing illustrations and full descriptions of these gears and including diagrams and tables.

Speed Recorders.—The Chicago Pneumatic Tool Company has issued a booklet containing full descriptions and illustrations of the Boyer railway speed recorder, together with detailed instructions for applying and operating the apparatus, and a catalog of repair parts.

Locomotive Cranes and Grab Buckets.—The Orton & Steinbrenner Company, Chicago, Ill., has issued an attractive illustrated booklet describing its locomotive cranes, drag line excavators, clam shell buckets, coal crushers, electric and steam hoists, and other elevating and conveying machinery.

Oxy-Acetylene Welding and Cutting.—The Davis-Bournonville Company, New York, has published an attractive illustrated booklet on oxy-acetylene welding and cutting apparatus. This booklet contains illustrations and descriptions of the various types of equipment, and shows the layout of several types of generating and compressing plants.

Waterproofing Cement Products.—The Chicago Ironite Waterproofing Company, Chicago, has devoted several illustrated booklets to ironite, a metallic waterproofing for all sorts of cement products. Ironite is designed to overcome the drawback to the porosity of cement products. These booklets include general descriptions, testimonials and specifications and tests.

Flexible Couplings.—The Francke Company, New Brunswick, N. J., has devoted bulletin No. 18 to Francke flexible couplings for direct connecting steam and gas engines, steam and water turbines, etc. The bulletin is illustrated and includes dimension tables and price lists. Inquiries should be addressed to the Smith-Farrell Company, Inc., general sales agents, 90 West street, New York.

Fuel Economy.—The Valley Iron Works, Williamsport, Pa., has published an interesting illustrated booklet entitled The Economical Burning of Coal. It gives a treatise on how coal can be burned to insure greatest economy, smoke prevention, etc., with hand firing. Illustrations and descriptions of the different grates made by this company, including the Ajax shaking and Ajax dumping grates, are also given.

Postal Car Lighting.—The Safety Car Heating & Lighting Company, 2 Rector street, New York, has issued a 30 page booklet dealing with the requirements of postal car lighting as specified by the United States government. Floor plans of full postal and apartment cars are included, showing the lamp locations, and illustrations and tables of this company's recommended lamps and fixtures for postal cars are given.

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Railway Construction.

ASHERTON & GULF.—According to press reports plans are being made to build the extension from Asherton, Tex., west to Eagle Pass, about 50 miles. The line may eventually be further extended up the valley of the Rio Grande to Del Rio, an additional 50 miles. It is understood that negotiations are pending for extending the line from Asherton Junction east to a point on the gulf coast either at Corpus Christi or at Rockport. (March 14, p. 528.)

BOSTON & MAINE.—See an item in General News regarding the completion of the Hampden Railroad from Bondville, Mass., to Springfield, 16 miles, also the new line from South Vernon, Vt., north to Brattleboro, to be opened for business on June 23.

CANADIAN NORTHERN.—A line has been located between Parry Sound, Ont., and Callander. The route is from a point on the Toronto-Sudbury branch at mile 170, northeasterly through Whitestone, Golden Valley, Restoule and Nipissing to Callander, where connection is to be made with the main transcontinental line. The new line will cross the Whitestone, the Maganatawan, the Pickerel, the South and the Wistiwasing rivers, also Commanda creek. At the crossing of the Maganatawan river, there will be a deck span bridge 100 ft. long and 45 ft. high, with about 300 ft. of trestle approaches, and over South river there will be a bridge 300 ft. long and 25 ft. high. Construction work on the line will not be carried out this year.

CANADIAN PACIFIC.—An officer writes that the company has made surveys for a line from Metaline, Wash., to Trail, B. C., also for an extension of the Crows Nest Pass line west, but nothing definite has been decided as to building these lines.

CHICAGO & NORTH WESTERN.—See South Dakota Roads.

FOSTORIA & FREMONT (Electric).—This company, which operates the line from Fremont, Ohio, southwest to Fostoria, is making surveys, it is said, for an extension over two routes to Port Clinton. One survey is being made from Fremont north to Oak Harbor, thence east to Port Clinton, and the other from Fremont northeast to Port Clinton.

GRAFTON, FAIRMONT & CLARKSBURG TRACTION.—According to press reports this company which was organized some time ago to build from Grafton, W. Va., west via Pruntytown, to Meadland, thence north via Boothsville to Fairmont, 32 miles, with a branch from Boothsville southwest to Bridgeport, 7 miles, will ask for bids at once for work on the section between Grafton and Pruntytown. George R. Kirk, president; J. W. Kirk, general manager, and J. W. Roberts, chief engineer, Grafton.

GRAND MARAIS & NORTHWESTERN.—Incorporated in Minnesota to build from Grand Marais west to a connection with the Duluth & Northern Minnesota, about 50 miles, and to build branch lines. A proposition has been submitted by the promoters to the voters of Cook county asking for $100,000 in aid of the project. A. Mitchell, president, and J. Jenswold, secretary, Duluth.

GRAND RAPIDS & NORTHWESTERN.—A contract for the construction of the line from Ludington to Grand Rapids, Mich., has been awarded to the J. H. Flick Construction Company, Chicago, and actual construction work is to be started at once. J. N. Tittemore, Chicago, is president.

HAMPDEN RAILROAD.—See BOSTON & MAINE.

HOUSTON & BRAZOS VALLEY.—According to press reports work has been started on an extension from Freeport, Tex., to Bryan Heights, where the mines of the Freeport Sulphur Company are located, about three miles. (March 14, p. 529.)

LEHIGH & NEW ENGLAND.—A contract has been given to the Reed Construction Company, it is said, to build a five-mile spur line south to Bath, Pa.

MEMPHIS, DALLAS & GULF.—According to press reports grading work and track laying is to be started at once to complete the extension north to Hot Springs, Ark.

MINNESOTA, DAKOTA & WESTERN.—An officer writes that a contract has been let to M. W. Barnard, Minneapolis, Minn., to build an extension of the Deer river branch, 10 miles south, and the work is now being carried out by Olson & Tully. The clearing is nearly completed, and grading has been started. It is expected that the improvements will be finished by September of this year. A contract has also been let to Fred Smith, Laurel, for extending the Loman branch, west across Black river, two miles, on which work is to be started this month. This includes all the construction work that the company expects to carry out during 1913.

MONTREAL & SOUTHERN COUNTIES (Electric).—An officer writes that the present track extends from Montreal, Que., through St. Lambert to Longueuil, 7 miles, and from St. Lambert to Golf Club, 1½ miles. New track is being laid from Golf Club to the Central Vermont Railway, 2½ miles, and the Central Vermont is to be electrified to Richelieu, 15 miles. It is expected that the section from Gold Club to Richelieu will be opened for operation early in May and that the Central Vermont electrification from Richelieu to St. Cesaire, 15 miles, will be completed this year. Surveys for an extension from St. Cesaire, via Abbotsford, to Granby, 16 miles, have been made, but it has not yet been decided when contracts for the work will be let. There will be one 200 ft. steel truss bridge, and three trestles. A station will be built at Abbotsford, and substations will be built at Abbotsford and at Granby. The company expects to develop a traffic in dairy products, fruit, coal and farm products. Work on a branch south to La Prairie and on the extensions will probably be started next year. (December 20, p. 1235.)

OGDEN, LEWISTON & NORTHERN (Electric).—According to press reports this company will begin work this summer on a line from Ogden, Utah, north to Preston, Idaho, about 65 miles. The company was recently incorporated at Salt Lake City, Utah.

OREGON RAILROAD.—According to press reports contracts are to be let soon to build a section of this line. The company was organized in February with a capital of $500,000, to build from Salem, Ore., southeast via Stayton and Minto to Bend, about 115 miles. The incorporators include G. A. Kyle, J. N. Mounce and A. L. McCloud. J. H. McNary, Salem, is attorney.

PARIS & MT. PLEASANT.—An officer writes regarding the reports that an extension is to be built from Paris, Tex., to Atoka, Okla., and into the Lehigh coal fields, that nothing definite has yet been decided as to this extension, and surveys for such a line have not yet been made. The company has completed the line from Mt. Pleasant to Bogata, 32 miles, and regular service will be started by June 1. (May 2, p. 1013.)

SOUTH DAKOTA INTERURBAN.—Work on a section of this electric line it is thought will soon be started. The company was organized several years ago to operate a line with branches from Sioux City, Iowa, into South Dakota, across the counties of Union, Clay, Lincoln, Turner, Yankton, Hutchinson Davison, Douglas, Charles Mix, Aurora and Brule, about 200 miles. W. E. Miller, Sioux City, has been securing right of way in South Dakota for a long time and has succeeded in getting a loan of $5,000,000, through the Farmers' Loan Company of Sioux City, upon the property already acquired and to be secured through the proceeds of the loan.

SOUTH DAKOTA ROADS.—Residents of the town of Wood in Mellette county, S. Dak., are now securing a right of way for a line west from Winner, the present terminus of the Chicago & North Western "Rosebud Line." It is understood that if the right of way is secured, the C. & N. W. will build an extension of about forty miles to Wood.

STOCKTON TERMINAL & EASTERN.—An officer of this company, which operates a line from Stockton, Cal., northeast via Linden to Bellota, 18 miles, writes that work is now under way by the company's men, building on Union street, Stockton, from the present terminus to Stockton channel.

TABER TRANSIT.—An officer writes that contracts are to be let in a few weeks to build from Taber, Alta., north to the coal mines at Retlaw and at Bow City. The work will be mostly earth work, with about 20,000 cu. yds. of solid rock work. The approximate cut per mile will be 5,000 cu. yds., and the approximate fill about 7,000 cu. yds. The maximum grades will be 1.9 per cent. and the maximum curvature 10 degrees. There will be one steel bridge 420 ft. long, and eight short pile trestles. The plans also include putting up four stations; twelve freight sheds; car barns and office buildings. The company expects to develop

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a traffic in coal and grain. J. F. Kramer, president, and V. O. Eastland, chief engineer, Calgary. (Apr. 18, p. 925.)

Texas Roads.—According to press reports a contract has been entered into between J. Fry, representing the Empire Construction Company, Omaha, Neb., and the commercial club of Big Springs, Tex., for the construction of a railroad from Tucumcari, N. M., to San Antonio, Tex., over 600 miles. The contract provides that Big Springs is to be made both a passenger and freight division point, also that the main shops and general headquarters will be at that place. Surveys will be started at once and track laying is to be begun before January, 1914.

Toronto, Hamilton & Buffalo.—This company has bids under consideration for building second track from Welland, Ont., to Smithville, 16.5 miles.

Trona Railway.—An officer writes that location has been made for a line from Searles, Cal., on the Southern Pacific in Kern county, northerly and northeasterly to the northwestern corner of San Bernardino county to the place known as Borax Lake or Searles Lake, 32 miles. The company expects to begin construction work in May. The maximum grades will be 2½ per cent., and the maximum curvature 4 deg. The line is being built to carry the output of reduction works, including soda-ash, potash and borax. The company also expects to develop a traffic in ores. Joseph K. Hutchinson, president, Claus Spreckels building, and W. A. Cattell, chief engineer, Foxcroft building, San Francisco.

Willapa Bay & Eastern.—An officer writes that the location is now being made and construction work is expected to be started soon from Lincoln Creek in Lewis county, Wash., west to Raymond and South Bend. The maximum grades will be 1 per cent., and the maximum curvature 4 deg. The company expects to develop a traffic in forest products. J. R. Holman, chief engineer, Seattle, Wash. (April 18, p. 926.)

RAILWAY STRUCTURES.

Keokuk, Iowa.—The Chicago, Rock Island & Pacific is planning the erection of a new freight depot to cost between $40,000 and $50,000.

Montreal, Que.—An officer of the Canadian Pacific writes that the company is building large extensions to the Angus shops, including the following: steel passenger and freight car shops, locomotive shop extension, new bolt and nut shop, power house extension, upholstering shop extension, general office building extension, pattern storage building extension, and maintenance building. The cost of the improvements will be about $500,000. (May 2, p. 1913.)

Saint Clair, Pa.—The Philadelphia & Reading has given contracts to Irwin & Leighton, Philadelphia, for two new car repair shops to be built at St. Clair, Pa. The buildings are to have one story, and will be 45 ft. high. One will be 83 ft. 10 in. wide x 604 ft. 8 in. long, and the other 53 ft. 9 in. wide x 464 ft. 8 in. long. They will be of steel, concrete and brick construction, with steel sashes. Work was started on the improvements on May 13.

Whitestone, Ont.—See Canadian Northern under Railway Construction.

Railroad Construction in German East Africa.—The German line from Dar-es-Salaam on the east coast of German East Africa, to Ujiji on Lake Tanganyika, reached Tabora early in 1912, and on October 1 was 82 miles west thereof; the line will be completed, presumably, early in 1914. The 530 miles of line from the coast to Tabora cost about $20,000,000, or $37,000 per mile. The line from Tabora to Kigoma, a bay on Lake Tanganyika about three miles north of Ujiji, will be 260 miles long, and will probably cost over $42,000 per mile. The completion of this railroad will put Lake Tanganyika, one of the most beautiful lakes in the world, within 20 days of Europe. With the completion of the German and Belgian lines to Lake Tanganyika, rail and steamer service will cross Central Africa from Dar-es-Salaam to the mouth of the Congo on the west coast of Africa.—*Mining and Scientific Press.*

Railway Financial News

Detroit Southern.—As the holders of outstanding certificates of deposit representing more than 50 per cent. of Detroit Southern division first mortgage 4 per cent. bonds have not filed dissent to the plan of reorganization mentioned in our issue of April 18, 1913, this plan has been declared operative. Bondholders and holders of certificates of deposit will be permitted to share in the reorganization only upon subscribing and paying to the Central Trust Company, New York, $500 for each bond of $1,000 deposited by them. The depositors, on the completion of the reorganization, will, in exchange for each $2,000 of bonds deposited and each $1,000 in cash paid, receive $1,000 in new adjustment mortgage bonds, $2,000 in new preferred stock and $1,000 in new common stock.

Hudson & Manhattan.—Stockholders will vote on May 29 on the question of authorizing the new bond issue mentioned in last week's issue. The reorganization plan has been assented to by the holders of about 59 per cent. of the 4½ per cent. bonds and by holders of 97 per cent. of the stock.

Lake Shore & Michigan Southern.—See New York Central & Hudson River.

Laramie, Hahns Peak & Pacific.—A new committee has been formed, consisting of Eugene J. Fabens, chairman, James W. Greene, Edward B. Carleton and Robert P. Clapp, to represent the first mortgage bondholders. Mr. Greene and Mr. Carleton have resigned from the committee of which Frank D. Pavey was chairman, because they thought that the interests of the first mortgage bondholders and those of the holders of the refunding bonds conflict, and that it is best to separate them. The committee in a circular requests the holders of the first mortgage bonds not to consent to the issuance of the $315,000 receiver's certificates asked for by the Hemphill committee, as mentioned in last week's issue, and advises the bondholders to request the trustees to foreclose the mortgage.

Mexican Northern.—This company has declared a semi-annual dividend of 1½ per cent., comparing with 2 per cent. paid semi-annually from 1910 to 1912 inclusive.

Mobile & Ohio.—The stockholders have authorized the purchase of the St. Louis & Cairo, now leased, and an issue of $3,000,000 Mobile & Ohio, St. Louis division 5 per cent. bonds and a mortgage upon the property purchased to secure the bonds. The St. Louis & Cairo runs from East St. Louis, Ill., to Cairo, 159 miles.

New York Central & Hudson River.—On June 16 stockholders will vote on the question of consenting to a plan for the consolidation of the Lake Shore & Michigan Southern and certain other lines with the New York Central & Hudson River. The New York Central now owns 90 per cent. of the common stock of the Lake Shore & Michigan Southren. This stock is pledged as security for the 3½ per cent. Lake Shore collateral bonds, and before the two companies can be consolidated the consent of the holders of 75 per cent. of these bonds will be required. The New York Central proposes to offer to the consenting bondholders the privilege of exchanging their 3½ per cent. bonds par for par for 4 per cent. bonds to be issued under and secured by a new mortgage on the railroads of the New York Central, including the lines recently consolidated. The total amount of bonds under this new mortgage will not exceed $167,102,400. The plan also includes the execution of another new mortgage, to be called the refunding and improvement mortgage, secured upon the same property as the first new mortgage, but subordinate to it, and upon such other property as the directors may determine to include thereunder. Under this improvement mortgage bonds may be issued for additions and betterments, to refund the short term notes and to provide for other general purposes.

Pittsburgh & Susquehanna.—This property will be sold on June 2, at Osceola Mills station on the line of the road. The road runs from Philipsburg, Pa., to Fernwood, 20 miles.

St. Louis & Cairo.—See Mobile & Ohio.

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Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$3.00
Canada	4.00
Foreign Countries (excepting daily editions)	5.00
Single Copies	10 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,000 copies were printed; that of these 8,000 copies, 5,500 were mailed to regular paid subscribers and 945 were provided for counter and news companies' sales; that the total copies printed this year to date were 182,150—an average of 8,676 copies a week.

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THE reports of the committee on stokers of the Master Mechanics' Association have in the past been confined largely to descriptions of the machines and the results of the experimental working of a few locomotives equipped with them. Within the past year the status of the locomotive stoker has changed so rapidly that it can now fairly be said that the device has advanced beyond the experimental stage. There are over 300 large locomotives in regular service, mostly of the mikado and Mallet types, equipped with mechanical stokers, and as many more on order are being so equipped, a fact which in itself indicates that those railroads which are now using stokers have found sufficient merit in them to warrant their co-operation with the manufacturers in eliminating defects and developing the machine to a thoroughly practical basis. While the claims of the firemen, that the work of firing the larger classes of locomotives is becoming beyond physical endurance, are not conceded by the railroads, the point remains one of contention, and the perfecting of the mechanical stoker, which will relieve the fireman from practically all physical exertion, should tend to greatly simplify future controversies with this class of labor. The committee on stokers of the Master Mechanics' Association this year has for its chairman the assistant superintendent of motive power of the Norfolk & Western, a road which is operating a number of Mallet locomotives equipped with stokers, and with the development that has taken place in these machines during the past year, it is probable that a report of more than ordinary interest from the operating standpoint will be presented at the June convention.

ONE of the conditions in which it is impracticable to protect a train by flag is that where the roadbed does not afford safe footing for the flagman. A case of this kind is reported, on another page, in Mr. Belnap's account of a collision at Gothenburg, Neb.—a long bridge exposed to a furious wind. Wind might possibly be provided against by stout railings, but that is not the only danger encountered at bridges. Ice and sleet make trouble of this kind at innumerable places every winter; not usually so positive and pronounced a danger as a blizzard, but still a serious obstacle to the uniform enforcement of the flagging rule. Such adverse conditions ought to be more carefully taken into account when estimating the value of flag protection. Uniformity is held to be a cardinal virtue in the framing of rules and in their enforcement; to secure it in the matter of flagging requires that many diverse conditions be taken into consideration. The single element of low temperature in northern climates may become a danger; and with a blizzard it may make the flagman's task absolutely dangerous to himself. A temperature of 40 degrees below zero may become dangerous to trains even before the flagman suffers any peril of life or limb, because of the temptation to neglect which assails a man when he is in distress. The increase in danger due to cold and snow has been recognized by some managers by the promulgation of a rule that snowplows should be protected by the space interval even when the space-interval system was not regularly employed. It is a plain lesson of experience that there are circumstances where the space interval is the only system that is both safe and reasonable. The automatic block system cannot be operated on single track without a provision for communicating ahead when a train is held by a false-stop indication; and, therefore, to deal with such situations as that at North Platte the rational provision is a manual space-interval system in reserve; telegraph or telephonic communication between stations which are open (or between conductors by means of roadside telephones). With this, the deficiency of the automatic system is made up for by a substitute which can be called even better than the system supplanted; while dependence on the flagman is admittedly an unscientific expedient.

A "STUDY of Railway Growth and Railway Earnings of the Railways of the United States for the Decade 1901-1910" has been compiled by E. E. Williamson, transportation expert and statistician for the Trade and Transportation Bureau. Apparently the object of this compilation is suggested by the note to Table H, which says: "The increase, 1910 over 1901, of 158.9 per cent. in the amount paid in dividends on capital stock, and 42.6 per cent. in the average rate paid on dividend-paying stock, indicates that the return upon the capital stock, 1910 over 1901, more than kept pace with the percentage increase, 1910 over 1901, of the various units in tables A to G (tables based on units of service, equipment and capitalization"). The other night at the Economic Club dinner in New York, B. F. Bush, speaking immediately after A. B. Garretson, expressed surprise at the figures for dividend increases quoted by Mr. Garretson and was apparently unfamiliar with their source. It is probable that Mr.

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Garretson got his figures from the same source as that used by Mr. Williamson, namely, the annual statistical report issued by the Interstate Commerce Commission, the last complete available one being for the year 1910. In quoting the figures which he did Mr. Garretson specifically called attention to the fact that these were the figures that were used by the unanalytical railroad employee. Our transportation expert and statistician is apparently willing to take his figures with no more analysis than Mr. Garretson gives the ordinary brakeman credit for. The Trade and Transportation Bureau figures show $405,771,416 paid in dividends; but of this amount the Interstate Commerce Commission's report shows that $293,836,863 only was dividends paid to the public, the remainder being dividends paid to other railway companies and so forming part of the funds on which they drew to pay dividends. In 1901 the dividends paid to the public amounted to $131,627,672. The percentage of increase is a little over 123 per cent., as against 159 per cent. shown by the Trade and Transportation Bureau exhibit. Whereas the average rate paid on *dividend paying* stocks was 7.50 in 1910 and 5.26 in 1901, the average rate paid on all stock *in the hands of the public* in 1910 was 5.29 per cent. and in 1901 a little over 3.20 per cent. We find, therefore, if we analyze the Interstate Commerce Commission's returns and try to get at what railroad capital is actually receiving on its investment that the rate of increase in per cent. paid in 1910 over 1901 is higher than is shown by the Williamson compilation; but it is pertinent in this relation to call attention to the fact that the rate of increase of dividends paid on a stock, which pays nothing in 1901 and pays 1 per cent. in 1910, is *infinity*. The fact of the matter is that a return of less than 3½ per cent. on railroad stock in the hands of the public in 1901 is a concrete measure of how inadequately the hopes of the investor in railroad securities of that period had been realized, and the fact that during these nine years his hopes have only been realized to the extent of less than 5½ per cent. paid on railroad stocks is certainly not an argument of any very great effectiveness against a demand on the part of investors for making railroad securities somewhat more attractive.

SOME DISPUTED POINTS IN RAILWAY VALUATION.

2.—Investment from Earnings.

IT has been the policy of the railway companies of the United States to invest large amounts of their earnings in permanent improvements in their properties. The earnings thus invested usually have been surplus earnings over what were required to pay operating expenses and interest on indebtedness, and in many cases they have been surplus after the payment of operating expenses, interest on indebtedness and larger or smaller dividends on part or all of the outstanding stock. In some instances where this practice has been followed the outstanding capitalization has represented only investment of funds raised by the sale of securities. In other cases part of it has consisted of securities issued for nominal or no consideration. Whether the total capitalization has represented investment actually made by the security holders, or part of it has represented such investment and part of it has not, there have been some cases where investment from earnings has been made before the owners of the securities have received a "fair return" on their actual investment, and other cases where it has been made after they have received such a "fair return." The total amount of these surplus earnings invested in the railways of the United States up to June 30, 1909, as carried on their books, was stated by Commissioner Lane in the opinion in the Western rate advance case to be $800,642,923.

It is clear that if railway valuation were based entirely on cost of reproduction this entire investment would have to be included. In the various state valuations based on the cost of reproduction it has been included, but the valuation law under which the Interstate Commerce Commission will act provides that it shall ascertain more than the cost of reproduction. It must "ascertain and report in detail as to each property owned or used by said common carrier for its purposes as a common carrier, the original cost to date, the cost of reproduction new, the cost of reproduction less depreciation, and an analysis of the methods by which these several costs are obtained and the reason for their differences, if any." The commission is also to ascertain and report separately other elements of value. After having ascertained all the elements the commission is both to include them in its report and to base its own estimate of the value of the different railways on them. If the railways disagree with the commission's conclusions they can appeal from it to the courts. It is evident, therefore, that all investments from earnings must be ascertained and reported, but the weight to be given to them is yet to be determined.

One view advanced by some lawyers and economists is that the owners of a railway or other public utility are entitled to have included in its valuation and to receive a return on only the actual investment from their own capital made by them, and that invested surplus earnings over and above interest on bonds and reasonable dividends on stock are not really investment by the owners. Commissioner Lane expressed this thought in the Western rate advance case, when he said, "Perhaps the nearest approximation to the fair standard is that of bona fide investment—the sacrifice made by the owners of the property considering as part of the investment any shortage of return that there may be in the early years of the enterprise." In other words, if a road is capitalized for $50,000 a mile, of which $25,000 is bonds representing actual investment and bearing interest at 4 per cent., and $25,000 is stock, also representing actual investment, on which dividends averaging 6 or 8 per cent. have been paid, and if, in addition, $15,000 per mile has been invested from earnings, the owners of the railway are not entitled to have this $15,000 included in the valuation. On the other hand, if the railway is capitalized as stated, and the bondholders have always received their interest, but the stockholders have received only 3 or 4 per cent. on their part of the investment and have allowed 3 or 4 per cent. to be invested in the properties, then the investment from earnings should be included in the valuation. This theory was strenuously insisted on by the attorneys for some of the western inter-mountain communities in the Pacific coast rate cases.

It is contended, on the other hand, by other lawyers and economists, that all investments from earnings should be included in a valuation. It is urged, in the first place, that when practically all of the railway mileage of the United States was built and the permanent improvements in it were made there was nothing in the charters of the railways, in the constitutional or statutory provisions applying to them, or in the law of public service callings as laid down by the courts, to indicate that investments made by railway companies from earnings would be treated differently from investments made from any other source. Therefore, those who built the railways built them on the assumption that, like investors in other concerns, they would be allowed to profit by their investments from earnings. The railway corporations of the United States could have followed the practice of those of England and paid out to their security holders annually all of their net earnings. There was nothing in the law, and there is nothing in the law now, to prevent this. Therefore, it is argued, to refuse to include in the valuation the investment from surplus earnings would be to break the public faith with the owners of railways and to confiscate part of the value belonging to them by what would be, in effect, retroactive legislation. Furthermore, it is argued, the application of this principle would lead to some absurd results. Reverting to the example already used, on this principle a railway, the original cost of which was $50,000 a mile, and which had earned the annual interest on its bonds, 6 per cent. on its stock and enough to invest $25,000 a mile from surplus earnings, making the total invested in it $75,000 a mile, would be valued at $50,000 a mile. A railway, which also originally cost $50,000 a mile, which had been in operation 10 years, and which during this period had paid 4 per cent. interest on its bonds and earned only 6 per cent. on its stock, of which one-half had been invested in the property, would at the end of the period represent

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an original investment per mile of $50,000 and an investment from earnings of $3,750, or $53,750 per mile. Obviously, the former railway, which had cost $75,000 a mile and was the better earner would be the more valuable, and yet on this principle, while a valuation of only $50,000 per mile would be put on it, a valuation of $53,750 a mile would be placed on the road which both had cost less and earned less. The valuations having been made on this principle, the question naturally arises, as to the valuation on which railway rates would be adjusted.

The foregoing summarizes the news on both sides of this very important question. How important it is, is indicated by the figure regarding the total investment from the surplus given by Commissioner Lane.

PROPOSED GOVERNMENT OWNERSHIP IN ALASKA.

IN extremely few countries has the adoption of government ownership of railways been preceded by full and intelligent discussion of the relative advantages of state and private management. There was pretty full discussion in Germany and Switzerland, and the decision was for state ownership. In Italy there was made the most exhaustive investigation in history, and the decision was against government management, but because of complicated financial relations between the government and the railway companies, state management came, anyway. With these exceptions, state ownership and management usually has resulted from fortuitous and temporary conditions or snap judgment. A beginning is being made with state ownership in the United States in the same way. The federal government acquired the Panama Railroad, not because it was decided that state ownership was preferable on principle—that point was not discussed—but because this road was to be used as an instrumentality in the construction of the Panama canal. Now government ownership in Alaska seems likely to be adopted without any consideration of the principle involved. To adopt the policy in disregard of the principle involved is to adopt it in disregard of the probable results.

On August 23, 1912, Congress passed a bill to create a commission to investigate the transportation question in Alaska and report "in respect to the best and most available routes for railroads in Alaska which will develop the country and the resources thereof for the use of the people of the United States." Within a week President Taft appointed a commission composed of Major Jay J. Morrow, Corps of Engineers, United States Army, chairman; Alfred H. Brooks, geologist in charge of division of Alaskan Mineral Resources, Geological Survey, vice-chairman; Leonard M. Cox, civil engineer United States Navy, and Colin M. Ingersoll, consulting railroad engineer. The three largest states in the Union are Texas, California and Montana. The area of Alaska is 20,000 square miles greater than the combined areas of these three states, and is one-fifth the area of the entire United States. This indicates what an assignment the commission was given. To execute it in a way that would enable it to make a report that would deserve respect would have required many months. Nevertheless, the commission, which included only one engineer of railway experience, made its report to the president on January 30. This was but five months after its appointment, and those five months were fall and winter months, during which the extreme weather in Alaska makes investigation of railway routes in that territory extremely difficult or impossible. Yet not only does the commission undertake to tell the best routes for the construction of railways in Alaska and recommend the building of two lines, but it also essays to estimate in considerable detail what the railways along all the different routes considered would cost to construct, what traffic they could expect, what rates they could make, and what their fixed charges, gross earnings, operating expenses and net earnings would be. And it is proposed on the basis of such an investigation and report that Congress shall embark the government of the United States on a policy of public ownership of railways in Alaska that it is estimated will at the start cost $35,000,000. The very fact that such a proposal can be seriously made and considered is an argument against government railway ownership in this country. Government ownership is a success in Prussia. But can any one imagine the Prussian government doing business in such a way? Can anyone imagine private capitalists giving engineers only five months—most of them winter months—to report on a proposed expenditure of $35,000,000 on railways in a country like Alaska?

The argument is advanced that the natural resources of Alaska should be developed, that a prerequisite to their development is the construction of a large new mileage of railways, and that the government should do this, first, because it can do it at a lower cost of capital, and second, because it is more likely to build an adequate mileage than private companies, because private companies must earn profits while the government need not.

That the natural resources of Alaska ought to be developed and that the construction of new railway mileage is essential for this purpose will not be controverted. The new mileage may be secured in any of three ways. Its construction may be left to private companies without government aid, or the government may build it, or private companies subsidized in one way or another by the government may build it. The three main objects to be sought are, first, that the new construction shall be adequate; second, that the total economic cost of the transportation provided, including operating expenses and return on the capital invested, shall be made as low as practicable; and third, that the rates shall be so made as best to develop the potential and handle the available traffic. The potential and available traffic would be the same for either government or private railways. Under government ownership railways ought to be built in the same places as they would be built by intelligent private capitalists, namely where the potential and available traffic are greatest. A traffic that would pay government railways would pay private railways, provided that the one were to be constructed and operated as economically as the other; and—again with the same proviso—a traffic that would not pay the one would not pay the other. If private railways were built and the government guaranteed their interest the government could by regulation make the rates as low as it could make them on government railways since if there were a deficit the government would make it good from taxation just as it would in the case of railways it owned. If the traffic and the rates applied were the same in either case the gross earnings would be the same; and in that event whether the total earnings would be sufficient to pay operating expenses and a return on capital—and if they were not, whether a larger deficit would have to be made good from public taxation under government or private ownership—would depend entirely on the economy with which the roads were developed and operated. The whole question, then, is whether public or private management would be the more economical.

The Alaskan railroad commission concluded that the total amount necessary to pay a return on capital and working expenses would be less under government than under private ownership. This was based on the assumption that the government could borrow money for construction cheaper than private companies unaided by government guarantees of interest. It was tacitly assumed that the cost of construction and operation by the government would be the same as by private companies. But, in the first place, it is not necessarily true that the government could borrow money at a lower rate than private companies. As the commission itself indicated, if the government guaranteed part or all of the interest of private companies as the government of Canada is doing in some cases, the private companies could borrow money as cheaply as the government. And in any event, the question whether construction and operation by the government or private companies would be the cheaper is a more important question than which could borrow capital the cheaper, for on most railways the operating expenses amount to more than the necessary return on investment. In the year ended June 30, 1911, the operating expenses of the railways of the United States were 68.66 per cent., and their net earnings, from which all return on investment was paid, only

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31.34 per cent. of their gross earnings. The expenses per mile were $7,867, and the net earnings $3,593. Therefore, a 10 per cent. saving in operating expenses would have amounted to $786.70 per mile, while a 10 per cent. saving in net earnings would have amounted to only $399.30 per mile. In Canada in the fiscal year 1912 operating expenses were 68.7 per cent. of gross earnings and net earnings 31.3 per cent. of gross earnings. These figures show that on most of the existing railways of North America it is more than twice as important to economize in operation as in cost of capital.

Now, statistics of railways throughout the world show that government management is usually less economical than private management. The following table gives the capitalization or cost of construction per mile of state railways in six leading countries and of private railways in six leading countries:

State Railways.	Capitalization or cost of construction.	Private Railways.	Capitalization or cost of construction.
Belgium	$187,787	United Kingdom	$274,562
Italy	124,586	France	148,886
Switzerland	116,692	Spain	77,077
Prussia-Hesse	114,000	United States	62,657
Canada (Intercolonial)	64,095	Argentina	56,161
New South Wales	63,999	Canada	55,829

This table does not indicate that under government ownership railways cost less than under private ownership. The private company that formerly owned the Panama Railroad, which was then a double-track line, had a capitalization of $221,120 per mile, while the reconstruction of the railway as a single-track line by the United States government cost $226,190 per mile. It is especially significant, as Alaska is a new country, that the cost of construction of both the government-owned Intercolonial of Canada and of the state railways of New South Wales has been larger than is the capitalization of the private railways of either the United States, Argentina or Canada.

Data regarding the expenses of operation are even more significant. While the traffic density—passenger and freight—of the private railways in France is 84 per cent. heavier than that of the state railways, their operating expenses per mile are but 5 per cent. greater. While the density of traffic of the railways of Canada as a whole is 83 per cent. as great as that of the government-owned Intercolonial, their operating expenses per mile are only 77 per cent. as great. While the density of traffic of the government-owned but privately operated railways of Holland is 43 per cent. greater than that of the Danish government roads, their operating expenses per mile are only 23 per cent.. greater. While the density of traffic of the Spanish private roads is 70 per cent. as great as that of the Italian government railways, their operating expenses per mile are only 39 per cent. as great. The French private roads have a traffic 68 per cent. heavier than the Swiss state roads, and their operating expenses per mile are only 9 per cent. greater. The traffic of the French private roads is 68 per cent. as heavy as that of the Prussian-Hessian state roads, and their operating expenses per mile are only 60 per cent. as great. The density of traffic of the Argentine private roads is 10 per cent. greater than that of the New South Wales government roads, while their operating expenses per mile are 2.4 per cent. less. The Canadian private roads have a traffic 63½ per cent. heavier than that of the New South Wales government roads and their operating expenses per mile are only 5½ per cent. greater. The railways of the United States as a whole have a traffic density 66 per cent. as great as that of the Prussian-Hessian government roads, and pay wages more than twice as high, and yet their operating expenses per mile are only 52 per cent. as great as those of the Prussian-Hessian government roads. The railways of United States group 2 handle a traffic 143 per cent. more dense than that of the Prussian-Hessian roads and pay wages twice as high, and yet their operating expenses per mile are only 11 per cent. greater than those of the Prussian-Hessian lines. It is a rule almost without exception that under conditions at all comparable the cost of operating government railways is larger in proportion to the traffic that they handle than on private railways.

Further evidence that government operation is almost invariably more expensive than private operation is afforded by the statistics of the railways which in recent years have been transferred from private to government management. The Western Railway of France was taken over by the government in 1908. In four years under government management its traffic increased 12 per cent., while its operating expenses increased 50 per cent. In the last ten years it was under private management the operating ratio of the Panama Railroad never exceeded 66 per cent. Under the management of the United States government it increased in 1905 to 77½ per cent.; in 1906 it was 79.5; in 1908, 74.5 per cent.; in 1911, 70.8 per cent. The increase in earnings between 1904 and 1911 was 84 per cent., and in expenses 110 per cent. The average operating ratio of the Italian railways under private management during the five years ending 1905 was 67½ per cent. Government operation was resumed in 1905, and never since then has the operating ratio been less than 77 per cent., and in 1908 it rose to 83 per cent. In view of all these facts it is rather startling to find a commission assuming without investigation or discussion that government development and operation of railways in Alaska would be as economical as private development and operation.

It may be said that under government management the railway mileage of Alaska would be increased faster than it would be under private management. This is an argument often advanced for government ownership in new countries. But the evidence shows that if a country affords any business for railways to handle they will be more rapidly constructed under private than under public ownership. In no country in the world did railway construction go on so rapidly until within recent years as in the United States. The only continent on which from the beginning the railways have been owned and operated by the government is Australia. There, if anywhere, the evidence that railways will be more rapidly developed in a new country by the government than by private companies should be forthcoming. Argentina and Canada are other new countries, and in them the great majority of the railway development has been left to private companies. The area of Australia is three times as great as that of Argentina and 70 per cent. as great as that of Canada. The following table, giving the railway mileage in Australia, Argentina and Canada in 1880 and 1911, shows where the increases in mileage have been most rapid:

	1880	1911.	Increases.
Australia	3,580	16,078	12,498
Argentina	1,408	19,843	18,435
Canada	6,874	25,400	18,526

It will be seen that in this period of 31 years the increase in mileage in both Argentina and Canada was 50 per cent. greater than it was in Australia. There has been for years one transcontinental railway across Canada, and soon there will be three. There is one across Argentina in connection with the Chilean railways. Australia, under government ownership, is still waiting for its first transcontinental railway. Furthermore, the statistics given do not do justice to Canada, for in 1911 there were 11,633 miles under construction in Canada, of which 1,560 miles were in operation. When all the mileage now under construction in Australia and in Canada is finished, Canada, with an area less than 50 per cent. greater than that of Australia, will have almost three times as large a mileage of railways.

If past and present experience is any criterion, private companies will provide a larger mileage and construct and operate it more economically than the government wherever the conditions warrant railway development. They will warrant it wherever the available and potential traffic are sufficient to make railways pay. And if the resources of Alaska are not sufficient to make the railways pay, in the long run, why should the people of the United States be taxed to subsidize either government or private construction in Alaska? If, however, the government is to adopt the policy of subsidizing construction the experience of the world indicates that it would secure more results with a given amount of subsidies if it subsidized private companies, as Canada is doing, than if it went into the business of building and owning railways on its own account.

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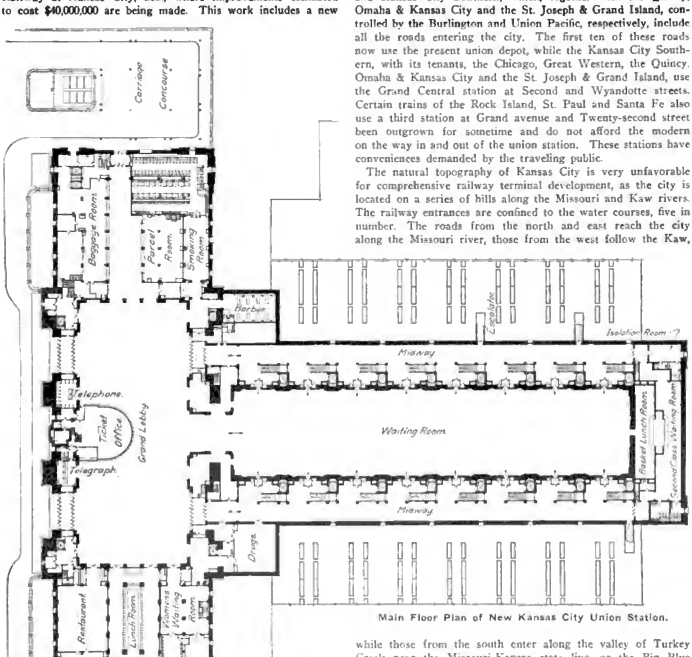
NEW KANSAS CITY, MO., PASSENGER TERMINAL.

Union Depot for All Roads Approaching Completion. Project Includes Belt Line and Complete Facilities.

The largest railway terminal development now under way, except the Grand Central Terminal in New York, which is now nearing completion, is that of the Kansas City Terminal Railway at Kansas City, Mo., where improvements estimated to cost $40,000,000 are being made. This work includes a new union station for all the roads entering the city, a belt line for passenger and freight traffic connecting with all the roads, new local freight houses, terminal switching yards for freight interchange, etc.

The Kansas City Terminal Railway Company is a corporation chartered for the purpose of providing new terminal facilities. The stock is owned equally by 12 roads, the Santa Fe, Alton, Burlington, Rock Island, St. Paul, Missouri, Kansas & Texas, Missouri Pacific, Frisco, Union Pacific, Wabash, Great Western and Kansas City Southern, which, together with the Quincy, Omaha & Kansas City and the St. Joseph & Grand Island, controlled by the Burlington and Union Pacific, respectively, include all the roads entering the city. The first ten of these roads now use the present union depot, while the Kansas City Southern, with its tenants, the Chicago, Great Western, the Quincy, Omaha & Kansas City and the St. Joseph & Grand Island, use the Grand Central station at Second and Wyandotte streets. Certain trains of the Rock Island, St. Paul and Santa Fe also use a third station at Grand avenue and Twenty-second street been outgrown for sometime and do not afford the modern on the way in and out of the union station. These stations have conveniences demanded by the traveling public.

The natural topography of Kansas City is very unfavorable for comprehensive railway terminal development, as the city is located on a series of hills along the Missouri and Kaw rivers. The railway entrances are confined to the water courses, five in number. The roads from the north and east reach the city along the Missouri river, those from the west follow the Kaw,



Main Floor Plan of New Kansas City Union Station.

while those from the south enter along the valley of Turkey Creek near the Missouri-Kansas state line, or the Big Blue river about three miles farther east. Because of the limited number of entrances it is difficult to secure a site for a union station which will be convenient for all roads. A number of roads now have very indirect entrance to the present union station, the Santa Fe having a reverse movement on through trains.

CHARACTER OF TRAFFIC.

The problem of providing for the passenger traffic at Kansas City is radically different from that at any of the other large stations recently built. While large numbers of suburban passengers are handled at the Pennsylvania and Grand Central terminals at New York, and the North Western station at Chicago, there is practically none of this traffic at Kansas City.

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Also while at the other stations there is practically no transfer of passengers to other trains leaving the same station, and nearly all the passengers, both through and suburban leave the building immediately on their arrival at Kansas City, both through, transfer and local Kansas City traffic are handled. The Santa Fe, Rock Island and Missouri Pacific each run a number of trains daily through the city. Numerous other trains on these roads, as well as all trains on the other roads, stop and start here. This gives rise to a large transfer of passengers from one train to another, over 30 per cent. of those handled through the union depot in 1911 being ticketed through, in addition to a large number of others who bought tickets locally to Kansas City and then to their destinations.

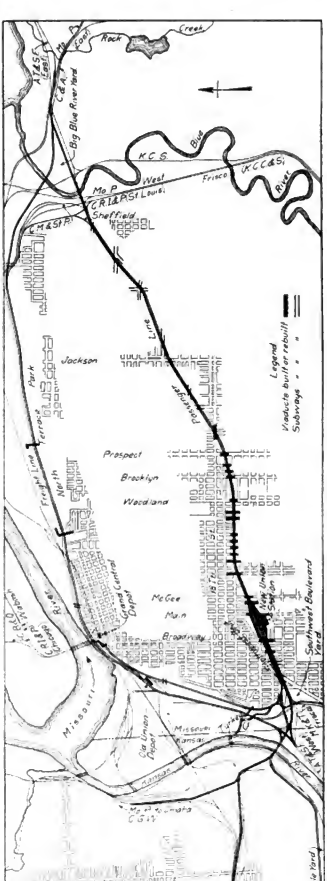
On trains passing through the city, considerable switching is necessary in the station to set in or remove dining cars, connecting line sleepers, etc. This requires a track layout such that a switch engine can work readily with minimum interference with other operations. These distinctly local conditions materially influenced the designs for tracks and buildings to provide for handling the trains promptly and expeditiously and to care for the passengers between trains.

Largely because of the importance of Kansas City as the gateway to the southwest, the number of passengers handled is out of all proportion to the size of the city. In 1911, 78,542 trains with 456,334 cars were handled for the ten roads entering the union depot alone. Over 2,215,000 pieces of baggage were handled in the union depot alone in 1911, and 2,076,084 pieces in 1912. This, combined with that handled at the Grand Central station in Kansas City, makes a total of 2,500,000, equal to that at South station, Boston, the largest in this country. Kansas City has a maximum daily record of 10,000 pieces of baggage as compared with a maximum of 6,000 pieces at the Pennsylvania terminal, New York. The income from storage on baggage at the union depot in 1911, amounted to $20,384, and in 1912 to $19,457, while the parcel room receipts for 1911 were $41,480, and for 1912, $40,564. The ticket sales in 1911 at the union depot ticket office alone, exclusive of Pullman tickets, numbered 1,401,238, amounting to $4,892,438, while in 1912, 1,330,544 tickets were sold amounting to $4,501,781.

The transfer of mail is also very heavy because of the number of diverging routes. The proportion of mail transferred, to that going through without change, is so great that the Santa Fe finds it more expeditious to set out one mail car and pick up another on its through trains and to transfer the mail going through, rather than that to be unloaded. From 225 to 300 tons of mail are handled through this station daily, and as most of this is transferred from one train to another, the terminal company must assume charge of the transfer and bear the expense, which is no small item in itself. The amount of mail handled compares very favorably with that at South station, Boston, where about 250 tons are handled daily, and at the Pennsylvania station in New York, where between 220 and 260 tons are handled.

A careful study of the increase in the traffic passing through the present union station shows that the number of trains has doubled every 13 years, the number of cars every 12 years, and the amount of baggage handled every 11 years. Naturally, this rapid increase in traffic long ago caused the old station to be completely outgrown. Also, the confusion and inconvenience resulting from maintaining two stations has long been recognized, and when plans for the new station were considered, opportunity was offered to combine in one terminal.

Negotiations have been conducted with city officials looking toward a reconstruction of these terminal facilities for several years, and ordinances providing for this work were passed in 1909. These ordinances were ratified by the voters at a special election and the preparation of plans was begun at once. As the details were worked out it became evident to the city and to the Terminal company that certain changes which affected the ordinances in details only rather than the general plan were necessary for the best interest of both parties. Accordingly a



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revised ordinance was prepared and passed by the city council in June, 1911. The most important changes made were regarding grades east and west of the new station. This ordinance provides for the construction of a union passenger station west of the present Grand avenue station, four freight stations where local freight will be received for all roads, a belt line formed by the lease of existing tracks and the construction of additional

The South or Plaza Side of the New Station.

track where necessary, and the complete separation of street and railway grades.

THE PASSENGER STATION.

The most important individual feature of this plan is the passenger station which is being constructed at a cost of about $5,000,000. As shown on the accompanying map, the new station is located between Broadway and Main streets, opposite Twenty-

this purpose by the terminal company. The creation of this plaza required the removal of 630,000 yds. of earth and rock, as the original site was a high hill sloping directly to the track. Beyond a wide boulevard this area will be parked, and the city will grade approaches to the streets on top of the hill. The Park Board of Kansas City is now considering sloping a portion of the hill to the level of the plaza as far south as Twenty-fifth street. The plaza is on the level of the main floor of the station, or one story above the tracks and connects directly with Main street and Broadway.

The main station building is "T" shaped with a stem projecting out over the tracks. The head house is 510 ft. long and 150 ft. wide, while the portion over the tracks is 410 ft. long and 165 ft. wide. The building is of Bedford stone with granite

The New Union Station—Looking East over Express Building.

third street, about three miles southeast of the present union depot and about 30 ft. above it, where it is safe from such floods as put the old station out of service in 1903. The station building is four stories in height above the basement or track level, with a sub-basement for express and baggage. It faces to the south on a large plaza covering two city blocks, purchased for

trimmings on the faces and bush hammered concrete in less important places. The exterior walls are of massive masonry, the Bedford stone being backed with brick, while the interior is of steel frame construction with reinforced concrete floors throughout. The foundations for the main building are carried to rock, while the train shed piers are supported upon rock upon spread

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footings resting on undisturbed natural soil or on Raymond concrete piles where there is a considerable depth of recent fill. Provisions are made for extension of the building over eight additional tracks which may be required in the future, giving 50 per cent. additional space for standing trains and waiting room.

The main or plaza level will be devoted to facilities for the public, all of which are on this floor, while the three upper floors over the end wings will be given over to general offices for the terminal company and tenants whose business is associated with that of the railways. Two main entrances lead from the plaza to the grand lobby in the center of the building. This room is 230 ft. x 100 ft., and is 85 ft. high, being open to the roof. Three large arched windows face on the plaza. With the exception of the ticket office, which is located under the center window on the south side, this lobby will be free of all obstructions. The lower portion will be finished in Tennessee marble with Kasota marble above. It will be lighted by large electroliers suspended from the ceiling.

Leading directly from the grand lobby, and extending over the tracks, is the main waiting room. This room is 54 ft. high, with a flat ceiling, and will be lighted by side wall lights. On each side of the main waiting room are train gates leading to the different platforms. Concourses are provided just outside these gates in which are located the stairways and elevators. Entrance to the station from trains will also be gained by these same stairs and elevators to the concourses from which the passengers will pass directly to the main lobby without going through the waiting rooms.

A lunch room, restaurant and women's waiting rooms are located in the east wing, directly off the grand lobby, while baggage and check rooms and men's waiting rooms are located in the west end. A drug store, newsstand, etc., will be along the north side of the main lobby. A covered cab-stand is provided on the plaza level along the west end of the station.

The basement or track level floor will be devoted to commissary, baggage and mail rooms. Baggage and mail will be received from a driveway on this level under the plaza, which connects with Grand avenue and Broadway, and will be lowered from this floor to the sub-basement from which two tunnels pass under the tracks beyond the ends of the station, with elevators to each platform. In this way all trucking at the track level is avoided and interference to passengers is eliminated. The interchange and sorting of mail, baggage and express, will be confined to this sub-basement level. The express business is also taken through these tunnels, and the sub-basement to the express building, a two-story structure with sub-basement west of the station. This building is 1,000 ft. long and 60 ft. wide, and is divided for the use of the four express companies operating into Kansas City. Offices for the use of these companies will be provided on the second floor of this building. A power house to provide, heat, light and power for all purposes about the station, at the coach and engine yard at Southwest boulevard, and for the interlocking towers at each end of the yard will be located opposite the west end of the express house.

Sixteen through passenger tracks are provided in addition to two thoroughfare tracks. The tracks are built in pairs, alternating 12.5 and 31.5 ft. centers, with concrete platforms between 8 in. above the top of rail. No special track construction will be provided. Each pair of tracks will eventually be connected by two crossovers opposite the center of the station, affording flexibility of train movement. Low train sheds 1,400 ft. long will be constructed over the tracks. All trains will pull through the station and stop with the baggage cars near the tunnels leading to the baggage and mail rooms, and the passenger cars near the stairways. In addition to the through tracks, several stub tracks will be provided at the east end of the station for the handling of mail cars, while similar tracks will be built opposite the express rooms at the west end for express business. Two of these latter tracks will be depressed so that the floor of the car will be level with the express room floor to facilitate loading.

BELT LINE CONNECTIONS.

Four main tracks will lead east from the new station to Sheffield. West of the station to the Frisco crossing there will be six main tracks, the two outer tracks all the way from Sheffield to the union station being for freight, while the two center southerly tracks will be used for passenger movements. Between the station and the Frisco crossing all tracks will be used as

Track Layout Through Station.

may be found convenient, for passenger movements, for freight movements or for movements of empty equipment to and from the coach yards.

At Southwest boulevard, a short distance west of the station, it was originally planned to separate the grades of the freight and passenger tracks, the freight tracks descending while the passenger tracks rise to a higher level. Under this plan the freight tracks would cross the Kaw river at the site of the present bridge and at practically the same elevation, turning abruptly to the west just across the bridge and continuing to Armourdale yard. A single track freight line connects the west end of this yard with the Union Pacific and Rock Island at Clark Junction. Connections from this low level freight line will be made with the Santa Fe, Frisco and Missouri, Kansas & Texas on the east side of the Kaw river, while a low level freight line will extend through the center of the present yard south of the union depot to a connection with the roads entering over the Hannibal bridge and with a north side belt line. The high level, or passenger, line will extend across the Kaw river on the upper deck of the same bridge, which carries the freight line, and will then divide into two double track lines, one extending north on a high steel viaduct across the present Rock Island and Union Pacific tracks to a connection with the Missouri Pacific main line to Omaha, the other turning west and descending to a connection with the Union Pacific and Rock Island. At the present time this high level line has not been definitely author-

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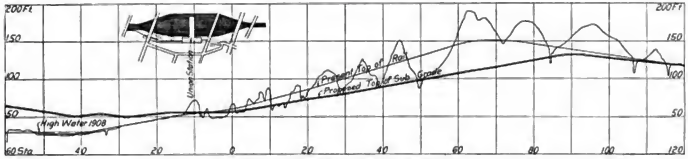
ized and the low level line may eventually be used for passenger traffic also. Another double track high level passenger line leaves the main track at Southwest boulevard and follows around the face of the bluff to a connection with the Burlington, Wabash and Rock Island near the Hannibal bridge. From Sheffield to the Hannibal bridge along the Missouri river the belt line for freight traffic will consist of two tracks, one of which will be



Profile Through Big Cut East of Station.

turned over by the Alton, and the other of which is now being built. The construction work along this freight line is very light.

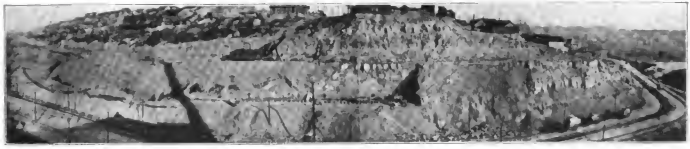
When these lines are completed, facilities will be provided for direct and expeditious movement of both passenger and freight traffic without interference with each other, and with no railroad grade crossings on the passenger lines except three close together at Sheffield, plans for the separation of which are now being considered. All crossings of street and railway tracks along the passenger line will also be separated, and there will be few grade crossings with streets on the north side freight line.

EXCAVATION WORK.

This extensive track arrangement requires a large amount of excavation, the heaviest work being the reduction of the grade on the existing line east from the station site through the divide between the Turkey Creek and Big Blue valleys from 1.5 per cent. to 0.9 per cent. The heaviest cut on the old line was about 40 ft. deep, a short distance east of Woodland avenue. On the new grade the tracks are being lowered 38 ft. further at this point, and the cut is being widened for four tracks, where it formerly held but two. The lowering of the tracks in this cut has presented some interesting problems, for the main line must be kept open for traffic at all times, as it forms the entrance for three roads to the present union station, and also for a heavy freight business, with a total of about 150 train movements every 24 hours. In addition, a number of industries are located along these tracks, and it was necessary that the track connections to these industries be maintained with comparatively little interruption.

This cut is about two miles long and requires the removal of about 1,000,000 yds. of earth and rock, of which about 750,000 yds. have been removed up to the present time. Because of the congested conditions, it has been necessary to give up one track to construction purposes and to separate the remaining track as a single track main line within the limits of the work. A block averaging about three-quarters of a mile long is established,

Burlington Connection Shortly After Work Was Started.



Burlington Connection on April 1, 1913.

crossovers are placed at each end and the intervening distance is operated as single track with telephone block.

Because of the narrow right-of-way owned and the difficulty and expense of securing additional land in a well built up residence and industrial community, retaining and facing walls are required in the deep portions of the cut and are being built as fast as the excavation proceeds. The material in this cut consists of a heavy clay overlying rock which is badly fissured and broken. In excavating through the rock it was first intended to use a Sullivan channeling machine to secure vertical faces for about 1,200 ft. in the deepest portion of the cut, in this way reducing the amount of retaining walls required, but the rock

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was so fissured that it was impossible to use the channeler with any degree of success. About 60 per cent. of the material consists of rock and shale which has to be shot, requiring very careful handling of explosives. The material is loaded by steam shovels into flat cars and 12 yd. Western air dump cars, and is hauled over the main line to fill the Blue River and Southwest boulevard yards and to raise the main tracks west of the station, 500,000 yds. of filling being required between Grand avenue and the Frisco crossing alone. The operation of these dirt trains on the main line results in considerable delay to the hauling trains, but in spite of these unfavorable conditions, the shovels have made very favorable records.

As the cut is lowered the amount of water coming into it increases, and it is necessary to keep outlet ditches open. In

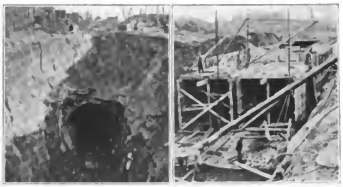
Abutments for Twenty-fifth Street Subway.

the final arrangements, a sewer ranging in size from 48 in. down, will be laid between the two center tracks sufficiently low to remove surface drainage and seepage, and to drain the wire conduit which will also be laid in the retaining walls through this cut. All sewers and water mains had to be lowered below the new grade in advance of the steam shovel work and because of the depth of the cut this has made very expensive work in certain places. Also, the fact that the city authorities required that all street car lines be kept open while the work is in progress and that only every other street without car lines could be temporarily closed, complicated the situation.

Another piece of heavy grading work is on the high level

Concrete Mixing Plant in Slab Yard Near Big Blue River.

Burlington connection between Southwest boulevard and the junction with the present tracks at St. Louis avenue, a distance of 9,300 ft. This double track passenger line is being built at an elevation considerably above that of the old yard alongside and requires the moving of 90,000 yds. of material, 40 per cent. of which is rock. The location of this line rendered necessary a change in several streets and the construction of several retaining walls to support the hill and streets above. Brook street is now being moved inside the curve from Twenty-fifth street to Allen avenue, and Allen avenue in turn is being moved further up the slope. The accompanying cross section and photographs give an idea of conditions at this place. One of the retaining walls is 1,700 ft. long and varies in height from



Circular and Rectangular Sections of O. K. Creek Sewer.

14 to 39 ft., with a maximum surcharge of material of 35 ft. Over 30,000 yds. of concrete is required in these walls and other work on this connection.

Allen avenue varies from 10 to 50 ft. above the tracks, and is 50 ft. wide. The railway company is required to do all the work in connection with building the street. At one point it was necessary to move two 20 in. and one 30 in. high pressure water mains which were laid up the slope of the hill. To do this a tunnel 240 ft. long was built, 100 ft. of which was inclined upward at an angle of 45 deg., and the three pipe lines were placed

Box Abutment Under Construction for Woodland Ave.

in it. In this same vicinity a 150,000 gal. oil tank belonging to the Frisco also had to be replaced with another located further up the hill. Because of the non-interference with traffic, the grading on this connection was let by contract. All other grading work, however, is being done by company forces.

YARDS.

Facilities for the handling of passenger engines and equipment will be provided by the construction of a yard in the triangle between the main line, the Frisco tracks and Southwest boulevard, a short distance west of the new station. At present each railway takes care of its own equipment, hauling trains in some instances three or four miles from the station to the coach yard. A number of the roads will use these new facilities immediately upon the opening of the station, and it is expected that eventually all will do so, although, for the present, as one or two of the roads have recently made extensive additions to their coach yard facilities, they may continue to use them. Complete

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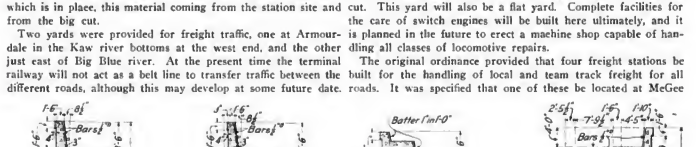
facilities will be provided for the care of locomotives and passenger equipment. A roundhouse and coal chute, water cranes, coach cleaning yard and ieing facilities are all being constructed. About 175,000 yds. of filling was required for this yard, all of which is in place, this material coming from the station site and from the big cut.

Two yards were provided for freight traffic, one at Armourdale in the Kaw river bottoms at the west end, and the other just east of Big Blue river. At the present time the terminal railway will not act as a belt line to transfer traffic between the different roads, although this may develop at some future date.

it was necessary to move the Alton tracks north for a distance of about a mile and to construct a new bridge for this line across the river. The grading here was considerably heavier than in the Armourdale yard, the material being brought from the big cut. This yard will also be a flat yard. Complete facilities for the care of switch engines will be built here ultimately, and it is planned in the future to erect a machine shop capable of handling all classes of locomotive repairs.

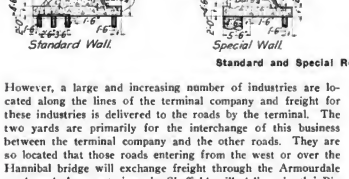
The original ordinance provided that four freight stations be built for the handling of local and team track freight for all roads. It was specified that one of these be located at McGee



Standard and Special Retaining Wall Sections.

However, a large and increasing number of industries are located along the lines of the terminal company and freight for these industries is delivered to the roads by the terminal. The two yards are primarily for the interchange of this business between the terminal company and the other roads. They are so located that those roads entering from the west or over the Hannibal bridge will exchange freight through the Armourdale yard, and those entering via Sheffield will deliver in the Big Blue yard.

The Armourdale yard is a flat yard with 26 tracks, in addition to two main tracks and a passing track along the north side. The layout is clearly shown in one of the accompanying photographs. A six track rectangular engine house, with a capacity of 12 engines is located at the west end of the yard for the use of switch engines. A small machine shop for making light repairs is also built in connection with it. A 100,000 gal. steel oil tank is provided for the storage of fuel oil which is used by the terminal company engines.

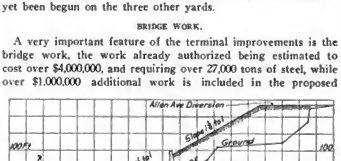


The Armourdale Yard.

The Big Blue yard is located between the Alton and Santa Fe tracks east of the Big Blue river. To make room for this yard street just east of the new station, one near Norton avenue and Fifteenth street, another in the Blue Valley just north of Sheffield, and the fourth near Grand avenue and the Alton tracks on the freight line. The McGee street freight yard, which has recently been completed and is now in service, includes a brick freight station 56 ft. x 176 ft. in size, with two platform tracks and 17 team tracks, with a capacity of 300 cars. Work has not yet been begun on the three other yards.

BRIDGE WORK.

A very important feature of the terminal improvements is the bridge work, the work already authorized being estimated to cost over $4,000,000, and requiring over 27,000 tons of steel, while over $1,000,000 additional work is included in the proposed



Cross-Section Showing Work Along Burlington Connection.

double track, double deck bridge over the Kaw river and the steel viaduct for the high level passenger line in Kansas. The majority of this work is for viaducts and subways in streets, it being necessary to reconstruct 13 viaducts, to construct 11 new viaducts and 11 new subways, and to reconstruct one subway.

If built the most important structure will be the two deck bridge across the Kaw river west of the new station, which will consist of two 300 and one 140 ft. spans. The two 300 ft. spans will be through spans for both decks, while the shorter span will be built as a deck structure for the upper level. The bridge is designed for Cooper's E-60 loading on all four tracks. About 4,800 tons of steel will be required for this structure, which will replace another bridge on the same site and will rest upon the present piers which were carried to rock when the present bridge was built in 1907. The high level passenger line viaduct in

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Kansas will be about 12,000 ft. long and will require about 15,000 tons of steel.

The standard construction for street viaducts is steel deck girders resting on concrete abutments and piers, the lower surfaces of these girders being encased in concrete with a cement gun to protect them from the action of the locomotive gases. Much trouble has been experienced here with the corrosion of steel in the older structures, and it is planned to prevent this in future works. Likewise, trouble has been experienced in one or two cases with the gases attacking concrete, but it is believed that this is the result of the chemical action set up between the stone, which is a local limestone, and the gases. The clearance at the viaducts ranges from a minimum of 19 ft. to a maximum of 56 ft. at Woodland avenue. All viaducts are designed to carry street cars, whether tracks now pass over them or not. Concrete decks are placed on all these viaducts, which are then paved with creosoted wood blocks. Both brick and wood block pavements are being placed in the subways.

The subways are of the flat concrete slab type resting on abutments and curb and center supports. An important departure from standard practice is being made here in the casting of the entire structure above the footings, including the vertical pillars and cross girders, as well as the top slabs for a number of these bridges in units at one central slab casting yard and erecting them with a derrick. Eight subways are being built in this manner, while others will be built monolithic, because of local conditions. The first of these unit construction types of subways has recently been completed and was described in the *Railway Age Gazette* of December 13, 1912. A minimum clearance of 13 ft. is required in all subways, and 14.7 ft. where there is street car traffic.

Among the larger viaducts are the Broadway viaduct, just west of the station and a structure at The Paseo, one of the city boulevards. The Broadway viaduct is 80 ft. wide and 700 ft. long exclusive of approaches, or 1,300 ft. long overall and is estimated to cost $475,000. The Paseo boulevard structure is 1,000 ft. long, including approaches; 50,000 yds. of earth being required for the grading of these approaches.

One interesting detail of the construction work which introduced several complications was the necessity of maintaining connections with the industries located on the old track level through the big cut. This required the construction of three bench tracks north and one south of the main line, leading off parallel to it on steeply ascending grades. Where these bench tracks pass under viaducts, box abutments have been provided as shown in the photograph of the structure at Woodland avenue, these abutments being found to be practically as cheap as posts and buttressed abutments where the excavation for the buttressed abutments was heavy. Another interesting detail was developed in the design of the retaining wall along the north side of the tracks between the new station and the passenger coach yard. It was necessary to carry a 5 ft. x 7 ft. steam tunnel for this distance of 6,200 ft., and in certain places the only suitable location was in a recess in this retaining wall. The special design of this wall is shown in one of the accompanying drawings, about 1,000 ft. of this section being built.

One of the conditions imposed upon the terminal company by the city in its ordinance was the construction of a large sewer 6,225 ft. long from Twenty-second street and Grand avenue to Turkey Creek, although this sewer laid for the greater part of the distance entirely out of the railway property. This work required an expenditure of about $930,000. With the exception of a 1,200 ft. tunnel near the center, the sewer was built in an open cut of 55 ft. maximum depth. The sewer was circular in section, 25 ft. in diameter at the upper end, gradually enlarging to a double 15 ft. 8 in. x 15 ft. box at the lower end, the rectangular section being designed to get the sewer under certain streets. Over 180,000 cu. yds. of excavation and 38,000 cu. yds. of concrete were involved.

Automatic signals will be provided on both the freight and passenger lines, the average interval being one mile, although the signals will be placed on the grades to secure a uniform time interval. Upper quadrant R. S. A. standard signals will be adopted outside of the station with dwarf signals through the station limits. While the details of the interlocking plants have not been definitely determined upon at this time, there will be a power interlocking plant at the east end with about 110 units and one at the west end with about 150 units, power for these plants being supplied from the central power house. Other towers will be built near the Santa Fe crossing at the east end, at Sheffield, at the Frisco crossing and at the Santa Fe crossing near the Kaw river, while the plants at Bridge Junction and at the union depot will be rearranged.

At the present time the exterior work at the new station is largely completed, and it is expected that the station building will be entirely completed late this year. It is expected that the excavation of the big cut and along the Burlington connection will also be completed about this same time. The Armourdale yard is now completed and in service, while the grading is finished for the Blue River yard. Seven viaducts are completed, while three others are completed with the exception of placing the floor slabs.

This work is all being handled under the direction of John V. Hanna, chief engineer, Kansas City Terminal Railway; A. C. Everham, assistant chief engineer; G. E. Tebbetts, bridge engineer; J. Tuthill, building engineer; S. O. Swenson, electrical engineer; G. E. Ellis, signal engineer, and A. H. Stone, assistant engineer. The construction on the west, central and eastern ends of the work is being handled under the direction of J. M. Hammond, E. P. Weatherley and D. S. McCalman, respectively, division engineers, to all of whom we are indebted for courtesies in connection with the preparation of this article.

DISCIPLINE ON THE BALTIMORE AND OHIO.*

We read much of misfits and "square pegs in round holes" in the industrial world, and in the railway service come in contact with a little of it, but when one delves into the records for the number of train-service men removed for incompetency he is struck by the small percentage he finds. On the other hand he finds that nearly all dismissals are due to no other reason than downright failure to comply with rules and regulations thoroughly understood by those removed. Harrington Emerson and Dr. Hugo Münsterberg have without doubt made great strides in the science of interpreting individual characteristics through psychological and physiognomic traits, particularly in those operatives requiring much dexterity in their work; and while every railway officer responsible for recruiting and strengthening his train-service organization would eagerly take advantage of the fruits of this service, he has learned by experience that he does not need mechanical geniuses nearly so much as he does young men of healthy mind and body and endowed with what is commonly known as mother wit, good common sense and an ambition to get along in the world. By the exercise of close scrutiny of applicants, and his fairly well developed knowledge of human nature gained in the school of experience, he is reasonably well qualified to select the right kind of men, yet at the same time he is not unmindful of the surprises in store for him arising from the complexities and varieties of the human family: "nature never rhymes her children, nor makes two men alike."

It is possible to make discipline so severe and clock-like in its precision as to vitiate initiative and to finally instill in the minds of the rank and file the feeling that the railroads existed principally for the sake of discipline, and not discipline as one of the important elements in the operation of the railroads.

The time-honored custom of taking men out of the service

*Extracts from a paper by Frederick C. Syre, trainmaster of the Baltimore & Ohio, St. George, S. I., N. Y., read before the New York Railroad Club, May 16.

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for from one week to three months for violations has never been a marked success, and frequently has imposed upon the supervising officer the unpleasant duty of temporarily, at least, depriving a man's family of its means of sustenance through no fault of its own; the family was punished more than the real culprit. . . . I have known many instances in which men have courted a suspension in order to get time off for pleasure or for some other purpose.

The Brown system of discipline was expected some ten or fifteen years ago to universally supersede the suspension system, but I have been told it did not prove very effective except where there was already a good class of men who took great pride in keeping their records clean.

Mr. Syze said that he had not fully informed himself concerning the progress of the Brown system on other roads lately, and he went on to describe the action of the Baltimore & Ohio in doing away with suspensions by an order which was issued by vice-president A. W. Thompson last January, and which was noticed in the *Railway Age Gazette* at the time. Mr. Syze showed samples of the blanks used on the Baltimore & Ohio to keep the individual records of the employees. Continuing, he said:

As instructed by Mr. Thompson, all cases seeming to require discipline are promptly, though deliberately and thoroughly investigated before the record is made, for when it is seen by a careful consideration of an employee's record he is "slipping backward" in spite of admonitions, reprimands and "record disciplines," he is removed from the service, never to re-enter it. In this lies the great efficiency of this system of discipline. I find it is more effective in each instance, as so far used, than the old system of suspensions. In many cases disciplined employees have told me frankly that they would "rather serve time than sign that paper"; and others have said, "You can bet your life this is the last one of these things I'll get if I know myself." What better proof can one ask as to the value of this system? It has also been observed that extra men do not fare so well under the new system as under the old.

Unionism, as every supervising officer knows, is an element to be reckoned with in administering discipline, not unionism as a whole perhaps, but that misguided element of it which, for some reason I could never account for, seems to take umbrage at railway companies for having the temerity to exercise their rightful prerogative of cleansing the service of men of proved unfitness. On the other hand, I know old members of the brotherhoods who are broad enough and big enough to see things from the company's view point and who fully recognize the latter's right to run its own business in the interest of its owners and the public; but there is unquestionably a percentage of the younger element which relies, to a degree never intended by the father of organized labor, upon the unions for protection in their wrongdoing and indifferent service.

Although the use of intoxicants among train-service men is on the decrease, it is still one of the most troublesome problems to deal with, particularly as many men drink off duty and in places and ways that it is difficult to get sufficient evidence of to administer discipline. A great improvement has been made in the last few years, however, and encourages us to hope for a continued improvement in the future.

DISCUSSION.

It was agreed by all those who took part in the discussion that discipline was essential to the proper conduct of railroads as well as of any other business affairs, and also that to hold men in proper restraint, some form of punishment must be threatened or inflicted. The point was emphasized, however, that it is not the strongest man physically who rules, but rather the man of the greatest force of character and will. So the Baltimore & Ohio system that has discarded all penalties save the final one of dismissal for the incorrigible will be a success in the hands of a strong man. With a weak one the scheme would spell disaster.

"Discipline by commission" is in vogue on the Erie No decisions or penalties are imposed by the superintendent. Every infraction of the rules is investigated. Records of such investigations are held back until the Monday afternoon following their completion, when they are presented at a meeting of the division staff and discussed. The records are read, the character of the man involved is shown and, after a full discussion of the case, the staff recommends the penalty to be imposed. Discipline so administered produces good results. The superintendent has nothing to do with the matter, as an individual, as it is taken out of his hands. As a rule, there are but few appeals from the decision, and these are taken back to the staff.

The principle underlying this method is that discipline should not be administered by one man and be the arbitrary expression of his will. The overbearing, tyrannical superintendent of former days was the cause of the first banding togther of the men for self-defence, which by regular increments has led to the present attitude on the part of labor organizations.

The Brown system of merit and demerit marks was touched upon. It substitutes marks for suspension, but depends for its value on the care with which the marks are adjusted. Those who spoke recommended it where there is a high grade of men employed; men who take pride in clean records. But where there is a large, unruly and partially anarchistic element it is not successful. As the old dispensation appealed to fear, the Brown appeals to the pride of the man, and if there is no pride there is nothing to which to appeal to except the fear of dismissal. When the number of demerit marks approaches the dismissal point, the men become nervous and their very nervousness is said to cause mistakes.

Favorable mention was made of the idea that employment and discipline of men should be in the hands of an employment bureau which should maintain the records and discipline. It should have a board before which all matters could be brought. All men are not amenable to the same discipline. No wise parent attempts to treat all of his children in the same manner, and so the same treatment cannot be applied to the heterogeneous mass of railway employees; and yet there must be a semblance of uniformity. The ignorant man should be relieved and instructed. He should be shown and drilled in the importance of obedience and should be taught that if he will but obey, the permanency of his position is insured. If men cannot be kept in the proper way by kindly talk and exposition, then the question of dismissal is pertinent.

One speaker brought out the significant point that if men are to be reprimanded for mistakes, it is a great help to compliment them for good work. Judgment must play a part in the execution of every task. For the novice complete obedience is the only safe course; but, as he increases in knowledge and experience, he can lay aside the blind following of instructions for a wider latitude in which his personal judgment may play the guiding part.

There was general agreement that it was not best for each department to administer its own discipline, but that it should be done by a board representative of all departments, and, perhaps, even including a representative from the men. Then it should be realized that men can be led to any heights; but it is difficult to drive them. It is better to reform than dismiss. Old men should be retained, and new administrations should familiarize themselves with past records and not be swept away by a desire to use new blood. The responsibility of employing should not be put in the hands of subordinates, nor should the power to discharge. When the occasion arises for the administration of discipline it should be done fearlessly and without any consideration as to the attitude that the labor organizations may assume, first making sure that the decision is based on the merits of the case, the requirements of simple justice and the demands of public safety.

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HENRY M. FLAGLER.

Henry M. Flagler died at his winter home, West Palm Beach, Fla., on May 20. He was 83.

At the time of his death he was chairman of the board of the Florida East Coast Railway, which had been built largely with his money, entirely under his direction and as a part of his general plans for the development of the east coast of Florida. Mr. Flagler made a large fortune in the development of the Standard Oil Company, but his chief interest in life in the last 15 years had been the development of the Florida East Coast, and the building of this railroad, which in many ways is the most unique of any in the United States, gives Mr. Flagler properly a place of no little importance in the railroad history of this country. The Florida East Coast runs from Jacksonville south along the extreme eastern shore of Florida to almost its southernmost end, and is there carried from the main line to the string of keys which ends with Key West. There is no more striking example in the history of western railroad building, of a country apparently without traffic whatsoever except that which would be developed after the building of a railroad, than this Florida East Coast line. The country through which it runs is largely a sand beach, with the everglades of Florida back of it. For through traffic it would have to compete directly with the Atlantic ocean. It must have taken imagination amounting almost to genius, as well as vast personal wealth, to begin such an undertaking as the building of this line. Mr. Flagler lived long enough to see the entire line, including the extension over the keys to Key West, in operation.

H. M. Flagler.

The 637 miles of line cost, with the equipment, $39,117,000, and was capitalized at $36,000,000, or about $56,000 a mile. Its earnings from operation in 1912 amounted to $4,427,000, or about $7,134 per mile. Its earnings, after the payment of expenses, rentals and taxes, amounted to $973,000 in the year 1912, or about 2.5 per cent. on the actual investment.

It is probable that Mr. Flagler never considered his railroad as an investment for the purpose of getting the highest possible interest on his money. It was built for the development of the country through which it runs, and as such it has already proved a success. Edwin Lefevre says that the value of the taxable property in the districts exclusively reached by the Flagler road has increased over $50,000,000 since he began it, and that there are today only about 25,000 acres under cultivation for fruit and vegetables out of a total of about 3,500,000 acres now available for such cultivation. In 1912 the Florida East Coast Railway carried 727,000 tons of freight, with an average haul per ton of 163 miles and an average ton mile rate of 1.772 cents, and with total freight revenue of $2,099,000. Vegetables alone furnished 63,258 tons of traffic and $380,923 of freight revenue. Even more remarkable, pineapples furnished 32,137 tons of freight and $165,667 of freight revenue. Thus over 18 per cent. of the total freight revenue was from vegetables and nearly 8 per cent. from pineapples. Lumber furnished the largest tonnage of any one class of commodities—145,000 tons—but, of course, takes a very low ton mile rate, furnishing but $183,000 of revenue.

Passenger earnings amounted to nearly 40 per cent. of the total operating revenue. Mr. Flagler furnished the money to build the Ponce de Leon and the Alcazar hotels at St. Augustine, the Breakers at Palm Beach, and other of the great Florida East Coast hotels.

Henry M. Flagler was the son of a Presbyterian minister of Canandaigua, N. Y. He started out to support himself when he was 14, and went into the grain business in Bellevue, Ohio, where he probably became acquainted with John D. Rockefeller, and before 1870 he was a member of the firm of Rockefeller, Andrews & Flagler, which in that year was dissolved and the Standard Oil Company formed. There is one story of Mr. Flagler's life that is probably so characteristic that it is worth repeating. When he first went to work in Republic, Ohio, he had a five-franc piece, accepted at that time for a dollar, and a few pennies. He never spent the five-franc piece, and in later life took a considerable pride in the possession of this particular coin.

John D. Rokefeller, in his random reminiscences of men and events, says of Mr. Flagler: "He invariably wanted to go ahead and accomplish great projects of all kinds. He was always on the active side of every question, and to his wonderful energy is due much of the rapid progress of the Standard Oil Company in the early days. It was to be expected of such a man that he should fulfill his destiny by working out some great problems at a time when most men want to retire to a life of considerable ease."

NEW LINE FOR BELGIAN CONGO.—The branch of the Great Lakes railroad, 167 miles long, starting at Kabalo, 50 miles above Kongolo, and ending at Lukuga on Lake Tanganyika, opposite the German post Ujiji, is well under way. On December 31, 1912, 60 miles of rails had been laid, and for 40 miles farther the grade was completed, as is also the 150-yd. bridge across the Luizi. This road should be finished by the end of 1913 or soon after. Coal was discovered near this line a year ago, about ten miles from the lake.—*Mining and Scientific Press.*

BRAZILIAN RAILWAY CONCESSION.—The President of Brazil has signed a decree granting the petition of the Companhia Estrada de Ferro Dourado, concessionaire of a subvention for building a railway which was to have started from Ibitinga, running to Rio Tiete, thence to a convenient point on the Bocaina-Barury branch, serving the town of Jahu, and terminating at Ayrosa Galvao. The petitioners asked for the substitution of Sao Joao das Tres Barras for Ibitinga as the starting point. The length of the line is to be 33 miles.

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THE PROBLEM OF RAILWAY VALUATION.*

The Change in the Public's Attitude Toward the Carriers and the Various Difficult Questions It Has Raised.

By Logan G. McPherson,
Director of the Bureau of Railway Economics.

For several months the Bureau of Railway Economics has been studying the question of a valuation of the railways. It has been our hope to issue first a preliminary and elementary exposition of the various factors that necessarily must be taken into account in making such a valuation and of the arguments that must be taken into consideration. It is the hope to follow this preliminary exposition with a rather complete digest of what has to this time been said upon the entire subject. We thought at first that the preliminary exposition which perhaps will be entitled "A Primer of Railway Valuation," would be rather a simple matter; that it could be prepared in comparatively a short time and that we would then devote our energies to the complete digest.

As, however, we began to study the subject, so many different points arose, there were so many arguments bearing upon every point and often in extreme conflict, that it was necessary to endeavor to get our bearings. We have therefore read through the existing body of literature upon this subject, have made an elaborate collection of all of the expressions that have been worth while upon the different points involved, have classified these expressions under various headings, and have given careful consideration to all of them.

The result has been to make very clear, what was apparent in the beginning, that there is a fundamental difference of opinion not only as to the use to which a railway valuation can be put, and as to how it should be made, but as to the social point of view from which the subject is approached.

As one of the best ways to clear up one's own mind in regard to a proposition is to be obliged to state that proposition, I have been very glad to accept the invitation to speak upon this occasion in the hope that what I am struggling to express may, perhaps, serve as a statement preliminary to the preliminary statement which the Bureau of Railway Economics hopes to issue.

Once upon a time when I had been designated to open a discussion at a meeting of an economic club, the chairman in his introduction gave me a sly dig by remarking that he hoped I would present the situation as it then existed, and not as it had previously existed, but that of course I was welcome to present it anyway I wanted to. My reply was that I am constitutionally and temperamentally unable to present any subject in the light of the present without developing it in the light of the past. Therefore, with your kind permission I shall endeavor to lead up to what seems to me to be the beginning of the demand for a valuation of the railways.

There was a time, of course, when there were no railways, when there were no great mills and factories. This was before the use of steam. In Europe in past centuries there have been laws limiting the prices of commodities: there were a few of such laws in the early days of our colonies, but they were an inheritance from Europe and rapidly fell into disuse. The spirit of our forefathers in this country was that of individualism. Opportunities of every kind were freely open to every one with the capacity to use them. The right of unrestricted and unregulated individual enterprise was cherished as an essential part of individual liberty. In the matter of prices, generally speaking, the buyer got as much as he could for what he had to sell, and the purchaser paid as little as he could for what he had to buy. It was thought that if the seller asked too much, or if it were found that he was making large profits other producers would enter the market and the price would be brought down to the lowest level at which there would be sufficient production to supply the demand. This, speaking generally, was the theory of competition, of a fair field and no favor, when men's valors were considered their own best gods.

THE OLD ATTITUDE TOWARD RAILWAYS.

When the railways were a demonstrated success this country wanted railways more than anything else and the people went to any length to get them. Until well along in the nineteenth century this country had more land than it knew what to do with. In the undeveloped regions it could be had not only for the asking, but for the taking. Homestead acts and the doctrine of squatter sovereignty were designed to bring settlers to the land. Not infrequently a settler took title to more land than he could use, to more land than he had the tools and appliances for cultivating. There is a story of a man who sent his son to see if he could not get a mule in exchange for three or four acres of land. The boy came home, reported that he had the mule, that he succeeded in slipping another acre over on the man he had bought it from, making him take five acres instead of four. Thousands of acres of land in what was then the wild west were bestowed upon anyone who would offer to build a railroad. Sometimes every alternate acre was thus bestowed, and the price of the remaining alternate acres doubled, or more because of the enhancement that railway service would bring in their value. This land as a rule was of little benefit to a railroad company until the railway had been built and a measure of traffic had developed.

It was expected that the railways would profit from the increase in the value of their land that would result from the development of traffic. That was the inducement held out in the grants of these lands to the railways. It was expected that the multiplication of railways would establish competition between them and that this would insure fair charges and good service. Therefore, the railways were unquestioned in their right to administer their property in the same manner that other business enterprises administered their property. Indeed, in those days it was an accepted principle that a man was welcome to whatever he could make out of any tool or instrument that he had. If with a set of tools a carpenter by skill and knack could make more money than another carpenter with tools equally good, he was welcome to it. If a wagoner who kept his horses in good condition and his wagon in good repair and was industrious and thrifty made more money than a rival wagoner, lacking these qualities, he was welcome to it. The faith of the people in the restraints of competition dispelled all fear of unfair charges for transportation; the love of individual liberty forbade all thought of interference with business enterprise.

It must ever be borne in mind that the whole theory of competition implies inequality between the competitors. To the swift, the strong, the farsighted, and often to the cunning comes the greater reward. In the United States the railways were built and they were operated upon the competitive theory. It developed that the strongest competitors for the service of the railways reaped the greatest profit from the service of transportation. Larger shippers secured lower rates and better facilities than the small. Industrial and commercial centers served by several competing railways obtained the benefit of lower rates than were accorded smaller communities with lower competitive strength.

The efforts of the country to obtain railroads led to its being supplied with more railways than were needed at the time. The

*An address delivered at the banquet of the American Association of Freight Traffic Officers at Washington, D. C., on May 16.

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fact that many railroads were built in advance of traffic and that there was bitter competition between redundant railways led to bankruptcies and reorganizations. Investors lost money, and their losses made other investors chary. They would not risk their funds except upon liberal inducements. They bought bonds at a discount with stock thrown in. Here again, those who furnished the capital that enabled the railways to continue in service were encouraged to look to the future for their reward.

THE DEPARTURE FROM THE COMPETITIVE THEORY.

Now, as we all know, in certain lines of our industrial activity there has been during the last twenty-five or thirty years or so a departure from the competitive theory. Workingmen have allied themselves in trades unions for the purpose of obtaining a certain uniformity of wages. Large producers of many commodities and large dealers in many kinds of merchandise have entered into alliances to maintain agreed prices. The railways at various times entered into agreements to maintain rates, but they were never very successful. The people didn't like such alliances; they wanted competition among the railroads to continue, and therefore they established the Interstate Commerce Commission and enacted laws which have made competition in rates well nigh impossible. The commission has been enjoined to see that rates be reasonable. From the days of the teamsters and stagecoaches the common law has ordained that rates for transportation be reasonable.

This Association of Freight Traffic Officers is composed of the very last men in the world who need to be told how the freight rate systems of the United States have developed. Broadly speaking, rates have been made that would get the traffic. Although the freight rate structures of the United States have often been characterized as a chaotic jumble, the truth is that they have been the resultant of varying forces; and, broadly and generally speaking, have well served the needs of the industry and the commerce of this country. This does not mean that they have always satisfied all of the industrial and commercial competitors. Far from it. As competition means the success of the swift, the strong, the far-sighted, and not infrequently the cunning, those who have been lacking in these qualities or in other respects have been deficient in competitive strength, and have sought the enactment of laws that would redress their weaknesses. They have had the sympathy of the great majority of the people of this country. It is said that as the railways are public servants, discharging what many have come to consider to be essentially a function of the government, they should treat all of the public alike.

Now, we are approaching the crux of the question. Upon the meaning, upon the significance, upon the construction which the people of this country place upon the public service character of the railways as set over against their character and necessities as private enterprises, depends not only the manner in which the valuation of the railways of this country shall be made, but the manner in which that valuation shall be used.

When this country was young, when land could be had for the taking, when cities were small, poorly lighted and the horse car was the means of urban transportation we did not hear anything of public utilities. As lighting by gas extended and gave way to lighting by electricity; as the cable car succeeded the horse car, and in turn has been displaced by the electric car; and as our cities have increased tremendously in population, it has become evident that a company having the electric light privilege or the local transit privilege, or the water power privilege for a particular city has a monopoly; that unless restrained it can fix its prices so high as to restrict the use of its service, or at a level that will give it profits far in excess of those obtained in business in general. There has been much litigation as to the amount of profit which should be allowed to such a company. It has been held that what such a "company is entitled to demand, in order that it may have just compensation, is a fair return upon the reasonable value of the property at the time it is being used for the public."

ARE THE RAILWAYS MONOPOLIES?

It is said that the railways are monopolies, and that as such their rates should be regulated. That the railways in respect to certain kinds of traffic partake of the monopolistic character every one knows; but no one knows so well as the men who constitute this association that the greater part of their traffic has always been competitive, and that they have had to fight for every ton of this traffic which their respective companies have carried. Now, it seems to me for this and other reasons that there is a very great distinction between a company having the exclusive right to furnish electric light to a city or electric transportation or water power, and a railroad company owning lines traversing a wide expanse, serving many communities and often under conditions which are not monopolistic. It has been held, however, by the United States Supreme Court in a very celebrated case, that of Smyth vs. Ames, in a decision rendered on March 7, 1898, "that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be a fair value of the property being used for the convenience of the public."

When the Interstate Commerce Commission was given the authority to determine what shall be a reasonable rate it found itself confronted with a series of freight rate structures in different parts of the country in which the rates seemed to be an inextricable maze. Therefore, it welcomed the decision of the Supreme Court in Smyth vs. Ames. Throughout the ensuing years it has besought the Congress to provide for a valuation of the railways of the United States, and it has not sought in vain.

I do not suppose that any member of the Interstate Commerce Commission would hold that upon the valuation of a railway alone can be determined just what shall be any specific rate. It is widely held, however, that a valuation of the railways will serve to determine what shall be the general level of rates. That is, that if a railway is to have a fair return upon a fair valuation the rates will be reasonable that will permit it to have such a fair return. Now, when we use such expressions as a "reasonable rate" and "a fair return," and "a fair valuation," I am reminded of the time when it is said that a considerable delegation of citizens of a foreign country went to the house of the prime minister. When he appeared upon the balcony and asked what they wanted, they said "We want our rights." He replied, "Very well, you shall have them." They went away satisfied. I am also reminded of that political convention at which when the committee on the platform were considering the tariff plank, one member suggested the expression, "We are in favor of judicious legislation in regard to the tariff"; and another member suggested an amendment making the clause read, "We are in favor of wise and judicious legislation in regard to the tariff."

WHAT IS A FAIR VALUATION?

What is to constitute a fair valuation and what is to constitute a fair return upon that fair valuation we do not as yet know, and it is to be hoped there will not be the devil to pay before we find out. There are many elements that enter into a valuation of the railways. The manner of determining the valuation of any one of these elements will depend in large measure upon the extent to which the people of this country regard the railways as the property of private investors, and the extent to which they regard them as public service corporations akin to the public utility corporations that furnish light and transportation and water within the limits of a municipality. Certain it is that when the railways of this country were built they were regarded from the standpoint of the investors as private property, their limitations as public servants did not affect the proprietary right to buy and sell real estate or other property at prevailing market prices. From this standpoint, which would seem to be guaranteed to them by the law of the country, the railways are certainly entitled to have their rights of way and their real estate in general valued at the prevailing prices for similar real estate; they are entitled to benefit by the enhance-

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ment of value as much as farmers and other land owners are entitled to benefit by the enhancement of value which has come with a growing population and development of markets, an enhancement which of course would not have come without the means of communication and transportation which the railways have furnished. On the other hand, there are those who hold that as the railways perform a public service they are not entitled to what is designated as the unearned increment in the value of their lands. These hold that a railway is entitled to a return only upon what the property of a railway has cost. They disregard excellence of location, excellence of administration, those economies which are due to managerial skill.

It has been the practice of many railway companies not to pay out all of their net profits to stockholders, but to reinvest a part of those profits in building up and extending the plant and equipment. There are railways which have followed this policy at all times; there are others which have followed it especially in prosperous years; there are many railways which for years habitually reinvested all of their profits without making any return to stockholders whatever. It is pointed out that inasmuch as all of these profits could have been paid out to stockholders and new capital acquired for increased capital expenditure upon which return would have had to be paid, it is no more than fair that return be allowed upon the reinvested surplus. Yet there are those who hold that surplus frequently signifies profits above fair return to stockholders, that it therefore belongs to the public and that even when reinvested in the property the stockholders are entitled to no return upon it.

FAILURE OF LAW TO KEEP PACE WITH ECONOMIC CHANGES.

In many cases lands have been donated to railways; that is, the passing of the title has been designated as a donation, although concession has been exacted from the railways as consideration. The government has in some cases in making such a so-called donation stipulated for concessions in the transportation of troops or the carrying of the mails. On the one hand, it is claimed that as such lands are held by the railways under proprietary rights they are entitled to a return upon them as property, to use them and to dispose of their use as property. On the other hand, it is claimed that as such lands are acquired without capital investment a valuation of the railways should take no account of their value.

These are but a few examples of the difference of viewpoint. It would be wearisome to enter into a discussion at this time of all of the factors that are affected by this difference of viewpoint. Are the railways to be valued at what they have cost, or at what it would cost to reproduce them, or upon the commercial or market value of the plant and going-business? These are but a few of the factors in regard to which there is difference of opinion, and each of these factors subdivides into manifold elements in regard to each of which there is difference of opinion.

It is not my purpose to endeavor to point out any solution. I have only hoped to indicate the seriousness of the problem and know that my effort has been all too inadequate. This much is certain, that the law has not kept pace with the changes that have occurred in our economic structure within the last generation. This was strikingly made manifest in the decision of Justice Hough in the Consolidated Gas Company case in which he first considered the value of the company's franchise from an economic standpoint, and then from a legal standpoint, arriving at conclusions that were respectively at variance. Another thing is certain, that whatever be the ultimate decision as to what constitutes a proper valuation of the railways and what may be the return to which they are entitled, that decision cannot be made retroactive throughout a regime during which the construction of railways as private property was encouraged, and their administration as private property was sanctioned by the law of the land.

There is another consideration which appeals to me as of foremost importance. A bank president once asked the head of a manufacturing establishment, who was endeavoring to negotiate a loan, just what were his "cold assets." The reply was that it was not so much the cold assets as the "hot assets" that brought about results. He said that anybody with the money could build or could buy a manufacturing plant, but that the selection of the proper men, the development of an organization in which one and all work together to promote economy and efficiency is a far more difficult task and entitled to the greater reward to the attainment of which such an organization is the most effective instrument. In the valuation of the railways, the so-called "physical valuation" which is but a valuation of the cold assets, are we not in danger of losing sight of the human element which alone can make these cold assets of use to the people?

Whatever may be the modification in our social structure, whatever may be the readjustment in our law, it behooves our country first and foremost to retain the services and stimulate the services of the efficient man, the man who can make two blades of grass grow where but one grew before, the man who can plan, design, and direct, the man who can bring about organized and efficient effort. It is to such men that we owe our present industrial and commercial development. It is through their efforts that the efforts of the multitude are lifted to a higher level and made more efficient in the service of the human race.

TRANSFERRING FLOUR AT FORT WILLIAM.

The new shed on the Canadian Pacific dock at Fort William, Ontario, is now in operation. It is a double decked structure, 950 ft. by 60 ft., the upper story for the reception of rail freight, and the lower one for freight unloaded from the vessels to be loaded on cars. For the unloading of freight from cars, there is a trestle along the rear of the building, the height of which is such as to bring the car floor at the level of the upper freight shed floor. The lower floor of the shed has a similar track for outgoing rail freight. One of the principal commodities handled is flour in bags, and a flour bag loading machine is used. Along the rear wall, and just under the upper floor, there is an endless belt, 26 in. wide, running the full length of the building, driven by a motor at one end. It is similar in every way to the usual conveyor belt, the upper part running over closely spaced idler pulleys. The belt is open the length of the building. At five points near one end of the shed, corresponding to the port openings of the vessel to be loaded, there are cross belts of the same width under the floor, at a slightly lower level, enabling the bags of flour on the belt to pass under the floor. These lead to chutes at the front side of the building, to which inclines can be attached for sliding the bags directly into the hold of the vessel. On the longitudinal traveling belt are dumped the bags of flour from as many cars as are ready to be unloaded, irrespective of the make of the flour. At each of the cross belts on which it is desired to divert the bags into the vessel's hold, there is arranged a vertical board, at an angle of 45 degrees to the motion of the longitudinal belt. This board, coming down just over top of the upper belt, diverts the bags of flour on to the cross belts; and thence they are carried into the hold. These diverting boards are set in vertical guides, each with a rope passing up over a pulley above. At each of the cross belts there is stationed a man who either leaves the board down and diverts the bag on to the cross belt or raises the board and allows the bag to pass on to that one of the cross belts to which it should be diverted. The belts move at a good rate of speed and, consequently, quick action on the part of the board operator is required; but by its means as many as five different brands can be unloaded on the belt simultaneously, and be diverted to the proper hold. It is the usual thing to unload as many as five 30-ton cars in an hour, or at the rate of 150 tons an hour.

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RAILWAY STOREKEEPERS' ASSOCIATION.

The Convention at Chicago This Year Was More Than Ordinarily Successful and Included Several Important Reports.

The tenth annual convention of the Railway Storekeepers' Association was held at Chicago, May 19 to 21, J. R. Mulroy, general storekeeper of the Pullman Company, presiding. The opening prayer was offered by Rev. William E. Barton. Eugene Chamberlain, manager equipment clearing house, New York Central Lines, made the opening address.

President Mulroy, in his address, commented on the important work accomplished by the association in raising the standard of the supply department and reported a material increase in the membership of the association.

G. G. Yeomans in an address emphasized the great opportunity of all storekeepers in furthering the success of their respective roads. Their opportunities are unbounded and their importance may be appreciated when it is remembered that they handle each year supplies valued at about $250,000,000. About 9 per cent. of the gross earnings of railways is spent for material, or 17 per cent. when fuel is included. The great possibilities for savings were illustrated by the fact that about $220,000,000 is invested in material, a decrease of which to the smallest degree would represent a considerable capital that could be used for other purposes. According to statistics all the roads are carrying a year's supply of material on hand, a condition which could be much improved by the combined action of the storekeepers with the other departments.

The secretary-treasurer's report showed a membership of 744, including 150 new members. There is a cash balance of $886.81 in the treasury.

A resolution was adopted inviting the arbitration committee of the M. C. B. Association to attend the meetings of the association and participate in the entertainment features.

Piece-work—It was pointed out that the storekeepers were in a position to greatly benefit by the adoption of piece-work. J. H. Waterman (C. B. & Q.) reported splendid success by its use in his timber treating plant, where 2,000,000 ties, or their equivalent, were handled per year.

Stationery.—The stationery committee advocated the handling of stationery by the general stores organization rather than by a separate organization.

Lumber—The committee on the uniform grading and inspection of lumber advocated the advisability of adhering to the 13/16 in. ear siding in reply to a request of a lumber dealer to adopt ¾ in. This was done to prevent, where possible, the use of re-sawn material.

INACTIVE AND OBSOLETE STOCK.

Five papers were presented on "Reducing Inactive and Disposing of Obsolete Stock." Abstracts of these follow:

E. J. Roth (C. B. & Q.).—All obsolete stocks are inactive, but of course all inactive stocks are not composed entirely of obsolete material. It should pass without question that the thing to do with obsolete material is to scrap it and utilize the scrap to the best possible advantage. Obsolete forgings can usually be worked over in a blacksmith shop into standard articles with a slight loss. The value of scrap brass is not much less than that of the manufactured product.

The real difficulty lies with the inactive stocks of standard material. The best remedy of course is prevention. With the better methods of arriving at the proper quantities of material to order, due to the almost universal use of stock books, there is no doubt that the percentage of inactive material to total stocks has been considerably reduced in the past few years.

There are certain stocks which from their very nature are and probably always will be inactive. Stocks of material carried for strictly emergency use are of this character. It is the practice on our road to carry emergency stocks of bridge lumber and piling and of track material on each operating division. These are charged to and are under the supervision of the division storekeeper. The quantity carried is determined in consultation by the storekeeper, the operating department and the bridge and building department. About all the storekeeper can do is to watch them closely and give special attention to particular articles which show the least movement. The accumulation of material by the operating and bridge and building departments is bad, for the time usually comes when a clean-up is made and the material is shipped back to the storekeeper, frequently increasing his stock of material of the kind shipped in beyond reasonable limits and giving him material which has often become obsolete while out of his care, but which could have been used if he had had it before.

In our experience the most effective remedies for reducing inactive stocks in storehouses and material yards have been:

First—Maintain stock books at all points where material is carried, whether this is directly in charge of a representative of the store department or of some other department.

Second—List all material of all kinds in the stock book.

Third—Carefully check the stock book to determine material that is surplus.

Fourth—Send with orders from division or district stores to the general storekeeper stock books or their copies and stock lists. Stock lists with a description of the material printed on them, containing information as to material on hand, due, ordered current year, ordered past year and surplus, if any, have seemed the better practice. This leaves the stock book in the hands of the stock man where it belongs, and the printing of the description of the material on the stock lists insures the material being listed on all reports to the general storekeeper in the same order and facilitates checking them with the orders in the general storekeeper's office. One of the other large railroads in the middle west is putting into effect a plan which appears very efficient and economical. Their storekeeper's stock book is printed in duplicate, two sheets being placed together, which are exactly alike except that the bottom sheet has perforations separating the entries for each month. A carbon sheet is placed between the sheets when stock is taken and after all the information has been filled in, the carbon copy is torn off at the perforations. These carbon copies for material in each classification are sent to the office of the general storekeeper where they are pasted in a printed stock book, a duplicate of the one which the storekeepers have. The slips from each store are identified by classification and page number and placed in the general storekeeper's stock book next to corresponding slips from other stores opposite the items they cover. This gives the general storekeeper a complete stock book for the entire line with very little if any additional work.

Fifth—When making orders consult frequently and freely with responsible officers in the departments using the material ordered for stock as well as for special work.

Sixth—Assemble surplus material as far as practical at the general or distributing store, where it is readily available for use at any point where needed, storing it with other material of similar kind so that it will be constantly before the stock man and may be used by him at every opportunity in filling orders—frequently by substitution, this always with the consent of the party ordering.

Seventh—Where surplus material is of such a character or conditions are such that it would entail unnecessary expense to move this to the general or distributing store, a special report to the general storekeeper or the general or distributing store of all such material with complete descriptions, etc., should be made.

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Eighth—Advertise surplus material among the departments which might be able to use it. On this I wish to lay particular stress. We have found that with the knowledge which they get, from the periodical reports we make them, of engines, pumps, boilers, large pipe, second hand lumber, brick, track material, etc., etc., on hand, the engineering, operating, mechanical and bridge and building departments are frequently able to arrange their plans for work to use such material instead of purchasing new. The storekeeper must have a knowledge of the purpose for which such material was originally purchased or can best be used and bend his energies in directing toward it the attention of the men who order material for this particular kind of work.

Ninth—A surplus committee composed of praetical men from the mechanical, engineering and store departments, periodically visits each storehouse and material yard, going over the stock in detail with the storekeeper and his stockmen, considering all surplus material of all kinds whether obsolete or not and authorizing scrapping of obsolete material or surplus material where, upon thorough investigation, this is found advisable.

Possibly the most important feature of our present plan is that of working closely with the departments who use the material. This accounts for a great deal of what success we have had. The storekeeper who can keep closely enough informed as to market conditions affecting time of delivery of material, and so gage his estimates of future requirements that he will not order and receive more material than he actually requires, will not have to worry much about inactive stocks.

H. A. Anderson (Pennsylvania):—There are several conditions which have heretofore been largely instrumental in the creation of surplus and inactive items:

First—The ordering of material in quantities largely in excess of actual current requirements.

Second—The ordering of material months in advance of requirements, considered necessary on account of stringent market conditions.

Third—The decrease of working hours and force.

Requisitions should be based on the average consumption for the preceding three months, considering amounts on hand and due on requisitions, as well as the length of time requested by the purchasing department in which to furnish material under normal conditions. There are, of course, many circumstances entering into this matter, over which the stores department has no control. This is especially the case on the larger systems, where heavier and more modern equipment is constantly being placed in service on main line divisions. This results in the transfer of the lighter equipment to branch line divisions, or the disposition of such by sale.

Changes in designs and standards are usually effected without regard to the stock of parts on hand made from previous designs, and have resulted in many items becoming surplus or inactive. To correct this, instructions should be issued that material of older design be disbursed until the exhaustion of the stock, except where a question of safety may be involved. In this latter event, arrangements should be made to have the balance of the original supply disposed of through the scrap account, immediately upon receipt of the new material.

It has often been considered necessary, particularly during periods when mills and factories are booking orders many months in advance, to request stores departments to anticipate requirements from three to nine months in advance of deliveries. This practice has also been responsible, in many instances, for articles finally finding their way to the lists of surplus and inactive material. The fact that manufacturers frequently fill orders in one consignment, instead of shipping in accordance with the delivery program as specified on requisitions, has a tendency to destroy the belief that such advance requisitions are necessary.

Decreases in working hours and force are productive, perhaps, of the greatest quantities of surplus stock with which we have to contend. Conditions making necessary such curtailment in hours and force are not discernible any great length of time in advance, and the reductions are made only when the question of expenses makes them imperative.

In determining what amounts shall be reported as surplus, care must be exercised to consider the issues of preceding months, and in the case of "seasonal" material, to issues during a corresponding period of the previous season. In addition, it is also essential that consideration be given the amount of stock permitted to be carried on hand, and the length of time required in which to replenish the stock by requisitions on manufacturers. After deciding upon surplus items, a list should be prepared and forwarded to the officer responsible, under the organization, for the transfer of such material. The list (upon receipt by the purchasing agent or general storekeeper), should be checked with all requisitions calling for the purchase of material. As a rule, the men doing such checking are those who have not had an active and intimate connection with supplies and for this reason detailed information should be such as would enable them to transfer an advertised article instead of allowing orders to be placed with manufacturers. Such transfer will be to the ultimate good of the railroads, even at the expense of a small charge for re-handling and movement over the road, as they will avoid the outlay of additional capital.

The accumulation of inactive and obsolete material has been brought about chiefly through the release of equipment, changes in design and standards and to reclaiming from the scrap of items without regard to requirements. There is little that can be done in the case of this material, lacking authority or ability to disburse the old standards until exhaustion of the stock, but to consign it to the scrap pile. The proper course would be to make disposition immediately upon the appearance of the inactive items. Having considered the disposition of an item after being reported as surplus for twelve months, and deciding to prolong its existence, except where, during such period, there may have been call for the article, it is thought that such item should be discontinued on the surplus list and included on the list of inactive and obsolete material. This inactive list should contain the same information as the surplus list, except that the entire stock, as a rule, should be shown. In the column "Number of Times Reported," the first appearance of the item should be indicated as "one." It should be necessary that its listing among the inactive items be continued only three or four months before again being considered for final disposition. This last "attention" should be given jointly by the representatives of the operating and stores departments, and, lacking visible use for the material, it should be scrapped and the difference between the carrying and scrap values debited to the expense account to which the material would have been charged, had it been actually used. In so disposing of either surplus or inactive material, particularly on the larger systems, it is likely that a small quantity of more or less serviceable material will be scrapped, but it is inconceivable that such seeming waste can total in money value the expense incurred by perpetuating the material in stock, considering the interest on investment and the clerical labor involved in handling and in monthly accounting for and reporting such items.

In connection with the lists which have been mentioned, it would be well to state that these would seem hardly necessary when the railroad is operating under the general storehouse plan. To such storehouses, we presume, would naturally be shipped all surplus and inactive material and the final disposition of it be there decided.

Finally, the fundamental principles in successfully controlling inactive and obsolete stock are harmony and co-operation between the operating and stores departments, first to avoid, if possible, the accumulation of such material, but lacking in this, to constantly keep the items of material before us and follow a regular system by which the disposition will be promptly accomplished.

E. J. McVeigh (Grand Trunk):—How do we acquire inactive and obsolete stock? There are several ways. One is by bad ordering; another, ordering material before the work to be done has been fully and carefully planned. Then there are, of course, the cases where our executives find it advisable to make changes irrespective of careful and proper planning. It is also created by changes made in our methods and equipment in an effort to

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meet the changing conditions of our country. Under the system in vogue on most roads today the storekeeper cannot do very much toward minimizing this stock. I have found that in proportion to the quantity of material used by them, the departments ordering obsolete and inactive material are, the electrical, bridge and building, engineering, motive power, car department and stores. And they are guilty in the order as named. Unfortunately, there is a tendency toward the evil of dealing with the electrical department directly, and permitting the separate storehouse. The engineering department creates inactive, and at times obsolete stock, through the action of young and inexperienced men. The bridge and buildings department create inactive stock by ordering material that they hope, or expect, to use this year, but find they can't. And they create obsolete stock by making changes and getting away from standards. They may not always be at fault in the matter, but they do it.

The motive power and car departments create little inactive, but much obsolete stock, and this is natural, and we all understand it. Our engines and cars with their spare parts are constantly going out of date, and these must go to the scrap pile.

What inactive and obsolete stock does the storekeeper create? I confess I am at a loss to point out wherein he does this thing. He orders what he knows from his experience will be called for by the different departments. If the departments make changes without notifying him that such changes are to be made, and by so doing leave him with material on hand, is such material made inactive or obsolete through his action? I say, no.

Assuming that the storekeeper has the authority and facilities he should hold up requisitions for material that he knows will become inactive and obsolete. He should see to it that there is no such material scattered over the road under his jurisdiction, but that such material (and there will always be some in spite of all he and others may do to prevent it) is collected at the stores, all left overs, ordered by mistake, ordered in excess of requirements and scrap.

W. D. Stokes (Ill. Cent.)—In summing up the general efficiency of the supply department on a railroad, two things are invariably considered: first, the ability to satisfactorily and promptly deliver material as required for maintenance and operation, and second, the conservation of stock or material and the supplies investment.

The causes contributing to a surplus of either staple, hard or obsolete stock are numerous and do not always indicate, upon analysis, either carelessness or indifference. Change of plans involving special materials, work deferred on account of insufficient appropriation previously anticipated, transfer of equipment between operating territories, change of standards, and purchases in excess of requirements in taking advantage of favorable market conditions either of price or delivery, are the most frequent reasons and are perfectly consistent and to be expected, as are also anticipations of slow deliveries or requirements in excess of what proves to be the actual case as frequently occurs.

In connection with the foregoing, repairs either temporary or permanent made in lieu of replacement after special and expensive items have been secured, or ordered and in such status as to necessitate taking off the consignor's hands, result in materials being, often by reason of their character, dead stock for an indefinite period.

Careful scrutiny of requisitions before affixing signatures and investigation where thought necessary; frequent consultations with operating officers with a view toward keeping in close touch with anticipated programs and a feeling of confidence and the utmost cordiality between the storekeeper and his customers, will probably eliminate a number of sources for future worry and add to the efficiency both of the individual and the department.

In the movement of materials for any purpose and more especially when not for prospective early requirements, economy in the use of facilties is obviously an important consideration. Back hauls should be avoided and as far as possible, loading of cars to less than capacity tabooed.

On roads equipped with a general storehouse, the simpler plan is to ship to it all surplus and obsolete material, and while there is no question as to the effectiveness of this system from an individual standpoint, it is objectionable, for various reasons, in that it places a premium on indifferent storekeeping, is expensive of transportaton and disturbs the general store's stock by reason of its being impossible to anticipate the extent to which the fluctuation will affect it, and the necessity for maintaining a staple stock irrespective of such unlooked for additions. Furthermore, there is comparatively little reduction in total stock balances effected, and except for prompt weeding out purposes, it is difficult to see what may be accomplished in this manner.

In departing from indiscriminate or hap-hazard methods, the first consideration would seem to be the establishment of some tangible system of interchange between stores, and in order to accomplish this result it is obvious that a knowledge must be had by all interested, of location and amount available, and for the sake of rapid consummation it has been the practice, to some extent, to make up at each division store, periodically, an itemized list of all surplus articles, sending one copy to each of the other stores and to the general store; and from this in lieu of ordering on the general store, requisitions are made between stores and prompt action obtained.

Another plan, apparently ideal, for medium sized roads, is to so arrange requisition forms as to show in addition to amounts on hand, due and ordered, the average monthly consumption, and from these the general storekeeper issues what may be termed a general store back-order on division stores, to serve in lieu of orders on the purchasing agent.

An elaboration of the foregoing and possibly the most efficient of any, contemplates having all items printed in stock books in order to insure uniformity of order and to have a surplus stock list printed in the same order, arranged to show the amount of surplus of all items in the same order, together with the average monthly consumptions and the amount on hand, in order to give the general storekeeper an opportunity for getting a line on the situation; such stock lists to be forwarded with the requisitions or at a time specified and used by the general storekeeper in making transfers, the idea being that with the items appearing in the same rotation as on the requisitions written from the stock books, the work of location would be minimized; furthermore, the necessity for sending stock books with the requisitions would be obviated.

Semi-monthly lists of hard stock, material on hand for work deferred, and principal items of heavy character on hand, will, if furnished the general storekeeper, ofttimes result in movement, in lieu of purchases.

One thing must be an absolutely imperative requirement, viz.: Correct information given regarding the amounts on hand and due, as without this precaution no hope can be entertained of intelligently coping with the situation.

Disposition of obsolete material presents a less complicated problem and is dependent largely on decision, location and amount. By decision is meant the passing by competent operating authority on items set aside or relieved, in order that the storekeeper may take further steps toward disposition as obsolete, when so determined; this is usually the greatest drawback, largely due to an aversion to burdening operating expenses with the shrinkage, although occasionally lack of time is advanced as the reason.

H. Stevens (Nat. Ry. of Mex.) in his paper on this subject, laid particular stress on the maintenance of way department material, mentioning various materials and methods of application that gave good results. He stated that a certain type of ballast car that had the sides opening up was well adapted for handling treated ties on account of their slippery nature. A storage yard for these ties would be a valuable adjunct to the treating plants, to allow their shipment at times of least traffic. The culled ties could also be used for temporary work, thereby saving the first class ties for more important work. He mentioned the use of old rail in making yard frogs and crossings. There should be a

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shop for this work, also for the repairing of switches, frogs, etc. All frogs and switches could be shipped to a shop of this kind before being scrapped, so that the usable material could be saved. In speaking of lumber he mentioned the good results being obtained by the L. S. & M. S. at Collinwood, Ohio, by the use of a resawing machine for reclaiming old lumber and timber which is cut into ties, crossing plank, bridge members, etc.

He also spoke of the importance of purchasing the highest grade of track tools obtainable, not only from a maintenance point of view but from the better results being obtained by them. All materials should be carefully tested.

In regard to emergency material he spoke of the emergency cars on the L. S. & M. S. which provide for the roadmasters on the important divisions and are so distributed along the line that with the co-operation of the operating department a broken frog or switch may be repaired in a comparatively short time. By using these cars the emergency stock of frogs and switches has been materially reduced.

Discussion.—A committee including the chief draftsman, chief car inspector, and men from the engineering department, besides the local men, was recommended for following up inactive and obsolete material. By this method the material could be better disposed of, especially those parts belonging to foreign cars, and the chief draftsman would be more particular to notify the storekeeper in advance of changes in standards. The system in vogue on the Northwest system of the Pennsylvania was also mentioned, whereby the chief clerk of the motive power department acts as the general storekeeper.

COUPLER MARKINGS.

A. H. Young (St. L. & S. F.):—We have about 40 different types of couplers on the railroads of this continent and the number is still increasing, although it is several years since the Master Car Builders' Association took up the question of designing and adopting a standard M. C. B. coupler. From an economical standpoint, the question of supplying repair parts for so many different kinds of automatic couplers should be a strong argument in favor of a single standard, and a coupler that could be used in repairing either foreign or system cars. The railway storekeepers are just as deeply interested in this matter as the master car builders or other railway officers, because it means not only less delay and less trouble in making repairs to foreign equipment, but will bring about a reduction of several thousand dollars in the amount of repair parts now necessary to be carried in stock by every railroad in this country.

We should take some action to have all coupler parts marked in such a manner that they may be quickly and correctly identified. This can no doubt be accomplished without adding any expense to the manufacturer, or much trouble to the Railway Storekeepers' or Master Car Builders' Associations, by compiling a complete list of all couplers now in use, assigning a number to each coupler with the parts classified under the proper heading and designated alphabetically; the coupler number with the alphabetical prefix to be cast in each piece by the manufacturer.

If all coupler parts were made with this identifying mark, it would enable the storekeeper or car department foreman to use the greenest and cheapest laborer on his force to handle this class of material without the assistance of experienced and higher priced workmen.

[A committee was appointed to work up a system of markings of couplers for better identification.]

SPECIFICATIONS FOR AND TESTING OF MATERIAL.

W. Davidson (Ill. Cent.):—Ordering material by specifications will help a storekeeper's stock for the reason that the company will get full value for every dollar spent; they will get what they desire made up or furnished according to their own specifications. Purchasing first class material will bring about a saving in more ways than affecting the stock of the storekeeper. It is expensive to apply inferior material to equipment, etc., at a loss of labor in removing and applying again. If a company buys material by specifications, in time it will reduce stock, as good material lasts longer and gives better results.

Specifications, when made up, should be considered from all sides so that they will not be too rigid, but should be plain, short and to the point and as near to commercial specifications as practical.

It is not necessary to make up specifications for all material, but only for such items as lumber, axles, wheels, tires, engine and staybolt iron, common, round and flat iron, brass, malleable, gray and steel castings, rubber goods, firebox, boiler and tank steel, paints, oils, frogs, switches, etc. All of the above material should be inspected at point of shipment where practical and if not, requisition should specify "To be inspected at destination."

Material not ordered by specifications should be watched by the storekeeper and the parties using it should be at liberty to criticize and complain and report any inferior articles received. This will keep a check on the engineer of tests or inspector or whomsoever the company has to inspect the material. The inspector should be required to go over the storekeeper's stock on hand with a view of catching material furnished that is inferior, which has not been ordered by specifications, or inspected at point of shipment, reporting such articles to the storekeeper, so that he can return to manufacturers. A manufacturer having a shipment or two returned will undoubtedly wake up and furnish a better grade of material on future orders.

J. S. Sheafe (engineer of tests, Illinois Central):—If for no other reason than that of appearance, the test department should be separated from the purchase and store departments. As the mechanical department uses the bulk of the stock carried, it is perhaps better for the inspection to come directly under such jurisdiction. With material purchased without specifications and with more or less indifferent inspection the loss to a company would, without doubt, be more than enough to pay for the support of a testing department. It is advisable for each road to have its own specifications and to put in, whenever possible, something which will prevent the substitution of poorer material.

On the Illinois Central a specification is blocked out and several copies are sent to the purchasing agent who submits one to each manufacturer for his criticism. It will always be found that this criticism is forthcoming and from the whole it is possible to fix the high limits of requirements to each of which two or three companies have agreed. If necessary, as sometimes happens, a revision can be made and again submitted.

On the one hand the specification should protect the companies' interests; on the other, it should not be used as a barrier to prevent the acceptance of material which is commercially good; that is, by means of a technicality to work a hardship on the manufacturer. Brevity is quite as much to be desired as any other one thing.

The testing of material is simply the following out of carefully predetermined methods, together with a little judgment or common sense. The arbitrary rejection of a large quantity of material on a technicality should be frowned upon, unless it is repeatedly evident that the manufacturer shows no disposition to improve his product. Although all chemical laboratory, and some physical laboratory, work is more or less technical, yet the constant effort should be towards practical simplicity.

Chemical laboratory results are of secondary importance, in many materials tested, to a practical performance or comparison. They are valuable more as a check or as a prophecy as to what the material will or will not accomplish in service.

As for the effect on stock of material inspection there is no reason for the store department to suffer any inconvenience in

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normal times. The storekeeper desires quality in material quite as much as any other official. Credit or discredit, directly or indirectly, easily reflects upon him and his department whether or not deserved, if he distributes poor material. He has as close a working knowledge of what the material is, where it belongs and what function it is to perform, as any one except the man who directly uses it. He is as anxious to have a supply of any needed commodity as the man who wants to use it. He appreciates the loss of revenue resulting from engines and cars held up for material. Such being the case, and with close working relations, the store department will never be affected by any inspection, or rejection, of material. If necessary to accept any rejected material all the storekeeper wants is an explanation as to wherein it is too poor for use and he will do his part, and more, towards keeping it away from the railroad premises.

It has always appeared to me that the purpose of the test department should be to serve and not to dictate, to strengthen and not to tear down, and to be an asset rather than a liability. If it is modeled along these lines it is fulfilling its purpose and will render itself more and more worthy of recognition.

F. H. Hanson (L. S. & M. S.).—The purchaser who does not inspect or test material bought in the open market very often receives material that has been rejected by the purchaser who does inspect or test, or who has his material furnished to specifications.

The method of purchasing only a few brands of material, of long established excellence and reliability, is reasonably safe and invariably insures the purchase of good material; it is, however, frequently found to be expensive, for while the product may be first class, its cost is greatly in excess of that of material of less popularity but which might withstand the necessary tests admirably.

The practice of purchasing on the basis of specifications and the testing and inspecting of all material places all bidders on a fair and equal basis, and at the same time protects the manufacturer against unfair, discriminative and unwarranted complaints. He knows what is wanted and the specifications show him what will be accepted.

The tests and inspections are merely means of determining whether the material furnished is of the kind and quality ordered, or, in other words, to prove that the requirements of the specifications have been complied with.

Discussion.—Inspection should be rigid and in accordance with specifications, for otherwise poor material will be obtained, and it will not be fair to manufacturers who make first class material, as they may be under-bid by less careful manufacturers. This refers to secondary material as well as the more important.

ROLLING MILLS FOR SCRAP DOCKS.

G. G. Allen (C. M. & St. P.):—The C. M. & St. P. has, for many years, manufactured practically all of its freight cars and a large proportion of its locomotives, and one of the best methods we have found for employing the rolling mill is to select the scrap—old arch bars, rods, etc.—shear them to the proper size, and roll them for special parts that enter into the construction of this new equipment, such as brake hangers, carry irons, brake jaws, bolts, etc., that are required in very large quantities. Thousands of drift bolts for the bridge and building department are made from re-rolled iron, in fact comparatively little new iron is used for common bolts for any class of work.

The mill requires a floor space of about 25 ft. x 32 ft. This allows space for storing billets as well as the rolled iron. The mill proper, which rests on a concrete foundation, is composed of two cast iron housings, set on rails similar to the rails of a motor, allowing of the adjustment of housings to accommodate different lengths of rolls. The housings are designed with rectangular openings which allow of fastening the bearings in which the rolls revolve. The bottom roll, being connected to the driving shaft, is fitted with a gear wheel which meshes with a gear on the top roll. These gears vary in diameter as the rolls vary. The rolls are made of cast iron, designed with ends grooved to act as key seats, and connected to the driving shaft. Different rolls are used in order to accommodate the different kinds of iron. The machine is belt driven, operating at the rate of 135 r. p. m., and is driven from a line shaft in connection with four 100-lb. cushion hammers and a 4-in. forging machine, by a 29½ h. p. motor. The mill requires 50 to 60 amperes running loaded and 20 to 30 amperes running light. A current of 220 volts is used.

The straightening table is a cast iron block, 5 in. thick, 3 ft. wide and 8 ft. long, and is located directly in front of the mill. The furnace is of brick work and cast iron plates, securely bolted together, and occupies a space at the side of the mill 17 ft 7 in. by 6 ft. It is arranged with one firing door and three material floors, Youghiogheny coal is used for fuel.

The initial cost of installation which includes patterns and experimental work, is as follows:

Rolling mill	$939
Furnace	450
Motor	669
Total	$2,058

Following is operating expense per nine hour day:

Roller, 33⅓ cents per hour	$3.01⅔
Heater, 22½ cents per hour	2.01½
Catcher, 24 cents per hour	2.16
Straightener, 24 cents per hour	2.16
Common labor, about	2.00
Fuel, power, etc	6.00
Total	$18.35

The billets used are from 12 to 24 in. long and the output of the machine varies from 3 to 6 tons per day, depending on the size of the material rolled. Various tests made from time to time, have demonstrated the fact that the re-rolled iron is of good quality and usually superior to the ordinary grades of new iron, the improvement being due to the additional rolling. Naturally, however, the quality of the re-rolled iron must depend to a considerable extent on the material of which the original bar is composed and can be determined only by a test of each piece, which would be impracticable. This element of uncertainty therefore, as a rule, precludes the use of the product of the mill for the more important work, the exceptions being instances where the material in the billets is known to be good. The cost of rerolling, not including value of scrap, is from $3 to $6 per ton, according to the size of iron rolled, and the profits will average $10 per ton.

A recent statement from the general storekeeper of the Illinois Central is to the effect that the present average daily output of their rolling mill is 3½ tons, cost for labor and fuel $4 to $4.75 per ton, and profits $700 to $900 per month.

The Chicago & North Western is also operating a mill of the C. M. & St. P. type at their Chicago shops, reducing 1¼ in and 1⅝ in. round to ⅞ in. and ¾ in. The daily output is 1½ tons and costs about $8 per ton. In addition to this they have ordered an Ajax three-roll-mill which will have a capacity of from 2 in. to ⅝ in. It is the intention to operate both mills.

The Chesapeake & Ohio has an Ajax reclaiming roll on its scrap dock at Huntington, W. Va. This has been in operation about five months, rolling flats up to 1 by 3 in., and rounds and squares up to 2 in., turning out finished bars as long as 13 ft. 6 in. Total cost of rolls, furnaces, oil tanks, shed, motor, etc., in the neighborhood of $12,000. Average daily output 3½ tons, on which it is stated they are making a profit of $1,100 a month.

The Southern Pacific is operating a rolling mill on the scrap dock at its Sacramento general shops, with a maximum output of 190 tons and an average output of 90 tons a day. Total cost per ton, including scrap, $28.60—total profits per year, $56,000. This, however, would hardly be considered a rerolling mill proposition such as I have attempted to cover, but a general rolling mill, and I have no doubt that further information can be obtained that will be of great interest, especially to roads located at considerable distance from the base of supplies.

As the difference between the market price of new iron and

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the market price of scrap is not always maintained at the same level, the profits per ton from the operation of rerolling mills must necessarily vary. The greater this difference, the greater the profit, but with sufficient tonnage to keep a mill steadily employed and manned by a regular crew, the profits from such a mill as I have described, having a capacity of from 3 to 6 tons per day, should not, at any time, be less than $10 per ton.

Discussion.—The discussion led to the general subject of scrap. The Rock Island handles scrap with magnets on locomotive cranes at less than two cents per ton, as against twenty-five to thirty-five cents by hand. The Southern Pacific reclaimed $960,000 worth of scrap last year at about one-half the cost of new material.

STORAGE AND HANDLING OF ICE.

Three papers were presented on this subject, abstracts of which follow:

G. T. Dunn:—Storage for ice should be such that it will accommodate the supply for all departments at any one point for the entire season. Experience has taught us that the larger the volume the less shrinkage will be. Ice can be handled more advantageously if packed on its edge than if packed on its side. When stored on its edge it is necessary as each layer is placed in the house to adze off the cakes to obtain a uniform surface on which to place the second layer and so on. All crevices or cracks in ice so packed must be completely filled with snow when possible to obtain it or ice broken up fine. After the house is once filled, a covering of shavings, saw dust or hay, preferably shavings of about from twelve to eighteen inches, should be placed over the top.

Ice stored for use in icing refrigerators should, from an economical standpoint, be stored on its side in that it is broken up more or less when used for this purpose, and that less loss will be had through shrinkage.

We store our ice on a piece-work basis, and by so doing make a saving of from three to five cents a ton. The following are figures covering the storing of ice for the past three years:

1911	1,436.25 tons	Cost per ton.....$.230
1912	1,415.9 tons	Cost per ton..... .266
1913	1,520.6 tons	Cost per ton..... .251

These figures represent all expenditures such as the cleaning of the house, boarding up of the doors, covering over of the ice and removal, installation of hoisting engine, etc.

Clarence Foster (C. & A.):—The most important consideration for the preservation of ice is the proper construction of a house which will minimize the shrinkage. After the ice is in the house all doors should be sealed and the embankments around the foundations should be gone over to see that no air can get into the chambers from below. A slight opening for air underneath can cause havoc in the way of shrinkage. No separate chamber should be opened until necessary for the removal of the ice. It is necessary to have a little larger air space between the rows when storing artificial ice and we have even found it advisable to put thin boards between the layers. If care is not taken in the storage of artificial ice it will congeal and in some cases dynamite will be necessary in its removal.

We find at Roodhouse, where the re-icing is all done by hand, except the crushing, that one and one-half to two minutes is the average time needed per car. The ice is handled with crews of twelve to fourteen men. On the Chicago & Alton we add to the first cost of the ice in the house 30 to 33 1/3 per cent. to cover shrinkage, which leaves but a small amount for adjustment at inventory time.

The Roodhouse station is handled in the nature of an outside operation. Ice, salt, labor and incidentals are debited to a ledger account in the general storekeeper's office the same as material at a division or terminal store. Charges to departments for ice furnished, and hills rendered versus shippers are credited. Any profit or loss accruing from the operation of the station is cleared monthly through operating expenses.

D. C. Curtis (C. B. & Q.):—Ice 22 in. square is the best size to pack and handle. A competent inspector should be at the loading point or field to see that the ice is furnished in accordance with the specifications. An inspection at the loading point saves paying for hauling and handling ice not suitable for packing, and there is also an added saving in the shrinkage caused by packing irregular ice.

A large loss of ice is caused by the methods used in taking it out of the house. It should be so handled that the cakes taken out will be the same size as the cakes packed. The care ice houses receive, is the determining factor as to what the shrinkage will be. In insulated houses, openings between the sill and foundation will cause an enormous shrinkage and in some houses this has caused the ice to melt for a distance of 6 ft. from the wall the entire height. Insulated houses should have no openings to the outside air, and should be as near air tight as it is possible to make them.

Ice packed in sawdust should be gone over at least twice a week to see that all cracks and openings are closed. Sawdust on top of ice will crack in ten days, so that 20 per cent. of the top surface of the ice will be exposed and this soon causes holes, and a very large shrinkage. Hay is a better covering for ice than sawdust, as it will not crack or form openings and expose the ice to the air. The space between the ice and roof of covered ice should be as large as possible, and so arranged as to have perfect ventilation, to remove the hot air caused by the sun's direct rays on the roof.

The cost of construction and insulation of ice houses that will pay for the interest on the investment can be closely figured and is a matter that should receive very much more attention than it has in the past. The accompanying table is based on observation and shows that shrinkage pays for the cost of insulation where ice is worth over 80 cents a ton in the houses:

House No. 1 is a house having several thicknesses of good insulating material such as lith cork board, water proof paper, sawdust, etc.

House No. 2 is a house with $1.00 less per ton of storage room spent for insulation.

House No. 3 is simply a shell to hold the sawdust or hay packed around the ice.

	House No. 1.	House No. 2.	House No. 3.
Cost of construction per ton of storage room	$4.00	$3.00	$1.50
Per cent. shrinkage	10	25	40
Additional cost for additional capacity to provide for shrinkage	.00	.45	.45
	$4.00	$3.45	$1.95
Interest at 6 per cent	$ .24	$ .207	$ .117
Depreciation 4 per cent	.16	.138	.078
Insurances, taxes, repairs, etc., 4 per cent	.16	.138	.078
Total cost per year of investment	$ .56	$ .483	$ .273

To provide for the loss by shrinkage using house No. 1 as the basis, ice in the different houses costs:

	House No. 1.	House No. 2.	House No. 3.
At 50 cents per ton	$ .50	$ .575	$ .65
At 80 cents per ton	.80	.92	1.04
At $1.20 per ton	1.20	1.38	1.56

The amount of money lost per ton each year by shrinkage using house No. 1 as a basis, would be:

	House No. 1.	House No. 2.	House No. 3.
At 50 cents per ton	$ .00	$ .075	$ .15
At 80 cents per ton	.00	.12	.24
At $1.20 per ton	.00	.18	.36

From the above table it will be seen that the difference between the additional cost of investment for construction of house No. 1 and the amount of money lost by shrinkage of ice in houses No. 2 and No. 3 will be as follows:

	House No. 1.	House No. 2.	House No. 3.
Ice at 50 cents per ton—			
Cost of investment	.....	$ .027	$ .287
Loss by shrinkage	.....	.075	.15
Ice at 80 cents per ton—			
Cost of investment	.....	.027	.287
Loss by shrinkage	.....	.12	.24
Ice at $1.20 per ton—			
Cost of investment	.....	.027	.287
Loss by shrinkage	.....	.18	.36

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It will be seen that when ice costs 80 cents per ton in the house, it would only cost 7.7 cents more to build house No. 1 than house No. 2, and the saving in the amount of money lost by shrinkage would be 12 cents, or it would save 4.3 cents on every ton, and the insulated house No. 1 should be built. When iee costs over 80 cents per ton in the house, it pays to build a well insulated house.

However, the question as to how early in the season the ice will be used, should be taken into consideration. In houses of more than one room it would pay to construct one of the rooms cheaper than the others, and use the iee out of this room first, before the real warm weather begins and heavy insulation is necessary.

It is poor policy to build a house of over 1,500 tons capacity that will require packing the ice in sawdust or hay, as it is expensive to buy the packing and waste it all in 2 or 3 years, to say nothing of the labor involved in the packing and handling. Where ice is cheap it is not necessary to build an expensive insulated house, but the ceiling should have as much, or more, insulation as the walls. The rooms should be as near air tight as it is possible to make them, and the ice should be hoisted by a skip hoist through an opening in the ceiling and then lowered by counterbalance elevator or gravity chute to a cooling room, and used from this cooling room as desired.

The service buildings for taking care of ice for passenger car use are the largest producers of shrinkage on a railroad. A service building should be well insulated and have a small vestibule equipped with a bench properly arranged for washing, draining the water off, and cracking the ice in a bin where the ice can be easily shoveled out. All this should be sanitary and so arranged that it is not necessary to touch the ice with the hands. This vestibule should be large enough to hold the necessary ice carts and receptacles which are needed in connection with this service. In icing passenger cars at the last division before reaching terminals, only enough ice should be put in the coolers to run the car to its destination, with, of course, enough extra to take care of the average delay.

There is a big loss of ice in refrigerator and cream cars by not keeping them in continuous service. In loading refrigerator cars in the winter time, a canvas curtain is used over the door to prevent the cold air getting in. This curtain is used at but very few points in the summer time to keep cold in. Instructions should be issued to all freight agents to use the canvas curtain whenever it is necessary to keep the door open. The use of these curtains will prevent a big waste of ice.

It is true the first cost, or cost f. o. b. car, is small, but added to this the cost of hauling, cost of packing, interest, depreciation, and taxes, etc., on the building in which it is stored, brings the cost up to where it is too expensive to allow ice to melt where it can be prevented. When the stored supply is exhausted in the hot summer months, the purchase price of ice is then $1.50 to $3.50 per ton, and this is the value of the ice which has been allowed to melt. Each year it costs thousands of dollars above the winter market price for the ice which it is necessary to purchase in summer. On a railroad of 5,000 miles or more, I daresay the waste in ice amounts to from $50,000 to $100,000 per year.

Discussion.—Mr. Roth of the Burlington claimed that his road saved $50,000 by putting the handling of ice in the hands of the storekeeper.

OIL HOUSE AND WASTE STORAGE.

C. S. Coe (A. T. & S. F.):—The Santa Fe has discarded the old time oil house, maintained separate from the storehouse, which necessitated two extra employees, one for the day and night, and instead a reinforced concrete basement has been adopted of sufficient size, according to the importance of the division point, to handle the illuminating and lubricating oils, varnishes, japan, greases, compounds and everything required in this class of material. This oil basement is situated as far from the storehouse as is desired, the oil being drawn by the Bowser system of long distance pumps situated in one end of the storehouse. This places the issuing of oils with the store department employees the same as other materials and eliminates the employing of special oil house men.

One of our most essential features is the handling of oil from the general oil house to the division oil houses. To accomplish this successfully, about forty-five 10,500 gal. capacity system tank cars are especially assigned to the store department for service at the general oil house. All oils ordered from the oil companies are consigned to the general oil house and transferred to these assigned system tank cars, thus saving per diem or demurrage charges. We have adopted colors for the different kinds of oils so that all employees will know at a glance what kind of oil is in a can, drum or any oil container, and will also recognize it as company material and handle accordingly. The assigned tank cars are also painted with a 24-in. stripe around each end of the tank in accordance with the above, and are stenciled for the kind of oil they are used for, boarded for store department service, and never used for any other kind of oil unless released by our department. All hose, pipes, valves, connections and other fittings are also painted according to colors, and there is no chance of getting oils mixed in taking the supply.

These tank cars on leaving the general oil house under load are routed over the line, making from five to ten points, according to the distance and the amount of oil required; they are then returned to the general oil house, reloaded, and again routed out for another trip, and are routed so each tank makes a trip about every thirty days; we have enough tanks to cover the entire road in this period.

The general oil house is a one-story conerete building having a basement, 50 ft. wide by 160 ft. in length. The storage capacity for illuminating and lubricating oils is about 125,000 gal. and consists of a series of 10,000 gal. tanks. The storage for turpentine, varnish, japan, paints, linseed oil and similar materials consists of a battery of tanks erected in such a way that by the use of an air hoist and carrier, barrels can be raised to a track and run by gravity to any desired tank and emptied. The material is then drawn for shop use or shipment by the long distance, automatic measuring, Bowser pump system. A sufficient space is partitioned off by a steel door where the heavy paste and compounds are kept in open stock for retail purposes.

On the main floor are located 32 self-measuring Bowser pumps. Steel counters are used for wastes and journal packing, while standard steel shelving is used for can paints and similar material. One side of this floor is used for storing of waste in bales and will be partitioned off with a fine screen wire to protect it from pieces of oily waste or anything which might cause fire.

Eleven power pumps are installed for the transferring, unloading and loading of tanks and supply cars, and for filling of drums and barrels for road shipments. These pumps have a capacity of from 8,000 to 10,000 gal. each per hour, and the maximum quantity of oil that can be transferred in a day is almost unlimited.

Indicating gages, in appearance similar to a steam or air gage, register the amount of oil in the storage tanks in the basement at all times, and can be placed anywhere in the building, on the wall, or in the office, and show at a glance just what oil is on hand, thus saving the necessity of going to the basement to take measurements.

Discussion.—The Illinois Steel Company saved $8,000 by adopting the centralized oil house at their plant.

EFFECT OF STORES DEPARTMENT ON OPERATING COST.

H. C. Pearce (So. Pac.):—A well-organized stores department on a railroad has the same direct effect and influence that a skillful and economical housewife has on the economical operation of the household.

How to measure the value of a well-organized, efficient and economical supply department in dollars and cents is as im-

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possible as it is to measure the value of an efficient, capable and economical administration of household affairs. The work is so far-reaching and so interwoven with all departments that it is impossible to segregate the unit of saving into dollars and cents, but its need and usefulness are so apparent and its field is so well defined that it is fundamental. The real value of a well-organized and efficient supply department can only be determined by the final results of the operation of the property. Its service should be measured from day to day. The condition of the property under its control shows for itself. The investment is indicated by the balance sheet. The real economy which is effected will be best shown by the percentage of *purchases* to the *issues* over a period, with knowledge of conditions.

I appreciate that it will be said that this is not an accurate unit of measure for the reason that some roads manufacture more than others, etc. This is true, but it will not affect comparisons on the same railroad and statistics have little value other than for comparative purposes and with full knowledge of conditions.

The supply department should be organized and operated to *reduce* purchases and not to *increase* them. The unit of price, unless service and need are considered, is a false one. The real unit is making the most of what you have and making everything give its full measure of usefulness and so handling and disposing of the salvage as to obtain every dollar there is in it, the ultimate purpose of it all being the *net* cost of materials and not the *first* cost. The economical housewife does all these things and in addition, which is probably more important than anything else, by precept and example lays the foundation for a self-respecting, self-supporting and capable family. This is what an efficient supply organization should and will do for a railroad.

It is to this department that we must look for savings in values, which are otherwise generally overlooked. The dollar is watched, checked and supervised. The same value in material hardly receives a thought. Our railroads must look to their supply departments to protect their materials to the same extent that it now looks to its accounting and treasury departments for the protection of its dollars.

The first purpose of a supply department is to supply the needs of the railroad. It must be organized in such a way that what is best suited for the purpose can be laid down promptly at the time it is needed at the least cost. The saving made by having an organization of this character can never be shown by statistics. It is represented only in the cost of the work.

Its second purpose is to market the salvage. With railroads having their own foundries and rolling mills, the railroad itself is its best customer and salvage should be handled in such a way as to apply it to the requirements of the railroad to the best advantage.

I will not attempt to go into detail as to how the salvage on our railroads should be handled, controlled and marketed. This matter was presented at last year's convention and in an article appearing in the *Railway Age Gazette*, issue of December 13, 1912. I wish to simply point out the one fact that the use and marketing of salvage is of second importance only to the providing and caring for the company's property.

The third purpose of a supply department is to handle its material with the least expense, always taking into consideration the first two principles, i. e., that it is necessary to provide and properly care for what you have.

The fourth purpose is to prevent deterioration and reduce interest on investment, deterioration for want of proper care and housing facilities, system, etc., changes in standards, changes in plans, curtailment of forces, lack of proper facilities and lack of proper care. The losses here are enormous. Very few railroads appreciate the enormous amount of money that is being lost annually in this way. An efficient organization should be such as to have perfect control and knowledge of every item on hand and on order and the organization should be so conducted as to reduce losses by deterioration, changes in plans, changes in equipment, etc., to the lowest possible basis. Interest on the investment is a big item and one which should be fully considered by any well-organized department, but this is one of the items which are exposed and the management can easily watch and protect this item, and, further, if the other purposes I have mentioned are taken care of, this item will take care of itself.

I have purposely avoided going into statistical details. My purpose has been to simply present certain fundamentals underlying the organization and the results that such an organization would have on the net revenue of a railroad company.

N. M. Rice (A. T. & S. F.):—The effect of a well-organized store department on the operating cost of a railroad, is far-reaching. In their organization the Santa Fe purchasing and stores departments are somewhat different from those of other railroads, in that the head of each reports to the same vice-president and while to a certain extent each is a separate department in itself, yet at the same time the two departments work in accord; consequently the assistance given by either department to the other brings advantageous results not obtainable otherwise.

Primarily, purchases made of railroad material and supplies, governed by quality and controlled by competitive bids, as well as those items bought under contract, assist very materially in laying the foundation of an economic effect on the operating cost; however, should the effort stop here the surplus and consequent waste thereafter to be encountered would destroy entirely the results thus far obtained.

It is well known that a railroad operating under most favorable circumstances, in so far as management is concerned, will suffer, from a monetary standpoint, from gross errors made in over-estimates of material required in construction of renewals. Then again there is an expensive outlay to meet the demands of new conditions. To reduce the expensive effect of conditions such as these, the store department must keep in touch with the situation and handle through its channels, the surplus and out of date material, giving credit to operating accounts, and then by application, by substitution, wherever possible, prevent expenditures, proved unnecessary by the acceptance of the substitute. The sources from which reclaims can be made are numerous and embrace items ranging from large and expensive bridge timbers left on the right of way at some bridge to serviceable second-hand track spikes found in the scrap yard, and which when returned to the stock of the store department and the proper operating account receives credit therefor has its effect on reducing operating expenses.

In a great many cases even where full care and caution are used by the heads of the different branches of the operating or constructing department, in figuring estimates and in placing requisitions for material required for some specific work, changes made after the material is on the ground and charged to that particular work, will oftentimes result in several dollars' worth of material being left unused, which if not taken up and turned back to store stock for credit and used elsewhere, will necessarily stand charged to the work for which it was originally ordered, and even though at that particular time it is the intention, at some future date, to use this material in connection with similar work at some other point, the probabilities are when that time arrives, if ever, it will be found that deterioration will prevent, thus necessitating another supply of material and its consequent additional charge. Conditions, however, on the Santa Fe, under which the store department endeavors to make its system effective, practically demand the prompt return of this material to its jurisdiction, and there have been years when the value of material returned to stock, on the entire Santa Fe system, amounted to over $2,250,000, or approximately 6 per cent. of the issues. In these figures, however, are included approximately $420,000 worth of serviceable material reclaimed from scrap.

The mechanical working stock at terminals and shops embraces exactly the same features as the line stock, only it is conducted

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on a larger scale and carries with it the additional advantage of being located in close proximity to the work for which it is required, thus dispensing with the necessity of mechanical department employees making long trips for material and thus securing their greater application to the work. This principle of handling is in universal practice on practically each and every item of material, the objective point being to prevent charges for material until actually required.

With the practice of issuing supplies and stationery from supply cars, which run monthly, the requisitions are made for thirty day needs only, instead of considering it necessary to carry on hand an extra 30 or 60 day stock for emergency, thus reducing charges to this class of operation, monthly, to a minimum.

One of the many economic effects on operation can be procured in systematizing the storing and distributing of oil. In the first place the cost of the oil is placed at the minimum, when proper storage has been provided therefor, by purchasing for delivery in tank cars. The use of steel tanks for storage and self registering pumps for delivery eliminates the inevitable attendant loss, not including increase in purchase price, when bought in barrels and issued therefrom through faucets. Practical tests by competent engineers show losses, in the barrel and faucet method of handling, of from 5 to 25 per cent. on lubricating oils and on volatile oils the loss is much greater.

Another source from which the store department can always draw means with which to affect operation is the scrap yard. Each and every ton of scrap picked up on the right of way or at terminals and sent in to the central scrap yard is just that much reduction in charges to operating accounts, and the more care and diligence that are employed in sorting the scrap and in the reclaiming of serviceable material, just that much more benefit will accrue. Brass, of course, is the one item of scrap, which on account of its value, stands out clear and distinct as requiring more care, more diligence in following up, than any other single item. Monthly comparisons of receipts of scrap brass with purchases of new, as well as care in safe storing are essentials, which, if overlooked, play havoc with returns in this class of scrap. When one takes into consideration that the cost of new brass on the Santa Fe System for one year is between $700,000 and $750,000, while the value of scrap brass sold is approximately $500,000, it is needless for me to add anything further to prove the effect on operation by this one item of scrap alone.

Reclamation and utilization of serviceable material taken from scrap has each year broadened and expanded until now practically no item which can be utilized to an advantage is placed on the market for sale. As mentioned heretofore, the value of serviceable material reclaimed from scrap approximates $420,000 yearly, while the sale of scrap, restricted somewhat on account of unsatisfactory market prices, has averaged for the past two years $1,250,000.

An arrangement is in effect on the Santa Fe whereby the store department periodically makes a check of way car equipment, and even though requisitions for this class of supplies are approved by trainmasters and superintendents, it is amazing in how short a time a surplus will accumulate. Just a short while ago a check of 32 cars resulted in the return to stock of $2,291.94 worth of supplies not required, an average of $71.62 per car. The return to stock of these items, of course, affects the operating cost of a railroad.

Fuel is the most expensive single item for which railroads pay and the one single item which can be made the greatest factor in handsome returns to operation. We have on the Santa Fe organized a branch of the store department, which gives its entire attention to this pursuit. If information procured on methods in use on other railroads in connection with handling fuel is correct, the system under which we are operating is decidedly more far-reaching than any other in existence.

It was not until June, 1908, that the store department assumed entire control of fuel handling. It is therefore necessary to use the twelve months following that date as a basis of comparison for the three fiscal years ending since June, 1909. While the decrease per ton mile since that time is fairly good, yet as this was the initial year in our efforts to reduce consumption, in view of the success secured since, it is apparent that the decrease over periods prior to June, 1908, for the years following 1909 is really greater than actually appears. The following is the result of the comparison of the fiscal year 1912, years 1910 and 1911 being not so good, but still a considerable decrease under 1909.

Ton miles	29 per cent. increase
Fuel consumed	16.2 per cent. increase
Fuel consumption per ton mile	9.7 per cent. decrease

Or in other words, the efficiency of a ton of coal was raised 9.7 per cent., which, when applied to a $9,500,000 yearly fuel bill, shows the effect on operation in no uncertain terms.

In the face of this decrease, for the first eight months of the fiscal year 1913, due to more rigid supervision, there is a further reduction over the same months of 1912 of $421,438.83. These figures take into consideration increase in purchase price of fuel and are based on the increased efficiency this year over last of a ton of fuel as compared with the increased cost to operation, had the efficiency of the fuel remained stationary or decreased.

Discussion.—G. G. Yeomans presented some interesting figures taken from an article published by him in the *Railway Age Gazette* of July 19, 1912, showing the savings made by establishing a stores department on a road where there was none before. The average reduction in operating expenses and purchases for five years after the store department had been in force was $1,359,000 and $774,000, respectively. The average increase in car mileage density, the best unit by which to measure material for a road for the five years, was 16.4 per cent., showing that the road was using more material. This road was no exception to other roads without a store department. N. M. Rice explained the system of handling fuel on the Santa Fe.

STORE HOUSE CASTING PLATFORMS.

D. Kavanagh (C. R. I. & P.):—It is desirable that the casting platform should be at the car floor height. In case it is not practical to have it thus, there should at least be a small platform for loading and unloading cars, reached by a platform hoist. The platform should be so arranged that sufficient space is allowed to pile castings of different pattern numbers separately. Each kind of casting should be placed together and in numerical order of pattern numbers as far as possible; that is, all grates, piston heads, draw castings, steam pipes, etc., should be grouped separately, as this arrangement makes a neater looking casting platform and also is more economical in putting away castings or getting them out for shipment, and is in my estimation a better plan than attempting to group various castings together for any certain class of locomotives, as in the latter instance if you have two or three classes of engines that take the same pattern of piston head, you have two or three patterns of castings in as many different places on the platform.

There should be a suitable storage shed to accommodate finished castings. This shed should be provided with the necessary racks to accommodate such material as cylinder packing rings, vibrating cups, etc., and the larger finished castings, such as crossheads, piston heads, cylinder heads, etc., should be kept on the floor suitably arranged for convenient handling. The office of the casting platform foreman, or stockman, could be located in this building. The finished casting house should be heated, as this class of material deteriorates not alone in the open air, but also in the natural moisture of an unheated building.

At points where the volume of material handled will warrant the expenditure, a crane operated by steam or electricity—a locomotive hoist or traveling crane of some kind—should be used. At smaller points an air hoist may be built at a comparatively small cost and will answer the purpose reasonably well. In all cases in considering the question of crane facilities, the cost of machinery must be taken into consideration in connection with

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the benefits to be derived from such improvements. It is important that the foreman or stockman in charge of the casting stock keep himself posted on all new power that is being built or purchased requiring a new pattern of casting, as well as to keep himself advised of castings that are becoming obsolete on account of changes in standards or on account of some particular type of locomotive going out of service.

LUMBER SHEDS.

W. E. Hatter presented a paper on this subject, recommending a building having a space of 2½ in. left between the siding boards, they being placed at such an angle as to prevent snow or rain from beating through. The building should be adequately lighted, or otherwise the material will season slowly and become susceptible to dry rot, mildew, etc.

All kiln dried material should be stored in a special room in which the conditions produced by the kiln will be retained. The room should be tight but ventilated and maintained at an even temperature.

Following is an itemized list and approximate cost of material needed for the construction of such a shed, having a capacity of one million feet of lumber.

Roofing paper	$ 536.54
Slate roofing	1,054.14
Glass	89.90
Oak floor for piling lumber	1,164.37
Oak floor between tracks	379.67
30,811 ft. t in. siding pine	687.70
37,750 ft. underlining for state at $32.00—white pine.	888.00
6,900 ft. flg. in dry shed at $27.00	186.30
Cement floor	200.00
Rafters, joists, beams, etc.	1,000.00
Total	$6,986.62

STANDARD SUPPLY CAR.

Two papers were presented on this subject, abstracts of which follow:

D. D. Cain (So. Pac.):—The supply car, when properly handled, is one of the greatest savers of material and money of any branch of the supply department. The real purpose of the supply car is to deliver material where it is wanted at a specified time each month, and at the same time pick up all tools and other material not needed and make a monthly clean-up of all scrap on the division.

The standard for supply cars should be in the standard of operating cars rather than in the standard car. To properly handle material with supply cars, the following will be needed on each division or district:

First—An oil car with the required number of tanks for oil. This car should be equipped with hand pumps and with an air pressure arrangement, the air to be used wherever it is necessary to draw any large quantity of oil, and at the same time the hand pump can be used for filling smaller orders. The air is taken from the train pipe line through a reducing valve.

Second—A general car equipped with the necessary shelves for small miscellaneous material and supplies for all departments. This car should be arranged with space for sleeping accommodations for the attendants and a desk at which to transact the clerical business necessary.

Third—A car with the necessary racks for roadway tools, block signal supplies, large station supplies, and similar material.

Fourth—A car for case oils, gasoline, etc., where used.

Fifth—A car for stationery if it is delivered by supply cars.

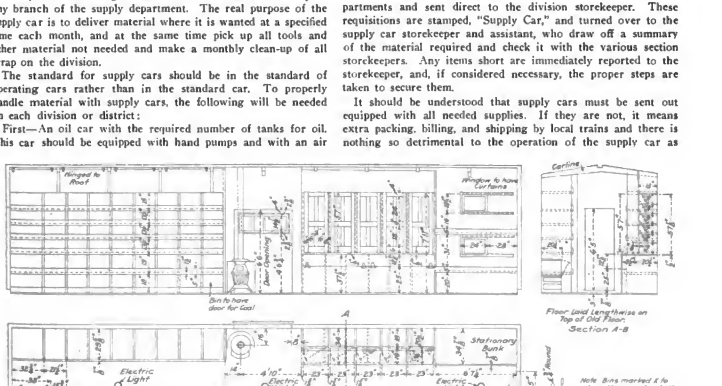
Sixth—A car for spikes, track bolts, and track supplies.

To the above should be added the necessary cars for assembled jobs complete, also hand cars, velocipedes, frogs, switches, track trimmings, etc., and, where treating plants are operated, lime, soda ash and distillate, and such flat cars as may be needed with side boards for scrap.

The first five cars should be equipped with end doors to enable the attendants to pass from one car to another while the train is in motion for the purpose of assembling material for the next stop. These cars should also be equipped with electric lights, which can be installed at a cost of $35 per car. We use a set of the same batteries that operate our block signals. In practically all of our supply trains on eight divisions we use from twelve to as high as thirty cars, depending on the amount of business each month.

With a properly organized division and the supply cars in charge of a thoroughly competent division storekeeper, there is no need for requisitions being delayed by having the approval of every officer on the division. These cars are built for action, and we are going to deliver what is needed and pick up everything that is not needed. Requisitions covering the estimated requirements for the ensuing thirty days are made by all departments and sent direct to the division storekeeper. These requisitions are stamped, "Supply Car," and turned over to the supply car storekeeper and assistant, who draw off a summary of the material required and check it with the various section storekeepers. Any items short are immediately reported to the storekeeper, and, if considered necessary, the proper steps are taken to secure them.

It should be understood that supply cars must be sent out equipped with all needed supplies. If they are not, it means extra packing, billing, and shipping by local trains and there is nothing so detrimental to the operation of the supply car as



Standard General Supply Car—Southern Pacific.

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being out of handles, track tools, or any supplies required.

The making out and forwarding of the requisitions and the checking and loading of the cars must be handled with despatch, and the supply train, loaded with full equipment of tools and all miscellaneous supplies for all departments, including frogs, switches, track bolts, spikes, and extra hand, velocipede and push cars and assembled jobs, is now ready to leave.

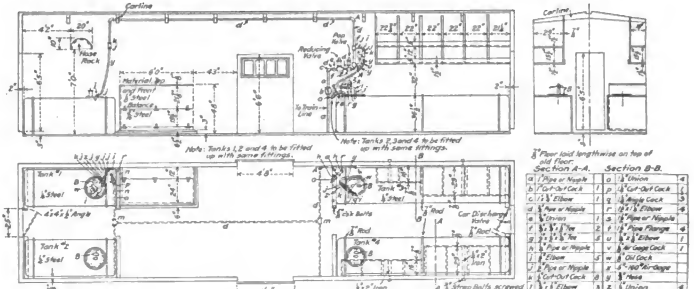
Schedules showing the dates on which these cars move, train numbers, etc., are prepared in advance and placed in the hands of division engineers, roadmasters, section foremen, agents, signal maintainers, pumpers, trainmasters, yardmasters, etc., so that all tools, scrap, etc., may be ready for quick inspection and handling.

The supply car must always be accompanied by the division storekeeper and by the roadmaster and signal supervisor over their own respective districts in order to be properly handled and to get the best results. Stops must be made at each tool house and station. Tools and supplies required are checked between stations and made ready for quick delivery.

The receivers of the material, i. e., signal maintainers, section foremen, agents, etc., receipt on the face of the requisition for the supplies delivered by the supply car storekeeper and the supply car storekeeper in turn receipts on the face of the shipping inspected by all the above men and any necessary business is transacted on the ground with the agents and section foremen personally. Tools are inspected and, if any surplus tools or materials are found, they are turned over to the supply train and the proper credit allowed. It may be that the tools on hand are badly worn and none were ordered, but no red tape is allowed to stand in the way and the necessary tools and supplies are issued, a memorandum requisition being made for charge. Then no excuse can be given the superintendent that sufficient material or tools were not on hand to do efficient work for the next thirty days. The turning in of old tools is rigidly enforced. Even the return of old brooms and similar material is required for the moral effect.

Scrap is taken from the bins and placed on the proper cars, the sorting being done at the time of loading, which costs no more as the bins at the tool houses are arranged as to wrought, cast, etc. This saves considerable labor at the general scrap docks.

The superintendent and other officers by this method of inspection become thoroughly acquainted with conditions at each point and the need for all material on the division, knowledge which they could not obtain by any other inspection. The division storekeeper becomes a very valuable assistant to the


Section A-A.
Section B-B.
Note: Tanks 1, 2 and 4 to be fitted up with same fittings.
Note: Tanks 3 and 5 to be fitted up with same fittings.
Tank "1"
Tank "2"
Tank "3"
Tank "4"
Tank "5"
Car Distributing Valve
Racks
Racks
Racks

oil spilled in them. No billing or shipping back of empty containers to the store. No pilfering of material. No loss from breakage. No claims or correspondence regarding shortages.

One of the greatest advantages of the supply cars is the fact that we are able to carry out the exchange arrangement regarding station supplies, signal supplies, track tools and supplies. This can be accomplished in no other way. When tools are delivered we insist that the old tools be returned to us in exchange or a satisfactory explanation given at the time on the ground as to why an exchange cannot be made.

There is also the advantage of picking up old material, scrap, second-hand tools, etc., and bringing them to the shops each month, picking out the serviceable material, getting the scrap ready for sale, and repairing tools, hand cars, etc., for the next month's trip. We appear to forget that, in picking up scrap without the use of supply cars, a flat car may be set out by the local train at ten or twenty stations, delaying the train and keeping the car out of service.

The more we work with supply cars the more uses we find for them. On some of our divisions we arrange to send out, as far as possible, all assembled shipments with the supply trains. That is to say, every job which does not assume the importance of immediate action is assembled at the division store and shipped out direct to the work with the supply train and set out exactly where it is wanted with absolutely no delay to local trains and no back hauls.

When men are sent out to do the work, they know that the material is there complete, and that there are no breakages or shortages to delay them. The superintendent and proper officers, who, as before stated, accompany the supply train, know that the material has been delivered, and no delay to the completion of these jobs can be passed up to the store department.

The supply cars can be used to good advantage between trips in supplying and keeping in shape small outside stores where they can not be supplied on regular trips of the supply cars, although as many of these points as possible should be handled on schedule supply car trips.

Properly handled, the supply car is the economical medium through which to deliver substantially all material used in ordinary operation and maintenance, with the exception of lumber. Even with this we have at times distributed fencing, stringers, etc., at considerable saving. There should be no local shipping of company freight unless in carload lots.

L. O. Genest (Can. Pac.):—Our eight cars are operated as separate units and patrol 7,500 miles at stated monthly intervals, and are equipped and directed by four divisional storekeepers with a storeman in charge of each car. Deliveries are confined to light supplies and tools, such as are required for maintenance purposes for stations, sections, water supply, etc. Requisitions from each of the sixteen sub-divisions are sent to each of the respective divisional storekeepers not later than the twenty-second of the month for the following month's requirements, and are fastened separately (with brass fastener) in station order for each department and each section or branch, as the case may be, to enable a check to be made in the superintendent's office to insure receipt of all requisitions. The storeman in charge of the car wires the superintendent a day or so in advance stating the sub-division of his district the car will cover so that all concerned may be advised to have their oil cans and old material in readiness for the arrival of the car. Second-hand and worn out tools and material unfit for further service, such as axes, brooms, brushes, chisels, pails, shovels, lamps and fittings, etc., are returned to the storeman in charge of the car before deliveries of new supplies of a similar kind are made. Section foremen, unable to meet the car, deliver to the nearest agent their empty oil cans and whatever second-hand and worn out material they have for exchange.

In the event of storemen being unable to obtain the signature of agents, roadmasters or section foremen, on account of their absence at night or for other causes, the train conductor signs receipt form acknowledging delivery of the goods. A careful record is kept of the tools, etc., issued, and old tools turned in in exchange, and periodical statements furnished the general superintendent drawing his attention to any falling off in exchange. To insure the correct loading of each car the quantities of supplies and tools, etc., are detailed and totaled on wholesale lists. This information is abstracted from combined receipt and shipping slip, which is written from the original requisition, and ultimately sent to the audit office, after pricing, to serve as a basis for invoicing the particular department and account.

Our standard 47-ft. supply cars contain six oil tanks, two with a capacity of 700 gal. for coal oil, and four with a capacity of 155 gal. each for car, signal, valve oil and disinfectant. . The coal oil tanks are equipped with No. 40 Bowser pumps fitted with vacuum valves to prevent syphoning; the smaller tanks are equipped with faucets, and tanks are fitted with automatic measuring gages.

Discussion.—The Santa Fe, in addition to operating in the same way as the Southern Pacific, carries workman for making minor repairs along the line that would not pay for sending a special man from the nearest shop. H. C. Pearce stated that the Southern Pacific supply train carries all kinds of material of which small quantities are required.

OTHER BUSINESS.

The Monday afternoon session was opened with an address by R. M. Huddleston, general auditor, New York Central Lines west of Buffalo.

F. W. Brazier addressed the association Tuesday morning, laying particular stress on correct discipline.

E. J. McVeigh presented a paper, "The Authorized List," which was referred to the committee on recommended practices for further consideration.

A paper was presented on the stationery storehouse Canadian customs regulations. Many roads in the States do not properly ship their materials that are sent to Canada. Each shipment should be covered by suitable invoices and certificates. The Canadian roads have experienced considerable difficulty in releasing this matter from the customs officials, and the paper was presented for the information of the members.

A committee also reported on a standard book of rules. This book was drawn up for the purpose of having a concise and a ready reference for roads desiring to start a store department, and is supposed to represent the best practice of all the roads. The committee has not fully completed the book, and is to be congratulated on the thoroughness with which it is handling the work.

The following officers were elected for the ensuing year: President, J. W. Gerber, Southern Railway; first vice-president, G. G. Allen, Chicago, Milwaukee & St. Paul; second vice-president, H. C. Pearce, Southern Pacific, and secretary-treasurer, J. P. Murphy, Lake Shore & Michigan Southern.

NEW LINES FOR BRAZIL.—The president of the state of Sao Paulo has signed a decree authorizing an expenditure of $30,000 for expenses in surveying a railway from Guaratingueta to Cunha, and a decree authorizing the Paulista Railroad to construct and work a 30-mile branch line from Nova Odessa on the company's Campinas-Rio Clara line. It will cost $1,000,000.

PROJECTED RAILWAY CONSTRUCTION IN GREECE.—The development of railway communication throughout western Macedonia and Epirus is occupying the serious attention of the Greek government. It is proposed to link up the existing railway system in southwestern Macedonia with the Thessalian railways by constructing an extension of 62 miles and by widening the present narrow-gage lines. The existing line from Volo to Kalabaka is to be extended to Grevena and thence via Siatista to Sorovits, where it will join the main line from Saloniki to Monastir. From Grevena it is proposed to construct a line running westward via Metsovo to Jannina and thence to Preveza. As soon as peace has been concluded the Greek government will raise a loan of $58,000,000 to $77,000,000 for railway extensions and improvements.

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HORACE G. BURT.

Horace Greeley Burt, for the past two years chief engineer of the Chicago Association of Commerce committee on Smoke Abatement and Electrification of Railway Terminals, and formerly president of the Union Pacific, died at the Oak Park Hospital, Oak Park, Ill., May 19, from the effects of an operation performed a few weeks ago. Mr. Burt was born in January, 1849. He was graduated from the high school at Terre Haute, Ind., in 1867, and from the University of Michigan in 1873. He began railway work in March, 1868, as rodman on surveys and construction of the St. Louis, Vandalia & Terre Haute, and from December, 1869, to December, 1870, was engaged on location and construction of the Joy railroads in Kansas. He then attended the University of Michigan until February, 1873, when he went to the Milwaukee & Northern for one month. He was next employed in the engineering department of the Chicago & North Western from March, 1873, to the summer of 1881, at which time he was made superintendent of the Northern Iowa division. In December, 1883, he was transferred to the superintendency of the Iowa division, and in October, 1887, he was promoted to chief engineer. He became general manager of the Fremont, Elkhorn & Missouri Valley in November the following year, leaving in July, 1896, to go to the Chicago, St. Paul, Minneapolis & Omaha as general manager. Three months later Mr. Burt was elected third vice-president of the North Western in charge of traffic, retaining that position until January 1, 1898, when he resigned to become president of the Union Pacific. After leaving the Union Pacific he took a trip around the world for his own recreation and instruction, leaving during the winter of 1904 and returning to Chicago in 1905. After returning from abroad he engaged in business as consulting engineer at Chicago, returning to active railway service again in January, 1909, when he was appointed receiver for the Chicago Great Western. In September of that year he once more took up private practice as consulting engineer at Chicago.

H. G. Burt.

Mr. Burt was probably best known from his connection with the reconstruction of the Union Pacific after Mr. Harriman got control. He was president during the general rehabilitation of the lines, shops and equipment. Later, while consulting engineer, he made a series of recommendations for the rehabilitation of the Kansas City Southern, which have been and are being carried out. He also had charge of important dock work at New Orleans, La., for the St. Louis & San Francisco and the Southern Railway, and reported on part of the Puget Sound extension for the Chicago, Milwaukee & St. Paul. He was suggested to President Roosevelt to take charge of the Panama Canal, but the position was not offered him. His experience covered the operating, traffic, engineering and executive departments. He was a persistent worker and was never satisfied until he had completed his work in the most thorough manner. He worked day and night. He was a reserved man and seemed brusque to most, but had a sympathetic side, which only his friends knew. He preferred to do his own thinking, and was inclined to dig into details himself unless he had intrusted them to a subordinate in whom he had implicit confidence. He was willing to receive the opinions of others without resentment, no matter how much they differed from his own, but he decided for himself. He took his trip around the world on his own account and not for Mr. Harriman. He had expected to make his report on the electrification of the Chicago terminals by January 1.

SPECIAL COMMITTEE ON LEGISLATION.

A meeting of the railways supporting the special committee on Relations of Railway Operation to Legislation was held in New York on May 21. The committee made its semi-annual report which was approved. The following is a summary of the report:

Three hundred and thirty-one roads (223,418 miles) are supporting the work of the committee.

At the third session of the Sixty-second Congress a bill was passed making the theft of property being transported in interstate commerce a federal crime, and constituting the transporting of any such stolen property from one state to another a separate offense.

This is the only legislation affecting railway operation passed at that session.

For reasons which are well understood, it appears probable that a number of bills will be pushed during the present congress, and the committee anticipates the necessity for active work during the next twelve months.

The working arrangement entered into by a committee representing the railways and a committee representing the employees, under the Hours of Service Act, was to expire on January 1, 1913, at which time a further conference on the subject was to be held.

In view of the fact that the Interstate Commerce Commission some months ago revised its reports in order that the effect of this working arrangement might be more clearly ascertained, it has been continued, by the tacit acquiescence of all parties thereto, until such time as the necessary data for consideration is available and further conference can be had on the subject.

After July 1, 1913, the rules for the inspection of locomotive boilers, issued by the Interstate Commerce Commission, June 2, 1911, require the setting of a factor of safety for locomotives which were in service prior to January 1, 1912.

This matter is of the utmost importance, as the establishment of such a factor of safety higher than is necessary would result in the elimination or reconstruction of a large number of effective locomotives now in service.

It will be necessary to conduct conferences with the Bureau of Locomotive Boiler Inspection, to precede hearings before the Interstate Commerce Commission.

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In preparation for this, your committee has issued Circular No. 43, dated May 15, 1913, asking for the information necessary for a preliminary study of this question, and will be prepared to undertake these negotiations if authorized thereto by the railways at interest.

In view of the necessity for the uniform application of the rules for the inspection of locomotive boilers, your committee has collected, from all available sources, the rulings and opinions which have been expressed relative to the application of these rules. A compilation of these has been made, and such of them as seem in accordance with sound practice will be issued for the general information of the railways.

In order to show the progress of the construction of steel and steel underframe passenger equipment cars, your committee issued Circular No. 40, January 10, 1913, asking the railways as to passenger train equipment in service December 31, 1912, that acquired in the calendar year 1912, and that under construction or contracted for but not yet received on December 31, 1912.

A bulletin showing the results of this compilation will be issued.

In report No. 9 you were advised that further conferences with regard to the lighting specification were under way.

As a result of these conferences, on January 14, 1913, a lighting specification was issued to the railways in Bulletin No. 44, which had been approved by the Postmaster General December 28, 1912.

In order to give full effect to this specification, your committee arranged for the formulation of lighting plans to be used in connection with it. These plans are completed, and, upon approval by the postoffice department, will be issued to the railways.

In order to deal more intelligently with the various bills which have been introduced in congress looking to the compulsory adoption of block signals, the Sub-Committee of Signal Engineers secured data showing unit costs for construction, maintenance and operation of manual and automatic block signals. This information was transmitted to the railways through Circular No. 41, February 26, 1913, and the roads were requested at that time to advise the number of miles upon which automatic or manual block signals are now in service or under construction, and the number of miles upon which such signals would be installed, assuming that they would be required upon all passenger lines except those on which but one train at a time was operated.

Replies to this circular are now being tabulated, that the data may be available when bills requiring the establishment of block signals are under discussion in congress.

Your committee calls the attention of the railways to the order of the Interstate Commerce Commission, issued March 13, 1911, extending the time within which equipment in existence July 1, 1911, must be brought into conformity with the United States Safety Appliance Standards.

It urges that the railways examine their individual situation with respect to this matter, and expedite the equipment of cars with these safety appliances so far as may be consistent.

The lack of adequate laws prohibiting and penalizing trespassing on railway rights-of-way in the several states results in the deaths of a great number of citizens annually.

Your committee procured the introduction of bills to remedy this in a large number of state legislatures. Practically none of the states legislated on this subject, and the situation remains as it has been heretofore. In view of this, it is an open question whether federal legislation should not be sought.

During the first four months of 1913, forty-one state legislatures were in session. Twenty-seven of these had adjourned May 1. Up to that date there had been introduced into these legislatures 1,308 bills affecting railway operation, of which 174 were enacted into laws.

A bulletin will be issued analyzing the state legislation enacted during 1913 throughout the country. At the present time it can be said that there is little change in the tendency toward burdensome regulation. It is significant that eastern states, which have heretofore been relatively exempt from this kind of legislation, have been more active in this respect during the last two years. A large number of headlight laws now on the statute books in the various states, involving conflicting requirements, seem to point to the desirability for federal legislation on this subject.

In report No. 9 you were advised that the committee had undertaken the initial steps looking to the formation of committees of operating officers in a number of states at the request of the roads operating therein. Such committees were formed in the following states: Arkansas, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, North Dakota, Ohio, Oklahoma, Oregon, South Dakota, Utah, Washington, Wisconsin, Wyoming.

The results obtained in most of the states where these committees were active have been such as to justify this method of dealing with state legislation.

The committee arranged to keep itself informed of all bills affecting railway operation introduced and passed in all states, and has kept its supporters advised. It has also made available for the use of the state committees data which has been found useful, either in Washington or in other states, thus co-ordinating the work of these committees as far as possible.

J. F. McGuire, general manager of the Lehigh Valley, was elected to succeed J. C. Stuart, vice-president of the Erie, as a member of the committee.

PLANS FOR NEW UNION STATION AT CHICAGO.

Plans for the proposed new passenger terminal at Chicago for the roads now using the old union station at Canal and Adams streets, the Pennsylvania Lines, Chicago, Burlington & Quincy, Chicago, Milwaukee & St. Paul, and Chicago & Alton, were placed before the committee on railway terminals of the Chicago City Council at public hearings on May 17 and 19, with the announcement that the roads are prepared to begin work at once, as soon as the sanction of the city is received in the form of permission for necessary street and alley changes. The general plan showing the location of the new terminal with reference to the present station, the official plan of the Chicago Plan Commission, and the proposed new post office building were described in the *Railway Age Gazette* of August 23 and 30, 1912, pages 354 and 390, but the detailed plans for the structure had not then been completed.

The designs have been made by D. H. Burnham & Co., who have been working out various studies for the new station for several years. The main station building, or headhouse, is to be on the west side of Canal street, bounded by Adams street on the north, Jackson boulevard on the south, and Clinton street on the west. To the east of the headhouse, and occupying the block east of Canal street to the river, between Jackson boulevard and Adams street, will be the main concourse, which will have on its north and south sides substantially two separate systems of stub-end tracks, 11 tracks for the roads entering the station from the north, and 15 tracks for the roads entering from the south. The concourse will be a covered building 180 ft. wide and 250 ft. long.

The principal feature of the main building is a waiting room 300 ft. long, 100 ft. wide and 120 ft. high. It is to be lighted by arched windows rising 100 ft. above the sidewalk. The entire space occupied by the building is to be about 320 ft. x 370 ft.

In architecture this building will be in classic style, freely interpreted and adapted to modern utilitarian requirements. Externally it will be featured by a Corinthian colonnade extending around the four sides. This colonnade will rise 64 ft. from the ground, the standard height adopted in the design of the chief buildings of the World's Fair in 1893. This Corin-

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thian order will be surmounted by a high attic story which will form a complete belt crowning the main mass of the building. Above this in the center will rise the vaulted arches and pediments of the large room within.

The character of this hall in proportions, design and adornment was an inspiration from the thermal establishments of imperial Rome where, in the baths of Diocletian and Caracalla, the world first witnessed the development on a grandiose scale of the system of round arch and vaulted architecture.

The material for the exterior of the main building will be American white granite. The interior of the waiting room will also be white stone, as befits a structure which must combine solidity, dignity and cleanliness.

The concourse, between Canal street and the river, with low roof rising from the center of a broad plaza, will be a vaulted building, and will harmonize in exterior structure with the main building.

The descending street grade from the river west proved a fortunate circumstance, and advantage was taken of it in designing the main building. The floor of the waiting room is below the street level and on the same elevation as the tracks in the concourse. Measured from Clinton street on the west the tracks will be only 12 ft. below grade. There will, therefore, be no long flights of stairs between travelers within the station and their trains.

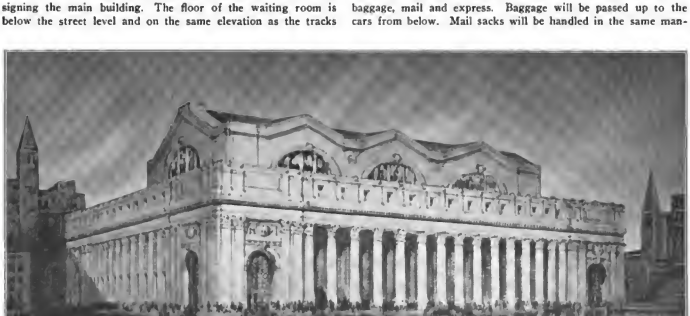
The buildings have many entrances. The main building will have no "main entrance," but will be equally accessible on all four sides. The designers have taken account of the fact that in a modern terminal passengers must be able to approach from any direction and pass at once by the most direct line to the waiting train. Entrances and exits must be universal that confusion may be avoided, time be saved and effort be unwasted. It is planned that there will be no crowding, even in the hours of the suburban rush. The people will be "melted away" through many passages. Access to the concourse will be as free as to the main building.

The main building and the concourse will have streets on all sides. Along the river a broad boulevard will flank the concourse on the east. Nowhere will there be anything to hamper ingress, egress or free movement within. Without will be broad streets and ample plazas. Cab stands will be conveniently located and under cover within the headhouse and concourse.

In designing this passenger terminal the aim has been to create a railway station completely separated from all railway service save the most convenient and expeditious handling of passengers and baggage. Elaborate office building features have been omitted; there will be only such offices as are necessary to the operation of the terminal itself.

The closest attention has been given to the needs and desires of the traveler. In addition to conveniently disposed ticket offices, baggage rooms and information bureaus, there will be grouped about the main waiting room restaurants, telephone and telegraph stations and numerous shops for which there is an increasing demand as the conveniences of traveling increase.

Facing the concourse there will be 26 train tracks—11 leading to the north and 15 to the south. In the lower levels beneath headhouse, tracks and concourse will be provided the most modern equipment for the mechanical handling of baggage, mail and express. Baggage will be passed up to the cars from below. Mail sacks will be handled in the same manner. Methods for the mechanical handling of mail, worked out in recent years in the Chicago postoffice will be further improved, and it is predicted that the facilities will show some striking advances in modern, scientific methods for the saving of time and labor.



Proposed New Union Station, Looking Northwest from Canal and Jackson Streets.

The location of the terminal, as decided upon by the roads now using the old union station, and announced by them last August, has aroused considerable controversy among the advocates of various plans for a general scheme of location for all new railway terminals to be built in the city. For this reason a committee on railway terminals, consisting of 15 aldermen, was recently appointed by the city council to consider the questions of electrification and the location of proposed terminals. This committee has begun a series of hearings at which it proposes to consider all plans that may be submitted to it. At a hearing on May 14 Jarvis Hunt, the architect of the new Kansas City union station now under construction, described before the committee the plan which he has recently been advocating before various local organizations, which provides for central passenger and freight terminals for

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all roads except the North Western to be located south of Twelfth street. The plan also contemplates the straightening of a bend in the Chicago river, and the re-location of railway freight terminals along the river in order to open up new streets into the central business district. Mr. Hunt urged the committee to force the union station roads to join the central terminal plan by refusing the necessary permission for their proposed station.

On Saturday, May 17, a hearing was held to allow the union station roads to present their plan. A. J. Earling, president of the Chicago, Milwaukee & St. Paul; Darius Miller, president of the Burlington, and J. J. Turner, vice-president of the Pennsylvania Lines, testified that they had investigated the Twelfth street plan and found it impracticable, but that after several years of planning they were ready to proceed along the lines announced last year, and to build for Chicago one of the finest railway stations in the world. Mr. Earling said that the Hunt plan could not be carried out in 50 years; that the location of the Chicago river would interfere with the operation of trains into the station, and that track elevation plans would so complicate the matter that no feasible arrangement could be worked out. Mr. Miller said that on account of the location of the river there was not enough room south of Twelfth street, and that it would require trains to enter the station by a draw bridge, which would be intolerable. Mr. Turner not only objected to the plan on account of the lack of space, and the conditions imposed by track elevation, but declared that Chicago is too large for one central terminal, both on account of the distances that would be involved, and the congestion that would be created.

F. A. Delano, president of the Wabash, placed before the committee various studies of the general plan he has long advocated for the location of the terminals of railways entering Chicago from the south on the south side of Twelfth street as widened into a boulevard, in accordance with the Chicago plan. He said he did not appear as the advocate of any particular plan, and that he had not proposed a union station, but a series of stations on Twelfth street for the groups of roads now using separate stations. He thought the Hunt plan included several excellent suggestions, but that the committee, with the advice of competent engineers, after having considered the various plans proposed, could devise a better plan than any that had yet appeared. He resented the statement that a location south of Twelfth street is impracticable and criticized some of the arguments made against it. He declared that if the Pennsylvania group of roads do not move back to Twelfth street the Rock Island and the New York Central Lines now using the LaSalle street station probably would not move back nor the roads now using the Western Indiana station at Polk and Dearborn street. Therefore, if the plan for the union station at Jackson street is adopted, the result will be six separate stations, as at present, with no relation to each other, or to the local transportation lines of the city.

He was followed by A. H. Smith, senior vice-president of the New York Central Lines, who said the New York Central had not seriously considered any plan for a new terminal in Chicago in the near future, and that the LaSalle street station would be adequate for some time to come. He frankly announced that the New York Central believed it now had an advantageous location, and that if the Pennsylvania were allowed to retain its present location near the heart of the city the New York Central could not afford to move south, and he thought that it would not be fair to ask the Pennsylvania to move south to Twelfth street, leaving the New York Central where it is. If the Pennsylvania moved its terminal south the New York Central would be willing to consider doing so also, but would want to know "where it would light before it jumped."

At another hearing on Monday, May 19, W. A. Gardner, president of the Chicago & North Western, said that the North Western with its new terminal had no reason to consider any of the new plans. The principal reason for its change in location when the new station was built was to eliminate the drawbridge over the river at the entrance to the station, which caused many delays to trains, and that while he was not interested in the Twelfth street plan, he thought no railroad man would want to place a new station where a drawbridge would be required to enter it, and he thought it would not be a good plan to put so many stations in one place.

C. H. Markham, president of the Illinois Central, declared that the Illinois Central was "too well fixed" at present to consider joining with the other roads in any union station plan, and therefore had not considered the Hunt plan. The Illinois Central is practically under contract with the city to build a new station, he said, and will ask permission of the city council to locate its station on the present right of way at Twelfth street and Indiana avenue, facing north. This will be a stub-end terminal, except for the suburban tracks, which will run through to Randolph street along the lake front as at present. It is planned to have room for 32 or 36 tracks on an upper level and 36 more on a lower level. He was asked by an alderman whether the station was being planned with reference to electrification, and answered by saying that there was nothing in the plan that would interfere with electrification. Mr. Miller made a similar statement for the proposed union station.

The union station plans were described to the committee by E. R. Graham, of D. H. Burnham & Co., who is also the architect of the Chicago Plan Commission. He declared that the site proposed for the union station is not at variance but in complete harmony with the Chicago plan, which originally proposed as the best available locations for permanent passenger stations for all the roads, first, between Canal and Clinton streets from Lake to Twelfth streets, and second, on Twelfth street widened. When the roads decided on the location for the new union station it was approved both by the plan commission and by the executive committee of the Chicago Association of Commerce, with a recommendation that the new postoffice building be located immediately west of the station. The plan committee also recommended that the main east and west axis of the Chicago plan be relocated so as to center on Jackson and Adams streets. The plan therefore provides for the terminals of the west side roads on Canal street and of the south side roads on Twelfth street, the Illinois Central at approximately its present location and other roads west of it, thus locating all terminals where they will be most accessible to the center of the city and to each other. With Michigan avenue widened and continued to connect with the North Side, Twelfth street widened to a boulevard, and Canal street boulevarded from Twelfth street north to Chicago avenue passing the North Western terminal at Madison street, all stations would be connected by a square of boulevards within which there would be no railway tracks.

Another hearing is to be held by the committee on Friday to consider other plans.

NEW RAILROAD COMPANY IN BRAZIL.—The Companhia Estrada de Ferro Agricola de Santa Barbara has been formed in Sao Paulo to construct a railway between Villa Americana or some other point on the Paulista Railway and the town of Santa Barbara, to engage in agricultural pursuits in the zone served by said railways, to exploit waterfalls, and to purchase and sell agricultural products.

STATION PLATFORM CHARGES IN ENGLAND.—The London & Northwestern now makes a charge of one penny for admission to train platforms at Waterloo station, London, and it is said that all of the large English roads contemplate imposing a like charge. This practice, designed to prevent unnecessary congestion on platforms has been in operation at a number of stations in Europe heretofore. It is said that the Lancashire & Yorkshire has adopted it at the Victoria station, Manchester.

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THE AMERICAN RAILWAY ASSOCIATION.

Meeting in New York Receives Reports from Several Committees. Membership is Now 358, Representing 267,177 Miles.

The spring session of The American Railway Association was held at the United Engineering Society building, New York City, on May 21, 1913. There were present 213 members, represented by 200 delegates.

The Executive Committee reported that the membership now comprises 358 members, operating 267,177 miles, an increase of 10 members, and an increase of 162 miles. The associate membership now comprises 137 members, operating 7,913 miles, an increase of 13 members, and an increase of 633 miles.

The Executive Committee stated that a member of the association had brought to its attention the question of shipping broken glass in bulk and which was duly referred to the Committee on Transportation. The following recommendation was received from that committee:

The Committee is of the opinion that shipments of broken glass in bulk should be accepted only when loaded in closed cars; when accepted for shipment in open cars the glass must be enclosed in packages. It was the feeling of the committee that the question should be brought to the attention of the various traffic associations so that the tariffs might be revised to cover the suggested recommendation of the committee.

The Executive Committee concurred in this recommendation and referred it to the several traffic associations. Advice has been received that the Official and Southern Classifications have been so changed to cover satisfactorily the suggestion made by the Committee on Transportation.

The Executive Committee also reported in connection with the action taken by the association to eliminate Per Diem Rule 5, effective July 1, 1913, that it adopted at a meeting held on February 5, 1913, the following resolution:

Resolved, That the president be authorized to request the appointment of a committee of traffic officials of two respectively, from the various traffic associations of the country interested and involved, to consider the request of certain switching lines for relief on account of the elimination of Per Diem Rule 5, effective July 1, 1913, and that this committee be requested to confer and act with the Committee on Relations between Railroads in the consideration of the subject.

Immediately following the meeting of the Executive Committee the Trunk Line Association, the New England Freight Association, the Southeastern Freight Association, the Southwestern Tariff Committee, the Trans-Continental Freight Bureau and the Western Trunk Line Committee were requested to designate representatives from the territories covered by these organizations to consider the subject in question.

In order to give sufficient time for the committee of traffic officials to complete its work in conjunction with the Committee on Relations Between Railroads, it is now proposed that the date for the elimination of Per Diem Rule 5 be changed from July 1, 1913, to January 1, 1914.

In connection with the elimination of the Per Diem Rule 5, it is the feeling that a further examination should be made of the subject of reclaims, and for that purpose the president of the association was requested by the Executive Committee to appoint a commission to study the question. The commission has been asked to report its conclusions to the Executive Committee in time for presentation to the association at its November meeting.

The president has appointed as members of this commission, F. A. Delano, receiver, Wabash Railroad; W. L. Park, vice-president, Illinois Central, and George L. Peck, vice-president, Pennsylvania Lines West of Pittsburgh.

In its report the Executive Committee stated that a number of members of the association have suggested to the Executive Committee that the association should recommend what in its opinion should be considered proper practice at cross-overs. This important question was referred by your committee to the Committee on Transportation for its recommendations and that committee made the following report to the Executive Committee:

Relative to the question regarding the proper practice to cover cross-over movements both as to rules and signaling which has been referred by the Executive Committee to the Committee on Transportation.

The subject has been carefully considered and it is the opinion of the Committee on Transportation that cross-over movements should be made under such careful speed regulations as are required by local conditions.

The committee believes that to make safe the use of signal installation, or cross-over arrangements, all railroads must require absolute obedience to the rules and regulations governing the observance of signals, the use of cross-overs and the speed of trains through turn-outs; and that with such proper speed regulations and enforced obedience thereto, cross-over movements at reduced speed may be made with safety.

The committee further recommends that on main tracks the top (high speed) arm of home interlocking signals should not be used for cross-over or diverging movements.

The Committee on Transportation also reported to the Executive Committee that it does not believe that a requirement that trains must come to a stop before using a cross-over is necessary for safe operation, and that it is inadvisable to require trains to come to a stop when unnecessary because it introduces an added element of danger.

The Executive Committee stated that at the request of a member of the association, and in view of the importance of the subject at the present time, it has requested the Committee on Transportation and the Committee on Maintenance acting jointly to define the essential requisites for the installation of automatic train stops and has referred the general subject of automatic train stops to them.

The Executive Committee also reported a memorial note placing on record an application of G. W. Parker, the first president of the American Railway Association, who died on January 19, 1913. When the former General and Southern Time Conventions were consolidated into the organization which subsequently became the American Railway Association at Cincinnati, Ohio, on April 14, 1886, Mr. Parker (who was then the vice-president and general manager of the St. Louis, Alton & Terre Haute Railroad) was unanimously elected its first president, serving in that capacity for the ensuing year. During his administration the organization was placed upon a firmly established foundation. His great interest in the association was shown not only at this time, but during its entire subsequent existence and he was present at its last meeting held in Chicago on November 20, 1912.

The Executive Committee also reported that W. F. Allen had been re-elected general secretary and treasurer, and J. E. Fairbanks, assistant general secretary and assistant treasurer, for the ensuing term.

The Committee on Transportation presented a report in which it submitted several questions and answers concerning practice under the Standard Code of Train Rules and the Standard Detour Agreement, which were approved by the association. The committee stated that its investigation of the current practice on the various railroads in regard to train rules has been most extensive and thorough, and that it has obtained a mass of information which is being carefully examined in detail. While the committee has been actively engaged with this subject and has devoted a great deal of time and attention to it, it is not as yet ready to report. The committee also reported that an auxiliary committee had been appointed to consider the best method of promoting the widespread establishment of "safety first" organizations among the officials and employees of members of the association. This committee consists of the following: R. C. Richards, general claim agent, Chicago & North Western; George Bradshaw, general safety agent, New York Central Lines; W. B. Spaulding, claim attorney, St. Louis & San Francisco; J. W. Coon, assistant to general manager,

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Baltimore & Ohio, and S. J. Peterson, general claim agent, Union Pacific.

The Committee on Maintenance reported that the question of the standard dimensions of box cars had been taken up with the several classification committees, and is being developed as rapidly as its importance will permit. The committee presented a summary of replies to circular No. 1239, showing the progress which has been made in the adoption of the resolution approved by the association on May 17, 1911, respecting the subject of salt-water drippings from refrigerator cars. The committee also included in its report a summary of replies to circular No. 1263, respecting the number of freight cars, passenger cars and locomotives equipped with safety appliances, as required by the United States Safety Appliance Standards, as of January 1, 1913, as follows:

	January 1, 1912.	July 1, 1912.	January 1, 1913.
Number of members reporting	287	323	324
1. (a) Freight cars in service	2,048,267	2,237,946	2,268,068
(b) Passenger cars in service	46,455	49,658	51,114
(c) Locomotives in service	53,072	59,599	60,898
2. Fully equipped with safety appliances required by United States Safety Appliance Standards, promulgated by Interstate Commerce Commission in its Order, dated March 13, 1911:			
(a) Freight cars	119,540	254,681	464,633
(b) Passenger cars	5,478	12,747	24,687
(c) Locomotives	14,391	33,784	47,483
3. Fully equipped with secure grab-irons or hand-holds on the ends and sides of each car, as required under Section 4 of the Act of 1893 as amended April 1, 1896, and March 2, 1903:			
(a) Freight cars	2,046,906	2,237,773	2,268,062
(b) Passenger cars	46,336	49,647	51,112

The Joint Committee on Automatic Train Stops reported that E. C. Carter had been elected chairman. The committee stated that the subject of automatic train stops had been carefully considered, but requires more time for its satisfactory investigation. It presented a series of tentative definitions and requisites of installation covering systems of automatic train control. At the request of the joint committee these were discussed and referred back to it for further consideration.

The Committee on the Safe Transportation of Explosives and Other Dangerous Articles reported that in response to requests from shippers of explosives and other dangerous articles, the Interstate Commerce Commission has agreed in conference upon several minor amendments to the regulations, and a date will be named upon which a hearing will be held. The committee also reported that the Board of Railway Commissioners for Canada has revised its regulations for the transportation of explosives to make them conform to the regulations prescribed by the Interstate Commerce Commission as amended January 1, 1912. The regulations for the transportation of dangerous articles other than explosives will be submitted to the board for adoption as soon as the result of the hearing in Washington is ascertained.

The Committee on Electrical Working advised that it has no changes to suggest in the standard limiting clearance lines for third rail working conductors, as adopted by the association, but proposes, after conference and agreement with the American Railway Engineering Association and the American Electric Railway Engineering Association to submit at a future meeting a recommendation for the prolongation of certain of the clearance lines within the space between their termination and the nearest running rail. The committee also reported that it had under consideration the question of clearances for overhead working conductors which it proposes to discuss with the Electrical Working Committees of the American Railway Engineering Association and the American Electric Railway Engineering Association, with a view of presenting a full report, at a later date, with recommendations covering the essential overhead clearance requirements. In advance of the final report, the committee submitted as information its preliminary conclusions of the limiting conditions to be met in operation with the existing rolling stock dimensions and locations of overhead permanent way obstructions. It is hoped that this information will prevent further encroachment upon the space required for the installation of overhead conductors by the building of cars of a height exceeding the recommended standard of the Committee on Maintenance.

The Committee on Relations between Railroads presented an amended form of Per Diem Rule 9, which was approved by the association. Amended forms of Car Service Rule 15, and also the standing resolution of the association covering the subject of advertisements on freight cars were presented and approved by the association. The following interpretations to Car Service Rules 10 and 15 were also presented and approved:

Question.—Under Car Service Rule 10 as adopted November 20, 1912, may claims for cars received prior to that date be made at any time prior to November 20, 1913?

Answer.—Yes.

Question.—Under Car Service Rule 15, effective September 1, 1912, must the delivering line, in the absence of a local agreement, honor a per diem reclaim to cover the detention of a car or cars held while undergoing transfer?

Answer.—No.

The association approved the recommendation of the Committee on Relations between Railroads that a monthly report be obtained from the members of the home and foreign cars light weighed on their lines.

A revised form of average agreement for use under Rule 9 of the National Car Demurrage Rules was approved.

The following resolution was also adopted:

Resolved, That proper car distribution rules, as referred to in the note to National Car Demurrage Rule 1, Section B, should include a provision to the effect that empties placed in time for loading and not loaded, part loads and loaded cars for which billing has not been furnished be charged against the succeeding day's allotment.

The committee reported that the Sub-Committee on Packing, Marking and Handling of Freight has been in constant communication with Classification Committees and Weighing Bureaus respecting the marking and packing of freight, and that on the recommendation of the Sub-Committee 30,000 copies of an article entitled "Why Some Men Fail" have been distributed. Instructions for trimming coal on freight cars as recommended by the Committee on Relations between Railroads were approved by the association.

Interpretation No. 39 rendered by the Per Diem Rules Arbitration Committee was approved as follows:

Question.—Are claims under Per Diem Rules 5 and 11 valid when presented by claiming road to the local freight agent of road from which allowance is claimed?

Answer.—No. Claims are not valid unless sent to proper car service officer of road from which allowance is claimed.

The track scale specifications and rules as recommended by the Committee on Relations between Railroads were approved as recommended practice by the association.

Henry Miller, general manager for the receivers of the Wabash, was elected second vice-president of the association; W. G. Besler, vice-president and general manager, Central of New Jersey, and Fairfax Harrison, president, Chicago, Indianapolis & Louisville, were elected members of the Executive Committee; Benj. McKeen, general manager, Pennsylvania Lines West of Pittsburgh; J. C. Stuart, vice-president, Erie, and G. W. Taylor, general superintendent of transportation, Southern Railway, were elected members of the Committee on Nominations. The New York Central & Hudson River, the Pennsylvania Railroad and the Seaboard Air Line were elected members of the Committee on Transportation. The Chicago & North Western, the Chicago, Rock Island & Pacific, and the Philadelphia & Reading were elected members of the Committee on Maintenance. The Chicago, Milwaukee & St. Paul, the Illinois Central and the Southern Pacific were elected members of the Committee on Relations between Railroads.

The association decided to hold its next session in Chicago on November 19, 1913.

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General News.

The Southern Railway has made a general increase in the pay of shopmen.

The Union Pacific is now double-track from Omaha, Neb., to Cheyennee, Wyo., 516 miles. This is by far the longest stretch of double-track railroad west of the Missouri river.

A freight house of the Cleveland, Cincinnati, Chicago & St. Louis, at Indianapolis, was partially destroyed by fire on the night of May 8. The loss, including a large quantity of freight, is estimated at $10,000.

Twenty-seven farmers along the lines of the Texas & Pacific Railway in Louisiana have filed suits against the road for damages ranging from $139 to $1,500 each for alleged failure of the company to furnish cars in which to ship their produce to the markets.

Four hundred men employed on the construction of the Kettle Valley Railway, a subsidiary of the Canadian Pacific, went out on strike on May 9, putting a stop to work on 47 miles of the road. Agitation by officers of the Industrial Workers of the World is said to have led to the strike.

The joint tunnel committee of the Denver commercial organizations has received a letter from President Darius Miller, of the Chicago, Burlington & Quincy, saying that the Burlington will be glad to see the Denver, Northwestern & Pacific tunnel completed, and "hopes to be able to co-operate with the company in making it profitable and useful to the commercial interests of Denver."

Disturbance of traffic in northern Mexico by reason of the activity of the rebels in that region seems to be growing worse rather than better; and press despatches from Mexico City say that a complete suspension of operations after June 1 is in contemplation. This is in furtherance of a plan to weaken the rebels by cutting off their supplies. In Chihuahua no railroads are operating south of Chihuahua City.

The state's attorney at Bridgeport, Conn., announces that the trial of President Mellen and ex-Vice-President McHenry, of the New Haven road, for manslaughter, in connection with a derailment last October will be postponed until the September term of the Superior Court. His plan to have the trial take place the present month could not be carried out on account of the assignment of judges allowing insufficient time.

The amount paid out by the Pennsylvania Railroad in the year 1912 for goods damaged in wrecks was only $1,600; while on claims for losses due to theft, the aggregate payments were $28,908. As the lines of the Pennsylvania run through many states the officers are congratulating themselves on the new federal law, the Carlin act, under which thieves stealing from interstate shipments may be prosecuted in the federal courts.

The workmen's compensation act passed by the legislature of New York at its session recently adjourned, has been vetoed by the governor, who finds serious objection to the law because it will not reduce the amount and cost of litigation, which is the crying evil under the present system. The governor thinks that the legislature should try again next year, and formulate a law which shall more fully carry out the promises which have been made by the democratic party.

Marcel G. Brindejonc des Houlinais, a French aviator, on May 18, flew from Hendon, England, to Calais, and back, without landing, a total distance of 100 miles, in 55 minutes; and he carried one passenger. On May 17 a flight in an airship was successfully made from Key West, Fla., to Havana, Cuba, the aviator taking a $10,000 prize which had been offered by the Cuban government. On the 19th another aviator, who failed in the competition of the 17th, made a successful flight, occupying two hours and ten minutes.

The Advisory Committee of the railroads which was created at the meeting in New York City, April 24, to attend to matters connected with federal valuation, met in New York, May 16. The committee will confer with the Interstate Commerce Commission at Washington, May 27. Thomas W. Hulme has been chosen secretary of the committee. Samuel Rea is general chairman; L. F. Loree, chairman of the eastern group; W. W. Finley, chairman of the southern group, and Hale Holden, chairman of the western group.

The New York State Civil Service Commission, Albany, announces competitive examinations June 14 in various cities for a number of positions in the service of the state, and of counties and villages. Among these are junior bridge draftsman, salary $900 to $1,200; bridge designer, salary $1,500 to $2,100; junior railway engineer for the Public Service Commission, First district, salary $900 to $1,200, and inspector of steel, salary $1,500. For the last-named position several men will be wanted to go to the steel manufacturing plants in Pennsylvania.

A press despatch from Hinton, W. Va., reports that on Tuesday of this week a train of the Chesapeake & Ohio in which were six passengers was swept 200 ft. down the mountain side by a landslide, and the six passengers killed. The train consisted of an engine, three freight cars and a caboose. The passengers were in the caboose. The train had been stopped between Sewell and Landisburg because of an obstruction on the track, due to a storm, and while the train was at a standstill and the trainmen were clearing the track, the cars were overwhelmed by a mass of earth which fell from the mountain above.

Beginning on July 1, the Texas State Railroad, operating between Palestine, and Rusk, Tex., will be operated under the jurisdiction of the governor instead of the State Prison Commission. Governor Colquitt has announced that he will assume the active management, and that instead of reporting a monthly loss he believes he will be able to make the road earn from $1,000 to $2,000 a month. The governor recently made an inspection trip over the road with President W. B. Scott, of the Sunset Central Lines, for the purpose of obtaining advice from a practical railway man. A number of improvements are contemplated.

The ticket office of the Pennsylvania Railroad at Pittsburgh has been reorganized so that a passenger can now get a ticket to any station by going to any one of the windows which is open. There are eight windows and the attendant at each of them has a complete stock of tickets. Heretofore, different windows were assigned to different divisions or sections of the road. Six additional sellers have been employed and the working hours of the men will be lessened. Four windows are open at all times, and this number is increased to eight during that portion of the day when travel is heaviest. By the new plan, which is the same as that in force at New York, Washington and Baltimore, a passenger standing in line and delayed by someone ahead of him who holds a long conversation with the ticket seller, can drop out of the line and go to another window.

The Pennsylvania Railroad reports that recently enacted legislation governing railroad operation in the States of New York, New Jersey and Pennsylvania will cost it about $1,200,000 a year. In Pennsylvania the full crew law costs the road $555,085 and the semi-monthly pay bill, which has just become a law, $275,000 a year. In New York the full crew bill will cost $101,160 a year. In New Jersey the grade crossing bill if literally enforced would cost the Pennsylvania more than $60,000,000. Put aside from that the semi-monthly pay bill in that state costs $30,000, the crew law $219,840 and the drinking water law $18,000 a year. Thus the legislation in these three states, excluding the New Jersey grade crossing bill, will cost the Pennsylvania $1,199,085 a year. This sum represents the annual return at 5 per cent. upon nearly $24,000,000 of capital. The expenditure by the Pennsylvania on account of new laws, Federal and state, from August 1, 1906, to January 1, 1913, was $10,936,134.

Boston & Maine Pensions.

The Boston & Maine now pays $8,206 a month in pensions to 258 employees. In the thirty months from October 1, 1910, to March 31, 1913, there has been an increase in the pensions paid to employees amounting to $169,742. The rate of increase in the amount of pensions paid is greater this year than in either of the two previous years, showing how the system is being extended.

The number of pensioners at the present time is 258. There are 22 general and other officers receiving a total of $2,409; fourteen clerks receiving $324; forty-seven agents and stationmen

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receiving $1,073; thirty-nine switchmen and watchmen receiving $675; thirty-nine enginemen receiving $1,245; sixteen passenger conductors receiving $545; six freight conductors receiving $198; four other trainmen receiving $110; forty-eight shopmen receiving $1,142, and twenty-three section foremen and laborers who get $481.

Hope Deferred.

After thirty-seven years of agitation and expectation on the part of the people of Western Canada, the first mile of the Hudson Bay Railway was completed May 17, when the J. D. McArthur Company's engine No. 15 finally crossed the Saskatchewan river, pushing before it a rail laying machine and hauling one material car. About 500 men are now at work on the first portion of the road and it is expected to lay almost half of the track this year.

The Pennsylvania's Mileage.

The annual record of transportation lines of the Pennsylvania Railroad shows a total of 11,644 miles of line in the system, and 25,695 miles of track. The system paid out last year $188,749,312 in wages, or $7,346 for every mile of track, and there are more than eight employees for every mile. While the present mileage of line is only 1,088 greater than in 1902, there has been an increase of 1,335 miles in second track, 277 in third track, and 224 in fourth track; and an increase of sidings and yard track from 5,916 to 8,965, or 3,049 miles.

Coal Producers Big Consumers.

The Department of Mines of Pennsylvania reports that in 1901 only 9.2 per cent. of the amount of coal shipped was consumed at the mines for steam and heat; while 10 years later, in 1911, this amount had risen to 11.4 per cent. In 1901 the number of tons of coal shipped from the anthracite regions of Pennsylvania was 45,271,608, and the number of tons consumed at the mines was 4,880,532. In 1911 the figures were $71,227,687 and 8,171,494. At some of the mines where twenty-five to thirty tons of water have to be pumped or hoisted for every ton of coal extracted, over 25 per cent. of the coal produced is used for steam and heat.

A Fifty-Year Comparison.

A man who bought 100 shares of Pennsylvania Railroad stock 50 years ago—say the first day of the battle of Gettysburg—paid approximately $6,000 for it. If he kept it until today he would have received about 6 per cent. on his money all that time, but his capital would now be only $5,600.

Had a man on the same day bought a piece of real estate for $6,000 in the central part of Philadelphia or in any direction around it or in almost any other thriving town, the increase in his capital now would be very great, in almost every case. One man who 24 years ago paid $30,000 for a Chestnut street property recently refused $460,000 for it. His capital has multiplied by more than 15.

It is a curious thing that there is such a general impression that those who own railroads have grown rich with amazing rapidity. The truth is that a dollar invested half a century ago in America's largest railroad and the one where traffic is densest and the people richest, and where business has grown the fastest, is worth a little less than a dollar today. Similar comparisons might be made with the other standard lines of the East.—*Philadelphia Public Ledger.*

Loyalty with a Definite Meaning.

The very unusual action of Illinois Central employees in offering to aid the company financially, following its losses from floods and other causes, was noticed in the *Railway Age Gazette* of May 16, page 1101. The publication of this fact brings out another case, that of employees of the Buffalo & Susquehanna in 1911. On September 25, of that year, J. S. May, superintendent, received a letter from H. E. Marvin, an engineman, acting as "secretary for employees," saying:

"The employees desire to express in a suitable way their appreciation of the attitude and kind treatment of the Receiver, Mr. H. I. Miller, the Assistant Receiver, Mr. E. R. Darlow, and yourself, and our belief in your policy of making and maintaining a successful railroad. We greatly regret the accident which occurred some time since, and the employees, therefore, are cheerfully requesting you to deduct a day's pay to help offset in so far as possible the financial loss caused by the above mentioned accident. We wish it, however, distinctly understood that we are not by this action trying to influence in any way your decision in regard to any men who are at present out of the service, as we have learned from our pleasant relations with you in the past that you are absolutely fair.

"It must be gratifying to know that today you stand in a unique position in American railroading as being the possessor of the good will, respect and the whole hearted effort of every man in the service. That this is true is evidenced by a great many facts."

Basis of the Model Station.

Even though a station may be perfect from the standpoint of official rules and regulations, it may yet fall far below when judged by the traveling patron. I want people to know that they are just as welcome when they come into this station to have some money changed, as when they enter to purchase a ticket across the continent.

Neither my clerks nor myself want passengers to think that they are obligated to us; we feel that we are obligated to them. I always make it a rule personally to request an investigation of any grievance held against us by anyone. Sometimes little unfortunate matters will occur where there is a misunderstanding between passenger and employee. We are glad to hear complaints, as it gives us opportunities to forestall repetitions of the kind. By having our weaknesses pointed out by patrons, we can therefore fortify ourselves in our weakest places, and thus can better please the public. Each day I make it a point, on arriving at the station, to inspect thoroughly all departments, not from the viewpoint of the agent but rather that of the passenger.—F. E. Watson, Pasadena, Cal., in *L. & N. Bulletin.*

International Engineering Congress, 1915.

In connection with the Panama-Pacific International Exposition, which will be held in San Francisco in 1915, there will be an International Engineering Congress, in which engineers throughout the world will be invited to participate.

The congress is to be conducted under the auspices of the following five engineering societies: The American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the Society of Naval Architects and Marine Engineers.

These societies, acting in co-operation, have appointed a permanent Committee of Management, consisting of the presidents and secretaries of each of these societies, and 18 members living in San Francisco. The personnel of this committee is as follows: Representing the American Society of Civil Engineers, Geo. F. Swain (president), Chas. Warren Hunt (secretary), Arthur L. Adams, W. A. Cattell, Chas. Derleth, Jr., and Chas. D. Marx; representing the American Institute of Mining Engineers, Charles F. Rand (president), Bradley Stoughton (secretary), H. F. Bain, Edw. H. Benjamin, Newton Cleaveland and Wm. S. Noyes; representing the American Society of Mechanical Engineers, W. F. M. Goss (president), Calvin W. Rice (secretary), W. F. Durand, R. S. Moore, T. W. Ransom and C. R. Weymouth; representing the American Institute of Electrical Engineers, Ralph Davenport Mershon (president), F. L. Hutchinson (secretary), J. G. De Remer and A. M. Hunt; representing the Society of Naval Architects and Marine Engineers, Robert M. Thompson (president), D. H. Cox (secretary), Geo. W. Dickie, W. G. Dodd, Wm. R. Eckart and H. P. Frear.

The committee has effected a permanent organization, with Prof. Wm. F. Durand as chairman, and W. A. Cattell as secretary-treasurer, and has established executive offices in the Foxcroft building, San Francisco.

The ten members of the committee, consisting of the presidents and secretaries of the five national societies will constitute a committee on participation, through whom all invitations to participate in the congress will be issued. The actual management of the congress and the work of securing and publishing papers will be in charge of the members of the committee resident in San Francisco.

The papers presented at the congress will naturally be divided

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into groups or sections. During the congress each section will hold independent sessions, which will be presided over by a chairman eminent in the branches of engineering covered by this section.

The scope of the congress has not as yet been definitely determined, but it is hoped to make it widely representative of the best engineering practice throughout the world, and it is intended that the papers, discussions and proceedings shall constitute an adequate review of the progress made during the past decade and an authoritative presentation of the latest developments and most approved practices in the various branches of engineering work.

Southeastern Accounting Conference.

The chairman of the Southeastern Accounting Conference has announced the appointment of the following standing committees for the ensuing year:

Committee on Efficiency.

W. D. Beymer, chairman (C. of G.); J. M. Rodgers (N. & W.); C. B. Glessner (B. & O.); F. C. Uhlman (Virginian); W. J. Baker (Old Dominion Steamship Company); R. Kemp Slaughter (A. B. & A.), and A. P. Ottarson (N. C. & St. L.).

Committee on General Accounts and Subjects.

M. F. Molloy, chairman (C. N. O. & T. P.); Joseph W. Coxe (N. & W.); Geo. Becker (L. & N.); J. W. Nokely (C. & O.); O. B. Bidwell, Jr. (Merchants & Miners Transportation Company); Wm L. Markley (N. Y. P. & N.), and H. H. Laughton (Southern Railway).

Committee on Freight Accounts.

William McGowan, chairman (B. & O.); W. D. McCaig (A. C. L.); J. V. Bryant (C. N. O. & T. P.); H. C. Carlile (N. Y. P. & N.); J. A. Robinson (Southern Railway); B. B. McCaa (S. A. L.), and H. B. Cutter (L. & N.).

Committee on Passenger Accounts.

T. H. Wright, chairman (S. A. L.); W. H. Alexander (G. & F.); L. C. Esschen (I. C.); H. M. Hood (N. O. M. & C.); W. M. Mooney (T. C.); M. T. Lanigan (W. & T.), and G. S. LeGrande (A. C. L.).

Committee on Disbursements.

J. H. McEwen, chairman (N. C. & St. L.); J. A. Muse (C. C. & O.); R. A. Williams (A. C. L.); L. B. Enslow (C. & O.); G. F. Tucker (G. & S.); R. B. Walker (S. A. L.), and A. E. Fowler (Southern Railway).

Illuminating Engineering Society.

At a meeting of the Convention Committee of the Illuminating Engineering Society held in Pittsburgh, Pa., May 16, it was decided to hold the next annual convention in that city during the week beginning September 22.

The Convention Committee consists of C. A. Littlefield, chairman, New York Edison Company; P. S. Millar, president of the society, Electrical Testing laboratories; H. S. Evans, Macbeth Evans Glass Company, Pittsburgh, Pa.; W. A. Donkin, Duquesne Light Company, Pittsburgh, Pa.; D. McFarlan Moore, General Electric Company; M. C. Rypinski, Westinghouse Electric & Manufacturing Company; C. J. Mundo, General Electric Company; J. C. McQuiston, Westinghouse Electric & Manufacturing Company; W. J. Sterrill, United Gas Improvement Company, Philadelphia, Pa.; S. B. Stewart, Philadelphia Company, Pittsburgh, Pa.; T. J. Pace, Westinghouse Electric & Manufacturing Company, and Prof. H. S. Hower, Carnegie Technical Schools.

W. D. Donkin, Duquesne Light Company, was selected as chairman of the Local Committee on Arrangements, which will have charge of the convention. J. C. McQuiston was appointed chairman of the Publicity Committee.

The program, details of which have not as yet been completed, will consist, in addition to the technical sessions, of a reception and dance, several excursion trips and visits to various industries in Pittsburgh.

Traveling Engineers' Association.

The twenty-first annual convention of the Traveling Engineers' Association will be held at the Hotel Sherman, Chicago, Ill., commencing Tuesday, August 12, 1913, and continuing four days.

The subjects to be discussed include committee reports as follows: "Uniform Instruction to Enginemen on the Handling of Superheat Locomotives," by J. W. Hardy, chairman. "Credit Due Operating Department for Power Utilization and Train Movement that Reduces the Consumption of Fuel per Ton Mile," by M. J. Howley, chairman. "The Care of Locomotive Brake Equipment on Line of Road and at Terminals, also Methods of Locating and Reporting Defects," by H. A. Flynn, chairman; also papers on the following subjects: "Advantages Obtained with the Brick Arch in Locomotives," by LeGrand Parish; "What Can We Do to Eliminate the Black Smoke Evil on Locomotives," by J. H. Lewis; "Scientific Train Loading—Tonnage Rating. The Best Methods to Obtain Maximum Tonnage Haul for the Engine over the Entire Division, Taking into Consideration the Grades at Different Points on the Division," by S. O. Beyer, Jr.

American Institute of Electrical Engineers.

At the annual meeting of the American Institute of Electrical Engineers, held in the Engineering Societies' building, New York, on Tuesday, May 20, two papers entitled Trunk Line Electrification, by Charles P. Kahler, of the Oregon Short Line, and 2400-Volt Railway Electrification, by A. H. Hobart, of the General Electric Company, were presented. Both of these papers discussed the electrification of western lines with moderate traffic and each worked out in some detail comparative examples of the cost of installation and operation by steam and by electricity. As a means of reducing the first cost, both of these papers also advocated the purchase of power from private concerns rather than the construction of separate power houses. The paper by Mr. Kahler will be printed in an early issue.

Western Railway Club.

The annual meeting and election of officers of the Western Railway Club has been postponed until May 27. There will be an entertainment, including a burlesque banquet cabaret show and the Western Railway Club's famous German band.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Frith, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June 16, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

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BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—J. W. Meyer, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 15, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; 1st Thursday, Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. June, P. & R. Shops, Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria; 2d Thursday, Peoria.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City, Mo.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOCIATION.—C. Sorber, 1021 Mordaock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Merrifield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, Wednesday and Thursday, June 11-12, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. C. B. and M. of W. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—C. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. Lee, Terminal Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. P. Verser, Mercantile Library building, St. Louis, Mo.; Annual meeting in November. Monthly meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 2042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The Great Northern has advised the Duluth Commercial Club of the addition of eight daily package cars from Duluth to points in Minnesota and North Dakota.

The Canadian Northern has announced that through passenger service between Chicago and Winnipeg via Duluth will be established on June 7, over the Chicago & North Western and the Chicago, St. Paul, Minneapolis & Omaha, providing a train each way every day, leaving in the morning and arriving the next morning.

Commercial travelers, in convention at Sacramento, Cal., want the State Railroad Commission to secure for them a law requiring railroads to carry aliens in separate cars, the same as negroes are carried in some of the southern states. The drummers say that their health is imperiled by the presence of objectionable aliens in first class cars.

The federal grand jury at East St. Louis, Ill., on May 16 returned five indictments charging rebating and discrimination in 63 counts against the Vandalia, the Cleveland, Cincinnati, Chicago & St. Louis, the Chicago, Indiana & Southern, the Grand Trunk and the O'Gara Coal Company which is said to have received the benefit of the discriminations. There are three counts against the Vandalia, 20 against the Big Four and 20 against the Big Four and the Chicago, Indiana & Southern jointly. The Grand Trunk and the coal company are charged in 20 counts jointly with receiving and granting unlawful concessions.

R. B. Shimer & Company, commission merchants, have been indicted by the federal grand jury at New York on the charge of soliciting and receiving information from a railroad agent concerning shipments of freight belonging to other parties, without the consent of either shipper or consignee. The case refers to shipments of eggs over the Baltimore & Ohio, received in New York last year. An agent of the road gave information as to the names of the shippers. The Interstate Commerce law, section 15, paragraph 6, makes an offense of this kind a misdemeanor and imposes a fine of not more than $1,000. H. C. Shimer, head of the firm, gave bail in $2,000.

The latest agricultural enterprise reported by a railroad is that of the New York, New Haven & Hartford in establishing a mill, at West Stockbridge, Mass., to grind lime for the benefit of the farmers of western Massachusetts and Connecticut. Representatives of the industrial bureau maintained by the road, learning that one of the principal needs of the soil in New England was lime, cast about for a supply of that article; and they found that the extensive deposit near West Stockbridge was of a suitable character. The Grangers' Lime & Marble Company has been organized, with Wilson H. Lee as president. Mr. Lee is vice-president of the state board of agriculture. It is proposed to sell ground lime at $1.50 a ton, and they expect to turn out 40,000 tons a year. This, however, is only a beginning; the farmers along the New Haven lines could make good use of 700,000 tons a year.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended from May 7 until November 7 the schedules in a supplement to Agent M. P. Washburn's tariff, which proposed to advance rates on ground iron ore from points in Alabama, Georgia and Tennessee to Boston, Mass., New York, N. Y., and Philadelphia, Pa.

The commission has suspended from April 23 until July 17 certain schedules in certain supplements to the tariff of the Norfolk & Western, which cancel existing through rates applicable to tanning extract from Lynchburg, Va., to points located on the Bangor & Aroostook.

The commission has suspended until September 11 the supplement to Agent F. A. Leland's tariff, which proposed to advance rates for the transportation of calves from Refugio, Tex., to New Orleans, La., and St. Louis, Mo., from 44½ and 52½ cents per 100 lbs., respectively, to 60 cents per 100 lbs., with a minimum carload weight of 17,000 lbs.

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The commission has suspended until August 16 the schedules in certain tariffs, which proposed to cancel through joint rates (both class and commodity) now in effect from and to stations located on the Kansas City & Memphis and points located on or reached via the St. Louis & San Francisco, providing that combination would be applicable, which would have resulted in material advances.

The commission has suspended from April 25 until August 23 the operation of the supplement to the tariff of the St. Louis & San Francisco which, by the cancellation of through joint rates leaving in effect combination rates, advances rates for the transportation of lumber and articles manufactured therefrom, in carloads, from points in Arkansas and Missouri to points in Iowa, Minnesota and other States. The increases amount to about 2 cents per 100 lbs. in all instances.

Rates on Glass Sand Reduced.

Charles Boldt Company v. Chicago, Rock Island & Pacific et al. Opinion by the commission:

In this case the complainant contends that the rate of $1.80 per ton for the transportation of glass sand in carloads from Ottawa, Ill., to Cincinnati, Ohio, is unreasonable. Reparation is asked. The commission decided that the rate in question was unreasonable to the extent that it exceeds $1.60 per 100 lbs., but that as the rate of $1.80 per 100 lbs. had not been unreasonable in the past, no reparation should be awarded. (27 I. C. C., 11.)

Joint Rates on Lumber Cancelled.

In re investigation and suspension of lumber rates from Mississippi to eastern points. Opinion by Chairman Clark:

The commission decided that the cancellation of joint rates on lumber from points on the Gulf & Ship Island and New Orleans Great Northern via the Illinois Central to points in eastern Trunk Line territory, eastern Canada and New England should be permitted, as other through routes and joint rates via shorter and more direct lines were provided, and as no increased charges to the shippers or receivers were involved. (27 I. C. C., 6.)

Reparation Awarded.

Central Coal & Coke Company v. Missouri & Louisiana et al. Opinion by Commissioner Prouty:

In this case the complainant asks for reparation on its shipments of coal over the lines of the defendant from coal mines near Bonanza, Ark., to destinations in Oklahoma, Missouri, Iowa, Kansas and Nebraska during the period between September 26, 1910, and February 27, 1911, during which time the defendants failed to maintain joint rates. The prayer of the complainant was granted. (27 I. C. C., 40.)

Express Package Incorrectly Marked.

Parlin & Orendorff Plow Company of St. Louis v. United States Express Company. Opinion by the commission:

An express package, on which an incorrect destination was marked by the shipper, was offered for transportation with receipt already filled out by shipper and showing correct destination. Carrier before signing receipt changed destination shown thereon to agree with that marked on package, and then transported the package to the latter destination. The commission decided that the carrier in issuing receipt was not bound to call attention to the change in destination and should not be required to return the goods without charges. (26 I. C. C., 561.)

Rates on Logs Reduced.

Memphis Freight Bureau v. Illinois Central et al. Opinion by the commission:

The complainant contends that the rate of 13 cents for the transportation of logs from Pearson, Miss., to Memphis, Tenn., is unreasonable. Reparation is asked. The commission decided that the through rate of 13 cents per 100 lbs. was unreasonable to the extent that it exceeded a combination of intermediate rates amounting to 9.25 cents, consisting of the initial carrier's local rate of three cents from Pearson to Jackson and a distance rate of the Illinois Central from Jackson to Memphis. The commission ordered that in future the rate from Pearson to Memphis should not exceed by more than three cents per 100 lbs. the local rate from Jackson to Memphis. Reparation was awarded. (27 I. C. C., 1.)

Middlesboro, Ky., Discriminated Against.

Middlesboro, Ky., Board of Trade v. Louisville & Nashville et al. Opinion by the commission:

The commission decided that Middlesboro, Ky., was discriminated against in favor of Jellico, Tenn., by the Southern Railway in its class rates from Birmingham, Ala., and other southeastern points, and ordered that in future the rate to Middlesboro from the points in question should not exceed the rates to Jellico from the same points. The commission also decided that the class rates, water and rail, from New York and other eastern points, and the all-rail rates from the Ohio river crossings to Middlesboro were unreasonable as compared with the rates from the same points to Jellico. The commission prescribed reasonable rates for the future. While no testimony specifically affecting the commodity rates was introduced, those rates should be readjusted to conform to the findings in this case, as should also the rates from the interior eastern cities as shown in Agent Ryan's tariffs. Reparation was denied (27 I. C. C., 14.)

Ice Rate Reduced.

People's Fuel & Supply Company v. Grand Trunk Western et al. Opinion by Chairman Clark:

In this case the complainant contends that the rate on ice from Silver Lake, Wis., to Chicago is unreasonable. Reparation is asked. The shipments moved from Silver Lake to Hawthorne, Ill., over the line of the Minneapolis, St. Paul & Sault Ste. Marie; from Hawthorne to Elsdon over the Illinois Northern; and from Elsdon to the plant of the complainant at Chicago over the Grand Trunk Western. Prior to August 1, 1911, the switching charge of the Grand Trunk on ice from the Soo line was $3 per car irrespective of weight, and this amount was absorbed by the Soo line when its revenue for the line haul equaled or exceeded $15 per car. On August 1, 1911, the Grand Trunk Western increased its rate for its share of the service and on November 15, 1911, again increased its rate to a minimum of $9 per car. The through rate was increased by this action of the Grand Trunk Western as the Soo line refused to absorb more than $3 per car. No evidence was introduced to prove the reasonableness of the increases and the commission decided that the present rate was unreasonable to the extent that it exceeded the rate in effect prior to August 1, 1911. Reparation will be awarded. No order was deemed necessary. (27 I. C. C., 24.)

Lumber Rates Reduced.

Michigan Hard Wood Manufacturers' Association et al v. Transcontinental Freight Bureau et al. Opinion by Commissioner Prouty:

In the original case, 22 I. C. C., 387, the commission decided that the rate of 85 cents per 100 lbs., for the transportation of hard wood lumber from the mills of the complainants to Pacific coast terminals was unreasonable, and that a rate of 80 cents per 100 lbs., for this service would be reasonable. The commission understood that the mills of all the complainants were included in the southern portion of the southern peninsular of Michigan, and awarded reparation on shipments from that territory. The complainants filed a petition for rehearing saying that their petition had related to the entire southern peninsula of Michigan, and that no good reason existed why the same rate which applied to the territory named in the opinion should not also be extended to the more northerly territory in which were situated many of the mills of the complainants. The commission decided that its opinion had been rendered under a misconception and granted a rehearing. The commission decided that the 80-cent rate should apply to the entire southern peninsula and that reparation should be awarded on shipments from all mills in that region on the same basis. A voluntary association can not by claiming reparation generally in behalf of its members interrupt the running of the statute of limitations as to those members. In this case the association filed the complaint in behalf of certain of its members who are specifically named, and also in behalf of certain other indi-

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viduals not members of the association who are also named. The commission decided that this was in substance a petition by the firms and individuals whose names are given and the case should be treated as though those persons were described as petitioners. The complaint contains no explicit statement that the complainants made shipments under the 85-cent rate, but alleges that they are shippers of hard wood lumber between the points named, that an extensive business had been built up under the 75-cent rate, which business had been injured and its existence imperiled by the 85-cent rate; and asks for a refund. The commission found that this petition is simply a filing of the claims of those firms and individuals named and will interrupt the running of the statute from the date when the petition was filed. The original petition claimed reparation from August 1, 1908, but subsequently complainants asked reparation from January 1, 1905 when the 85-cent rate became effective. This cannot be permitted. All the original complainants are entitled to reparation with respect to shipments subsequent to August 1, 1908; and the five complainants not mentioned in the original proceeding whose claims were first filed September 19, 1912 are entitled to reparation on shipments subsequent to September 19, 1910. The defendants claim that as the complainants increased the price of their lumber by the amount of the increase in the transportation charge, they have suffered no damage. The complainants assert that in subsequent settlement between the consignees and themselves, the freight money was in all cases repaid to the consignees. The commission decided that reparation would be awarded when the complainants had proved that they had refunded the amount of the freight charges. (27 I. C. C., 32.)

STATE COMMISSIONS.

The Wisconsin Railroad Commission has ordered a general reduction of 20 per cent. in the rates for transportation of merchandise by express, to go into effect in 20 days. The hundred pound basing rates are considerably altered and the graduate scales on which the charges for the various weights are computed are completely changed.

COURT NEWS.

The appellate division of the supreme court, in one of the suits against the Delaware & Hudson growing out of the issuance of fradulent bills of lading two or three years ago, has decided in favor of the road. In this suit, that of Kausch, assigned to Williams, the lower court had given the plaintiff a verdict of $90,711; but this is now reversed. It is expected that Williams will appeal to the higher court. Other suits, aggregating $650,000, are pending against the road. Oliver, one of the men tried as a principal in the crimes connected with these bill-of-lading transactions, has never been convicted but he is now under indictment in New York county. Palmer, the freight agent who was implicated, was convicted but has never been sentenced.

The decision of the supreme court of the United States, holding the Norfolk & Western liable for damages on a shipment of tobacco when the damages occurred on the boat of the Old Dominion Steamship Company, was reported in the *Railway Age Gazette*, May 16, page 1109. The bill of lading in this case bore the usual stipulation that no carrier should be liable for damages occurring beyond its own line, the company resting its claim for the justification of this stipulation on the fact that its action in giving a through rate was involuntary. In the Virginia State court the decision against the road had been based on the ruling of the supreme court in an earlier case where there was a presumption that the carrier was a voluntary party to a through route and rate, whereas in the present case the Norfolk & Western had not formed any through route with the Old Dominion. Being required by the statute to give a through bill of lading was claimed to be the same as having its property taken without due process of law. But the decision, by Mr. Justice Holmes, shows that in the earlier cases, depended on by the Virginia court, the supposed through routes were only presumed. The present case goes against the Norfolk & Western on the ground that there is no substantial distinction between this and the earlier cases.

Railway Officers.

Executive, Financial and Legal Officers.

Frank J. Lawlor has been appointed acting treasurer of the Chicago, Terre Haute & Southeastern, with headquarters at Chicago, succeeding E. F. Young, retired.

Bruce Wyman, professor of law at Harvard University, has been engaged by the New York, New Haven & Hartford as consulting counsel in matters affecting interstate commerce.

Edward Francis Kearney, who has just been elected first vice-president of the Texas & Pacific, in charge of maintenance, operation and traffic, with headquarters at New Orleans, La., and Dallas, Tex., was born March 27, 1865, at Logansport, Ind. He was educated in the public schools and began railway work in 1882 as telegraph operator for the Pennsylvania Lines, and was subsequently freight clerk, chief operator superintendent's office, train despatcher and trainmaster's clerk and chief clerk to superintendent, until December, 1899, when he was made trainmaster at Indianapolis, Ind. In February, 1903, he went to St. Louis, Mo., as superintendent of the Terminal Railroad Association and St. Louis Merchants' Bridge Terminal Railway. One year later he left to become supervisor of mails of the Chicago, Rock Island & Pacific, and two months afterwards was appointed general superintendent of transportation of the St. Louis & San Francisco, resigning in October. Mr. Kearney went to the Missouri Pacific in April, 1905, as superintendent of terminals at St. Louis, and on February 15, 1908, was made superintendent of transportation of that road and the St. Louis, Iron Mountain & Southern. He was promoted to general superintendent of transportation of the Missouri Pacific system, in January of this year, and now assumes the vice-presidency of the Texas & Pacific, as above noted.

E. F. Kearney.

Operating Officers.

J. A. Somerville, superintendent of transportation of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with office at St. Louis, Mo., will assume the duties and authority of E. F. Kearney, who recently resigned as general superintendent of transportation.

J. F. Keegan, superintendent of the Monongah division of the Baltimore & Ohio, at Grafton, W. Va., has been appointed superintendent of the Chicago division, with headquarters at Garrett, Ind. J. M. Scott, assistant superintendent of the Cumberland division at Keyser, W. Va., succeeds Mr. Keegan, with headquarters at Grafton, and M. H. Cahill, who recently resigned as superintendent of the Buffalo division of the Delaware, Lackawanna & Western, succeeds Mr. Scott.

Traffic Officers.

H. W. Stoutenborough has been appointed assistant general freight and passenger agent of the Bingham & Garfield, with headquarters at Salt Lake City, Utah.

H. C. Bush has resigned as traffic manager of the Colorado Midland and the office is abolished. L. C. Rafert, chief clerk in the freight department, has been appointed general freight agent, with headquarters at Denver, Colo.

G. Z. Phillips, general passenger agent of the Baltimore Steam Packet Company, Baltimore, Md., has been appointed assistant general passenger agent of the Seaboard Air Line, with headquarters at Jacksonville, Fla., effective June 1.

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W. G. Barnwell, general freight agent of the Atchison, Topeka & Santa Fe Coast Lines, with headquarters at Los Angeles, has been appointed assistant freight traffic manager, with office at San Francisco, Cal., succeeding Edward Chambers, promoted. H. P. Anewalt, assistant general freight agent at San Francisco, succeeds Mr. Barnwell. Effective June 1.

C. E. Perkins, general freight agent of the St. Louis, Iron Mountain & Southern, at St. Louis, Mo., has been appointed assistant general traffic manager, a new position. The office of assistant to general traffic manager has been abolished and A. T. Stewart has been appointed general freight agent of the Missouri Pacific, with office at Kansas City, succeeding K. M. Wharry, resigned. E. H. Calef, assistant general freight agent at St. Louis, has been appointed general freight agent of the St. Louis, Iron Mountain & Southern, succeeding Mr. Perkins. W. I. Jones, assistant general freight agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, in charge of coal traffic, has been appointed assistant general freight agent in charge of solicitation of outside agencies and interchange, succeeding J. B. Trimble, assigned to other duties, all effective June 1.

Ralph C. Caples, general agent of the traffic department of the New York Central Lines, with headquarters at New York, has been appointed general traffic manager of the Western Maryland, with headquarters at Baltimore, Md. He was born on December 23, 1872, at Fostoria, Ohio, and was educated at Oberlin College, Oberlin, Ohio, also at Northwestern University, Evanston, Ill., and in 1896 entered Princeton University, Princeton, N. J. Previous to this, at the age of 18, he became yard clerk on the Lake Erie & Western, at Fostoria; the following year was advertising agent of the New York, Chicago & St. Louis, and in 1892 he became traveling passenger agent for the Mobile & Ohio. After leaving college he was passenger agent of the Delaware, Lackawanna & Western at New York, and then for two years was general passenger agent of the Detroit & Lima Northern, now a part of the Detroit, Toledo & Ironton. During 1900 and 1901 he was general manager at Tampa, Fla., of the Florida West Coast Transportation Company, operating a line of steamers. In 1907 he entered the service of the New York Central & Hudson River, and in May of that year was made special representative of that road. In February, 1909, he was promoted to general agent of the traffic department, covering all New York Central Lines both east and west of Buffalo, N. Y., and leaves that position on June 1, to become general traffic manager of the Western Maryland as above noted.

R. C. Caples.

Engineering and Rolling Stock Officers.

F. E. Hutchison has resigned as electrical engineer of the Chicago, Rock Island & Pacific.

George Peck has been appointed roadmaster of the Canadian Pacific at the Calgary, Alta., terminals, in place of T. Bradshaw, transferred.

M. C. Blanchard, division engineer of the Atchison, Topeka & Santa Fe, at Topeka, Kan., has been appointed office engineer at Topeka, in place of K. B. Duncan, promoted.

L. J. Putnam, division engineer of the Chicago & North Western at Boone, Iowa, has been appointed principal assistant engineer, with headquarters at Chicago. M. E. Thomas, division engineer of the Minnesota and Dakota divisions at Winona, Minn., succeeds Mr. Putnam as division engineer of the East and West Iowa, and Iowa and Minnesota divisions at Boone. Mr. Thomas is succeeded by W. J. Jackson, division engineer of the Madison division at Madison, Wis., and Lee Jutton takes the place of Mr. Jackson.

P. Alquist, who has been appointed superintendent of the car department of the Missouri, Kansas & Texas, with office at Sedalia, Mo., as announced in last week's issue, was born in Stockholm, Sweden, in 1874. Mr. Alquist came to this country in 1885, settling at Memphis, Tenn. He started his railroad career as car repairer for the Illinois Central at Memphis in the early part of 1895, working for the same road as car interchange inspector, rip track foreman, assistant general foreman, and general foreman of the car department of the Memphis, Mississippi and Fulton divisions until 1910, when he left to go with the Cincinnati, Hamilton & Dayton as general foreman of the car department at Lima, Ohio. He left that road after about eighteen months' service to go to the Pere Marquette as general car foreman at Grand Rapids, Mich., general inspector and chief inspector of car department respectively, until his recent appointment as superintendent of car department of the Missouri, Kansas & Texas, succeeding W. A. Mitchell, who was master car builder. The office of master car builder has been abolished. Mr. Alquist was vice-president of the chief interchange inspection association at Toledo, Ohio.

P. Alquist.

Kenneth B. Duncan, whose appointment as engineer of Gulf lines of the Gulf, Colorado & Santa Fe, with headquarters at Galveston, Tex., has already been announced in these columns, was born September 5, 1878, at Princeton, Ind. He was graduated from Purdue University in 1902. Mr. Duncan began railway work in November, 1899, with the Cleveland, Cincinnati, Chicago & St. Louis at Mt. Carmel, Ill., and with the exception of two winters spent at Purdue University, remained with that road until June, 1902. He was then with the U. S. Department of Agriculture, engaged in drainage investigations at Fresno, Cal., until February, 1903, when he went to the Gulf, Colorado & Santa Fe as draftsman at Galveston. From July, 1903, to June, 1905, he was an instructor in civil engineering Purdue University, and the following three years he was with the Houston & Texas Central successively as topographer, on location, resident engineer and division engineer on construction. Mr. Duncan returned to the Gulf, Colorado & Santa Fe in June, 1908, and for three years was assistant to the chief engineer at Galveston, leaving in June, 1911, to become office engineer of the Atchison, Topeka & Santa Fe at Topeka, Kan., which position he held until his promotion on May 1 as engineer of the Gulf lines of the Gulf, Colorado & Santa Fe, as above noted.

K. B. Duncan.

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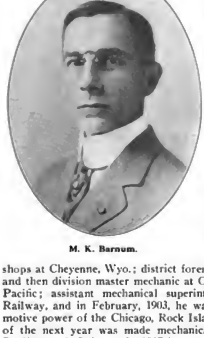
Morgan K. Barnum, who has resigned as general superintendent of motive power of the Illinois Central and the Yazoo & Mississippi Valley, was born on April 6, 1891. He graduated from Syracuse University in 1884 with the degree of A. B. and later received the degree of A. M. He began railway work the year he graduated as a special apprentice in the shops of the New York, Lake Erie & Western, now the Erie, at Susquehanna, Pa. He was then consecutively machinist and mechanical inspector and later general foreman of the same road at Salamanca, N. Y.; general foreman of the Louisville & Nashville shops at New Decatur, Ala.; assistant master mechanic of the Atchison, Topeka & Santa Fe at Argentine, Kan.; superintendent of shops at Cheyenne, Wyo.; district foreman at North Platte, Neb., and then division master mechanic at Omaha, Neb., on the Union Pacific; assistant mechanical superintendent on the Southern Railway, and in February, 1903, he was made superintendent of motive power of the Chicago, Rock Island & Pacific, and in April of the next year was made mechanical expert of the Chicago, Burlington & Quincy. In 1907 he was appointed general inspector of machinery and equipment of the same road. He left that road in April, 1910 to become general superintendent of motive power of the Illinois Central and the Yazoo & Mississippi Valley, from which position he has just resigned.



M. K. Barnum.

L. J. Putnam who has been appointed principal assistant engineer of the Chicago & North Western, with office at Chicago, was born on February 17, 1878, at Manchester, Iowa. He was educated at Cornell College, Mount Vernon, Iowa, receiving the degree of B. S. in civil engineering in 1903, and of C. E. two years later. He began railway work in June, 1898, with the Illinois Central; and in June of the following year went with the Chicago & North Western as an instrument man, and he has been with that road ever since. From February, 1901, to March, 1906, he was assistant engineer on construction, location and maintenance, and was then made acting division engineer of the Ashland division at Kaukauna, Wis. From March, 1907, he was consecutively assistant engineer in charge of second track and terminal improvements at Janesville, Wis., assistant engineer in charge of the bascule bridge over the north branch of the Chicago river and of the Wells street yard at Chicago; resident engineer of the Milwaukee track elevation; resident engineer of the Escanaba ore dock construction; and from July, 1910, to April 1, 1912, he was with the Milwaukee, Sparta & North Western, the new line of the Chicago & North Western across Wisconsin, first as resident engineer on construction, and then as acting resident engineer. On April 1, 1912, he was promoted to division engineer at Boone, and now becomes principal assistant engineer of the same road as above noted.

L. J. Putnam.

Robert W. Bell, superintendent of machinery of the Illinois Central at Chicago, has been appointed general superintendent of motive power of the Illinois Central and the Yazoo & Mississippi Valley, with headquarters at Chicago, succeeding M. K. Barnum, resigned. Joseph H. Nash, superintendent of the Burnside shops, has been appointed superintendent of motive power for the Illinois Central lines north of the Ohio river, with headquarters at Chicago, and Frank B. Barclay, master mechanic at McComb, Miss., has been appointed superintendent of motive power of the Illinois Central lines south of the Ohio river, and of the Yazoo & Mississippi Valley, with headquarters at Memphis, Tenn., all effective June 1.

Purchasing Officers.

G. E. Scott has been appointed assistant purchasing agent of the Missouri, Kansas & Texas System, with headquarters at St. Louis, Mo., effective May 15.

OBITUARY.

William Edward Davis, passenger traffic manager of the Grand Trunk and the Grand Trunk Pacific, with headquarters at Montreal, Que., died on May 15, at Vaudreuil, near Montreal. He was born on August 2, 1850, at Wilson, Niagara county, N. Y., and began railroad work in 1868, as a clerk on the Hannibal & St. Joseph, now a part of the Chicago, Burlington & Quincy. From 1873 to 1877, he was with the Kansas City, Fort Scott & Gulf, now a part of the Frisco system, and in August, 1877, he entered the service of what is now a part of the Grand Trunk system, then known as the Chicago & Lake Huron. This company afterwards passed to the control of the Grand Trunk and is now what is officially known as the Grand Trunk Western. He was subsequently to April 1, 1896, assistant general passenger agent of the Grand Trunk and then to May, 1900, was general passenger and ticket agent of the same road at Montreal. On May 1, 1900, he was appointed passenger traffic manager of the entire system and at the time of his death was also passenger traffic manager of the Grand Trunk Pacific.

W. E. Davis.

Henry Schlacks, formerly superintendent of machinery of the Denver & Rio Grande, died on May 16, at Chicago, aged 73 years. Mr. Schlacks was born November 25, 1839, at Daun, Rhine Province, Germany. He began railway work in August, 1855, as machinist apprentice at the Weldon shops of the Illinois Central, and after completing his apprenticeship was machinist for that road until June, 1865. He was then with the Chicago, Rock Island & Pacific from June, 1866, to January, 1873, successively as foreman erecting shop, foreman machine shops and general foreman. On the latter date he returned to the Illinois Central as master mechanic, and from November, 1882, to February, 1893, was superintendent of machinery of that road. In December, 1893, Mr. Schlacks became superintendent of machinery of the Denver & Rio Grande, resigning in August, 1902. Mr. Schlacks was the father of Charles H., vice-president of the Western Pacific; Henry J., an architect in Chicago; Joseph T., vice-president of the McCord Manufacturing Company, Detroit, Mich.; William J., with McCord & Company, Chicago; Edward L., in the coal business in Nebraska, and Robert J., manufacturers' agent in Denver, Colo.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE TEXAS MIDLAND has ordered 2 consolidation locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 22 in. x 28 in. cylinders, 56 in. driving wheels and in working order will weigh 190,000 lbs.

THE ATLANTA, BIRMINGHAM & ATLANTIC, mentioned in the *Railway Age Gazette* of January 31 as being in the market for 5 locomotives, has ordered this equipment from the Baldwin Locomotive Works. These locomotives will be equipped with the Baker valve gear.

THE NEW YORK CENTRAL LINES have ordered 45 locomotives from the American Locomotive Company and 10 switching locomotives from the Baldwin Locomotive Works in addition to the 124 locomotives recently ordered and mentioned in the *Railway Age Gazette* of May 9.

CAR BUILDING.

THE HOCKING VALLEY has ordered 1,000 coal cars from the Ralston Steel Car Company.

THE BETHLEHEM STEEL COMPANY, South Bethlehem, Pa., will soon place orders for about 50 freight cars.

THE SEABOARD AIR LINE will soon place orders for 10 seventy-foot steel coaches, and 5 seventy-two-foot steel dining cars.

THE GREAT NORTHERN has ordered 20 baggage cars, 25 coaches, 25 combination mail and baggage cars and 2 mail cars from the American Car & Foundry Company.

THE ERIE has ordered 1,000 hopper cars from the Pressed Steel Car Company, 1,500 box cars from the American Car & Foundry Company, 1,500 box cars, 500 hopper cars and 500 gondola cars from the Standard Steel Car Company.

IRON AND STEEL.

THE ATCHISON, TOPEKA & SANTA FE has ordered 15,000 tons of rails from the Illinois Steel Company.

THE MISSOURI, KANSAS & TEXAS has ordered 175 tons of structural steel from the American Bridge Company.

THE CHICAGO, BURLINGTON & QUINCY has ordered 225 tons of structural steel from the American Bridge Company.

SIGNALING.

The New York, Ontario & Western has adopted green for the night clear indication in fixed signals and yellow for caution; and has changed the colors of signal blades also, following in general the standards in force on the New York, New Haven & Hartford. Heretofore, automatic signals had blades with square ends and train order signals had pointed blades. The accepted standard has now been made universal throughout the length of the company's lines; automatic block signal arms, pointed; distant signal arms, fish-tail, and painted yellow; train order signals with rounded ends. On this road there are a considerable number of automatic signals, controlled by track circuits, in isolated sections, not making a complete block system. These have now all been made caution signals. Several different gangs of men were employed and the changes were made throughout the line on the same day. The color of switch targets and lights was also changed at the same time.

RAILWAY SURVEYS IN BRAZIL.—The President of Brazil has signed a decree authorizing $65,000 for expenses in the definite surveys of a railway from Coroata, in the State of Maranhao, to the right bank of the Rio Tocatins, and a decree approving the definite surveys and estimates amounting to $1,600,000 of the last section (47 miles) of the Campo Maior to Anarracao branch.

Supply Trade News.

The Pilliod Company, New York, has moved its offices from room 1823, 30 Church street, to room 829 in the same building, where larger floor space has been secured.

George D. Rosenthal, manager of the St. Louis, Mo., office of the General Electric Company, Schenectady, N. Y., died in New York on May 19. Mr. Rosenthal had been with the company for over 20 years.

The Engineering Construction Company has been organized, with offices at 106 North LaSalle street, Chicago, to do a general engineering and contracting business. The officers are: I. J. Crowley, general manager; E. A. Clark, chief engineer, and Jas. X. Gunning, secretary and treasurer.

J. W. Cleary, one of the oldest electric headlight men in the country, who joined the forces of the National Electric Headlight Company in Indianapolis in 1891, and in 1899 became associated with the Pyle-National Electric Headlight Company, Chicago, as traveling engineer, has resigned his position and will go abroad for several months.

The American Blower Company, Detroit, Mich., announces that William C. Redfield, having been appointed a member of President Wilson's cabinet, has deemed it advisable to terminate his business connections, and therefore has resigned as vice-president and director, and has retired from active participation in the management of the company.

TRADE PUBLICATIONS.

WATER POWER PLANTS.—The Stone & Webster Engineering Corporation, Boston, Mass., has published an illustrated booklet entitled Water Powers, giving brief data regarding various water power plants constructed by this corporation. Of the 12 plants described, six are for companies managed by the Stone & Webster Management Association, and six are for companies which are not in any way affiliated with the Stone & Webster organization.

ROLLED STEEL WHEELS.—This is the title of a 56 page catalog just issued by the Standard Steel Works Company, Philadelphia, Pa. The book is very completely illustrated and includes dimensioned drawings of rolled steel wheels for all classes of service together with complete specifications. For the guidance of purchasers, data and dimensioned drawings of the standard axles of the Master Car Builders' and Master Mechanics' Associations are also given

ASBESTOS METAL.—The Asbestos Protected Metal Company, Beaver Falls, Pa., is publishing a series of illustrated bulletins giving general descriptions of Asbestos Protected Metal which is designed to meet the demand for an economical roofing and siding material which will incur only small maintenance cost. The booklets include estimating data and descriptions of Asbestosteel, concrete roof and floor construction and Asbestosteel, lath wall and ceiling construction.

NEW LINE FOR NORWAY.—A short railway is to be constructed connecting Aalgaard with the present Stavanger-Egersund Railroad. It will be the first branch line to penetrate the mountainous region, although requiring no difficult engineering feat, for its roadbed will lie in one of the valleys. According to the estimates announced on April 9 by the engineer who has made the preliminary survey, the line will be 8¼ miles in length, have a maximum grade of 2 per cent, and will cost approximately $575,000. There is a possible alternative preliminary survey, hence the exact location of the right of way will not be determinated until about the last week in May. As this proposed line to connect Aalgaard with the present Stavanger-Egersund Railroad is a government project any inquiries should be addressed to the Bureau of National Railways, Christiania, Norway.

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Railway Construction.

CALIFORNIA, SHASTA & EASTERN.—This company which was recently incorporated in California with $600,000 capital, has secured control of the Anderson & Bella Vista, formerly the Terry Railroad, a lumber line, 16 miles long, and plans to rebuild the road and to build an extension to Ingot, 12½ miles.

CANADIAN PACIFIC.—See Toronto, Ont., under Railway Structures.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—The new second main track between Citico, Tenn., and Boyce, just out of Chattanooga, has been completed and was put in service on May 15. The company is now at work on 29.6 miles of second track between Erlanger, Ky., and Williamstown. (June 21, p. 1589.)

GLENGARRY & STORMONT.—An officer of this company writes that the line will probably be built, from St. Polycarp Junction, Que., on the Canadian Pacific via Williamstown to Cornwall, 30 miles. The work will involve handling about 10,000 cu. yds. a mile. There will be three steel bridges, each to have a 100 ft. span. The company expects to develop a traffic in agricultural products, cotton goods and furniture. C. L. Hervey, chief engineer, 400 St. James street, Montreal, Que. (April 11, p. 863.)

HUDSON RIVER CONNECTING.—See New York Central & Hudson River.

LAKE ERIE & NORTHERN.—An officer writes that the general contract has been given to Johnson Bros., Brantford, Ont., and work is now under way on the line from Galt, Ont., to Paris, Brantford, Simcoe and Port Dover on Lake Erie, 53 miles. The company expects to begin tracklaying in July, and to develop a traffic in coal and manufactured articles. W. J. Kellett, chief engineer, Brantford. (May 2, p. 1013.)

LOGAN RAPID TRANSIT COMPANY.—See Ogden Rapid Transit.

MATADOR & NORTHERN.—Organized in Texas to build from a point on the Quanah, Acme & Pacific to Memphis, Tex., about 75 miles. It is understood that the first division will be built at once, and it is planned to eventually extend the line north from Memphis to Canadian, an additional 100 miles, where connection is to be made with the Santa Fe. The headquarters of the company are at Matador.

MINNESOTA & INTERNATIONAL.—An officer is quoted as saying that the company is planning to build a cut-off from Leaks, Minn., southwesterly to a connection with the main line of the Northern Pacific at a point just west of the Northern Pacific hospital, about 58 miles, to provide an easier entrance into Brainerd. It is expected that the work will be started soon.

MONTEZUMA SAN JUAN SOUTHERN.—An officer writes that the company has been incorporated in Colorado with $4,000,000 capital, and surveys will be started at once. Financial arrangements are being made with Baron Ludwig de Leopold, Paris, France. The plans call for building via Cortez, Colo., south to Fruitland, N. Mex., thence to Grants, where connection is to be made with the Santa Fe, about 200 miles. It is expected that contracts for building the line will be let in about four months. There will be one steel bridge, also terminal stations. G. O. Harrison, president, and Emil Stein, general manager, Cortez. (April 18, p. 925.)

MUSKOGEE & MISSOURI PACIFIC CONNECTING.—Incorporated in Oklahoma to build an 8-mile line from Muskogee, Okla., to a point on the St. Louis, Iron Mountain & Southern, two miles south of Ft. Gibson. Former Governor Joseph Haskell and J. Hall are incorporators.

NEW YORK CENTRAL & HUDSON RIVER.—The New York Public Service Commission, Second district, recently held a hearing upon the application of the Hudson River Connecting for permission to construct a line from Stuyvesant, Columbia county, N. Y., to Fuera Bush, Albany county, with two branches, also to issue $250,000 capital stock, and upon the application of the New York Central & Hudson River to purchase the capital stock of the Hudson River Connecting. (April 11, p. 863.)

NEW YORK, NEW HAVEN & HARTFORD.—The Connecticut legislature has passed a bill authorizing the Westchester Northern to build and operate a line in Connecticut. The plans call for building from White Plains, N. Y., to Danbury, Conn. The company has a New York charter and asked for the right to build and operate in Connecticut. (October 11, 1912, p. 710.)

OGDEN RAPID TRANSIT.—An officer writes that the Logan Rapid Transit Company is now building an extension south about 12 miles to Wellsville, Utah, and arrangements are being made to build a connection from the Ogden Rapid Transit at Brigham north to Wellsville, a distance of from 16 to 25 miles, according to the route selected. Arrangements are also being made to build an extension of the L. R. T. north via Lewiston to Preston, Idaho.

TEXAS ROADS.—Plans are being made by residents of Ennis, Tex., to build a line, it is said, from Ennis to a connection with the Trinity & Brazos Valley, either at Bardwell or at Emhouse. A bonus of $30,000 is being raised by residents of Ennis in aid of the project. E. M. Thomas, A. L. Berge and E. Raphael, of Ennis, are interested.

WESTCHESTER NORTHERN.—See New York, New Haven & Hartford.

WEST TENNESSEE TRACTION.—An officer is quoted as saying that financial arrangements are about completed to build this line. The plans call for building from Memphis, Tenn., northwest via Brownsville to Jackson, 86 miles. D. T. Bennett, president; D. G. Sargent, vice-president and general manager, Memphis. (January 24, p. 191.)

RAILWAY STRUCTURES.

BLOOMINGTON, ILL.—The Chicago & Alton has awarded a contract to Westinghouse, Church, Kerr & Company, for the construction of a machine shop and other buildings.

CHICAGO, ILL.—The Minneapolis, St. Paul & Sault Ste. Marie has announced that the new freight terminal being built on the west side of Chicago by the Central Terminal Railway will be completed by January 1, 1914.

DULUTH, MINN.—The Minneapolis, St. Paul & Sault Ste. Marie has announced that its roundhouse at this point is to be enlarged from a 12-stall to a 20-stall structure.

EOLA, ILL.—The Chicago, Burlington & Quincy has announced that approximately $700,000 will be expended in the construction of a large freight yard at this point. Ten tracks will be completed this year, and others will be added later.

LAKE JUNALUSKA, FLA.—The Southern Railway is putting up a passenger station at Lake Junaluska, formerly Tuscola, which is three miles east of Waynesville. The contract for the construction work has been let to the Melton Construction Company, Greensboro, N. C. A small freight house is also being put up by the railway company's forces.

MEMPHIS, TENN.—A contract for the construction of the union passenger station to be used by the Illinois Central, Chicago, Rock Island & Pacific and St. Louis & San Francisco, has been awarded to the James Alexander Construction Company, of Memphis.

TORONTO, ONT.—An officer of the Canadian Pacific writes that the north Toronto grade separation work includes the elevation of over 3 miles, to be mostly five track, necessitating the contraction of 10 subways. Bids will shortly be asked for building the subway at Yonge street. A contract has been given to Jennings & Ross, Ltd., Toronto, for the subway at Avenue road, and this work is now under way; contracts have been given to Wells & Gray, Ltd., Toronto, and work will be started shortly on the subways at Davenport road, at Spadina road, at Holland avenue, and at Bathurst street. Bids have been received and are at present under consideration for the subways at Shaw street, at Christie street, at Ossington avenue, and at Dovercourt road. The work of raising the track will be carried out by the Canadian Pacific with company's forces. The new station to be built just east of Yonge street will be used jointly by the Canadian Pacific and the Canadian Northern Ontario, and bids will probably be called for the erection of this building soon. At the present time about one mile of track has been elevated between a point east of Yonge street and west of Avenue road. (May 9, p. 1053.)

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Railway Financial News

BALTIMORE & OHIO.—The circuit court of Baltimore has held that the B. & O. did not need to obtain the approval of the Public Service Commission of Maryland before issuing the $8,250,000 4½ per cent. convertible notes which were recently sold.

BOSTON & MAINE.—This company has sold to J. P. Morgan & Co., New York, $12,000,000 one-year 6 per cent. notes of June 2, 1913, and $2,000,000 Connecticut River Railroad one-year 5 per cent. notes. This provides for about $12,000,000 bonds and notes falling due June 10, 1913, and for additional working capital.

CHESAPEAKE & OHIO.—The Hocking Valley, of whose $11,000,000 stock the C. & O. owns $8,825,800, has declared an extra dividend of 4½ per cent. in addition to the regular quarterly dividend of 1¾ per cent. The Hocking Valley paid 3 per cent. total in 1911 and 7½ per cent. total in 1912, and is paying regularly quarterly dividends at the annual rate of 7 per cent. The Chesapeake & Ohio declared the regular quarterly dividend of 1¼ per cent., payable June 28.

CHICAGO, ROCK ISLAND & PACIFIC.—The $7,500,000 *railroad* 5's, held in the treasury of the railway company and maturing September 1, will, it is understood, probably be extended for 10 years.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.—This company has sold $2,500,000 5 per cent. debenture bonds, due March 1, 1930, to Rhodes & Company and White, Weld & Company, both of New York.

CINCINNATI, HAMILTON & DAYTON.—This company has asked authority of the Ohio State Public Service Commission to issue $787,000 5 per cent. first mortgage bonds, to be sold at 80 per cent. The money is to be used in repairing damage done by the March floods.

DENVER & SALT LAKE.—This company has filed in Denver a notice of increase of stock from $10,000,000 to $35,000,000.

The city of Denver has voted 3 to 1 in favor of a proposition to build a $5,000,000 five-mile tunnel through the Rocky mountains at a 9,000 ft. level for the Denver & Salt Lake road.

ERIE.—J. P. Morgan & Co., New York, have undertaken to extend to July 1, 1943, the $4,000,000 6 per cent. New York, Lake Erie & Western Docks and Improvement first mortgage bonds maturing July 1, 1913. Of the total $4,000,000 bonds there are outstanding in the hands of the public $3,396,000. The new bonds are to bear interest at the rate of 5 per cent., and are offered in exchange for the maturing bonds at par.

HOCKING VALLEY.—See Chesapeake & Ohio.

INTERNATIONAL & GREAT NORTHERN.—The Texas railroad commission has granted the request of the International & Great Northern for an addition to the valuation of its property for the item "value of right-of-way of $591,143," which item was not included in the former valuation under which bonds have been issued.

MIDLAND VALLEY.—Harris, Forbes & Company, New York, and Drexel & Company, Philadelphia, are offering $4,800,000 new first mortgage 5 per cent. bonds of April 1, 1913-1943 at 92, yielding about 5½ per cent. on the investment. The road runs from Wichita, Kan., to Fort Smith, Ark., 321 miles.

J. H. McDonough, of Dallas, Tex., has been elected a director, succeeding J. B. Dodd, of New York.

NATIONAL RAILWAYS OF MEXICO.—Press despatches from London say that arrangements are being made for a Mexican government loan for $25,000,000, a part of which is to be used to pay for the reconstruction of property destroyed during the Mexican revolutions.

NEW YORK & HARLEM.—Harold Vanderbilt has been elected a director, succeeding J. P. Morgan, deceased.

NEW YORK, NEW HAVEN & HARTFORD.—A quarterly dividend of 1½ per cent. has been declared, payable June 30. This reduces the annual rate from 8 per cent., which has been paid from 1895 to the present time, to an annual rate of 6 per cent.

A stockholders' committee has been formed consisting of George Von L. Meyer, chairman; Charles F. Adams, 2nd; Philip Dexter; Wilmot R. Evans, president of Boston Five-Cent Savings Bank; James L. Richards, president of Massachusetts Gas Co.; Charles A. Stone, of Stone & Webster; and Eugene V. R. Thayer, president of Merchants National Bank, Richard Olney and B. W. Palmer will act as counsel. Two or three additional names will later be added.

Circular to stockholders says:

"It is evident from price of stock there is uneasiness on the part of investors, although gross earnings are increasing and assets, according to the valuation commission, considerably exceed all liabilities, including stock. Policy of the company ought to be studied, all facts bearing on future management to be ascertained, and appropriate action taken to remove apprehensions of investors.

"It is the intention of the committee to invite co-operation of directors. We do not now express any judgment as to the management. Probably the decline has been due, at least in part, to rapid expansion of activities and consequent increases of capitalization, and charges.

"To determine whether expansions have been wise requires more accurate acquaintance than we possess and than shareholders possess. The more important question, whether policy of expansion should be continued, deserves immediate consideration. It may be period of rest and consolidation should follow. Equally it may be that partially completed recent acquisitions cannot wisely be so treated.

"It is time investigation concerning future policy be made on behalf of stockholders, looking to determination of these vitally important questions and proper steps to care for various interests affected. Public employees and stockholders are all equally concerned in future policy. Investigation and subsequent action by a committee of those who have had no hand in any of the policies, and may, therefore, be unbiased, would be useful.

"Any such action, to be of value must be the action of the greater part of stockholders. Unless the committee has stockholders behind it, nothing can be accomplished. Therefore, we request you to sign proxy sent herewith, and agreement to furnish additional proxies if committee finds necessary."

SEABOARD AIR LINE.—James B. Colgate & Co., and Townsend Scott & Son, both of Baltimore, Md., have bought $750,000 first mortgage 5 per cent. bonds, of April 1, 1913-1953, of the Tampa & Gulf Coast, guaranteed principal and interest by the Seaboard Air Line. The Tampa & Gulf Coast is being built from a connection with the Tampa Northern through the Pinellas peninsula, 77 miles.

SOUTHERN PACIFIC.—Kuhn, Loeb & Company, New York, have sold $5,000,000 4½ per cent. equipment trust certificates at a price to yield nearly 5 per cent. These certificates mature in annual instalments over ten years. They are part of the $10,120,000 equipment trust certificates recently authorized.

See also Union Pacific.

TAMPA & GULF COAST.—See Seaboard Air Line.

TEMPLE & NORTHWESTERN.—The property of this company has been sold to W. S. McGregor, of Temple, Tex., who had previously held control.

UNION PACIFIC.—There has been substituted under the Oregon Short Line refunding mortgage bonds, $6,170,000 Baltimore & Ohio common, $4,000,000 New York Central & Hudson River stock, $3,306,000 San Pedro, Los Angeles & Salt Lake 4 per cent. bonds and $55,000,000 Oregon Short Line refunding 4's (the total issue of these bonds is $100,000,000, of which $45,000,000 are outstanding and this $55,000,000 now deposited under the mortgage has been in the treasury of the Union Pacific) for the $108,000,000 Southern Pacific stock which heretofore formed part of the collateral for these bonds. This leaves the entire $120,000,000 Southern Pacific stock, which the Union Pacific owns, free in the Union Pacific treasury.

WHEELING & LAKE ERIE.—On May 7 five directors were elected as follows: E. S. Cook, W. A. Turner, Myron T. Herrick, of Cleveland, Ohio, and W. R. Nicholson, of Philadelphia, Pa., by the majority interests, and Ralph E. Cohen, of Steubenville, by the minority interests.

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Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	6.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues: North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,100 copies were printed; that of these 8,100 copies, 6,666 were mailed to regular paid subscribers and 344 were provided for counter and news companies' sales; that the total copies printed this year to date were 190,250—an average of 6,968 copies a week.

VOLUME 54. MAY 30, 1913. NUMBER 22.

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GENERAL NEWS SECTION 1194

*Illustrated.

THE railroads of Missouri have decided to appeal the train crew legislation in that state to the highest court, viz., the people themselves. They are circulating a petition for submission of the measure to a referendum vote. There seems to be little doubt that they will get the necessary signatures to the petition. This action by the Missouri roads merits the heartiest commendation. It seems to be the belief of many that the interests of the railways and the people are necessarily conflicting, and that whatever will hurt the former must be good for the latter. No better means for correcting this notion is available than that of public discussion of train crew legislation. The appeal of the roads to the people may or may not result in the nullification of the train crew legislation; but the evidence it will afford that the roads are not afraid to lay their case before the public can hardly fail to produce a favorable impression on the latter. The experience of recent years indicates that if, in the long run, the roads are to get fair treatment, they can do so only by going behind governors, legislatures and commissions to those who make and unmake all public officials. The roads secured a referendum in Arizona last fall on several measures that had been passed by the legislature. They conducted an actual literary and speech-making campaign, and while all the measures were adopted, the vote polled against them was large, and it seemed that if the campaign had lasted a few weeks longer most of the bills would have been beaten. If the roads in Missouri do get the train crew law submitted to the people it is to be hoped they will carry on an actual educational campaign throughout the state. Only in this way can they actually test the value of a referendum. The arguments that can be made against the train crew legislation are so overwhelmingly convincing to every rational mind that if the roads cannot get the public to vote against it their situation is bad, indeed.

AT the convention of the International Railway Fuel Association, held last week in Chicago, railway fuel contracts and the storage of railway coal were discussed at some length. The coal operators strongly urged a reduction of the "spread" or difference between the maximum and minimum amounts that could be demanded by the railways at their pleasure, as specified in all coal contracts. They also advocated an extension of the practice of storing a large amount of coal in the summer months for the next winter's use. In support of this it was pointed out that plenty of coal cars are available in the summer, while the contrary is true during the cold weather. Furthermore, the coal could be hauled in summer without further complicating the traffic problem, which, on most roads, is serious during the winter months. If coal is stored, as suggested, the necessity for the wide range of daily or weekly tonnage that can be demanded, which sometimes is as much as 100 per cent., disappears. On the other hand, it seems that coal stored for several months will cost from 15 to 60 or 70 cents a ton more than coal direct from the mines. The exact amount varies with the quality. This is due to the cost of the extra handling and the depreciation of the fuel, owing both to the rehandling and the weathering. While some slight reduction in price might be offered in some cases, it would not cover the difference in value and the locomotives would be supplied with a lower grade product at a higher price. The present practice, while evidently somewhat of a hardship to the coal operator, is the only satisfactory one to the railway, and unless conditions change materially it will probably be continued. A fuel contract that is entirely satisfactory to the operators is in use by one railway, at least, and does not require the storage of coal during the summer. In this case the future requirements are estimated with the greatest care and the "spread" is but a small percentage of the minimum. When more coal than the maximum is required, a premium of a small amount is paid for the first mutually determined amount, a larger premium for the next increment and so on. Such a contract is practically ideal if the future requirements can be determined with reasonable accuracy.

THE use of the telephone in railroad service increases so rapidly that its extent can be realized only by frequently looking back. Our railroads neglected the advantages of long-distance telephone facilities for a number of years, but they are rapidly catching up, and today—as New York City reports in use 500,000 telephones, or nearly as many as the aggregate number in the three cities of London, Paris and Berlin—the railroads of America can report nearly or quite 100,000 miles of long distance telephone circuits. (In the matter of ordinary short-distance telephone communication the railroads have not been lacking in enterprise.) This estimated total is based on the statistical report of the Interstate Commerce Commission, noticed in our issue of May 16, page 1063, and on the data given by Mr. Johnson, superintendent of telegraph of the Pennsylvania Railroad, in his paper which was read last week

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at St. Louis, and which is abstracted in another column. The government's total of road having telephone despatching wires is 68,097 miles. On the basis of the partial statistics gathered by Mr. Johnson it will be safe to add to this mileage at least one-third to represent other circuits, used for messages; and in the five months since the statistics were collected there has been such a considerable addition that the total is more likely to run above than below 100,000 miles of line. In addition to this there is an aggregate of 23,002 miles of road on which telephones are used for manual block signaling, an increase in 12 months of 6,458 miles. That the introduction of the telephone has greatly simplified train despatching is now a commonplace fact. Not so fully appreciated, perhaps, is the value of the portable telephone. Mr. Johnson estimates that telephones carried on work trains increase the efficiency of such trains no less than 40 per cent.; and his track-repair foremen, of whom 138 have telephones, are estimated to be 45 per cent. more efficient because of this aid. While these, no doubt, are rough estimates, they are highly suggestive, nevertheless. Among other interesting facts Mr. Johnson reports 3,324 telephones in use in booths and in other places along the Pennsylvania Railroad outside of stations, towers and offices. The Western Electric Company, which reports new orders for telephone despatching apparatus nearly every week, this week gives the names of eight railroads, on which 2,200 miles of telephone circuits are to be put up. One of these is an electric road, the order for which covers thirty miles; the others are the Chicago, Burlington & Quincy, 405 miles; Chicago & North Western, 165 miles, and a message circuit of 85 miles; Denver & Rio Grande; Lehigh & New England; Missouri, Kansas & Texas, 1,000 miles; New York Central, 70 miles, and Seaboard Air Line, 285 miles. The Denver & Rio Grande order includes 26 portable sets for use on trains.

SOME DISPUTED POINTS IN RAILWAY VALUATION.

3.—Depreciation.

A VERY important problem in railway valuation, and one regarding which there is a wide divergence of opinion, is that of depreciation and the allowance which should be made for it. Many railway men contend that no deduction for depreciation of track and roadbed should be made in the case of a properly maintained road. For the first ten years after a road is built, or until renewals become fairly constant, there is undoubtedly depreciation of the ties, rails and track structure which is not offset by repairs and renewals. But during the same time there is a definite appreciation of the roadway and surface, owing to their becoming better adapted to the service of transportation, so that at the end of this period the entire track and roadway are more valuable for the purpose for which they exist than when built. After this period of approximately ten years both depreciation, on the one hand, and appreciation due to solidification and adaptation on the other hand, cease if a road is reasonably maintained.

The general practice of the state commissions has been to deduct a percentage for depreciation from the various units entering into the valuation. It would seem that if depreciation should be thus allowed for, so ought appreciation to be, and in some cases it has been. This item of appreciation has been handled in two ways. In making an appraisal of the Spokane & Inland Empire the Public Utilities Commission of Washington fixed 110 per cent. of the reproduction cost new as the reproduction value of the grading at the time the valuation was made. In Minnesota appreciation was provided for by a separate item, "adaptation and solidification of roadbed" amounting for all the roads in the state to $11,743,007, which was 21 per cent. of the reproduction cost of the grading, clearing and grubbing. The commission questioned, however, whether this allowance was proper. In the valuation by the Massachusetts commission of the New York, New Haven & Hartford an allowance of $500 per mile, or a total of $805,000, was made for solidification, this being considered by the commission as very low. A similar allowance was also made by the commission in Washington in valuing the roads of that state. This appreciated value was also admitted in the recent valuation in New Jersey, but because of its indefiniteness no figure for it was included in the final report.

In Michigan and Wisconsin, on the other hand, depreciation was deducted without any allowance being made for appreciation.

Aside from the method of allowing for depreciation, the extent of the allowance for it has varied greatly. For instance, in New Jersey the item for track laying and surfacing was depreciated 25 per cent. on the assumption that while 50 per cent. of the labor was devoted to surfacing and remained in the property, undiminished, the other 50 per cent. was devoted to the laying of the track and depreciated with the track structure. In the valuation of the Spokane & Inland Empire an annual depreciation of 6.7 per cent. was charged against the item of track laying and surfacing. In Michigan this charge was 2.5 per cent., while in Wisconsin, Minnesota and Massachusetts full reproduction value new was allowed. Again, the item of ballast was depreciated 33.2 per cent. in the Wisconsin appraisal, while in Minnesota, Michigan and Massachusetts no deduction on this account was made.

With reference to equipment, the problem is perhaps less complicated, but even here at least two methods have been used. The plan adopted in Michigan and later used in Wisconsin was for representatives of the commission to make examinations of large numbers of each kind of equipment operating within the state, and accept the average per cent. of depreciation of the equipment actually inspected as typical of all of it. In Michigan about 33,000 freight cars were thus inspected, while in Wisconsin it was stipulated that 50 per cent. of the locomotives, 50 per cent. of the passenger cars, and not less than 20 per cent. of each class of freight cars operating wholly or partly in Wisconsin should be inspected. The percentages founded on these inspections were then applied to all the equipment. In Washington, on the other hand, the depreciated value of the equipment was determined by the use of mortality tables. Knowing the ages of the various classes of equipment, which were available from the records, and the average life, straight line depreciation could be readily applied and the average value for each unit of equipment determined. The Washington commission believed that more accurate figures were secured in this way and at a lower cost than by other methods.

ST. LOUIS & SAN FRANCISCO RECEIVERSHIP.

THE immediate causes of the receivership of the St. Louis & San Francisco are misfortunes due to the flood and to the general state of railroad credit; the ultimate causes were financial. Unlike the case of the receivership of the Missouri Pacific, the St. L. & S. F. receivership is not due in any degree to past mistakes in the operation of the road. The St. Louis & San Francisco and its subsidiary, the Chicago & Eastern Illinois, have been and are fully maintained in accordance with the standards of the best roads in their territory. The St. L. & S. F. itself is a heavily capitalized road and in addition to this the company has assumed in the process of expansion various burdens, some of which have proved too heavy for it to carry. Most conspicuous of these burdens is that of the purchase of the Chicago & Eastern Illinois.

In 1902 the St. Louis & San Francisco offered to buy the preferred stock of the C. & E. I. for $150 per share and the common stock for $250 per share, and on June 30, 1912, had bought $8,096,900 of the total outstanding $12,146,500 preferred stock ($3,154,500 of this preferred stock was issued in 1911-12 to stockholders of the Evansville & Terre Haute to effect the consolidation of this property with the C. & E. I.) and $7,217,900 of the $13,626,100 common stock, the entire remaining $6,408,300 of common stock being deposited with the Equitable Trust Company of New York to be issued only for enlargement or improvement of the property. The St. Louis & San Francisco issued trust certificates in exchange for this C. & E. I. stock, paying on these trust certificates amounts equal to 6 per cent on the par value of the preferred stock deposited under them and 10

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per cent. on the par value of the common stock. The C. & E. I. would therefore have had to pay 6 per cent. dividends on its preferred and 10 per cent. dividends on its common to enable the St. L. & S. F. to wash the cost of carrying this investment. In the fiscal year ended June 30, 1912, however, the C. & E. I., while paying 6 per cent. on the preferred, paid but 5 per cent. on the common, which would leave a difference of $360,890 to be made up by the St. Louis & San Francisco.

In addition to this, the St. L. & S. F. had to pay in that year from profit and lose $903,969 deficit on the New Orleans, Texas & Mexico, beside making advances to other subsidiaries for additions and betterments, etc.

When the Chicago, Rock Island & Pacific and the St. Louis & San Francisco separated in 1910 the prospects for both roads appeared to be improved by the separation. The Rock Island, however, was not burdened with any expensive guarantees, such as that of the Frisco on the C. & E. I. stock. It was for this reason, possibly, that the C. R. I. & P. was enabled to get its money needed for improvements since 1910 at a more reasonable rate than was the Frisco. On June 30, 1912, the St. Louis & San Francisco was carrying $12,929,615 unextinguished discount on funded debt, and the combined balance sheet of the Frisco and the C. & E. I. and New Orleans, Texas & Mexico showed loans and bills payable of $7,459,107. The St. L. & S. F. last September sold $2,600,000 2-year 6 per cent. secured notes, dated September 3, 1912, due September 1, 1914. These notes were offered by the company's bankers to the public at par, and presumably the money cost the Frisco well over 7 per cent. In the fiscal year ended June 30, 1912, the net increase in funded debt and equipment bonds and notes was $7,918,907, and the increase in amount of unextinguished discount on funded debt was $2,196,527, of which $903,969 was charged out to profit and loss for that year and the remainder added to the amount carried on the balance sheet, the total of which at the end of the year has already been commented on.

The application for receivership of the St. Louis & San Francisco was on a bill of complaint by the North American Company, which said that the St. L. & S. F. was unable to pay $400,000 matured notes. At the same time an application was made for the appointment of a receiver for the Chicago & Eastern Illinois. President Winchell and Thomas H. West, of the St. Louis Union Trust Company, were appointed receivers of the Frisco, and W. J. Jackson, vice-president, and Edwin W. Winter, formerly president of the Northern Pacific, and more recently president of the Brooklyn Rapid Transit, were appointed receivers of the C. & E. I. The Frisco has $2,225,000 notes maturing on June 1, and it was apparently an absolute impossibility to sell any securities with which to refund these notes.

The receivership ended one of the gamest fights to prevent such an outcome in the history of American railways. If hard and able work by an excellent organization could have kept these properties solvent they would have remained solvent. No railway president in the country has worked harder than Mr. Winchell has since he went to the Frisco Lines somewhat over three years ago. He has almost lived in his car out on the line supervising personally as far as he could the operation of the properties, and contributing in a way for which he is peculiarly fitted to increasing the popularity of the Frisco Lines. The work of the traffic and operating departments separately and their team work have been admirable. On the part of the traffic department no stone has been left unturned to find and develop new sources of business. The operating department has made a fine and successful fight both to improve the service rendered and to increase the economy with which it has been rendered. The Frisco has had available very small means for improving its physical property. Nevertheless it has been well maintained, and by careful and thorough supervision its average revenue freight trainload was increased from 195 tons in 1903 to 221 tons in 1909, and to 255 tons in 1912. In spite of the relatively meager funds available many improved methods of handling business and dealing with the public have been adopted. Several of these have been described from time to time in the *Railway Age Gazette*, such as the systems of handling loss and damage claims, of moving merchandise freight and of giving station agents large authority in the handling of claims and the solicitation of traffic. It cannot be too emphatically said at this time when there might develop some misunderstanding as to the facts that the organization and personnel of the operating and traffic departments of the Chicago & Eastern Illinois and the Frisco have been exceptionally good, and that their officers have done all that men can do to prevent the result which has now come.

ACCIDENTS ON PRIVATE AND STATE RAILWAYS.

A SOCIALIST writer in a popular magazine recently has been discussing railway accidents in this country and seems to be approaching the conclusion that government ownership is the only efficient remedy for them. If the accident statistics of the railways of the United States be compared with those of the leading state railways of the world, and no other comparisons be made, the conclusion is sure to be drawn that state railway management conduces to safety. But a conclusion based on this evidence alone would be unscientific and misleading. In order to reach a sound conclusion as to whether state management is superior in respect of safety or any other matter to private management it is necessary to make comparisons of several classes. One of the most enlightening classes of comparisons is between state and private railways in the same country. The least satisfactory class of comparisons is between railways in different countries, because in different countries the conditions are apt to be quite different and may be widely different.

To ascertain whether there is any relation between state or private management and safety the *Railway Age Gazette* recently asked the Bureau of Railway Economics to compile from the official reports of the railways of a number of countries data showing the ratios of the numbers of accidents to passengers to the numbers of passengers carried, or the numbers of passengers carried one mile; and the ratios of the numbers of ac-

FATALITIES TO PASSENGERS, EMPLOYEES AND OTHER PERSONS RESULTING FROM TRAIN OPERATION.

	Mileage.	Number passengers killed.	Passengers killed per 100,000,000 pass. miles.	Number employees killed.	Number employees for one killed.	No. employees killed per 1,000,000 train miles.	Other persons killed.
Austria (Year ended December 31, 1910)—							
State railways	11,783	22	.60	93	2,409	1.0356	292
Private railways	2,353	7	.70	19	2,822	.8174	47
France (a) (Year ended December 31, 1910)—							
State railways	3,546	66	3.15	83	855	1.7032	104
Private railways	19,610	5	.06	237	1,131	1.2355	238
Sweden (Year ended December 31, 1909)—							
State railways	2,717	2	.40	21	1,188	1.5894	28
Private railways	5,733	3	.71	11	1,867	.6276	31
Switzerland (Year ended December 31, 1911)							
State railways	1,705	12	.92	29	1,214	1.3728	45
Private railways	1,138	00	.00	2	3,269	.2611	11
Germany (Year ended March 31, 1912)—							
State railways	34,892	115	.48	554	1,273	1.2553	680
Private railways	2,216	3	.71	9	1,266	.7564	26
Canada (Includes state and private railways. Year ended June 30, 1913)	25,400	78	1.07	237	622	2.4099	238
United States (Year ended June 30, 1911)	243,434	456	1.07	3,163	527	2.4557	6,438

(a) Casualties to passengers include only those occurring in train accidents.

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cidents to employees to the numbers of train miles run and to the total numbers of employees. The data furnished relate to countries where private management is almost the sole policy, to countries where state management is almost the sole policy, and to countries where there are both state and private management. Only statistics relating to fatalities will be given here, both because of limitations of space and because figures for injuries are compiled on varying bases in different countries. The wide discrepancy between the bases on which injuries are reported is illustrated by the fact that in the United States all employees are reported as "injured" who are incapacitated for duty more than three days out of the ten immediately following the accident; that in the United Kingdom all are reported who are incapacitated for one day; that in Germany only those are reported who are incapacitated for work for at least fourteen days; and that in France only those are reported who are incapacitated for at least twenty days. Obviously, comparisons between statistics made up on such different bases are worthless. There are also differences between the bases on which fatalities are reported, but these do not vitiate comparisons. In the table on the preceding page figures are given separately for the state and private railways of Austria, France, Sweden, Switzerland and Germany. Figures are also given for the railways of Canada and those of the United States.

In the foregoing table the unit on which comparisons of fatalities to passengers are made is the number of passengers killed for 100,000,000 passengers *carried one mile*. In several countries statistics for passengers carried one mile are not compiled, and the following table gives for the United Kingdom, Italy, New Zealand and Victoria information similar to that given for other countries in the preceding table, except that in the following table the unit on which comparisons of fatalities to passengers are based is the number of passengers killed for 100,000,000 passengers carried, regardless of the distances they were carried.

FATALITIES TO PASSENGERS, EMPLOYEES AND OTHER PERSONS RESULTING FROM TRAIN OPERATION.

	Mileage.	Number passengers killed.	Passengers killed per 100,000,000 pass. carried.	Number employees killed.	Number employees for one killed.	No. employees killed per 1,000,000 train miles.	Other persons killed.
United Kingdom (Private). Year ended Dec. 31, 1911.	23,417	112	8.40	430	1,416	1.003	617
Italy (State). Year ended December 31, 1909.....	8,875	43	54.38	122	1,227	1.8475	228
New Zealand *(State). Year ended March 31, 1911..	2,742	7	62.50	10	1,588	1.2283	18
Victoria (State). Year ended June 30, 1912.....	3,543	9	8.63	26	.....	1.8791	32

*Includes casualties in train accidents only.

A glance at the table is sufficient to show that the accident records of Canada and the United States are relatively bad. Only a second glance is necessary to show that there is no relationship between state railway management and safety. The figures show that generally the accident records of state railways are worse than those of private railways in the same country. The proportion of passengers killed was greater on the private railways of Austria, Sweden and Germany than on the state railways of the same countries; the opposite was the case in France and Switzerland; and the proportion of employees killed was greater on the state railways than the private railways in every case. The worst record in Europe is that of the French state railways. In proportion to the number of passengers carried one mile they killed almost four times as many passengers as the railways of any other leading country of Europe, and three times as many in proportion as the railways of Canada or the United States. Nor was their record in the year for which figures are given exceptional. "The six big railway accidents which have occurred in France for the last five years have been on the state systems, three on the old system and three on the Western," said Pierre Leroy-Beaulieu, a member of the Chamber of Deputies, in a paper before the Royal Economic Society of London on January 11, 1912. Their record for killing employees is also the worst in Europe.

New Zealand has been held up by socialistic writers to the admiration of the world because of the alleged safety of its railways. It is, therefore, interesting to note that of the railways for which figures are given in the second table those of New Zealand killed more passengers in proportion than any others, their record in this respect being almost eight times as bad as that of the railways of the United Kingdom, and worse even than that of the railways of Italy. While the record of the French state railways for safety is very bad, that of the five large private railways of France is extremely good. There is close competition for first place between the private railways of France, the private railways of the United Kingdom and the state railways of Prussian-Hesse. The Austrian railways, both private and state, make nominally the best records, but probably this is largely because trains are less numerous and their speed lower in Austria than in the United Kingdom, France, Germany and the United States.

The figure in the tables which perhaps stands out the most prominently is that showing that in the year ended June 30, 1911, 6,438 "other persons" were killed on the railways of the United States. Of these, 5,284 were classified by the Interstate Commerce Commission as trespassers. Most of the rest of the "other persons" were killed in accidents at highway grade crossings. The accident record of the railways of the United States compares badly enough with those of most of the railways of other leading countries without having this large number of fatalities to trespassers, which is due to inefficient government and not to railway management, added to it.

The reader who studies the statistics on the subject with an open mind is sure to conclude that under similar conditions the accident records of state railways are certainly no better than those of private railways, and that there is no connection between state management and safety. The accident record of the railways of the United States is not due to private management, but to local conditions which the government and public must co-operate with the railway managements in dealing with if they are ever to be remedied. On the one hand, the railway managements should exhaust every resource at their command to reduce accidents. On the other hand, the government and public should give the railways a chance to earn enough money to make necessary improvements, should back them up in adopting and enforcing rules necessary for safety, should keep trespassers off their rights of way, and should then hold the railway managements up to the highest standards of public duty.

NEW BOOKS.

Safety Valve Rating. By Alfred R. Carhart, E.E. Bound in paper; 105 pages, 6 in. x 9 in.; 8 illustrations. Published by the Crosby Steam Gage & Valve Company, Boston. Copies sent free on application to Mr. Carhart at 40 Central street, Boston, Mass.

This book is intended only as an elementary disscussion of the subject of safety valve rating. Three new rules are proposed and are developed one from another, all the calculations being given in detail. The preliminary discussion takes up the objections to present rules and makes comparisons between them; the subject of reduced lifts is discussed. Various considerations in safety valve design are next taken up, such as limiting the size of the valves, the disadvantages of larger valves and increased lift and the advantages of flat-seated valves. There are numerous tables included, and six appendices are given at the end of the book, dealing with such subjects as Napier's rule, formulas for flat and bevel seated valves, calculations of pressure, etc.

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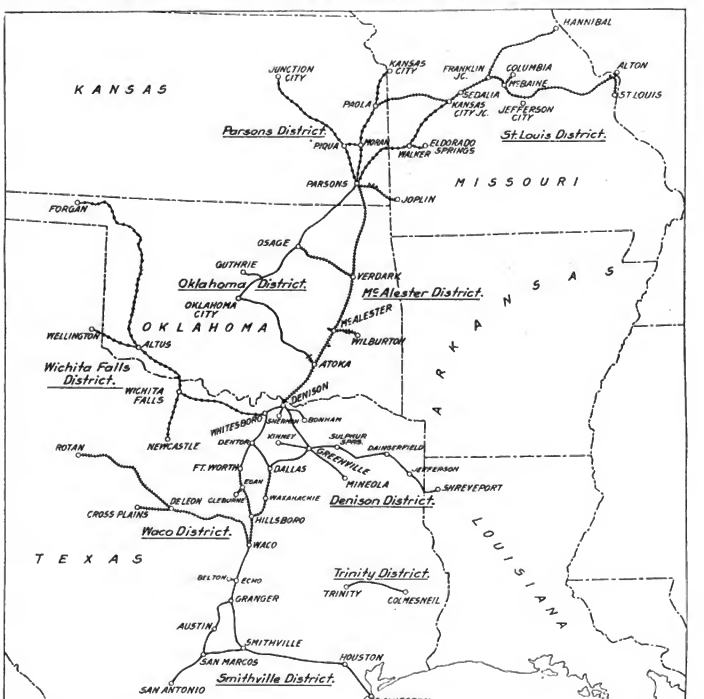
STUDIES IN OPERATION—THE M. K. & T.

A Substantial Reduction Made in the Transportation Ratio of the Texas Lines Without the Addition of Heavier Power.

The Missouri, Kansas & Texas operates 3,399 miles of road, of which 1,635 miles are in Texas, and few companies with lines in Texas have ever succeeded in making the operation of their Texas lines profitable. The M. K. & T. north of the Red river has for a number of years had to help bear the burden of the operating income of $2,973,279, as compared with $945,841 net income for the corresponding eight months of the previous year, an increase of 214 per cent. It is proper to point out, however, that even with this extraordinary increase in net income, the Texas lines are probably not earning a fair return on the invest



The Missouri, Kansas & Texas, Showing the Operating Divisions.

operation of the lines south. It is therefore the profitable operation of the Texas mileage which presents the most difficult problem to be solved, and in the successful solution of it lies the hope of the greatest possible development of the country and of the future prosperity of the railroad company. In the eight months ended March 31 the Texas lines showed a net ment in them, but it is true the prospects for the Texas lines are good for the first time in the history of the company.

To adequately understand operating conditions on the M. K. & T. it is necessary to review briefly the history of the property. In 1888 the Missouri, Kansas & Texas was lost to Gould control by being placed in the hands of receivers. The Goulds

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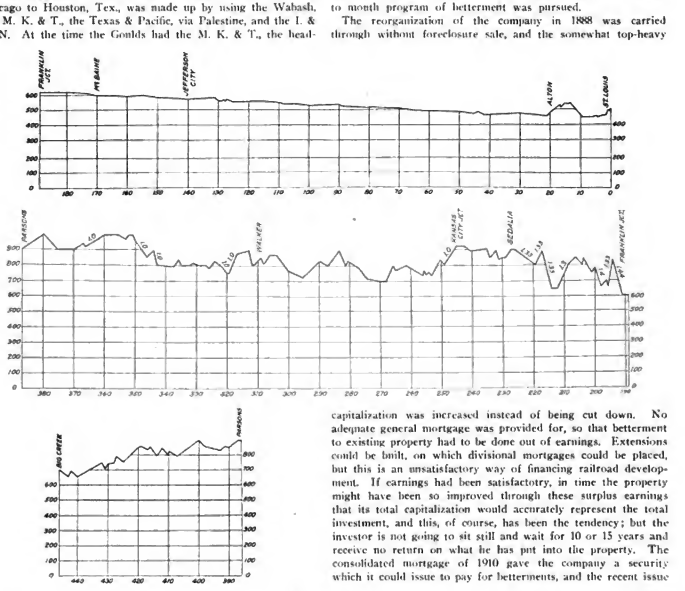
had bought or built the property piecemeal, their idea being to form a Gould system in the southwest combining the M. K. & T., the Texas & Pacific and the International & Great Northern. Some idea of the way in which the lines were put together may be suggested by the fact that the main Gould line from Chicago to Houston, Tex., was made up by using the Wabash, the M. K. & T., the Texas & Pacific, via Palestine, and the I. & G. N. At the time the Goulds had the M. K. & T., the headquarters of the company were at Palestine, Tex., which is about one hundred miles from the nearest station on the M. K. & T.

At the time of the receivership the road was quite incomplete; the receivers were given permission to make certain extensions and when the property was reorganized certain further extensions and purchases were made. The Oklahoma lines were acquired after most of the other roads had already got lines in Oklahoma. Later the Texas Central was acquired and more recently the Wichita Falls lines were purchased. After the termination of the receivership there was a lack of continuity of policy. At times the road was managed from New York, at other times from St. Louis. The sums required for rebuilding the lines on modern standards were so great that a sort of hand to mouth program of betterment was pursued.

The reorganization of the company in 1888 was carried through without foreclosure sale, and the somewhat top-heavy capitalization was increased instead of being cut down. No adequate general mortgage was provided for, so that betterment to existing property had to be done out of earnings. Extensions could be built, on which divisional mortgages could be placed, but this is an unsatisfactory way of financing railroad development. If earnings had been satisfactotry, in time the property might have been so improved through these surplus earnings that its total capitalization would accurately represent the total investment, and this, of course, has been the tendency; but the investor is not going to sit still and wait for 10 or 15 years and receive no return on what he has put into the property. The consolidated mortgage of 1910 gave the company a security which it could issue to pay for betterments, and the recent issue



Condensed Profile Main Line M. K. & T., St. Louis to Denison.

of $19,000,000 notes was secured by a deposit of these consolidated mortgage bonds. This situation has been a drawback to the company's credit, the effects of which are still shown in the prices at which its securities are selling.

The result of this kind of a history may easily be imagined. The system as a whole at the time the present management took it over about two years ago was most unevenly developed. The Texas lines especially had been inadequately developed, and

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while the main line of the company north of the Red River was in fairly good shape, even here there was a considerable betterment work to be done before heavy locomotives could be put in operation. The company had a surfeit of light and obsolete power.

The M. K. & T. has had for a long time a strong traffic department. About 35 per cent. of the total operating revenue comes from passenger service, and largely through the efforts of the traffic department the "Katy" passenger service was widely known. This much the new management had as a valuable legacy from former managements.

In addition to this, the road serves a territory that is developing about the most rapidly of any in the United States. While the M. K. & T. is not the short line in a single important instance, it nevertheless reaches all of the best cities in Texas and some of the best in the southwest, and now has an important and growing business in Oklahoma. Besides, however, taking a property that was unevenly developed, the new management found an operating, mechanical and engineering organization that was by no means satisfactory, and which was working under conditions often very far from modern. It is absolutely necessary to appreciate this before it is possible to understand the changes that are being made, the unsatisfactory showing that was made in the year ended June 30, 1912, and the extent of the progress in the present fiscal year.

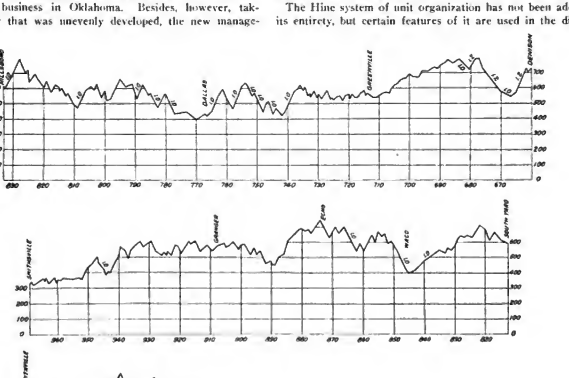
Of course, in comparing the showing made in the first eight months of the present fiscal year with the corresponding period of the year before it should be borne in mind that the conditions in the year before were quite abnormal. It may be true, however, that in part these abnormal conditions were the result of the non-application of the very methods the application of which is meeting with so much success in the current eight months.

One of the first undertakings that the new management carried out was to give the property a strictly divisional organization. It was divided into two grand divisions; the lines north of Denison and the lines south of Denison. The new president, while making his headquarters in St. Louis, spends most of his time in Texas; the general manager is in Dallas. The accompanying diagram shows the scheme of the organization.

The lines north of Denison were divided into four divisions—the M. K. & T. calls them districts—each in charge of a superintendent, and the lines south into four, excluding the "orphan line."*

Under the former organization the superintendent had entirely lacked authority to either finally dismiss an employee or to adequately decide on increases of force. He is now given very full authority. The mechanical department had not been under the direction of the superintendent, but now the superintendent is given authority over the master mechanic and is held directly responsible for the performance of the mechanical department on his division. He likewise, as will be seen by the diagram, has jurisdiction over and is responsible for maintenance of way on his division.

The Hine system of unit organization has not been adopted in its entirety, but certain features of it are used in the divisional



Condensed Profile Main Line M. K. & T., Denison to Galveston.

organization that has been adopted. There is one common division superintendent's file, and all letters, whether they pertain to the mechanical, engineering or train service departments, are kept in this file. The offices of the entire staff of the superintendent are located in the same building. The Hine distinction between line and staff officers is recognized in the M. K. & T. form of organization. Thus the chief engineer of maintenance is a staff officer of the general manager, as is also the superintendent of motive power, and in the same way the engineer of maintenance is a staff officer of the general superintendent. These changes in organization were preliminary to an effort in the direction of the most obvious possibility of economy—namely, increasing the train load.

The average revenue train load on the entire system was 241 tons in 1912, and was about 175 tons on the Missouri, Kansas & Texas of Texas. The reasons for this very low average train load were, first, that the physical condition of the property, especially in Texas, did not permit of the use of heavy modern

*The "orphan line" runs from Trinity, Tex., to Colmesneil.

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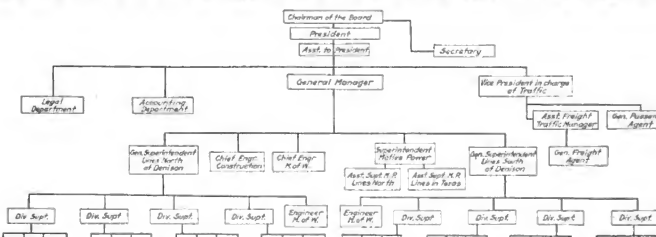
locomotives, and even where, as on parts of the main line north of the Red River, heavy power could have been used, it was not. As will be seen from the accompanying profile, the road has heavy grades—throughout Texas the ruling grade is 1 per cent. Double-heading could not be done because in Texas the laws forbid it, and north of the river the company in the past got itself into an agreement with its employees which provided that the only double-heading which could be done was where no increase in tonnage was made to the train and a second caboose was carried. Furthermore, the nature of the traffic is such that over 40 per cent. of the total car mileage is made by empty cars and the loaded movement has necessarily to be performed at fast speeds.

Out of St. Louis the M. K. & T. gets a large and what should be a fairly profitable merchandise business. Since, however, this business is highly competitive, the movement of it must be rapid and prompt. For example, there are from two to four through freights run south out of St. Louis each evening. The nature of the St. Louis division is such that it would be perfectly possible to operate considerable heavier locomotives; but, since to get the business at all the first train of merchandise must be started from St. Louis by about eight o'clock p. m., regardless of whether or not even a light engine has its full



The Divisional Form of Organization on the Missouri, Kansas & Texas.

rating, no gain can apparently be made by assigning to this division heavier power. By eleven o'clock or so a train load of manufactures, beer, etc., is ready to move, and possibly an hour or so later a second train of merchandise.

The merchandise movement over the entire system is almost without exception southbound and must, of course, be loaded in box cars. The north-bound movement at present consists principally of cattle, fruit and vegetables. The cattle are loaded in stock cars, the fruit and vegetables in refrigerator cars. The principal coal fields on the M. K. & T. are in the neighborhood of McAlester, Okla., and a quite heavy movement of coal is shipped down into Texas. At present there is no north-bound lading for the coal cars. There is no south-bound lading for the refrigerator and stock cars and there is a comparatively small north-bound lading for the box cars in which merchandise has been shipped south. The cotton movement, which is presumably the most profitable traffic which the M. K. & T. has, nearly all moves in four months of the year, beginning in August, and this also is a south-bound movement unbalanced by any north-bound traffic.

When Mr. Schaff became president, one of his first undertakings was to lay the foundation for the development of a [illegible] north-bound traffic. On the M. K. & T. proper there is now almost no timber, but the so-called "orphan line" which runs from Trinity, Tex., to Colmesneil, lies in the heart of the timber country of East Texas. Arrangements are now being made for a line connecting this "orphan line" with the main line. The installation of the divisional form of organization has already been mentioned. The next step was the preparation of the physical property for the use of heavier power. Fifty Mikado locomotives were ordered, ten of which are to be placed in operation from Waco, Tex., to Smithville, and the remainder on the main line from Sedalia, Mo., via Parsons, Kans., and McAlester, Okla., to Denison, Tex. The bridges on the line on which heavier power was to be installed were immediately renewed where necessary with steel or concrete structures, and 60 and 66-pound rails were taken out and replaced with 85-pound rail. A five-year program was started of replacement of chatts ballast with stone ballast on the main line north of the Red River, and an immediate beginning was made on the lines in Texas in strengthening the burnt clay ballast that is used in this territory. An eight-year program of renewing all wooden bridges on the main line with permanent structures of concrete or steel has been commenced.

There are two classes of freight locomotives in service at present for main line work. These are what are called 30 per cent. and 41 per cent. engines, the first class having 30,000 lbs. tractive effort and a total weight of 152,000 lbs., and the second class having a tractive effort of 41,000 lbs. and a total weight of about 200,000 lbs. On the main line of the St. Louis division 30 per cent. locomotives are in use and have a rating of 1,850 tons, except between New Franklin and Sedalia, Mo., where to get this rating it is necessary to double-head. From Sedalia to Denison the 41 per cent. engines are in use, with the following rating:

Sedalia to Parsons	1,521 tons
Kansas City to Parsons	1,215 tons
Parsons to North Wagoner	1,960 tons
North Wagoner to North McAlester	1,570 tons
North McAlester to Atoka	1,900 tons
Atoka to Denison	2,620 tons

The new Mikado locomotives which are being put in service have a tractive effort of 53,000 lbs., and it is estimated that their rating will be about 38 per cent. greater than that of the old 41 per cent. engines. The rating of the 41 per cent. engines and 30 per cent. engines in Texas is shown in the following table:

From	To	Per cent. engine	Tonnage rating
Denison	Fort Worth	30	870
Denison	Fort Worth	41	1,180
Fort Worth	Hillsboro	30	1,045
Fort Worth	Hillsboro	41	1,425
Denison	Dallas	30	985
Denison	Dallas	41	1,340
Dallas	Hillsboro	30	900
Dallas	Hillsboro	41	1,230

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From	To	Per cent. engioc.	Tonnage rating.
Hillsboro	Waco	30	960
Hillsboro	Waco	41	1,310
Waco	Smithville	30	960
Waco	Smithville	41	1,310
Smithville	Houston	30	980
Smithville	Houston	41	1,330

The heavier power is just now arriving, but in the year and a half in which the present management has had the property, operating conditions have changed to an extent that is really remarkable because it is not due to heavier power, but to other activities.

Without doubt the single most important change that was made was that of organization. The concentration of authority and responsibility in the superintendent was a long step in itself; the establishment of the company's headquarters in Texas was a recognition of the tremendous possibilities of the country served by the M. K. & T. in that state. There were a thousand other changes made, possibly the great majority of them nothing more than the establishment of generally accepted modern operating methods, the net results of which, however, are quite strikingly shown in the two accompanying tables of figures for the lines in Texas.

M. K. & T. Ry. Co. of Texas.

Month.	Total operating revenue	Total operating expenses	Ratio total op. exp. to total op. rev.	Transportation expenses	Ratio trans. exp. to total op. rev.	Net operating income (or loss)
1911.						
July	$719,264	$827,146	115.0	$429,709	59.90	—$107,882
August	888,145	764,892	86.11	402,038	44.96	123,343
September	1,125,131	816,855	72.60	446,788	39.47	308,275
October	1,297,305	864,170	66.61	514,083	39.63	433,134
November	1,193,874	960,440	80.45	583,638	49.00	233,384
December	1,069,987	983,085	91.88	586,757	54.80	86,902
1912.						
January	854,037	920,099	107.74	556,853	65.2	—66,061
February	810,197	811,623	100.17	520,165	64.2	—1,426
March	719,280	783,109	108.88	490,889	68.2	—63,828
Total	$8,677,170	$7,731,329	89.03	$4,530,920	52.22	$945,841
1912.						
July	$853,253	$758,160	90.03	$418,708	49.1	$85,092
August	1,072,931	721,915	67.28	430,870	40.1	351,016
September	1,320,395	791,878	59.97	478,768	36.2	528,517
October	1,596,685	871,143	54.56	552,647	34.7	725,542
November	1,460,433	879,790	60.24	569,122	38.9	580,642
December	1,233,529	875,507	70.98	556,147	45.08	358,022
1913.						
January	1,056,954	940,546	88.99	620,643	58.7	116,407
February	1,014,719	864,463	84.90	511,748	50.4	150,256
March	971,648	896,862	92.30	518,100	53.32	74,785
Total	$10,580,547	$7,607,264	72.09	$4,656,753	44.01	$2,973,279

REVENUE TONS STATISTICS.

Texas Company.

Month.	1911-1912. Rev. tons per train mile.	1911-1912. Rev. & Co. tons per train mile.	1911-1912. Rev. tons per loaded car mile.	1911-1912. Rev. & Co. tons per loaded car mile.	1912-1913. Rev. tons per train mile.	1912-1913. Rev. & Co. tons per train mile.	1912-1913. Rev. tons per loaded car mile.	1912-1913. Rev. & Co. tons per loaded car mile.
July	109.84	144.67	12.28	16.17	181.00	232.20	13.28	17.04
Aug	170.65	226.01	11.10	17.13	174.26	225.16	11.72	15.15
Sept	209.47	246.23	13.68	16.08	214.21	243.37	14.51	16.49
Oct	203.12	229.97	13.40	15.17	238.77	267.20	14.98	16.38
Nov	187.80	215.12	13.44	15.39	224.22	253.73	14.35	16.23
Dec	167.27	194.39	12.70	14.76	194.63	221.55	13.81	15.72
Jan	167.43	222.40	14.55	19.27	199.22	255.72	14.39	16.88
Feb	166.14	214.84	12.71	16.43	195.11	236.93	14.86	18.04

Some of the changes made in operating methods are worth mentioning. It had been the practice to do part of the local business with the through freight trains in an attempt to give the through trains their full rating, but with the result that through trains were anywhere from twelve to twenty-four hours late arriving at destination. Instructions were issued to use through trains for through business only, all local work, which on the M. K. & T., as on most other roads, amounts largely to a switching business, is done by local crews and carried in local trains. A somewhat similar idea was carried out in passenger service. In the first place the schedules were re-adjusted, so that it was possible, under the proper operating conditions, for all passenger trains to be on time. Additional local trains were put on, running a certain distance ahead of the two fast through trains. The result was that the local service was improved and that the through service was brought up to a standard never before considered possible. At present about 95 per cent. of all passenger trains are on time at destination. The saving made in overtime has been remarkable.

It had been the practice to load north-bound freight into the first available car without any regard for car-loading, since there was a great surplus of empty cars moving north in any case. Instructions have now been issued to devote as much care to full car-loading north-bound as south-bound. Full trains of empty cars are run north-bound and the surplus locomotive and caboose is run north as the first section of the passenger train. Here again the saving in overtime has been remarkable. Company freight which had been moved indiscriminately in revenue freight trains is now moved in revenue trains *only*, where a distinct advantage can be gained by filling out a train's tonnage rating.

At many places on the M. K. & T. the water is not good. A chemist has been engaged and a comprehensive study of water conditions is now being made. Good results are already being obtained by the use of compounds for water treatment at numerous places, especially in Texas.

It used to take from two to four months for the traffic department to explain away the delays to shipments during the four rush months, August to December. The handling of cotton for export shipment is a service that requires a great degree of accuracy, but one which is handled under very heavy pressure. A system of notification of shippers as to the progress of their shipments has been inaugurated. A careful record of rush traffic is kept in one general office of the shipments all over the line. Shippers, therefore, can find out at any time just where their goods are and what are the prospects of delivery within any particular time. A system has just been started of sending cotton waybills on to Galveston, Tex., by train mail, so that expense bills may be made up for them before the arrival of the cars containing the shipments. Under this system, of course, cars move on card waybills. In this way notification of the arrival of a shipment of cotton and the bill of lading covering such shipment can be delivered to the consignee literally within a few minutes of the arrival of the car at Galveston. The importance of such service lies in the fact that cotton is sold very often at a price which is the current quotation in Galveston at the time of the arrival of the shipment. A question of minutes, therefore, may be of considerable importance.

It has been found that heavy movement can be materially facilitated and congestion avoided by moving cotton trains in fleets.

The make-up of trains in the yards has been studied with a view to economical operation of the whole system. Yard masters who previously made up trains without any apparent knowledge of how the cars were to be handled at destination points, are now instructed so that the train is made up in a way which will avoid as far as possible switching at way stations or destination. As a matter of fact, this studying of the needs of the system as a whole and the adaptation of local conditions to these needs has been almost as important a factor in the improvement of operating conditions as the change to a logical divisional organization. Before the present management took over the property, division superintendents received no monthly earnings' statements, and this was characteristic of the lack of co-operation between the different parts of the system.

A material reduction is being made in the operating ratio, and yet considerable increases in many instances are being made in operating forces; where heretofore there were two road foremen of engines, there are now eleven; where heretofore it took an agent three to four months to get authority to make an addition to his forces, he can now make that addition on his own authority and is then called on to justify such an addition.

Labor conditions are probably the hardest problem that the

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M. K. & T. has to face. In the past public opinion and legislative activities in Texas were violently anti-railroad—but in 1912 Texas was almost the only state in the Union that passed no adverse railroad legislation. This matter therefore—adverse legislation—appears to be getting better, but the labor problem remains. With a business that varies so widely in volume as between different seasons, the M. K. & T. in Texas is to a certain extent at the merey of a floating class of very undesirable employees. There has been a spirit of insubordination, a disregard of rules, a lack of loyalty that has hurt all of the railroads in Texas to a marked degree. The lack of authority given to superintendents and the sort of hopeless attitude which was taken toward the operation of the Texas lines of the M. K. & T. at various times in the past history of the road did nothing to better this condition. Naturally with a stronger and firmer administration there was engendered a certain hostility, especially among the rougher elements of the employees, on which the company is dependent to some extent for its trainmen. The hope of the company to better this condition lies largely in the possibilities, first, of educating public opinion; second, of opening a future for steady and profitable employment to the younger generation of men who are growing up along its own line. The difficulty is that the railroad company has to compete so strongly with other industries in a new and rapidly developing country where both labor and capital are at a premium. A strong administration which will hold out a prospect of permanent employment, of fair treatment, and of chances for advancement for those who show loyalty to it, is the one hope of a railroad situated in that part of Texas through which the Missouri, Kansas & Texas runs. The things that are being done to improve operating conditions suggest such an administration. Coupled with this is a certain cheerful optimism that it would seem in the long run would be bound to have its effect from the top to the bottom of the organization. On the lines north there is now a fair degree of esprit de corp. For instance, Parsons is a railroad town almost pure and simple, and it is a "Katy" town.

It would seem that in the long run if a permanent organization can be built up, fair treatment, optimism and success should be sure of permeating down through the rank and file until it builds up that asset which is so essential to the operation of any railroad, a loyalty to the company. In the year and a half that the new management has been operating the property it would be foolish to expect that such results could be completely accomplished. It is true, however, that a substantial start has been made in this direction. Western men are quick to recognize efficiency, especially efficiency that is practical rather than theoretical. Success in the West is given a value even greater possibly than it has in the East. The showing that is being made on the Texas lines stands a fair chance of cumulative effect. Of course, there is always the danger of adverse and hostile legislation which may be brought to bear against any corporation which is making a success in Texas. But if the M. K. & T. can get with it the imagination and the good feeling of the best class of people whom it serves, and this is the class that the present management is aiming its service at, it should have a strong weapon with which to fight class agitators and professional demagogues.

This is a far more serious problem than that of building up the physical condition of the property. Credit is quickly sensitive to success and the adoption of modern methods in railroading are meeting with success on the M. K. & T. It remains to be seen, however, whether those who are to benefit the most by such a development as is being carried out on these lines will be as quick to appreciate the advantages that will accrue to them from such a change. The possibilities of the Southwest, the fertility of the black land belt of Texas, the increase in land values, the remarkable crops of this section have so often been described that it seems superfluous almost to mention them here. Rich as is the yield of this black belt of Texas, only a fraction of the possibilities of the country have as yet been realized. It is this fact which is the justification for the expenditure of the very considerable sums which the Missouri, Kansas & Texas is putting into its property in the way of additions and betterments. As long, however, as the operating ratio of the lines in Texas remained in the neighborhood of ninety per cent., the railroad failed to share in the growing prosperity of the country.

The operating problem of the Missouri, Kansas & Texas is like that of every other road, intimately connected with its traffic conditions, but on the M. K. & T. to a rather unusual degree operating conditions depend, and with them the prosperity of the territory served, on the support which the management can elicit from its own employees and from the people whom it serves.

The operating methods that are being introduced are not new; they are based simply on standard practice, as it has been developed on other roads; but the conditions and luckily also the possibilities, are quite unusual. It is not difficult for a man to figure out with a fair degree of accuracy what would be the result in dollars and cents of a reduction of grades, of the introduction of heavier locomotives, of the development of the traffic which will tend to eliminate empty car mileage, but it is a far nicer problem and one requiring an unusual degree both of patience and determination to introduce modern methods on a road which has heretofore been operated under an entirely different theory. This is the operating problem which is being solved by the M. K. & T.

INSTITUTE OF CONSULTING ENGINEERS CONSIDERS VALUATION.

A special meeting of the American Institute of Consulting Engineers was held at the Engineers' Club, New York, on Thursday evening, May 22, to discuss the subject of railway valuation. About 25 members and guests were present and participated in the discussion. As this association is composed of the leading consulting engineers of the country, who are free from affiliations with either of the parties primarily interested in the forthcoming valuation, it is in position to view the subject from an unbiased standpoint. The discussion was for the most part general in nature, dealing with the broader principles which should govern rather than with the smaller problems of a direct engineering nature. The need for a very careful and thorough appraisal as a means of protection to the public, investors and railways alike was strongly emphasized, and the point was urged that the best talent available should be secured to carry out the work. In view of the vast interests at stake it was the consensus of opinion that no one of less experience than the chief engineer of a road should be called on to pass upon the estimates and appraisals made by that officer. There was also a feeling expressed by several speakers that the making of this national valuation was the first step in the government ownership of the railways.

Much interest was added to the meeting by the presence of Jean de Pulligny, chief engineer of the department of public works of France, who stated that the French railways, both government and private, have been valued for 60 years. In this case, however, the original cost or book value only is considered. The first cost of construction has been kept as various roads have been built and this cost has been increased from time to time by that portion of the cost of improvements which should be charged to capital account. No account is here taken of any increase in land or other values not represented by an actual outlay of capital. As the government guarantees a fixed rate of earnings upon this book value of the property it has worked out satisfactorily in that country. These valuations are kept up by engineers of the same education and experience as the chief engineers with whom they come in contact.

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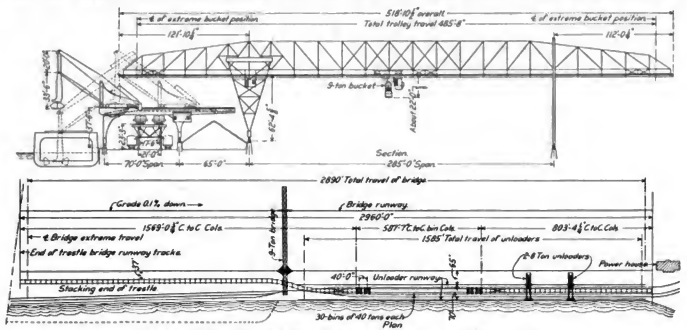
CANADIAN PACIFIC COAL UNLOADING DOCK.

New Plant Located at Ft. William, Ont., Having Large Capacity and Differing Radically from Designs Commonly Used.

A coal unloading plant has recently been installed by the Canadian Pacific at Fort William, Ont., which is essentially different from the plants commonly used for handling coal. The unloading equipment is similar to that used in some of the most recent designs of ore unloading plants at lower lake ports, and as this dock is designed to unload coal from the same boats that carry ore down the lakes, there is no reason to believe that the type of plant which has so successfully handled ore will not also serve with satisfaction for coal. The principal features which distinguish this new dock are the ets used on the unloaders have a capacity of eight tons, and those in the transfer and rehandling bridge nine tons, while in coal unloading plants of the more common type, 5.5 tons is about the largest bucket that is used. It is not expected that coal will be broken as badly with this equipment as is usual in the smaller plants, since the amount of coal that comes in contact with the crushing edge of a large bucket is much less than when the same amount is handled in smaller units. The buckets are in two parts, being of the same general design as those used for handling ore, although slightly modified to allow



Sectional Elevation and Plan of Canadian Pacific Coal Unloading Dock.

provision that has been made for expansion and the use of extremely large buckets for handling the coal. The plant has been located on a low marshy island opposite the city of Fort William at the Canadian head of the lakes where there will be abundant room for any amount of expansion desired. Two movable bridges are being built to reach the island. The buckcoal to flow freely from both ends when the halves are forced together, thus preventing the crushing of coal against the top of the bucket.

General View of Dock Soon After it Was Placed in Service.

UNLOADING EQUIPMENT.

The river channel from the lake has been dredged by the government to a depth of 27 ft. and a width of 400 ft. The

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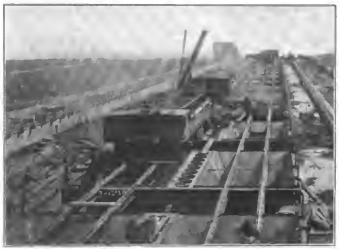
face of the dock along which boats can anchor is a little less than 1,600 ft. long. There are three of the Hulett unloaders serving this dock face, which have a travel of 1,585 ft. These unloaders are carried on steel structures weighing about 600 tons and having a span of 70 ft. between runway tracks. The walking beam carrying the bucket is operated over a track on the framework of the unloader, the bucket leg being suspended from the outer end of the walking beam and so arranged that



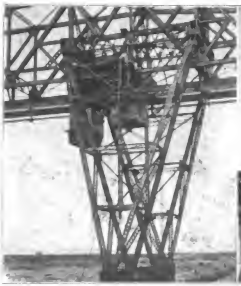
Looking East from Unloader During Construction, Showing Bins and Larry Cars.

it can reach all parts of the hold of a vessel. The man who operates the bucket is located inside the bucket leg, allowing him to get a good view of the work at all times.

The coal is dumped by the unloader bucket into a conveyor car, also supported from the framework of the unloader and operated by a man in a cab at the rear end of each machine who also directs the travel of the whole machine along the face

Looking West from Unloader During Construction, Showing Trestle and Storage Space.

scale beam is located in the operator's cab at one end of the car. It records the weight automatically so that the operator has no calculations to make. Coal is discharged from these cars through undercut gates operated by air cylinders, the controlling valve being located in the operator's cab and air being supplied from a small compressor hung beneath the car body. At the rear end of each unloader a movable chute is provided, into which the coal for the temporary storage pile can be dumped to prevent the breakage of coal so discharged. This chute can be adjusted to suit the natural flow of the coal



Operating Leg of Transfer Bridge.

The Two Hulett Unloaders and Some of the Coal Hoppers.

of the dock. The conveyor car is built in the form of a steel bin which can be discharged in any position on its runway. Each conveyor car has a capacity of two buckets of coal. These conveyor cars are dumped either into scale larry cars running over the loading bins under the main span of the unloader or into a temporary storage pile under the rear cantilever arm of the unloader. The larry cars are low, flat cars of 35 tons capacity, consisting of a double hopper carried on scales. The on the pile, having a telescope arrangement to allow it to be raised as the height of the pile increases. The transfer bridge spanning the main storage ground back of the unloaders has a total length of 518 ft., 10.5 in., the span between runway tracks being 285 ft. The nine ton bucket which is operated on this bridge has a total travel of 485 ft. 8 in., and the bridge itself can move 2,890 ft. along the runways. Additional storage space can easily be secured by extending this travel if necessary.

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The unloaders are carried on three 4-wheel trucks under each tower, the wheels being 24 in. in diameter and 24 in. gage. The main tower of the transfer bridge is carried on four 4-wheel equalized trucks, all wheels having a diameter of 30 in., and the trucks having a gage of 36 in. center to center of wheels. The two end trucks are drivers and the two interior ones idlers. The shear leg of the bridge has a 4-wheel equalized transfer truck at each end and a 4-wheel spring idler truck in the middle. The wheels in these trucks also have a 30 in. gage. The maximum moving load per wheel on the unloader trucks is 45,000 lbs., and the maximum standing load per wheel is 70,000 lbs. The same standing load per wheel is maximum for the trucks under the transfer bridge. The maximum moving load for the bridge is 58,000 lbs. on each tower wheel and

The Operating End of One of the Larry Cars.

50,000 lbs. each for the wheels under the shear leg. The tracks supporting both the unloaders and the transfer bridge are laid with 100-lb. rails on tie plates and secured with screw spikes. The third rail for power is of 85-lb. section in both cases. The unloader runways are level, but the tracks under the transfer bridge are on a grade of about 0.1 per cent.

LOADING AND STORAGE EQUIPMENT.

As the country served by the Canadian Pacific is agricultural, a very large proportion of the company's freight equipment consists of box cars, making it necessary to utilize these cars for hauling coal from the head of the lakes back to the western provinces. With the facilities that have been at hand for loading coal into box cars, the percentage of full capacity loads was too low, resulting in a very considerable loss in revenue. It was one of the requirements, therefore, in the design of the new plant that it be capable of rapidly and accurately loading box cars to the maximum tonnage. This feature of the plant has been very carefully worked out and the problem has been solved successfully. When cars are being loaded directly from boats, the coal is taken out of the boats by the unloader buckets, deposited near the face of the dock in the conveyor car which travels back on the framework of the unloader and dumps the coal into one of the scale larry cars running over the loading bins. There are 30 of these steel bins arranged in two rows of 15 each and spaced 40 ft. center to center. The amount of coal placed in each bin is accurately regulated by the scale car, the practice being to load each bin with the capacity of a given car which is waiting in a string of empties in the adjacent yard. In order to do this rapidly, a man in the yard checks the capacities and numbers the 15 empties and gives the list to the operators on the dock, who follow it in loading the 15 bins in one row. When this string of 15 empties is spotted alongside the bins loaded for them, each car receives its maximum tonnage by simply emptying all the bins and there is no loss of time in trimming or weighing. When box cars are being loaded, Christy loaders are used which are of a special design for this plant. These loaders operate on runways under the trestle supporting the bins, the supporting carriage being so arranged that each loader can be shifted from side to side so as to operate under either row of bins. It is driven by a single motor equipment in either of these positions. Two loaders are provided so that when a string of empties on one side of the trestle is to be loaded, one loader starts working at each end of the string and loads the cars successively towards the middle. While the loading is going on on one side, the loads on the other side are being pulled out, the bins refilled and another string of empties spotted, so that when the loaders finish on one side they are shifted over under the other row of bins and can load from the middle toward both ends. This makes the loading process continuous and eliminates all needless waste of time.

If coal is not needed for immediate shipment when a boat comes in, the conveyor cars, instead of being dumped into the larry cars, are run back onto the cantilever arm of the unloader structure and the coal is dumped into the temporary storage pile between the rear unloader runway and the front transfer

Unloaders in Operation.

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bridge runway. It is picked up from this pile by the transfer bridge bucket and deposited wherever desired in the main storage pile under the transfer bridge. The cross section of the temporary storage pile into which the unloaders can dump the coal is equal to that of any of the boats in this service, so that a boat can be unloaded into this temporary pile without any unnecessary movements of the unloader along the dock face.

When it is desired to load cars from the storage piles, the nine ton bucket operating on the transfer bridge picks up the coal from the pile and dumps it directly into the larry cars. The trestle on which the larry cars operate is continued alongside the transfer bridge runway beyond the end of the dock face in order that these cars may be loaded by the transfer bridge without unnecessary movements of the entire bridge. The trestle is equipped with two sets of crossovers so that the larry cars can be transferred from one track to another and kept in continuous operation.

Cars intended for loading at the dock are brought from Fort William around the north side of the storage ground and into the plant at the east end. A through track is provided along the face of the dock adjacent to the loading track, which provides access to a three track gravity yard located west of the face of the dock. From this yard cars can be run at will in strings of 15 or less and spotted at the loading bins by car hauls running the length of the dock adjacent to each loading track. After being loaded the cars are hauled to the east end of the dock from which they are handled by switch engines.

A large part of the preliminary work of construction was done during the season of 1911 and work was carried on through the winter of 1911-1912. The site was cleared in June, 1911, and excavations for the foundations were begun about August 1. Placing of concrete was begun about the first of October and was carried through the winter, sometimes at temperatures as low as 40 deg. below zero. All concrete work was of mass design and ample precautions were taken to prevent freezing. In order to raise the level of the ground which will be used for storage, considerable material from the hydraulic dredges in the channel leading to the dock was used for filling. The problem of getting material to the work was a very difficult one at certain stages. There was then no rail connection with the island except by car ferry, and it was necessary to transport the heavy structural members used in the unloading plant across the river on a ferry which had a capacity of only one car. During the closed season for navigation, a temporary trestle was thrown across the river between Fort William and the island, and some equipment was hauled in over this.

The construction of this plant has been handled under the direction of J. G. Sullivan, chief engineer of the western lines; Frank Lee, principal assistant engineer, and D. C. Chisholm, resident engineer at Fort William. The Wellman-Seaver-Morgan Company, Cleveland, Ohio, had the contract for the coal handling plant; Amos Harned being the contractor's superintendent on the work.

USE OF TELEPHONES ON THE PENNSYLVANIA RAILROAD.*

The first use of the telephone for despatching trains on the Pennsylvania was in 1897 on the South Fork branch, 32 miles long. At that time the number of trains was four a day, but for the last ten years the average movement is eighty trains a day; and there has been no accident due to any misunderstanding of orders. The Pennsylvania now uses 17,000 telephones; some of them owned and others leased.

In the preparation of this paper, there was secured information from 35 prominent roads (not including the Pennsylvania) operating 115,000 miles of line, and the statistics obtained from these different companies is summarized. Much of the information given is of the same character as that recently published by the Interstate Commerce Commission. Other facts of interest are as follows:

Average number of train orders sent per day over each despatcher's circuit by telephone, 77.2; average on telegraph circuits, 56.6; number of cases of trouble per month per 100 instruments on telephone lines, 8; number of cases of trouble on telegraph lines, per 100 instruments, 9. Reporting as to the efficiency of lines, the average efficiency is 94.3 on telephone lines and 72.8 on telegraph lines; this being taken as evidence of the well understood fact that telephone lines are less troubled than the telegraph by bad weather. The 35 companies report about 1,000 portable telephones in use, as follows: On freight trains, 268; on wrecking and work trains, 386; on passenger trains, 150; in the hands of track foremen, 20; miscellaneous, 168. The number of telephones in boxes or booths at sidings is given as 5,255; number at automatic signals, 206.

On the Pennsylvania Mr. Johnson's inquiries show the following averages: Average cost of a way station installation, $128; average number of train orders per despatcher's circuit, per day, on single track lines, 32. The efficiency of telephone lines is impaired by bad weather 5 per cent.; of telegraph lines by bad weather, 17 per cent. The number of portable telephones on wreck and work trains is 107; on passenger trains, 4; in the hands of track foremen, 138; miscellaneous, 47. Mr. Johnson estimates that the efficiency of wrecking trains is increased by the use of the telephone 45 per cent.; of work trains, 40 per cent.; of passenger trains, 45 per cent., and of track foremen, 45 per cent. The number of telephones in boxes or booths at sidings is 2,081; number at automatic block signals, 312, and at intermediate points along the road, not previously included, 931.

On nine out of twenty-three divisions of the Pennsylvania the telegraph is kept in service for emergency use, after the telephone is installed. There has been no reduction in the number of telegraph operators at small stations. Explaining an apparently higher cost of installations on the Pennsylvania as compared with other roads, it is stated that emergency equipment is maintained at most or all of the stations; test panels are also freely installed, so as to facilitate patching of wires when necessary. The small number of orders issued by the despatchers of the Pennsylvania is explained as probably due to the extensive use of automatic block signals. Telephones at outlying points along the road have been found of great value. A standard shelter box has been devised, the door of which, hinged at the top serves, when open, to protect the user of the telephone from rain or snow.

A special wall telephone has been developed for installation in the shelter boxes and booths which is expected to give excellent results. It is equipped with an insulated transmitter and all exposed metal parts are insulated, including the generator crank, switch hook and transmitter. The receiver has concealed binding posts. The windings of the receiver, induction coil, ringer and generator-armature and cords are given a special moisture-proof treatment. Exposed metal parts which are ordinarily nickeled will be finished in a dull black.

Mr. Johnson says that on the Pennsylvania, as on other roads, an accurate estimate of the saving made by the introduction of telephones is difficult to get at, although the importance of the saving is universally recognized. The Great Northern reports that the acceleration of train movements since the use of the telephone has produced a saving of $85,100 a year.

Mr. Johnson thinks that there has now been sufficient experience with telephone apparatus to warrant action looking to standardization of equipment. Concerning loud speaking receivers he says: "We have conducted some experiments with loud speaking receivers with a view to relieving the despatcher of the burdensome head receiver and providing him with a substitute to use during lightning storms. The snapping or cracking noises of static discharges during these storms become very

*Abstract of a paper by J. C. Johnson, superintendent of telegraph of the Pennsylvania Railroad, read at the annual meeting of the Association of Railway Telegraph Superintendents at St. Louis, Mo., May 20.

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annoying with the standard head equipment, and while it may not be altogether dangerous, it is at least objectionable. It is possible that some of the despatchers have expected too much from the use of the loud speaking receiver, and have thought that it should be readily heard when they are some distance from it, instead of arranging the receiver to be heard at a distance of about 6 in. or a foot from the ear when the operator is directly in line with it. There is quite a field for development in this particular part of the apparatus, and we are confident that something will eventually be developed along this line which will be the solution."

The Pennsylvania is considering the installation of underground cables for emergency use. With such a cable looped into every station and signal station the road could cope with any adverse weather conditions. In station offices arms or brackets to hold the telephones are found of great value. The cost of maintenance of cords is reduced, the telephone is less disturbed by local noises, telephones do not get knocked off the desk, and with a head receiver the operator is free to use both hands for other work. The Pennsylvania has telephones on some of its limited trains, and also on its private cars, for use while lying at large terminal stations.

At certain points along the road five-pair emergency cables 1,000 ft. long are kept ready, on special reels, to be used in making quick temporary repairs in case of damage by storms or blasting operations, etc. Mr. Johnson has in mind the construction and equipment of an emergency car equipped with a switchboard apparatus, emergency cable, selector equipment, etc., with which a temporary despatcher's office could be set up at any point.

Mr. Johnson discusses one of the principal objections to the use of the telephone, that an operator at a station does not know the location of approaching trains as he does when he has the Morse telegraph, by which he can hear what is going on among other offices while attending to his office work. With a head receiver so connected that he could move around the office, or with a loud speaking receiver, the operator could perhaps get this information from a telephone line; it is a question, however, whether operators ought to burden themselves with this information, a large portion of which is of no value to them. The constant wearing of a head receiver for eight hours is objectionable, as sometimes the pressure produces painful sensations; and it may make the ears too sensitive to weather conditions. On divisions of light traffic a signal circuit is provided so that way stations can call the despatcher by means of a buzzer, and he need not wear the receiver at all times. Some despatchers are nervous during thunder storms, but some of the oldest have found no trouble wearing the receiver through all kinds of storms. Rubber ear cushions are worn by some despatchers, but these are objectionable, as they cause excessive perspiration. The loud speaking receiver would seem to be the best remedy for troubles due to thunder storms. Many of the oldest despatchers have worn the head receivers through all kinds of storms and have never received any injury, but there is a snapping and crackling sensation which disturbs the more timid.

The benefits derived from the use of the telephone, as summarized by Mr. Johnson are set forth in about the same way as has been done by other superintendents in the past. Using the telephone a period of one or two months is sufficient to train an operator, as compared with six months to a year where the Morse telegraph is used. The saving in the time of sending and completing orders is estimated at about 40 per cent. With the telephone there is no chance that an operator will leave the train-wire open. Many operators have said that it seemed a hardship to go back to the telegraph key, as has had to be done in case of trouble on the telephone selectors. Many telegraphers suffering from paralysis of the fingers or other disabilities have been enabled to maintain their positions. Derailments have been prevented; Mr. Johnson, however, gives only a single instance, that where a trackman discovered a broken flange and the train endangered by the break was stopped just before going down a steep grade.

The conclusion of the paper is that as the use of the telephone is constantly being extended, it is not rash to predict that it will eventually supersede the telegraph entirely, not only for despatching, but for the transmission of messages also.

REPORT ON GOTHENBURG COLLISION.

The Interstate Commerce Commission has issued a report, by Chief Inspector Belnap, dated April 16, giving the causes of the rear collision of passenger trains on the Union Pacific at Gothenburg, Neb., March 14, in which four passengers were killed. This collision occurred at 3:37 a. m. in a severe snow storm, and the cause was the failure of the engineman of train No. 12 to see an automatic signal which indicated stop about 1,000 ft. in the rear of passenger train No. 4, which was standing at the station. The distant signal, 2,427 ft. in the rear of the stop signal, was at caution and the engineman saw it and reduced his speed to about 20 miles an hour, but smoke and snow blowing to the southward obscured the home signal and he passed it without seeing it; then, while drifting along and trying to locate his position, he suddenly saw the fusee which was being waved by the flagman of the standing train about 100 ft. in the rear of the last car. Train 4 had been there only two minutes, and no blame is attached to the men on that train. The fireman, on account of some little difficulty in keeping up steam, had seen none of the signals during the run from North Platte, about 35 miles. The engineman had a good record of 14 years' standing. He had been on duty only two hours and seventeen minutes.

This report, in explaining the spacing of the trains over the 35 miles from North Platte to Gothenburg, incidentally shows the care and precision with which flagging is carried out on the Union Pacific, and also illustrates some of the difficulties of flagging. Passenger train flagmen have been instructed—whether in print or by word of mouth does not appear—that at regular stops the flagman must immediately take his position 60 ft. from the rear of his train and be prepared to protect his train should an emergency arise. After waiting five minutes, if the train does not start, he must go back, according to rule 99. Flagman Frosch was carrying out this rule at Gothenburg. His train was behind time, and so was the following train; but the line is fully equipped with automatic block signals, and as telegraph offices were 12 miles or more apart, dependence for spacing was placed wholly on the block signals.

About one mile east of North Platte there is a long bridge, over which the road is single track. On this bridge the signals, on the night in question, were out of order, and stood in the stop position throughout the night, all trainmen being notified accordingly. But although, according to the report, the trainmen had been notified, it is also said that the conductor of No. 12 instructed his engineman to carry the flagman on the engine and proceed slowly across the bridge, not deeming it safe for the flagman to walk across ahead of the train on account of the severe storm. Train No. 4 had also complied with the rule requiring a flagman to be sent in advance when a signal on single track indicates stop; and it consumed 17 minutes in crossing the bridge; but No. 12 took only about 10 minutes, thus shortening the time interval between the two trains, which had been 16 minutes apart leaving North Platte. The time interval was further shortened, because the second train made no stops at stations.

LONGITUDINAL RAILWAY, CHILE.—During 1912 there were 362 miles of railroad constructed at a cost of $14,999,000 by the syndicate building the Longitudinal Railway connecting Santiago and Iquique under a 5 per cent. guaranty by the Chilean government. It is expected this line will be completed and open for traffic before the close of 1913.

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INTERNATIONAL RAILWAY FUEL ASSOCIATION.

Includes Among Other Important Reports Those on Self-Propelled Cars and Semi-Bituminous and Lignitic Coals.

The fifth annual convention of the International Railway Fuel Association was held in Chicago, May 21-24. President H. T. Bentley, principal assistant superintendent of motive power, Chicago & North Western, presided. The opening prayer was offered by Rev. William Carson Shaw.

The secretary reported a total of 523 members, which during the convention was increased to about 590. The total number of members attending the convention was 278.

PRESIDENT'S ADDRESS.

Mr. Bentley commented on the rapid growth of the association since its inception five years ago, the membership having grown from 35 to over 500 members during that time. He pointed out that whereas 500,000,000 tons of coal are used annually, only 75,000,000 tons are actually turned into service and power, showing what a wide field of improvement was possible by fuel engineers. A great saving may be made by those having anything to do with fuel by carefully studying the various conditions under which they are handling it. Its constantly increasing cost requires that a special effort be made for the satisfactory use of the lower grades of coal. There are quantities of lignite beds throughout this country which, if a uniform supply was required, could be mined at a profit; therefore by stimulating its use a much cheaper fuel would be available. This fuel has been used successfully on locomotives and is also suitable for the production of producer gas.

Another feature in regard to cheaper fuel is the use of pulverized coal which is being investigated by one of the railroads. The obstacles heretofore encountered appear to have been in the inability of the fire brick to withstand the intense heat generated, and means for properly pulverizing and storing the coal in the tender. Attention was also directed to the fact that the coal could perhaps be obtained from the mines at a reduced cost during the summer months and stored with a net saving. Mention was made of fuel saved, due to the better design of locomotives and the use of superheaters.

MR. QUAYLE'S ADDRESS.

Robert Quayle, superintendent of motive power, Chicago & North Western, mentioned the possibilities of increasing the thermal efficiency of locomotives. He agreed that the large grate area was more efficient for burning coal as suggested in Dr. Goss' paper of last year. Particular stress was laid on the proper preparation of the coal for the locomotive and of assisting the fireman as much as possible in the performance of his work. An important factor is the co-operation and team work between the engineer and fireman. The use of brick arches and superheaters was advocated, the latter to be applied to all classes of engines, even switchers.

MR. PEABODY'S ADDRESS.

Francis S. Peabody, president of the Peabody Coal Company, Chicago, followed Mr. Quayle with an interesting talk from the operator's standpoint. He stated that about 40 per cent. of the coal was left in the mines for the simple reason that it could not economically be removed. There are 22,000,000 acres of coal in the State of Illinois and only 1 per cent. of it is being used. About 57,000,000 tons are being taken from these mines and records show that the average production doubles in about 10 years. In speaking of the railroad contracts he said that the maximum and minimum clause was causing great inconvenience to the mine operators, as the roads were inclined to demand the maximum tonnage at times that were most inconvenient for the operators to supply it. This was especially true in case of strikes. The strike of 1912 caused an increase of 6 cents per ton in the cost of coal.

In 1897 the cost of coal at the mine was 25 cents per ton, but now it is 90 cents. Sixty per cent. of this is paid to labor. Railroads should store four months' supply during the storage period as advantage could be taken of the decrease in traffic and the lower cost for transportation, and it would keep the mines busy during the dull season. A storage yard with trestles and steam shovels for loading was recommended, the cost of storage being only 15 cents per ton—2 cents for unloading, 3 cents for loading and 10 cents for depreciation. These figures, however, apply only to certain grades of coal; others depreciate more rapidly.

CONTRACT FORM FOR PURCHASE OF COAL.

A proposed standard form of contract covering the purchase of railway fuel coal was presented by a committee of which J. G. Crawford (C. B. & Q.) was chairman. One of the provisions on which there was a difference of opinion was the relation of car tonnage to the number of the purchaser's cars at the mine. Eugene McAuliffe (Frisco Lines) questioned the desirability of mentioning in the contract the number of cars to be supplied at the mine by the purchaser, while thoroughly believing that the purchaser should co-operate with the mine operator in this respect. He favored the storage of coal where practicable and strongly recommended that the invoices should carry the serial number of the contract. In considering the contracting of coal as a general proposition, Mr. McAuliffe pointed out that the condition of the mine should be considered by the railroad on whose line the mine was located, or on which the railroad relied for its coal supply. By this is meant the accepting of fuel that is not quite up to standard, but must be disposed of, the price, of course, being satisfactory to both the operator and the railroad.

Other members suggested that the contract should include specifications as to the fusing point of the ash, the heat value, the percentage of ash in the coal, and a standard method of obtaining samples.

SUB-BITUMINOUS AND LIGNITIC COALS.

Samuel B. Flagg, engineer, Department of the Interior, Bureau of Mines, read a paper on this subject from which the following is taken:

The effort to reduce operating costs has resulted, on the one hand, in a demand for much more powerful locomotives, and, on the other hand, in a tendency to utilize lower grades of fuel, among which may be mentioned the lignitic and sub-bituminous coals found in certain sections of the country. Lignitic coals are characterized by a high moisture and high volatile matter content, by a fairly low percentage of ash, and by a low heat value. The lower grades of sub-bituminous coal differ from the lignites mainly in their appearance, as is indicated by the designation "black lignites" that is frequently given them. These lower grades of sub-bituminous coal like the lignitic coals, are high in moisture and volatile matter contents and low in heating value. Their behavior upon exposure to the air is also similar to that of the brown lignites. The better grades of sub-bituminous coals, on the other hand, have a much lower moisture content and higher heat value; in fact, the heat values of some of them are considerably higher than those of many of the bituminous coals. Even these high grade sub-bituminous fuels, however, have the same tendency to disintegrate upon exposure to the air, and the same is true upon exposure to heat in a furnace. Another characteristic feature of both the lignitic and sub-bituminous coals is their liability to heat in the pile or bunker and to take fire spontaneously.

A few typical analyses of fuels from some of the different fields are given in the table below, the last two being classed

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by the U. S. Geological Survey as medium grade bituminous coals, although they are frequently designated as sub-bituminous or lignitic coals. The Bureau of Mines is authority for the analyses given in the first, sixth and seventh columns.

Proximate Analysis.	Gebo, Bighorn Co., Wyo., Slack Coal. (Sub-Bit.)	Sussex, Johnson Co., Wyoming. (Sub-Bit.)	Hudson, Fremont Co., Wyo. (Sub-Bit.) U. P.	Roundup, Musselshell Co., Mont. (Sub-Bit.) C. M. & St. P.	Erie, Weld Co., Colo. (Sub-Bit.) U. P.	Gallup, McKinley Co., N. Mex. (Sub-Bit.) Lump, Nut and Slack.	Williston, Williams Co., N. Dak. (Lignite).	Rock Springs, Sweetwater Co., Wyo. (Bit.) U. P.	Superior Sweetwater Co., Wyo. (Bit.) U. P.
Moisture ...	16.58	6.72	8.37	7.83	15.84	11.90	42.88	7.32	7.40
Vol. Mat...	31.97	45.06	41.10	32.66	34.55	37.85	24.32	39.83	40.17
Fix. Car....	46.05	39.11	48.02	53.63	43.95	41.57	24.96	45.37	46.93
Ash	5.40	8.05	3.51	5.88	5.34	8.68	7.94	6.42	4.57
Sulphur ...	.64	.66	.38	.22	.32	.56	1.53	1.06	.91
B. t. u.....	10,609	11,462	.....	12,771	10,215	11,077	5,683	12,017	12,283

It has been estimated* that of the coal easily accessible and still remaining in the coal fields of the United States one-third is represented by the lignitic and sub-bituminous deposits. The principal beds of these coals are found in Texas, North Dakota, South Dakota, Montana, Wyoming, Colorado, New Mexico and Washington. The fields of the lower grade coals commercially most important today are those in Montana, Wyoming, Colorado, New Mexico and Washington. About 2,000,000 tons of sub-bituminous coal per year is taken from the Bull Mountain field in Musselshell county south of Roundup, and the Red Lodge field in Carbon county near Red Lodge in Montana.

Mining costs in the different fields producing sub-bituminous coals vary considerably, probably ranging between 80 cents and $1.70 per short ton as extreme values. These costs, of course, are proportionately higher where the output is small than where the development has been more extensive. They are also affected by the physical mining conditions.

Because of the disintegrating effect of heat on these coals, it is especially important that the coal in the tender should contain little slack. Nearly all of the sub-bituminous coals suffer more or less seriously from breakage unless carefully handled in the screening and loading processes. In the loading of either open or closed cars precautions may be taken by using an apron on the screens or the car-loader so that the coal has less of a fall.

Opinions seem to differ as to the necessity for shipping these fuels in closed cars when intended for railroad use. The cost of loading and unloading box cars is obviously greater than when gondola or drop-bottom cars are used. The increased cost obtained from three authorities ranges from four to ten cents per ton of coal. This is probably offset to some extent by the prevention of loss in transit.

The question of storing such coals involves not only the slacking and the deterioration resulting therefrom, but also the liability of spontaneous combustion. The author's limited experience with coals of this type leads him to the belief that they may possibly be stored for a short time without serious deterioration from the standpoint of their steaming value in locomotive use, but that the coals which are not impaired after storage for a year are more likely medium grade bituminous coals than either sub-bituminous or lignitic.

*Production of Coal in 1907, by E. W. Parker, in Mineral Resources for 1907, U. S. Geological Survey.

The liability of spontaneous combustion, although greater for the lignitic fuels, is considerable in the case of the sub-bituminous coals and dust or slack must not be allowed to accumulate.

The substitution of these low grade coals for bituminous fuel introduces, in addition to the difficulties already mentioned, a number of problems of operation. The grate area must be greater—one authority says 50 per cent. greater—than would be required for good bituminous coal. High drafts are necessary to maintain the required rates of combustion, and to get them the exhaust pressures must be increased to such an extent that the efficiency of the locomotive is reduced 5 to 10 per cent. thereby. One point in favor of these coals that should not be overlooked is the freedom from clinker troubles. The percentage of earthy matter in them is usually low—in many instances under 5 per cent.—and the sulphur content is also low.

In some sections the greatest problem connected with the use of sub-bituminous fuels has been the one of preventing spark troubles. The first attempts to solve this problem were made with different sizes and arrangements of screens and usually included two screens for the gases to pass through. It was usually found, however, that one of the screens clogged and prevented the free steaming of the engine. By using a single screen properly set most of the clogging trouble can be done away with, unless there is a steam leak in the smoke box or wet slack coal is being used, and some roads claim to have found the screen as satisfactory and effective as any means for eliminating spark troubles. Screens set horizontally will, with some forms of stacks, remain clear longer and give less trouble than if set on an incline, and likewise small mesh netting of small wire is more satisfactory than small mesh netting made of large wire.

A front-end arrangement designed to reduce in size the sparks or cinders, and also delay their delivery from the stack has been patented by the American Locomotive Company. On the western lines of one road a number of locomotives have been equipped with this device and it is stated that the sparks are reduced to such small size that they give no trouble. Some of the engines so equipped have been in service as long as four years, and others for over two years, and during this time no fires have been set by sparks from them, although they are operated on the most dangerous divisions of the line.

Another front-end arrangement was designed by one of the road engineers of a western road and has been used principally in locomotives burning coal from the Roundup, Montana, district. With this arrangement the sparks do not pass through any screens or netting, the success of the device depending rather upon the delayed delivery of the solid particles, thus allowing them time to cool down.

In the following table are given some of the principal data and results of road tests made by different railroads to determine the value of the lower grade fuels. The variation in the equivalent evaporation per pound of coal as fired shows probably better than anything else the relative values of the coals for locomotive service. For the last three tests these figures could not be inserted, as it was impossible to compute them from the data at hand. So far as the writer knows none of these coals in question have the very high moisture content or the other identifying lignite characteristics such as those of the

Gross ton-miles	Number of cars in train	Train weight, tons	Average steam pressure	Coal used, pounds	Water used, gallons	Equiv. evap. from and at 212° F. per lb. of coal fired	Average speed, miles per hour	Service		Remarks	
86,594	11.67	632.0	195.9	24,916	14,724	5.95	29.65	Passenger	Hannah, Wyo.,	Sub-Bit.,	C. & N. W.
88,291	11.33	633.3	192.0	33,120	14,304	4.34	28.30	Passenger	Erie, Colo.,	Sub-Bit.,	C. & N. W.
213,149	51.66	1,888.9	177.1	42,360	27,255	6.47	17.15	Freight	Hannah, Wyo.,	Sub-Bit.,	C. & N. W.
209,541	55.33	1,853.0	176.2	57,311	38,433	4.99	14.30	Freight	Erie, Colo.,	Sub-Bit.,	C. & N. W.
.....	7.2	.....	201.0	17,960	10,265	5.86	32.90	.....	LaFayette, Colo.,	Sub-Bit.,	C. B. & Q.
.....	7.5	.....	203.0	11,650	10,030	8.76	33.20	.....	Las Animas, Colo.,	Bit.,	C. B. & Q.
161,117	34.0	1,445.0	194.0	17,749	11,900	6.83	.....	.....	Roundup, Mont.,	Sub-Bit.,	C. M. & St. P.
145,011	....	.....	.....	34,034	19,575	....	23.1	Freight	Hudson, Wyo.,	Sub-Bit.,	C. & N. W.
113,387	21.5	588.9	.....	38,726	21,841	....	21.9	Freight	Hudson, Wyo.,	Sub-Bit.,	C. & N. W.
136,387	.....	.....	.....	20,845	13,428	....	23.8	Freight	Buxtoo, Iowa,	Bit.,	C. & N. W.

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Williston, N. Dak., fuel, analysis of which is given in the first table in this paper.

The costs of using bituminous and sub-bituminous coals given below were determined for one road whose sources of supply for the two kinds of fuel were Buxton, Iowa, and Hudson, Wyo., respectively. Cody, Neb., was considered as the approximate dividing point for the use of the two fuels and costs were figured to and from that point, using the results of a dynamometer car test as the basis of computations.

Bituminous Coal.		Sub-bituminous Coal.	
Price at Buxton, Ia.....	$133.83	Price at Hudson, Wyo.....	$153.26
Cost of haul to Cody, Neb..	196.26	Cost of haul to Cody, Neb..	171.46
Cost to return empties.....	54.63	Cost to return empties.....	47.88
Total cost	$384.72	Total cost	$372.60

Saving in favor of Wyoming coal, $12.12.

The results of these tests show that the better of these low-grade fuels can be used, and, in fact, they are today being used over those divisions of the roads where length of haul of bituminous coal makes it too expensive or otherwise inadvisable to use the latter fuel. Some of the lines which are today using this sub-bituminous fuel are using it on the same engines that at other times burn bituminous coal. It is possible that it may sometimes be found of sufficient advantage to build all the locomotives which are to be fired with the lower grade fuels with special reference to obtaining the best results from them.

The probability of a marked increase in the use of the true lignites in the near future is believed to be not great. The present undeveloped condition of the parts of the country in which the lignites are found, their low heating value, and the availability of the better sub-bituminous coals are all factors that will check the increased use of lignitic coals for steaming, and particularly for locomotive purposes.

DISCUSSION.

C. T. Malcolmson stated that the heat value of run-of-mine coal was increased 18.4 per cent. by briquetting as shown by some 600 tests.

W. S. Roberts (Roberts & Schaefer Company) mentioned as the greatest factor in briquetting the obtaining of a suitable binder. His experience showed that a pitch binder had given the best results. The whole proposition of briquetting is a purely engineering one, and it should be carefully studied. Most of the failures are due to not giving it the proper consideration.

J. G. Crawford (C. B. & Q.) stated that there should be plenty of air opening in the grates, that the ash pan should be tight and the air openings should be covered with netting. He also found the lignite burning locomotives not as powerful as those burning bituminous coal.

E. W. Pratt (C. & N. W.) mentioned engines in service on his road that were especially designed for burning lignite. These have a grate area 50 per cent. larger than the other engines of similar type, but until the gyrus spark arrester was installed they threw a large number of sparks.

Mr. Crawford thought that brick arches should be used on all lignite burning engines on account of the large amount of slack in the fuel and the rapid breaking of the lumps.

Mr. Flagg stated that this device would greatly increase the efficiency of the fuel as it would allow the high volatile matter to become thoroughly consumed.

SELF-PROPELLED CARS.

The authors of this paper, S. T. Dodd and B. H. Arnold, of the engineering department of the General Electric Company, considered all types of self-propelled cars, but went more thoroughly into the discussion of those with internal combustion engines. In a summary of those operated by steam the committee said:

"In summing up the position of the steam motor car, we note that of all the types which have been built very few have been duplicated and none have been adopted as standard by operating roads in spite of the fact that they have been before the public for a length of time reasonably sufficient for their development. The objections which seem to have prevented their success are apparently:

"Cost of maintenance. The necessity of developing a relatively high horse power in a limited space results in a special or cramped design of boiler and engine which is not economical in maintenance or repair.

"Limited tractive power, or excessive weight on drivers. The majority of cars of this type which have been built have the driving power applied to one axle only. Frequent stop service, for which the independent car should be particularly fitted, demands a high tractive effort in starting, if acceptable schedule speeds are maintained, and such tractive effort is not obtainable without a fairly high proportion of the weight upon driving axles. This results in excessive weight on the driving wheels when there is only one driving axle.

"Limited operating radius: Tanks of 100 gals. of fuel and 1,000 gals. of water seem to be acceptable in practice. This represents a weight of fuel and water of nearly 10,000 lbs., and gives apparently an operating radius of only about 50 miles for fuel and 30 to 40 miles for water. For practical success, it appears that such a car should have an operating radius of about 100 miles without recharge."

The chief difficulty in regard to cars operated by compressed air seems to lie in their inability to develop a sufficiently high speed for railway service with a thoroughly practical design.

In the consideration of the storage battery car it was shown that while cars of small capacity and of a rather limited radius of operation had proved very successful in street car service "a car for branch line service might fairly be assumed to have a weight of 40 tons and to require about 50 watts per ton mile for operation. This is equivalent to 2 k. w. per car mile, or for a run of 100 miles, without recharging, would require a battery which would have a weight of about 10 tons or one-fourth the total weight of the car. These figures are presented to show that long distance operation of heavy cars without recharge of battery would entail a prohibitive weight of battery."

Internal Combustion Engine Car.—Under this heading were considered the gasolene cars with mechanical and electrical transmissions. The McKeen car was somewhat briefly described, its maximum low and high speeds being given at 10 to 15 m. p. h., and 60 to 70 m. p. h. respectively. In April, 1913, 138 of these cars were in service on 50 different railroads. Among other mechanical drive passenger cars the Fairbanks-Morse Company, Chicago, has built a car with single trucks, steel body and a seating capacity of 21. The P. H. Batten Company, Chicago, has also built cars of this type with a seating capacity of about 30 passengers which are in operation on three roads in the central west. The Stover Motor Car Company, of Freeport, Ill., has supplied small single truck gasolene cars on the Waterloo, Cedar Falls & Northern and the Chicago, Rock Island & Pacific. The Hall-Scott Motor Company, Oakland, Cal., has built double truck cars with a seating capacity of 50, and a 100 h. p. four cylinder engine driving the rear axle through longitudinal transmission and double gears.

The gas-electric car was next considered, the General Electric Company's type being described. There are 50 of these cars in regular daily service. The operation of the gas-electric car, made by the French Westinghouse Company, and which has recently been introduced in this country by the Drake Railway Automotrice Company, on the Arad-Csanad Railway, Hungary, was mentioned. These cars are running approximately 1,000,000 car miles per annum at an average maintenance cost of 2.5 to 3 cents per mile.

Speaking of the combination of the gasolene electric car with a storage battery auxiliary, the paper said:

"The fact is, that the storage battery is of no real value in combination with the electric drive, as it has been developed today. The real value of the electric drive is the possibility of working through a wide range of voltage and current. With a storage battery auxiliary this advantage would be eliminated, as

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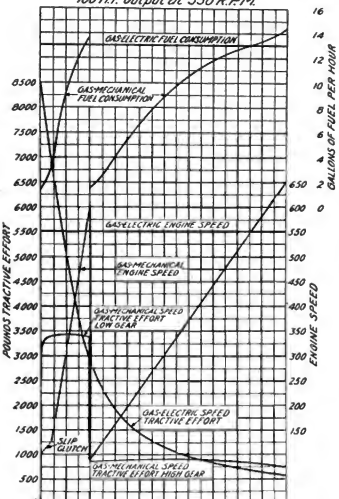
the generator would be forced to work at the constant voltage of the storage battery. The weight and cost of the battery is a considerable item and the same weight and cost could be expended to greater advantage in increasing the capacity of the engine and generator, if necessary.

"Comparing now the characteristics of the mechanical drive gasolene car, and the electric drive gasolene car, the fundamental difference between them lies in the method of transmission of the power between engine and axle. The comparison of the characteristics is well illustrated in the curves shown herewith. These curves show the speed, tractive effort, and gasolene consumption of a car equipped with a 100 h. p. 550 r. p. m. gasolene engine, driving in the one case, through electrical transmission,



Characteristics of Gasoline Car, Mechanical Transmission Compared with Electrical Transmission.

the motors geared to 33 in. driving wheels, and in the other case, through mechanical transmission, a single pair of driving wheels, 42 in. in diameter. The slow speed gear reduction has been assumed at 7.5 to 1 and the high speed gearing at 1.6 to 1. These conditions correspond approximately to those ordinarily obtained on mechanical drive gasolene cars of this weight and capacity. The following characteristics are to be noted:

"In the electric drive car the engine speed is independent of the car speed and is maintained at the normal value 550 r. p. m. throughout the whole range of car speed. In the mechanical drive the engine speed is proportional to the car speed. It starts at a low value with the starting of the car, and increases with the car speed up to 600 revolutions at a car speed of 10 m. p. h. At this point the change gear clutch is thrown in, the engine speed is cut down to 100 r. p. m., with the higher gearing, and is again raised with the car speed to 650 r. p. m., at a car speed of 50 m. p. h.

"*The engine horse power* is approximately proportional to the engine speed. With the electric drive the horse power is maintained at 100 h. p. throughout the range of car speed, but with the mechanical drive the horse power varies, reaching its maximum value at the maximum speed corresponding to the two gear ratios.

"The electric drive car, on account of its constant horse power output, develops a tractive effort which varies inversely with the speed. The speed-torque characteristic of the electric drive is very similar to that of the steam locomotive. The maximum tractive effort is limited by the slipping point of the wheels, or by the maximum current which the generator can drive through the motors with the full engine output. General Electric gas-electric cars will in practice develop a maximum tractive effort of 10,000 to 14,000 lbs., depending on the gearing."

Fuel—The authors stated that the Baumé or any other such scale told very little of the relative suitability of various gasolenes or naphthas as they would be greatly affected by the character of the oil field from which they originally came. A better method is based on the fractional distillation. The following is abstracted from the remainder of the report.

"The specifications of these light distillates should give the initial boiling point, that is the point at which the liquid starts to vaporize, the final boiling point at which all liquid has disappeared from the flask, and possibly two or three points in between and the percentages which should boil over at these temperatures. The initial boiling point should be the maximum temperature which will insure easy starting. Final boiling point should be set as high as possible so as to produce a fuel which will not burn too rapidly, and yet this must not be so high as to cause carbon deposit. Fuel should, of course, be free from water and other impurities.

"The following specification for liquid fuels will be found very satisfactory for use on gas electric cars. As a matter of fact, a considerable number of cars are operating with fuels having dry points in excess of those here specified:

"Fuel shall be free from impurities.

"The initial boiling point shall not be in excess of 185 degs. F.

"Dry point shall not be in excess of 356 degs. F. (Dry point will be indicated by a small puff of white vapor from residue in flask.)

"The fractional distillation proceeding at the rate of one drop per second should be recorded in 10 per cent. cuts.

"The first 10 per cent. should distill at a temperature not in excess of 230 degs. F.

"Fifty per cent. should distill at a temperature not exceeding 270 degs. F.

"Not less than 97½ per cent. of the liquid should be recovered from the distillation.

"Generally speaking, alcohol, either wood, grain or denatured, is a fuel better even than gasolene, and undoubtedly will figure more prominently in the future than it has in the past. Its advantages lie in the fact that it can be obtained from any vegetable matter and is, therefore, available in nearly all parts of the earth. The apparatus required is simple, inexpensive and the cost of production small. Chemically, alcohol is a much more simple substance than gasolene and will be found more uniform. The one bar to its use is a legal one. The government requirements as to inspection, bonding and storing are such as to increase the price unduly. Once these restrictions are removed, alcohol should be a popular fuel. It is true that alcohol has a lesser heat value than gasolene, 14,000 B. t. u., as compared with gasolene at about 20,000, and, therefore, somewhat larger quantities will be needed for the same amount of work, but alcohol should be profitably sold for 4 or 5 cents a gallon if the legal restrictions were out of the way."

The following operating results of the General Electric Com-

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pany's gas-electric cars on the Minneapolis, St. Paul, Rochester & Dubuque Electric Tract. Company were included:

COST OF OPERATING GAS-ELECTRIC MOTOR CARS FROM JANUARY 1 TO AUGUST 31, 1912.

Total motor car miles	216,498
Total trailer car miles	75,948
Total car miles	292,446
Per cent. of time trailers hauled	35.5
Number of motor cars in service	8
Length of line, miles	37.34
Maximum grade, per cent.	1.5
Schedule time for express trains	1 hr. 17 min.
Average distance between stops for express trains, miles	3.734
Schedule speed m. p. h. of express trains	29.1
Schedule time for local trains	1 hr. 35 min.
Average distance between flag stops for local trains, miles	1.067
Schedule speed m. p. h. of local trains	23.6
Gals. fuel used per motor train mile	.758
Gals. fuel used per car mile	.527

	Total cost for 1 year.	Av. cost per motor train mile.	Av. cost per car mile.
Wages of crew	$12,056.95	$.0557	$.0412
Fuel (naphtha)	17,622.26	.0814	.0603
Lubrication (gas engine)	1,141.56	.0052	.0039
Journal oil	77.77	.0004	.0003
Supplies and car heating	1,389.03	.0064	.0047
Maintenance of electric equipment	1,949.81	.0090	.0067
Maintenance of cars and trucks	1,394.56	.0065	.0047
Shop expenses of heating	3,507.77	.0162	.0120
	$39,139.71	$.1808	$.1338

An appendix included a list of questions to be used in the qualifying examination for gas-electric motor car operators, a monthly report of mileage and expenses and a report of expense of general overhauling.

DISCUSSION.

O. S. Beyer (C. R. I. & P.) spoke of the storage battery car as being too light to meet the conditions of railway service with the increasing demand for steel equipment. The maintenance costs, the reliability and depreciation of the gas-electric car should also be considered, the latter item being considerable when compared to the depreciation of a small locomotive and car which it replaces.

D. C. Buell (U. P.) pointed out that the chief troubles experienced with all motor cars were from a lack of the proper instruction of the men handling them, that the whole proposition was in its infancy, comparatively speaking, and that troubles should be naturally expected. The motor cars are here to stay and their development will constantly be going on.

J. H. Tracy (Electric Storage Battery Co.) presented a written discussion stating that the lead battery car could be operated at 100 miles per charge at a free running speed of 30 m. p. h. with a seating capacity for 70 passengers and a suitable baggage compartment. A car 34 ft. 4 in. long, weighing 32,000 lbs., the battery weighing less than 8,000 lbs., and having a seating capacity for 32 passengers, is being operated on the Lewisburg, Milton & Watsontown Passenger Railway. This car has run 20,000 miles, or approximately 122 miles a day, from October 9, 1912, to April 1, 1913, losing only 19 miles from the full schedule which was due to a damaged charging plug. The current consumption was 4.25 ampere hours per car mile. With an average live load of 1½ tons the actual power consumption amounts to 41 watt hours per ton mile. The ruling grade is 0.7 per cent. A two-car train can also be successfully operated at a decrease in the power consumption of two single cars.

F. E. Drake (Drake Railway Automotrice Co.) mentioned the service given by the "Dracar" gas-electric motor car, on the M. O. & G. Five cars are in service, the longest run being 210 miles per day. During the month of April 15,800 car miles were made at 3.3 miles per gallon of gasolene. The operating expenses per car mile were 16.4 cents. Three men are required on each car because of the state laws.

J. E. Osborn (Ann Arbor) reported that one of the main troubles with the McKeen motor car was the breakage of chains. He also stated that they operated on 2½ miles per gallon. Kerosene has also been used as a fuel with these cars.

It was also brought out that motor cars were oftentimes operated under conditions that were unsuitable for steam trains, and that trouble should be expected in these cases.

MODERN COALING STATION.

A progress report of the committee on modern locomotive coaling stations, of which Hiram J. Slifer, consulting engineer, is chairman, was presented. The committee, realizing that no definite design of coaling station could be made to fit the conditions of all climates, has only considered certain dominant factors that pertain in all cases. The committee recommended that a careful study regarding the character and permanency of the fuel supply be made before constructing permanent chutes; that the coaling stations be located away from the terminal a distance equal to that which can be covered by one tank supply of coal, and that no engines, except possibly one or two fast passenger engines, be coaled at the larger terminals. This recommendation, of course, being subject to the prevailing conditions. Forty-one questions were sent to the members for reply, but sufficient information has not been collected to make possible a complete report. Eighteen replies were received.

The gravity chute was generally favored where sufficient room was available and the cost of property was not excessive. Eight members favored this type where 10,000 tons or more are handled per month. Twelve members favored the balanced bucket type where space for chutes was restricted. This type was especially favored for large stations. The bucket type conveyor was recommended by three members and it was especially noted that where this or the previous type was used there should be a duplicate hoisting arrangement. Seven members recommended the locomotive crane and clam-shell for the smaller stations and for temporary use. Three members recommended the use of the inclined trestle with coal pockets, into which the coal is shoveled from the cars, for smaller stations handling less than 50 tons per day and where a more expensive plant could not be considered. An inclined skip car type of plant and a mono-rail system taking the coal from depressed tracks to the bins were also suggested.

Frame, concrete and steel construction were all recommended for various circumstances such as permanency of structure and economical considerations. Creosoted timbers were also mentioned in connection with the frame construction. It was the unanimous opinion that an operator should not be required to look after more than one plant. As a general rule the storage of coal was not recommended except under special conditions.

Eight replies opposed a weighing device for determining the amount of coal consumed by each locomotive, six favored it and three were qualified but in favor of it. The consensus of opinion was in favor of gasolene engines for operating mechanical coaling stations. It was agreed that there was more or less depreciation due to coal passing through a handling plant, but this could be corrected to a certain extent by breaking the fall of the coal through deflectors, spirals or by some other mechanical device. Considerable difficulty has been experienced in handling plants by the lump being separated from the fine coal with a result that some engines get all fine coal and others all lump.

The locomotive crane equipped with a clam shell bucket was not considered as good as the modern coaling station and should be used for emergency service only. The following reply gives the operating costs of different types of stations:

Two Balanced Buckets, 350 Tons Capacity.—First cost, $22,000. Cost of operation, 2 to 8 cents per ton; average cost, 3½ cents per ton. Cost of maintenance, 2 cents per ton. Fixed charges, interest 5 per cent. and depreciation 5 per cent. per annum, 2 cents per ton.

Link Belt, Bucket Conveyor, 200 Tons Capacity.—First cost, $37,000. Cost of operation, 1.7 cents per ton. Cost of maintenance, 1.4 cents per ton. Fixed charges, interest 5 per cent. and depreciation per annum 5 per cent., 1.5 cents per ton.

Link Belt, Bucket Conveyor, 150 Tons Capacity.—First cost, $9,000. Cost of operation, 5.6 cents per ton. Cost of maintenance, 3.0 cents per ton. Fixed charges, interest 5 per cent. and depreciation 5 per cent. per annum, from 1.0 cent to 2.0 cents per ton.

Inclined Conveyor, Belt, 150 and 350 Tons Capacity.—First cost, $10,400 and from $13,000 to $23,000. Cost of operation, from 1.5 cents to 8.8 cents per ton. Cost of maintenance, from 0.1 cent to 0.7 cent per ton. Fixed charges, interest 5 per cent. and depreciation 5 per cent. per annum, from 1.4 cents to 3.6 cents per ton.

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Locomotive Crane.—Average total cost, 20 cents per ton.

Inclined Trestles with Pockets.—First cost, $4,000 to $12,000. Cost of operation, from 1.0 cent to 5.0 cents per ton. Cost of maintenance, average 2.0 cents per ton. Fixed charges, interest 5 per cent, and depreciation 10 per cent, per annum, from 1.0 cent to 2.0 cents per ton.

Large Balanced Buckets, 15 Tons Capacity, Running Up Vertically and over Horizontal Track, Capacity 1,500 Tons.—First cost, $64,000. Cost of operation, 2.0 cents per ton. Cost of maintenance, 3.0 cents per ton. Fixed charges, interest 5 per cent, and depreciation 10 per cent. per annum, 1.6 cents per ton.

DISCUSSION.

J. W. Hardy (C. R. I. & P.) presented some photographs showing the manner in which the coal is broken up after passing through a coaling station, and said that run-of-mine coal with 50 per cent. slack would run as high as 72 per cent. slack after passing through the coaling station. Another test with railroad lump having 25 per cent. slack when received in the car showed an increase of 40 per cent. slack by the time it got on to the tender. He substantiated the replies received by the committee in regard to this question.

J. G. Crawford (C. B. & Q.) stated that egg coal in passing through such stations would come out worse than run-of-mine coal, which could be purchased for from 15 to 20 cents a ton less.

LOCOMOTIVE BOILER SCALE.

J. S. Sheafe (Ill. Cent.), chairman, read the committee report on this subject. The committee was unable to secure much data on the subject of heat loss due to boiler scale, and believes that such loss is considerably over-estimated. It was pointed out that in order to keep the tubes 100 per cent. clean the tube borers should be educated as to the importance of doing their work in a thorough manner and that they should be carefully watched by the foreman in charge. Convenient and accessible plugs should be supplied in order to thoroughly inspect the boiler after it has been washed out.

Larger arch tubes were recommended to adequately take care of the steam generated in them. The ideal way to treat water is in settling tanks so that it may be commercially pure before being put in the boiler. The adding of a boiler compound by the guess method is to be generally discouraged, and each treatment should be chemically correct, as much harm may be done otherwise.

The use of pure amorphous graphite was strongly recommended as it is purely mechanical in its action, having a tendency to break off the scale as well as preventing its formation. A simple laboratory experiment was made by applying this grade of graphite to one side of a plate and intermittently boiling. After 80 hours, extending over a period of 10 days, the graphite was still as active in its protection of the plate as it was originally. The opposite side of the plate was rusty.

In an appendix to the report attention was directed to the return of Henry Kreisinger to the service of the United States Bureau of Mines to resume experimentation on the transmission of heat into steam boilers. It is planned at present to investigate the following factors: Effect of velocity of gas through tubes, effect of initial temperature of gas, effect of the steam pressure in the boiler, effect of the different diameters of tubes, effect of the different lengths of tubes, effect of conductivity of the tube metal (both iron and copper tubes will be used at different times), effect of scale on the water side of the tubes, and effect of a coating of soot on the gas side of the tubes. Illustrations accompanied the report showing the arrangement of the testing apparatus.

DISCUSSION.

Mr. Bentley emphasized the importance of keeping the boiler clean, both inside and out, and of the careful inspection by either candles or pocket flashlights, as used on the North Western. Too much boiler compound will be apt to pit the tubes.

W. E. Dunham (C. & N. W.) did not notice any appreciable difference between the hard and soft scale as regards the fuel consumption. He suggested that the arch tubes be increased in size in the engines handling specially bad water, but if used, special care must be exercised to prevent failure. On the North Western the boilers are blown-off every mile in the bad water district to reduce the concentration of the boiler compound.

R. Collet (Frisco Lines) stated that too extensive blowing-off would greatly decrease the fuel economy.

OTHER PAPERS.

Construction, Development and Operation of a Bituminous Coal Mine.—J. A. Garcia, Allen & Garcia Company, Chicago, presented an interesting paper on this subject describing the latest practices in mine operation. He stated that an extraction of 75 per cent. should be made from a mine properly developed and operated 200 to 250 days per year. In the section of the country about Chicago the percentage of extraction is about 56 per cent. The remaining 44 per cent. is allowed to remain, as it would cost more to mine it than its price in the market. The best of engineering practice is required in the construction of a mine to insure its permanency and safety. It was stated that track scales under the tipple were unsatisfactory and should be so located only when it is not possible to secure the proper gradient.

W. S. Roberts, in the discussion, stated that this was an important item, as it would greatly facilitate the obtaining of correct weights and the railroads could aid the operators by locating their tracks accordingly. He also pointed out that a mine provided with up-to-date equipment would be in a position to furnish coal more nearly to specification than other mines without such equipment, and that this should be considered when comparing the various contract bids.

It was pointed out that the railways could greatly assist in mine operation by making their orders more uniform and keeping the mines supplied with cars, which in both cases would benefit the railroad as well as the mine operators. The variation in the quality of coal was laid to the labor conditions prevailing throughout the mining industry. It was also suggested that representatives of the miners be included in conservation committees as they were in a better position than any one else to effect the savings.

Firing Practice—A committee, of which D. C. Buell (U. P.) was chairman, presented a report on what it considered the best practice in firing locomotives. It was well received and thoroughly discussed by the association. The different items included firing tools, draft appliances and blower, care of boiler tubes, hand firing, mechanical stoking, education of firemen, interesting railroad officers in fuel economy, waste of coal for which the fireman is responsible and methods of obtaining the co-operation of the fireman.

The committee is to incorporate in its next report the suggestions adopted during the discussion, together with designs of the best practice in firing tools.

OTHER BUSINESS.

The following officers were elected for the ensuing year: President, R. Collet, superintendent of fuel service, Frisco Lines; first vice-president, D. R. Sebastian, fuel agent, Chicago, Rock Island & Pacific; second vice-president, D. C. Buell, chief educational bureau, Union Pacific, Illinois Central and Central of Georgia. Executive committee, two years, B. P. Phillippe, C. F. Ludington, J. S. Sheafe and F. F. Gaines; for one year, Eugene McAuliffe and W. H. Averill.

Chicago received the largest number of votes for the next convention.

RAILWAY IMPROVEMENTS IN ROUMANIA.—A bill has been introduced in the Roumanian parliament to authorize the expenditure within the next five years of $80,000,000, for the completion of railway lines now under construction, the improvement of existing lines by double tracking, building of new stations, etc., and the construction of new lines of about 1,000 miles in length and of a bridge over the Danube.

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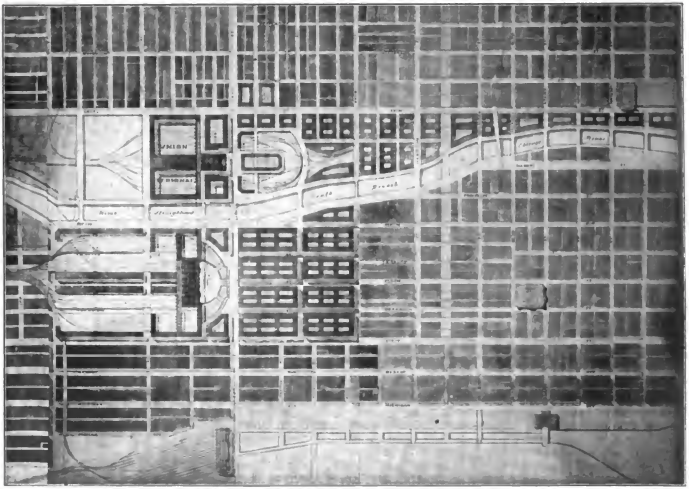
RELOCATING OF CHICAGO RAILWAY TERMINALS.

The Principal Features of the New Plans with Some of the Reasons for Rebuilding the Chicago Terminal District.

A new plan for the relocation and co-ordination of the railway passenger and freight terminal system of Chicago was submitted to the City Council Committee on Railway Terminals at a hearing on May 24 by the Chicago Plan Commission, a body appointed by the mayor to study and recommend means for the improvement of the city on the basis of a scheme prepared several years ago by a committee of the Commercial Club, known as "The Plan of Chicago." This new plan provides for a series of passenger terminals on the south side of Twelfth street in three units, one between Michigan avenue and the lake for the roads using the Illinois Central terminal; one between State street and the Chicago river for the roads now using the Dearborn and LaSalle street stations, and one between the river and Canal street for the roads now located west of the river and using the Union and Baltimore & Ohio stations.



Plan of the Central District of Chicago Showing Proposed Three-Unit Plan of Passenger Terminals at Twelfth Street, Proposed Straightening of Chicago River and Proposed Development of Railway Property North of Twelfth Street for Warehouse and Business Purposes.

The new plan was presented by Charles H. Wacker, chairman, and W. D. Moody, managing director of the Chicago Plan Commission, as "representing the best product of the efforts of the executive officers and the architectural and engineering staff of the commission, but not passed upon by the commission," pursuant to a resolution adopted by the Plan Commission after the failure of the efforts of its subcommittee on railway terminals to induce the roads now using the Union station to change their plans for a new station to harmonize with the Chicago plan. It was submitted to the committee for their consideration in connection with a vigorous objection to the plan for the location of the new Union station between Jackson, Adams and Clinton streets and the river, as described and illustrated in last week's issue, which was declared "a distinct menace to the future welfare of the city."

The objection was not directed solely at the plan for the passenger terminal, but was based largely on the grounds that it contemplated a new freight terminal for the Pennsylvania Lines, to replace the present freight facilities on the site of the proposed Union passenger terminal, to be located between Jefferson and Desplaines streets, from Van Buren south to Ewing, and that the passenger and freight terminals together would constitute a "permanent impregnable Chinese wall" hemming in the expansion of Chicago's congested business district toward the west and south, besides preventing the carrying out of a comprehensive permanent plan for the railway terminals of the city as a whole. The plan is based mainly on the plans that have long been advocated by F. A. Delano, president of the Wabash, for a series of terminals on Twelfth street, and the proposals of the original plan of Chicago as drawn by D. H. Burnham. It includes the idea

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suggested in the plan recently advocated by Jarvis Hunt for the straightening of a bend in the Chicago river between Twelfth and Sixteenth streets, but rejects his plan for one central terminal, and it places the new Union station on the west side of the river, while moving it back to Twelfth street, instead of requiring the railroads to cross the river to enter the station, as proposed by Mr. Hunt's plan. Instead of a central freight terminal at Sixteenth street, as proposed by Mr. Hunt, it provides for the use of railroad property north of Twelfth street for large freight terminal and warehouse buildings entered by tracks underground and for the opening of streets through territory now closed by railroad property.

The principal features of the plan, together with some of the reasons advanced by its framers as to the need for reconstructing the Chicago terminal district, are given in the following extracts from the report:

The report states that at present Chicago has a population of 2,250,000 people and a central business area of one-quarter of a square mile with a mixed fringe of business and warehousing surrounding it. It is estimated that this loop district is carrying today 60 to 70 per cent. of its ultimate business capacity, and that to provide for the business necessities of a population of 5,000,000 people at least 50 per cent. more area than is now in use will be required. The business district can grow southward only along three streets; it can grow westward and northward only after jumping the gap of the river and adjacent railroads, which ranges from 400 to 700 ft. wide on the north and from 1,100 to 1,500 ft. at Harrison street. It is declared that the history of cities shows that only under the strongest sort of pressure will business jump even the smallest gap.

"In order to bring about a more orderly development of business southward and a movement of business westward, it is necessary to remove the obstacles which are restricting and making the growth unshapely and disorderly. The terminals—freight and passenger—must either be removed altogether or else the areas which they occupy must be developed in such a way that they will become a magnet rather than an obstacle to business.

"The location of the river and of the railroads immediately adjacent has been a hindrance to the westward flow of business and the trend of the river eastwards and the presence of the railroads in long strips up to the loop has broken up and is preventing west of State street a solid movement southwards.

"For proper development to take place in the future in either of these directions, it will be necessary to overcome both of these forces which are operating to break it up and obstruct it."

Then follows a description of the street system of Chicago, showing the condition of imperfect and inadequate means of passage to and from the central district, caused by the location of the river, the changing of the street system south of Jackson boulevard to accommodate the railroads, and "improper development by the railroads of the property owned by them south of Polk street and the closing by them of streets."

"If business is to grow southerly and westerly," the report declares, "we must develop east and west streets south of Jackson boulevard, and north and south streets between Michigan avenue and Halsted street." The report then continues: "As a means, at one and the same time, for relieving restrictions on business growth, for improving the street system and for providing for the city railroad terminals which will be adequate for present needs, and which will provide for expansion in the future, it is proposed that all passenger terminals of the railroads be moved back to Twelfth street, that the river channel be changed from Twelfth street to Sixteenth street, and that the space occupied by the railroads north of Twelfth street be developed for freight-warehouse and wholesale occupancy.

"The movement of business can then be progressive and natural. It is immaterial, as far as business is concerned, what is under the street surface, and if all the railroad tracks be placed under ground business can flow over them without interruption. The lower part of the buildings can be used as delivery floors and the upper sections as offices and business houses. Along the river, west of the present business center, buildings can be built which in appearance will not differ in any way from business buildings. Loading to and from these warehouses can be done in courts over the tracks inside the buildings and the frontages along the streets can be used for stores if so desired. When business demands outlet to the west this occupancy will give place.

"It will be readily seen that most of these improvements, which are practically the only means of relieving downtown congestion, are bound up with and dependent on a complete rearrangement of railroad facilities, and lie for the most part on railroad property.

"The railroad passenger terminals as proposed are dependent on the straightening of the river. This is proposed from Twelfth street to Sixteenth street, and the new channel provided will be 200 feet wide. (This is an improvement recommended by the Harbor Commission and by the Sanitary District.)

RAILROAD TERMINALS.

"The passenger terminals should be accessible to all parts of the city. They should be reasonably close to the business district. They should be within easy reach of each other. They should be perfectly placed in their relation to the present and proposed transportation facilities. They should cause a minimum congestion on the streets in their neighborhood. They should not interfere with the growth of the business area. They should not be located so as to in any way obstruct or disarrange the street system. They should be as economical in first cost and operation as compatible with convenience and service to the public. Their operation should be noiseless and smokeless.

"Under the preferred plan Twelfth street should start from Michigan avenue, with the Field Museum and new Illinois Central station at its intersection with Michigan avenue, as a double-deck street, and continue as such to the river. West of Canal street it will be a one-level street. On the south side of Twelfth street, east of the river, it is proposed to provide business buildings and a station which centers on Clark street. This station will house the Lake Shore, Rock Island and Western Indiana group of roads. On the north side of Twelfth street there will be buildings which will have a combined utility of stores, offices and warehouses. West of the river, as far as Canal street, there will be on the south side of Twelfth street, the station building for the Union terminal group of railroads, with adjunct office development. On the north side of Twelfth street there will be offices or station building development. The above arrangement with the additions of the Illinois Central station proposed at Indiana street and Michigan avenue, will constitute a three-unit plan interrelated along Twelfth street.

"The Illinois Central-Michigan Central group will occupy their present station. The Western Indiana or Polk street station group, consisting of the Wabash, Grand Trunk, Santa Fe, Monon, Chicago & Eastern Illinois, Chesapeake & Ohio, and Erie will be united with the Rock Island-New York Central lines, or LaSalle street station group to occupy the large terminal centering on Clark street. The Union terminal group, consisting of the Pennsylvania, Burlington, Alton and St. Paul railroads, will receive the B. & O., or Harrison street station group, and occupy the terminal between the river and Canal street.

"The passenger terminal which it is proposed to place between State street and Fifth avenue, extended, will have its head house or terminal building centering on Clark street. In order to allow of the looping of trains, it is necessary to place this building 300 ft. south of Twelfth street. In front

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of the head house and between it and the loop will be an open plaza at the level of Twelfth street viaduct. Into this plaza and to the entrance to the station are taken the street car tracks which run on the upper level of Twelfth street. All traffic coming to the station along this upper level will also be cared for there. Entrances to the station for both vehicles and street car passengers are provided on Clark street, Dearborn street, LaSalle street, and on the lower level of Twelfth street.

"Directly back of the station building and at the level of Twelfth street the plaza and the head house floor is placed the concourse with the incoming section to the left and the outgoing section to the right of the head house.

"Express and baggage buildings may be placed in the central area between the incoming and outgoing sections of the station and when the station is electrified the space under these buildings may be used for car yards and later made an addition to the station. Building development may take place over the whole station area as soon as electrification is complete. In order to relieve Twelfth street of as much station traffic as possible driveways are provided along each side of the head house which are connected independently of Twelfth street with Canal street to the west and by a bridge over the river with Fifth avenue and the plazas of the other terminal.

FREIGHT TERMINALS.

"It is proposed that all the railroad property north of Twelfth street not taken for passenger terminals and such of the station area as can be built over after electrification be developed as freight terminals with warehouse and wholesale offices on the upper floors.

"East of the river this area owned by the railroads and developed in this manner can be approached from the south by tracks which will pass under the station along the west line of the terminal. These tracks will pass over Wentworth avenue, south of Sixteenth street and the lower level of Twelfth street. At this latter point they will be at an elevation of about 6 ft. below Chicago city datum, or about 19 ft. below the normal street level of 13 or 14 ft. above Chicago city datum. As soon as the elevation of 6 ft. is reached, branch tracks will be run out from the main running tracks into each of the warehouse blocks which they will serve. Each of these warehouse blocks will have its own private teamway or driveway and all the loading and unloading will be done there.

"On the west side of the river it is proposed that the approach tracks to the passenger station from the north be placed under Canal street from Madison street to Harrison street so as to leave all the area between Canal street and the river north of Harrison street free for wholesale and warehouse buildings. This area has the advantage of providing rail and water connection.

"Tracks for serving the properties to the east of the passenger approach tracks will pass around the east side of the terminal of the Union terminal association, and then up through the center of this area or along the east edge close to the river. These tracks will be at an elevation of about 6 ft. above Chicago city datum.

"Tracks to serve the area lying between Canal street and the approach tracks to the passenger station will be carried between the west side of the terminal and Canal street.

"The former of these freight connections will serve the Pennsylvania and the Alton property and the latter the Burlington property.

"The property lying to the north of Van Buren street as far as Madison street between Canal street and the river is held by the Pennsylvania and proposed for the new Union terminal. It can still be held by them for freight warehouse and wholesale purposes, and the area now held by the Alton south of Van Buren street can still remain Alton property to be used for freight warehouse and wholesale purposes. This will be a more economical use of the property than would its use for passenger terminal purposes.

SUBURBAN TRAFFIC.

"The heavy lines of suburban travel are from the north and west over the Northwestern and Milwaukee, from the south over the Illinois Central, Rock Island, Lake Shore, Pennsylvania, and from the west over the Burlington. At present these lines of travel are grouped into travel leaving the center of the city from the west of the river, travel entering from the south and travel entering from the east. It has been one of the aims of this study of the railroad situation to care for this suburban travel and bring it as far into the center as possible, even though it has been thought necessary to place the terminals themselves at Twelfth street, and it is proposed to handle this class of travel in the following manner. The lines which use the Union terminal west of the river, and enter from the south will deliver their suburban trains on to tracks set aside for that purpose, which shall run along the west side of the terminal to Harrison street. From Harrison street to Madison street these tracks will be placed under Canal street and from Madison street they shall parallel the Milwaukee tracks to some point to the north of the loop, where there can be placed a loop where the trains can be turned or else a yard where they can be stored.

"The Milwaukee suburban trains, and at some time in the future, the Northwestern suburban trains can be handled in the same way, using the Twelfth street station or else running farther south to a loop or yard. In this manner the whole loop will be served by these lines, and it is apparent that a large amount of travel can be handled each way at the rush hours. It is proposed to handle the traffic on the lines which use the terminal east of the river in much the same way—that is, to bring it up to the north end of the business center. It is proposed to pass suburban traffic over the present tracks of the St. Charles Air Line from Clark street to the lake front. Thence it will use tracks on the Illinois Central right-of-way to the river, where a loop can be provided for use of both this traffic and of suburban traffic over the Illinois Central. This loop would undoubtedly be an advantage to this road and with it, it could handle the additional burden which is outlined.

"As an alternative of this, these suburban traffic lines might be brought into the center under ground to the present passenger stations, and there turned, or they might be carried north of the river to a run-around or yard.

"With this complete arrangement for suburban business, the center of the city would then be served at all points along its edges, and at no time would a second fare be necessary to get to the business district, as is the case in New York.

"The arrangement of suburban lines along the west bank of the river and along the Illinois Central right of way, with a loop north of Randolph street, would be flexible and economical for the railroads and a convenient solution for the public."

Then follows a detailed plan of connecting the railway terminals with the local transportation system of the city, surface and elevated railways and the proposed subway.

In presenting the plan to the committee Mr. Wacker severely criticised the Union station roads for ignoring the Plan Commission, and accused them of attempting to "railroad" their plan through the council without reference to the revised plan which was submitted to them on May 16. He argued that a comprehensive scheme must be worked out and the railways he required to co-operate if the business district of the city is to be allowed to expand, and that any plan that does not provide for expansion to the west and south, and the reclamation of a part of the central territory now occupied by railway tracks should not be encouraged. Of the quadrangle bounded by Twelfth street, Halsted street, Chicago avenue and Michigan avenue, which the plan of Chicago proposes to make the central business district of the city, he said that 32.5 per cent. is owned by the railroads, and that if the Union station roads are permitted to retain

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their present location all hope of inducing competitive roads to move their stations back to Twelfth street must be abandoned. To provide for proper expansion additional streets must be opened up east and west and north and south, as provided by the plan, including a new main east and west artery or "civic axis" on Congress or Harrison street, leading to a civic center at Halsted street, where it is proposed to erect a city hall at the point of convergence of several main diagonal streets which penetrate the northwest and southwest sides of the city.

The plan for the proposed freight terminal of the Pennsylvania lines, as described by E. R. Graham, architect for the Union station roads, contemplates an architecturally attractive head house facing on Van Buren street, a warehouse building occupying the block from Van Buren to Harrison street, and a loading and unloading platform in the block south of Harrison street, between Jefferson and Desplaines streets. The terminal would be approached by four tracks south of Twelfth street, and two tracks north of that street at an elevation of from 20 to 27 ft. above the street level. This would provide for the handling of all package freight designed for local consumption. Loading and unloading would all be done entirely on the property of the railroad, and five entrances to the loading and unloading platforms would be provided in one block. Tall masonry walls would border the tracks along their entire length, so that the freight cars would be out of public view.

F. A. Delano, president of the Wabash, sent a letter to the committee at the hearing on May 23, criticising the plan of the roads for the Union station, and also addressed the committee at the hearing on May 24. He said that many features of the Pennsylvania plan were bad, as tending toward the restriction of the business district instead of providing for its expansion. He opposed the change in the proposed civic axis of the city from Congress street north to Jackson, saying that the growth of the city was toward the west and southwest, and he objected to allowing any tracks over the streets north of Twelfth street. He advocated no particular plan, and admitted there were many difficulties in the way of getting all the roads to agree on a general scheme, but thought the committee was in a position to refuse its sanction to any project that did not tend toward a solution of the whole terminal problem. He therefore suggested that a final decision on the plan proposed by the Union station roads be deferred a few months, and that the engineers of the various roads get together in a conscientious effort to work out the problem in a co-operative way. The adoption of the Union station roads' plan would mean, he said, that nothing would be done by the other roads toward working out a general solution, whereas he was sure that the Rock Island and Lake Shore would agree to move back to Twelfth street if a satisfactory plan is evolved. If all interested would place their cards on the table perhaps a better plan than any yet suggested could be worked out.

The plans for the Union station announced by the Pennsylvania Lines, the Chicago, Burlington & Quincy, and the Chicago & Alton were endorsed by the Chicago Real Estate Board at a meeting on May 22, by a vote of 95 to 10. They have also been approved in resolutions adopted by the people of several suburbs served by the Union station lines, and by a large number of west side property owners who have appeared at the various hearings and protested against any plan of locating the proposed terminal on Twelfth street. A large number of prominent business men have also written to the committee or appeared at the hearings, expressing a preference for the Union station lines plan over the Twelfth street plan, and particularly over the Hunt plan for a central terminal, while a few have expressed a preference for the latter or some other plan. The Chicago Building Trades Council submitted a resolution urging the approval of the Union station plan on the ground that it would give employment to a large number of men.

At a hearing on May 26 an entirely new plan was submitted to the committee by Irving K. and Allen B. Pond, architects. This scheme provides for a series of terminal units between Canal and Clinton streets, paralleling the river, extending from Madison street south to Twelfth street, and connected by a series of elevated tracks, on two levels, one for through trains and one for suburban traffic, operated on the loop principle with the stations inside the loop. This terminal system would accommodate all roads except the Illinois Central, and it was suggested that the Union station roads could build their proposed passenger station in approximately the present location, as the first unit.

At the meeting of the city council on Monday night three ordinances were presented on behalf of the Union station roads to provide for necessary street and alley changes in connection with their terminal plan.

An enabling act to provide for the incorporation of a holding company to construct the Union station, with a capitalization not to exceed $50,000,000, was passed by the Illinois legislature on May 22, after assurance had been given by the railways that they would pay to the state the full fee for such incorporation instead of incorporating under the "not for profit" act.

RAILWAY TELEGRAPH SUPERINTENDENTS.

The thirty-second annual convention of the Association of Railway Telegraph Superintendents was held at St. Louis, May 20, 21, 22 and 23, with over 200 members and ladies present, and President J. B. Sheldon in the chair. At the opening session Belvidere Brooks, vice-president of the Western Union Telegraph Company, spoke briefly, referring to the importance of harmonious relations between the telegraph company and the railway telegraph superintendents, and to the problems that were constantly arising for solution. The auditing committee reported total receipts of $1,972 and disbursements, $1,377, leaving a balance on hand of $595. Secretary P. W. Drew announced that the association now had 200 members, active and associate. A large number of new active and associate members was elected.

The Committee on Wire Crossings, G. A. Cellar, chairman, presented a report which, with a few amendments, was adopted; and the specifications embraced in it were ordered to be submitted to the American Railway Association.

A committee, E. P. Griffith, chairman, reporting on "Form for Delivery of Telegrams to Trains," advised that a universal system for making such deliveries or reporting non-deliveries would be impracticable. A paper on telephone transmission, by Elam Miller and C. A. Robinson, was read in abstract by Mr. Robinson and discussed by M. H. Clapp.

The next paper, entitled, "Use of telephones by railroads for despatching trains, and for messages," by J. C. Johnson, of the Pennsylvania Railroad, was read by I. C. Forshee, electrical engineer of that road. This paper is abstracted in another column. It brought out a long discussion, which was participated in by Messrs. William Bennett, Charles Selden, E. P. Griffith, W. J. Camp, C. S. Rhoads and others. The cost of way station telephone equipment was the subject of special interest to the members. Reference was made by various speakers to the value of concrete telephone booths.

On Wednesday morning P. J. Howe (W. U. T.) read a long paper on inductive disturbances. A. Wray, of the Rock Island road, said that the best means of insuring that lines shall be clear of inductive disturbances from power lines is to keep away from them. On his road harmonic ringers are used. These respond to alternating currents of different frequencies. This method of party line ringing is very successful. By its use any one of four parties may be called on a metallic line, or any one of eight called by ringing to ground from each side of the metallic circuit. He suggested that it might be possible to design relays that would respond only to the frequency for which they were built and in this way

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make telegraph circuits free from inductive disturbances from parallel power circuits.

N. E. Smith (N. Y. N. H. & H.) gave some experiences as a result of induction from the single phase 11,000-volt traction system of his company, which he thought had no equal. He gave a detailed account of the efforts to overcome inductive disturbances, and the satisfactory results obtained.

M. H. Clapp (N. P.) presented a paper on protection against lightning, which was discussed by J. C. Forshee (Pennsylvania) and others. Mr. Forshee described the methods of protection employed on his road. R. E. Chetwood (W. U. T.) said that railroads spent much money on protective apparatus and failed to get the results expected because of poor grounds. It was hard to devise any standard method of making grounds. The best way is to drive pipes in the earth and use salt. If necessary drive several pipes and connect them in parallel. Vacuum lightning arresters, he stated, could not always be relied on. Their efficiency depended upon the vacuum, and the word of the manufacturer was the only guarantee that could be obtained as to this. His company is to introduce a new type of cable box which will be an improvement on the present type.

At the afternoon session, R. F. Spamer (Western Electric Company) read a paper on "Main line power for selective circuits, including transmission and signaling." In the discussion on this E. C. Keenan read a communication from C. S. Rhoads, Jr., engineer of the Hall Switch & Signal Company, New York, in which it was stated that there are points other than first cost, depreciation, etc., which must be considered in the choice of battery supply for selector circuits. The human element, he stated, was a strong factor. Reliability is what is desired, not cheapness. Storage battery gives excellent results when properly maintained, but it has disadvantages. Dry battery has some excellent points in its favor. It can be installed and maintained by any inexperienced man. No reserve battery is absolutely necessary, and the first cost is reasonable. Primary cells, he said, are almost beyond consideration for railroad telephone service, except for certain specified uses. Chemical rectifiers are slow to come up to voltage after being idle. This fact is against them for main battery purposes. Motor-generators give reliable service and require very little attention. E. E. Hudson (Thomas A. Edison Co., Orange, N. J.) called attention to the reliability and low maintenance costs of primary cells.

H. D. Teed, superintendent of telegraph of the St. Louis & San Francisco, read a paper on the full use of wires, describing various improvements which have been made on his road. The first essential in getting full service out of all wires on a large system is to have an energetic manager and a wire chief, supplied with the necessary testing instruments—voltmeter, ammeter and Wheatstone bridge—who will appreciate their responsibility and the value of the property whose efficiency is in their hands. In adopting telephones, it was the policy on the Frisco to use them everywhere that economy could be effected. If good for despatching, telephones should be also good for messages; and it follows that the great volume of correspondence which burdens most railroads can be reduced also. From the headquarters of this road at Springfield, Mo., lines radiate in six different directions; and on four of these lines message circuits have been installed as well as despatching circuits. The message circuit and the despatching circuit together are used to make a phantom circuit for through business, and this has been very successfully carried out. The arrangement of the phantom circuit cost only $800, and it takes the place of an expenditure of $143,000 which would have been necessary if a separate new line had been put up. On all of the message circuits the signaling is done by monitor operators at Springfield. The Frisco makes extensive use of telegraphone instruments, to talk by telephone over telegraph wires, but only for moderate distances.

In the discussion of Mr. Teed's paper, R. F. Finley (N. Y. C.) reviewed the work done and what is proposed on the New York Central lines in the West in order to obtain the full use of facilities. M. H. Clapp, A. B. Taylor and others took part in the discussion, after which M. C. Allen, of the Western Union at New York, read a paper entitled "Organization for Maintenance of Lines."

On Thursday the paper of Mr. Allen was discussed at length by G. A. Cellar, A. B. Taylor, C. Selden, C. S. Rhoads, W. J. Camp and others, all of whom commented favorably on the practicability of the plan outlined by Mr. Allen. Mr. Cellar stated that he saw no reason why the organization described by Mr. Allen would not apply to railroads as well aa to telegraph and telephone service.

J. F. Richardson (C. P.) read the paper of J. B. Sheldon, entitled "Organization for Wire Chiefs and Telephone Inspectors." W. J. Camp, A. B. Taylor, J. F. Caskey and others described the methods in vogue on their respective lines, and a general discussion ensued.

At the afternoon session amendments were made to the by-laws providing that hereafter only one meeting of the eastern and the western divisions be held annually, instead of two, and that the officers of the divisions be elected at the annual general meeting. The eastern division will hold its annual meeting in November, and the western division in March. Additional meetings can be called on the application of five members.

The committee on "Preparing Uniform Rules for Train Orders by Telephone," through Chairman L. M. Jones, of the Santa Fe, Topeka, Kan., reported progress.

At the session of Friday morning officers were elected as follows: President, William Bennett, Chicago & North Western, Chicago, Ill.; first vice-president, A. B. Taylor, New York Central Lines, New York; second vice-president, N. C. Walstrum, Norfolk & Western, Roanoke, Va.; secretary and treasurer, P. W. Drew, Minneapolis, St. Paul & Sault Ste. Marie, Chicago, Ill.

New Orleans was selected as the place, and May 19, 20, 21 and 22 the time for next year's convention. W. H. Potter, Southern Railway, Washington, D. C., was elected chairman of the eastern division, and Mr. E. C. Keenan, New York Central Lines, Chicago, chairman of the western division. After the installation of the new officers the convention at 11:45 a. m. adjourned.

SHIPPERS AND THE ADVANCE IN FREIGHT RATES.

The Railway Business Association has published in Bulletin No. 13 its arguments in favor of freight rate increases for the eastern roads. The association urges railroad managers to confer directly with shippers and says that industrial and traffic bureau representatives should have sanction from their employers for a liberal attitude. The bulletin starts with the following statement signed by the president of the association:

"Fight" is not an appropriate name for the new effort of the eastern roads to raise freight rates. There isn't any fight about it. It is a conference. Antagonism to railways has subsided. Regulation of rates is complete. Confidence in the Interstate Commerce Commission is thorough. The public views the situation with equanimity. Shippers, consumers, the press and everybody else are obviously content that the roads should make their showing if they can and get the advance if they need it.

This is progress. It is vastly more important that railway questions shall be settled in good temper than that any particular rate case shall be decided any particular way. It is to be hoped that the country has seen its last "fight" over freight rates.

The Railway Business Association presents in this bulletin two exhibits. One is that the railroad share of total new securities issued has been declining sharply until it was in 1912 the lowest of the decade, while other corporations were

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issuing their highest. The other is a number of extracts from representative newspaper editorials breathing a spirit of willingness to consider the proposed advance without prejudice. These two exhibits taken together signify first that there is something the matter with railway credit upon which railway ability to serve the country adequately depends, and second, that whatever is the matter the country wants the Interstate Commerce Commission to find a remedy, in which there will be general and cheerful acquiescence.

In that frame of mind no nation is apt to make a serious mistake. The country is to be congratulated on having emerged into an era of calm thinking and good feeling with regard to transportation.

GEO. A. POST,
President, Railway Business Association.

The exhibit in regard to the need for higher rates and the small amount of new securities issued by the railroads is substantially as follows:

Applying for the reopening of the advanced rate case of 1910, the eastern trunk lines are about to go before the Interstate Commerce Commission and endeavor again to show need for larger revenue.

Lessons learned three years ago by all concerned should, and we believe will, make possible at this time a procedure distinguished by good feeling, by earnest purpose to ascertain what is the highest public interest and by conference and co-operation for the best results.

It is necessary that the railway managers should demonstrate their need. It is desirable that shippers and the public shall appreciate the burdens of cost which have been and are being laid upon the roads, the greatness of the task which the roads must perform to meet their obligations to the public and the generous allowance which ought to be provided for doing, on the higher scale of operating cost, the vastly greater things demanded by the miraculous growth of our agriculture, commerce and industry. Shippers and railroads can aid the commission substantially by endeavoring to reach agreements as to the schedules and the traffic upon which the increases, if any are to be granted, should fall.

The Railway Business Association is not a party to rate cases and will not discuss the schedules involved in this proceeding. Being, however, deeply interested in the welfare of the roads, which are the customers of our members, and having on general grounds as business men and citizens an earnest desire to promote enlightened methods of solving railway questions, we regard it as our function to encourage the fullest ascertainment and employment of pertinent facts. It would be possible for anyone desiring to resist advances otherwise than on the merits to make prominent at such a time past railway practices which have been criticised and alleged current shortcomings of individual companies susceptible of an interpretation injurious to the roads. Such attacks, indulged in at the hearings or through the newspapers, though foreign to the question whether the roads with existing revenue and under existing conditions can perform service adequate to the public need, might complicate the already difficult task of the commission and result in national injury.

We urge all those who discuss the question to deal in authentic information bearing directly on the merits. We ourselves shall invite attention to such facts as we feel competent to obtain.

Our study of the credit situation of the roads gives a result so striking that in our judgment it should arrest attention and demand consideration. The generally accepted authoritative record of listings on the New York Stock Exchange is the file of the *Commercial and Financial Chronicle*. That publication presents early in each calendar year a table giving new securities listed during the year preceding by all corporations, classifying railroads separately. For all corporations the *Chronicle* of January 25, 1913, page 241, gives a table covering a series of ten years, from which, adding stocks and bonds together and segregating steam railroad from all other corporations, we get the following:

NEW SECURITIES LISTED.

Year.	Total.	Non-Railroad.	Railroad.	R. R. Percentage of Total.
1903....	$1,008,179,095	$511,404,695	$496,774,400	49.2
1904....	710,946,400	246,994,350	463,952,050	65.2
1905....	1,513,461,550	797,954,750	715,506,800	47.2
1906....	1,234,667,950	680,753,900	553,914,050	44.8
1907....	996,845,050	582,102,250	414,742,800	41.6
1908....	1,386,885,450	680,222,850	706,662,600	50.9
1909....	2,424,482,585	911,473,770	1,513,008,815	62.4
1910....	2,047,664,045	1,241,830,885	805,833,160	39.3
1911....	1,224,449,230	721,555,780	502,893,450	41.0
1912....	1,816,008,540	1,470,221,540	345,787,000	19.0

An analysis of this table shows that from 1903 to 1909 inclusive, the steam railroad share of total issues of all corporations listed on the New York Stock Exchange fluctuated until 1909, when it was 62.4 per cent., the highest of the decade except 1904. After 1909 there was an annual drop in the amount of railway securities issued. In 1912 railroads issued only 19 per cent. of the total for all corporations, and this was the lowest percentage and the smallest amount for any one of the ten years.

In 1909 there were listed by all corporations issues aggregating $2,424,482,585. Of this total steam railroad corporations put out $1,513,008,815, leaving for other corporations $911,473,770.

In 1912, all corporations issued $1,816,008,540, of which steam railroads issued $345,787,000, leaving for other corporations $1,470,221,540.

In 1909, therefore, the railway securities issued were $601,535,045 more than the non-railroad, and in 1912 the non-railroad securities issued were *more than four times the railroad securities.*

The securities put out by railroads in 1909 were 62.4 per cent. of the total for all corporations.

If this ratio had been maintained in 1912 the railroads would have issued in that year $1,133,189,328, or *more than three times* as much as they did issue.

This decline in railway issues was persistent year by year since 1909. Corporations other than steam railroads issued in 1909 securities aggregating $911,473,770, in 1910, $1,241,830,885, in 1911, $721,555,780, and in 1912, $1,470,221,540. Steam railroads issued in 1909, $1,513,008,815, in 1910, $805,833,160, in 1911, $502,893,450, and in 1912, $345,787,000.

In other words, corporations other than steam railroads have issued since 1909 securities showing an increase in every year excepting 1911, whereas the steam railroad issues have declined in every year since 1909. The non-railroad issues in 1912 were $558,747,770 more than they were in 1909, while the railroad issues in 1912 were $1,167,221,815 less than they were in 1909, a falling off of 337.5 per cent.

"RELIEF MUST COME"—PROF. RIPLEY.

So independent an authority and careful investigator as William Z. Ripley, Profesor of Economics at Harvard University, accepts as sufficient the fact that "Today the Chicago, Milwaukee & St. Paul cannot sell its 4½ per cent. bonds at par," and declares:

"Relief in the form of rate advances must come. Unless relief does come from that source, the public is going to be denied the facilities and the accommodations to which it is justly entitled."

Many executives of industrial enterprises whose annual freight bills are the largest have for some time felt the danger that a breakdown of transportation facilities would cause them losses a hundred fold greater than any advance in freight rates which the roads were likely to file or the commission sanction. These matters are ordinarily left in the hands of experts whose specific job is to keep rates down. This occasion calls for first-hand study of the problem by heads of concerns.

It was evident after the hearings in 1910 that able and influential traffic experts looked forward to another such proceeding determined to contribute all they could to a friendly atmosphere from which appeals to popular prejudice

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should be banished and in which the common purpose should be to reach a wise result.

Traffic representatives of shippers and of business bodies are entitled to have at this time the assurance that those who employ them are cognizant of the situation and will appreciate the reason why the presentation of the carriers' case is scrutinized in an amicable rather than in a hostile attitude.

To the commission above all is it due that public sentiment shall seem broad and farsighted. There is no precise point at which the rate from New York to Chicago can be fixed as the only reasonable and equitable rate. What would be a wise rate if the railways had developed their facilities in advance of the traffic might not be at all an adequate rate if facilities had lagged behind and the public wanted the roads to catch up and resume leadership.

In the case at bar facilities have lagged behind. Even with the mild weather and unprecedented co-operation of shippers and railroads to expedite car movement in the fall of 1912 the net car shortage rose to 51,102, and the gross number of cars asked for and unavailable to 73,745. A winter of normal severity would undoubtedly aggravate this situation into a serious and perhaps a disastrous congestion. Traffic has grown faster than facilities.

Does the public want the roads to overtake traffic and go on ahead as in the past?

This is for the public to say, and it is a perfectly proper function of administrative statesmanship for the commission to heed public demand on that point.

We take it for granted that the railway managers will offer shippers the frankest explanation of the situation and arrange opportunities for the fullest exchange of views. We are confident that the public now understands much more thoroughly than three years ago the increased operating cost which has been imposed upon the roads by wage arbitrations and by outlays compelled under federal and state statutes, and appreciates much more vividly the expensive undertakings which confront the roads in the enlargement of terminals, mostly in the heart of large cities where land-cost is highest.

This diffusion of knowledge gives reason to hope that the public will consider the new application for rate advances on the merits and without prejudice.

MASTER BOILER MAKERS' ASSOCIATION.

The seventh annual convention of the Master Boiler Makers' Association was held in Chicago, May 26 to 29. President M. O'Connor, general foreman boiler maker, Chicago & North Western, presiding. John H. Smythe, Parkesburg Iron Company, made the opening prayer. Addresses were then made by W. L. Park, vice-president of the Illinois Central, and John F. Ensign, chief boiler inspector, Interstate Commerce Commission.

W. L. PARK'S ADDRESS.

I shall take advantage of this opportunity to endeavor to point out the way in which your association can be helpful to the railroads by discussing the tendency of laws affecting your craft, thereby assisting the operating department of which your railroad membership is a part, in correcting certain abuses of the railroads that are insidiously creeping into our national and state jurisprudence.

There are being inflicted upon the railroads numerous laws, rules and regulations, some of which have real merit, many of which, however, are ill-considered, ill-advised, inconsistent, unnecessary, unreasonable and impossible of compliance. They are born in ignorance of the existing conditions, not always sincerely in the interests of the safety of the public or the employees of the railroad. There is frequently to be observed in their proposal a taint of commercialism or self-interest. The railroads cannot, therefore, be justly criticised for being on the alert to safeguard their interests and to see that the public who pay the bills are not imposed upon. A proper and reasonable regulation of our railroads is necessary. The public may be easily misled, and is very apt to be, if those who are employed upon the railroads are not keenly alive to passing events and zealous in protecting their employer—the stockholder—from the effect of unnecessary and expensive regulation.

There is unquestionably a sincere disposition on the part of the administrative part of our government to be reasonable; it is not their intention or desire to be otherwise. They, however, do not make the laws. Once placed on the statute books they have no other course but to enforce them. If railroad men are asleep at the switch and permit obnoxious laws to be passed, they must content themselves thereafter with the best possible observance until they can be modified or repealed. To change laws once passed is extremely difficult. The advisable course is to oppose them vigorously at their inception and continually until killed or harmlessly amended. Expert knowledge will remove the fangs from almost any venomous measure.

The difficulty in opposing adverse legislation is in invoking this expert assistance continuously as well as at the critical time. So called "efficiency experts" who do not know a gusset sheet from a crown sheet, or a hydraulic shear from a press, or the completed boiler from an air reservoir, are on hand before and after to explain the deficiency of present practice, and pneumatically exploit some hobby that would work out if the railroads were compelled by law or regulation to adopt their scheme. The good laws we should approve and improve.

It is natural that we should, on this occasion, discuss first the rules and instructions for inspection and testing locomotive boilers and their appurtenances as authorized and required by the Act of Congress approved February 17, 1911. We have now had an opportunity to observe the working of this law for nearly two years. In referring to the report of the chief boiler inspector for the first year, I am struck with the apparent lack of instructions and failures to make systematic tests on the part of the railroads. Not until after the inspection bureau was organized did the railroads get together on uniform rules. There is no doubt, so far as I can judge from Mr. Ensign's report, of the advisability of a boiler inspection law. The law if reasonably applied can apparently work little hardship.

The great bulk of the defects are broken staybolts, tell-tales stopped up, plugged flues and unclassified steam leaks, few of which would make the locomotive unserviceable or unsafe. The report records only three explosions during the year which, out of a total of some 65,000 locomotives in use, speaks well for the efficiency and carefulness of our master boiler makers and their assistants.

The inspectors should be met with in a co-operative spirit, and every facility afforded them to do their work properly. The intelligence, knowledge and ability of the railroad master boiler maker is at least equal to that of the federal inspector, and the higher plane upon which you establish your reputation for honest effort to co-operate with the law, the greater will be the respect for and deference to your judgment when a dispute arises over the inspection of an engine.

While we have perhaps less to criticise in connection with the boiler inspection law than many of the others of recent mintage, the fact must not be overlooked that it, as well as those of similar import, entail additional supervision and a duplication of labor adding heavily to the financial burden of the railroads.

The public must be kept fully advised of this, as they pay the bills. If there is to be added to the cost of operation refinements that have not heretofore been considered necessary, the cost of service must inevitably rise. As you are aware there has been created comparatively recently great additional expenses incident to hours of service, standardization of equipment, air brake requirements and those relating to safety appliances, none of which in any way add to the efficiency of the service, but very materially interfere with and impede traffic; nor do operating officials generally admit that they noticeably affect the safety of trains, at least not to any extent greater than would have been the natural evolution of good practice.

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The sequel has demonstrated conclusively that accidents are not in this way prevented or decreased; the money could have been much better spent for more permanent track, block signals, grade separation, interlocking, stronger equipment, safer shop conditions and modern tools and appliances, and in many other ways well known by practical railroad men, to be efficacious in the prevention of accidents.

"Safety to the employees and to the public" is made a cover for all kinds of class legislation, and is being worked day and night to this end. I am glad to testify that there is coming about a desire on the part of government officials to confer with those who are responsible for the expenditures, and to get at both sides of these questions, which is encouraging.

There are many other laws pending, which I would like to bring to your attention had I the time. The so-called "full crew bill" is the most pernicious. It is entirely unnecessary. Where it is made a law it becomes a dead letter, as it is utterly impossible to comply with it and satisfy the patrons. It is simply an outrage on industrious people and an insult to railroad management. The headlight law is unnecessary legislation in behalf of those who have a certain system of lighting.

If the railroads are not used as a means to promote private or class interests; if they are made better and safer and permitted to earn enough to provide for the convenience and safety of employees, as well as the public, we are all benefited.

L. F. ENSIGN'S ADDRESS.

Mr. Ensign called attention to the moral obligation of the boiler makers, not only to their employers but to the general public, by being sure that the locomotive boilers are in an absolutely safe condition before they are sent out on the road. He emphasized the importance of having men perform the inspections who thoroughly realize the importance of their work, and who would insist that the necessary repairs be made before the engine was allowed to be used.

He favored the placing of a boiler maker in charge of all work done on a boiler, such as the installation of the various boiler appurtenances. From July 1, 1911, to December 31, 1912, 16 deaths and 1,383 injuries were due to the failure of these appurtenances, which could have been easily repaired had they been given the proper inspection.

The effect of the boiler inspection law has been to make the railroads more careful in the inspection and maintenance of their power with a noticeable decrease in engine failures on some roads. It was also stated that during the last nine months over 4,000 locomotives have been ordered from service without any appeal to the chief inspector by the affected roads.

PRESIDENT'S ADDRESS.

Mr. O'Connor spoke of the responsibility of the boiler maker, urging the members to carefully study the difficult problems that frequently arise in the work of boiler construction. In speaking of the apprentices he said: "We should do everything we can to encourage and help them and by their examples they will lead other men who are selected to fill their places, if only they are taught to show that mental culture on moral and mechanical ideas is a pleasure to them as well as a duty."

REPORTS OF SECRETARY AND TREASURER

The secretary reported a total membership of 415, with 313 in good standing. Sixty-eight applications for new members were received the first day of the convention. The treasurer reported a cash balance of $441.67.

MR. SELEY'S ADDRESS.

C. A. Seley, president of the American Flexible Bolt Company, addressed the convention Tuesday morning. Speaking of railroad legislation he emphasized the statements made by speakers on the first day of the convention concerning the civic duty of the railroad employees and suggested that the members advise their representatives concerning intended laws which especially concern their work. Railroads are the only corporations that have government regulation without being allowed to set the price of their products and should have the employees' co-operation. He mentioned the efficient way in which the boiler inspection laws are being enforced.

MIDWAY SUPPORTS FOR BOILER TUBES.

J. A. Doarnberger (N. & W.), chairman of the committee, presented the report and spoke of the general tendency toward the longer tube, the greatest length being 24 ft. when 2¼ in. tubes were used and 22 ft. for the 2 in. tube. The 22 ft. tube does not seem to require the intermediate support, the buoyancy of the water being sufficient to support the tubes between the tube sheets. While there have been intermediate supports applied experimentally they were of such design as to make the removal of the tube an expensive and difficult proposition.

A good rule deduced from tests and experience shows that so long as the length of tube does not exceed 110 diameters (outside measurements) satisfactory results may be obtained. Good results have been reported from the 24 ft. tube, 2¼ in. diameter, with the intermediate support, but the difficulty of removing the tubes still remains; while tubes of this diameter have been installed without the support there is no available data as to the results. The two prime objections to the long tubes are, first, their manufacture, and second, the efficiency of their supports and the retardation of the gases. While the long tubes receive material support from the water they are liable to spring leaks when the boiler is hauled over the road empty.

It was also shown that while other parts of the locomotive have been improved, the rate of combustion being increased, etc., the general arrangement of the tubes in the boiler, the methods of application and the treatment thereafter are substantially the same as they were 25 years ago. The question of intermediate supports is not to be regarded as an impracticable, or an unnecessary arrangement; on the contrary, the idea seems to be good, but it introduces the difficulties of interference to circulation and to the removal of the tubes, both of which are serious.

While some designers are going to the above limits in lengths of tubes, the adoption of the combustion chamber has affected the situation. Dr. Goss in his report on the tests of the Jacobs-Schupert and radial stay boilers, made at Coatesville, Pa., has shown that while the ratio of heat absorbed by the flue varied with the length of the flame, which might be accepted as a function of the fuel, the rate of heat absorbed per foot of heating surface by the firebox to that absorbed per foot of total heating surface, with a moderately long flame bituminous coal, is as 6.15 to 1. The combustion chamber will therefore undoubtedly find more favorable consideration than in the past, especially since some of the objections to it seem to have been removed by changes in boiler design.

Discussion.—Most members found little difficulty with long as compared with short tubes. Long tubes are more likely to leak on account of the greater expansion. Midway supports are objectionable because of difficulty in removal of tubes, poor circulation of water, and the inclination to cut the tubes because of vibration. The method of arching tubes to allow for expansion by deflecting the tube sheets one-eighth inch while the tubes are being installed is not considered good practice.

UNSAFE CONDITION OF A BOILER.

A committee, of which E. W. Young, Interstate Commerce Commission, was chairman, presented a report on "When is a Boiler in a Weak and Unsafe Condition?" in which were mentioned as the causes of boiler trouble the faulty and defective design, poor material, poor and careless workmanship, improperly made repairs, bad water and improper care. Among the contributary causes were mentioned the rigidity of construction which would not allow for free expansion and contraction; this might be caused by too rigid staying and the improper location of the stays.

A well designed boiler should have every part of the same strength at all temperatures, and so placed that adjacent parts

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will expand and contract together under all conditions, and will not work against each other.

A poor and careless workman may cause many defects, not only from poor workmanship but by using improper material. Repairs to boilers are very important and should be carefully made. Bad management is the chief source of boilers getting in a weak and unsafe condition. All troubles can be discovered before becoming dangerous by careful, painstaking and competent examinations.

Discussion.—The ends of sheets should be carefully shaped when rolled. In case of a red hot crown sheet bank the fire and get water into the boiler as soon as possible to harden sheet. It is not necessary for the boiler to cool down before introducing the water.

WELDING SUPERHEATER FLUES.

It was the opinion of the committee reporting on this subject (B. F. Sarver, Penna., chairman) that all safe-ending should be done at the firebox end, thereby always having good and new material at the place it is most needed. It is necessary to keep these large flues tight at all times to obtain successful results. The demands on a superheater flue at the firebox end are as great, if not greater than on an ordinary tube, and under some conditions, such as bad water and the failure to keep them absolutely clean, they are very liable to give trouble and require considerable work to keep them tight. There should not be more than one weld in these flues at any time, as old welds will give trouble. To do this it is necessary when safe-ending to cut the tubes as close to the tube sheet as possible; the first end should be 5 in. long, the second 8 in., the third 11 in. and the fourth 14 in., which is possible with the average flue welding machine.

The flue with the safe-end attached is heated in a furnace arranged to give a narrow flame on the joint to be welded. When at a welding heat the flue should be bumped against a water cooled iron block, inserted in the rear wall of the furnace, which will practically weld the tube while in the fire. It should then be placed on a welding machine which revolves around the tube. With such a machine the weld is made much quicker than in the machine that requires the tube to revolve, but it is claimed that the first type of machine will not leave a smooth finish on the inside which will cause the flue to clog rapidly. Also it is found hard to keep the two parts straight. The committee did not report as to which was the best type of machine and recommended further consideration of the subject.

Discussion.—Most of the members weld the superheater flues the same as smaller tubes and with good results. Some have safe-ended the front end of the tubes with good results, but the firebox end should be safe-ended where possible. Rollers are best for welding although the pneumatic hammer has been found satisfactory. Trouble has been experienced with a cold mandrel cooling the tube when welding.

EFFECT OF SUPERHEATERS ON THE LIFE OF FIREBOXES AND FLUES.

C. L. Hempel (U. P.), chairman, reported that the committee had gathered information from several railroads having engines equipped with superheaters of the Baldwin, Vaughn-Horsey and Schmidt type, the steam pressure ranging from 165 to 200 lbs., and that the committee is unable to find any well founded claim to show that superheating of steam has a detrimental effect upon the fireboxes or flues, but, to the contrary, it is shown that the life of the fireboxes and flues is prolonged considerably, from the fact that where steam is superheated the working pressure is reduced. However, there are many large engines carrying 200 lbs. working pressure with superheaters that show no ill effect on fireboxes or flues.

Discussion.—The superheater increases the life of the firebox due to lower boiler pressure and less water evaporated. One member reported a failure of a superheater pipe on account of its damper not being used. General opinion favored the use of the damper. Welding the superheater tube end in the firebox increases the life.

MR. QUAYLE'S ADDRESS.

Robert Guayle, superintendent motive power and machinery, Chicago & North Western, addressed the convention Wednesday morning. He urged the members to participate more freely in the discussions and to bring new ideas to the convention each year. They should know just what kind of material was being used in the shop, and what was the best material for each purpose. Information along these lines should be sought for in books and from experts. He commented on the ill effects of punching sheets and predicted a discontinuance of the practice. Special care should be taken when laying-out so as to avoid the use of drift pins. Boiler makers should be honest and fair to themselves and not allow bad work to go out of the shop. Treat the government inspectors fairly and aid them in their work, for the locomotive boiler inspection law is a great thing. Superheaters add to the life of the boilers and should be used on all locomotives. The more extensive use of welding in boiler work is to be commended.

Frank McNamany, assistant chief boiler inspector, urged the men to aid the government inspectors so as to get the best possible results. The law represents the best practice and is entirely practical.

OXY-ACETYLENE AND ELECTRIC WELDING FOR BOILER REPAIRS.

A. N. Lucas (C. M. & St. P.), chairman of this committee, reported the successful use of both these welding processes in many railroad shops. One of the greatest savings made with the oxy-acetylene process is the cutting out of old or damaged parts. Both processes are used for welding cracked sheets, patches, pitted shells and tubes, etc. Difficulty has been experienced in welding vertical cracks, but this has been overcome by making the patch oval instead of rectangular. Some railroads are cutting their superheater unit pipes and welding them with the oxy-acetylene process. The chief objection to the electric welding process is that no cutting can be done with it, and although it does very good welding it is not as fast as the oxy-acetylene.

Discussion.—Eight electric welding machines are in use on the Erie, and about 60 per cent. of the work done by them is on boilers. It is necessary to preheat the sheets, and steam jets are used for that purpose. The weld should be one-eighth inch thicker than the sheet. Patches are put on the flue sheets at all points and flues are also welded in.

On the Rock Island difficulty is experienced in making welds on flanges and in welding between flues and rivets in the tube sheet flange. Vertical welding is good for only two or three months. Apparatus for both oxy-acetylene and electric welding should be in each shop. Keep the parts to be welded clean and hammer the metal while hot. Eight tubes are welded per hour with electric welding on the Erie. Electric welding does not interfere with other work being done on the locomotive.

BEST DESIGN OF GRATE.

C. J. Murray (So. Pac.) strongly recommended the rocking finger grate for bituminous coal-burning engines. On the Chicago & North Western a close meshed grate, similar to what is used on the hard coal burning engines on the Delaware, Lackawanna & Western, is used on locomotives burning lignite with good success. On oil burning engines there are no grates, but the ash pan, or brick pan as it is called, must be absolutely air tight.

F. D. Timms (C. H. & D.) also recommended rocking finger grates, the fingers to be 6 in. in length and the dump grates at the rear of the firebox. A good steady fire can be maintained on these grates, and when dumping the fingers will erush the clinkers, and at the same time force them into the ash pan.

EFFECT OF CHEMICALLY TREATED WATER ON BOILERS.

The committee, of which A. E. Shaule (D. M. & N.) was chairman, sent out questions to the members from which it was determined that good results had been obtained from the use

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of soda ash and caustic soda. There is some difference of opinion as to benefits derived from treated water as a preventive of corrosion. One member reported the use of a polarized metallic preparation, applied direct to the boilers in bars distributed over crown sheet and tubes before closing the boiler and after each washout. This produces an effect more mechanical than chemical; it has an affinity for the material the boiler is made of and forms an amalgam over the boiler plates and tubes which prevents scale forming, also in the case of dirty or scaly boiler the fissures in the scale render it susceptible to removal because the material gets access to the plates and tubes through them, resulting in the scale becoming rapidly loosened and removed, falling to the mud ring or to the bottom of the boiler under the tubes, where it is blown or washed out. Local conditions govern the application of the treatment.

Investigation shows that increased mileage between washouts is obtained by using treated feed water.

Reports indicate that the life of the flues and fireboxes has been lengthened from 150 to 500 per cent. by using treated water. There is also a substantial decrease in cost of maintenance and running repairs.

The use of soda ash will cause trouble to injectors, discharge pipes and check valves. It will also require a larger amount of cylinder lubrication, but such expense is offset by the reduced cost of boiler maintenance.

The cost of treating water is 4 cents per 1,000 gals. on the Santa Fe; and 2 to 5 cents, according to conditions, on the Canadian Pacific. The polarized treatment costs about 3 cents per 1,000 gals.

OTHER BUSINESS.

J. F. De Voy, assistant superintendent motive power, Chicago, Milwaukee & St. Paul, made an address at the closing session on Thursday morning, and the election of officers was held. The report of this session was not received in time for publication in this issue, but will be noticed next week.

FUEL FAMINE IN RUSSIA.—There has been great scarcity of fuel in Russia, and this has seriously interfered with the development of the industries of the country, which are increasing faster than the production and supply of fuel. In consequence, the government proposed to permit the importation to Russia, without duty, of coal from abroad, chiefly for the needs of the railroads.

BAGGAGE RATES IN GERMANY.—No special provision is made in the regulations of the German railways relative to the cost of shipment of samples accompanying commercial travelers, baggage of this class receiving the same consideration as that enjoyed by the traveling public generally. There is no exemption of any character for baggage shipped over the German railway system other than an allowance of 55 lbs., which the traveler is allowed to carry with him in his compartment. Baggage checked to destination is subject to the payment of a rate which varies according to the zone and weight. There are 14 zones, the first having a distance of 15.5 miles and succeeding zones increasing by 31 miles each, up to 497 miles, beyond which distance there is a flat rate which varies only with the weight of the baggage.

FRENCH TRANS-AFRICAN RAILROAD.—The French project for a trans-African railroad from Algiers to Cape Town, using the Belgian-English line from Stanleyville to Cape Town, took rather definite form last year by the incorporation of L'Union Française pour la Realisation des Chemins de Fer Trans-African. In January, 1912, an expedition to make a preliminary survey from Colomb-Bechar, the present southern terminus of the Algerian railroad, to Lake Tchad, started out from the former point. The engineer who arrived at Lake Tchad in September is said to believe that the crossing of the Sahara desert presents no unsurmountable difficulties. From Lake Tchad the line will presumably follow the divide between the Shari and Nile basins and will enter the Belgian Congo at Semio on the Bomu river, from there going to Stanleyville.—*Mining and Scientific Press.*

General News.

Natural gas has been found near Medicine Hat on the Canadian Pacific, the first well throwing out about 2,000,000 ft. a day.

The New York, New Haven & Hartford now has 402 former employees on its pension roll, and the monthly payments amount to $158,941.

An anti-pass bill, amended to permit members of the legislature, their families and one clerk or secretary to receive free railway transportation, has been reported favorably by a committee of the Illinois house.

The large shops of the New York, New Haven & Hartford at Readville, Mass., are now running eight hours a day, five days a week; a reduction in the time of most of the men of fourteen hours a week.

The Nebraska state board of equalization has fixed the valuation of the Union Pacific property in the state at $81,192,530, an increase of $3,060,368 over that of last year. The main line valuation was increased $5,000 per mile.

The train accident near Sewell, W. Va., May 20, noticed in our last issue, did not occur on the Chesapeake & Ohio, as reported in the press despatches, but was on a narrow gage line of the Beury Coal & Coke Company.

The Brotherhood of Railway Trainmen, in convention at San Francisco, has adopted resolutions contemplating an effort to obtain additional safety legislation, including a requirement for couplers operated from both sides of a car, and amendments to the hours of service law.

The new office building of the Canadian Pacific Railway, on the corner of King and Yonge streets, Toronto, will be opened next month. This building is 16 stories high and is spoken of as the highest office building in the British Empire. The building is fireproof, 82 ft. x 90 ft.

The Baltimore & Ohio announces that after June 1 its employees will be paid semi-monthly. Laws requiring employees to be paid twice a month have lately been enacted in Pennsylvania and in Indiana; and the company has decided to extend the same practice to other states.

Reports that the Pennsylvania Railroad intends to use a wireless telegraph between Philadelphia and Pittsburgh have again been published. There seems to be no foundation for the statement that the road will establish such a system; but it has a wireless apparatus at Philadelphia and communications have been sent by it to Harrisburg.

A bill before the legislature of Connecticut makes compulsory one day of rest in seven for train despatchers, telegraph operators, towermen and ticket sellers; and representatives of the Order of Railroad Telegraphers have presented to members of the legislature a memorial giving a list of stations in the state at which men, 648 in all, have to work seven days in a week.

Congressman Neeley, of Kansas, has introduced in the House a resolution directing the attorney general to proceed against the Missouri Pacific to recover $3,362,346 due on subsidy bonds advanced by the government in aid of the construction of the Central Branch of the Missouri Pacific. Mr. Neeley has also made a formal request, direct to the attorney general, that action be taken.

Railway mail clerks, said to number 8,000, have sent to the postmaster general a petition asking that white mail clerks be not required to work in the same cars with negro clerks. It is declared that in some instances whites are subject to the authority of negro superiors. A special protest was made, because on long runs members of the two races frequently have to share the same sleeping quarters.

The Missouri, Kansas & Texas has appointed a valuation committee, with S. B. Fisher, chief engineer of construction, as its chairman. It is announced that the work of the committee will be to ascertain and report in detail as to all property owned or used by the railway, the original cost to date, the cost of reproduction new, the cost of reproduction less depreciation, and analysis of the reasons for their differences.

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New rules of the pension department of the Frisco Lines have been issued which provide that after July 1, men inexperienced in railway work who are over 35 years of age, and experienced men over 45 years of age will not be employed, except that provision is made for temporary service, irrespective of age, at the discretion of the president, and the age limit will not be enforced in the case of services requiring professional qualifications.

Telegraphers of the Erie Railroad continue to give out statements to the effect that a strike is impending. After hearing the representatives of the operators a month or two ago, the company made an increase in pay, but the brotherhood leaders now say that the new rates are unsatisfactory; and they declare that a strike vote has been taken, and that it shows that 97 per cent. of the operators have voted to sustain their leaders in a strike if such action shall be found desirable.

A press despatch from Martinsburg, W. Va., May 26, reports that nine workmen were killed and four injured by being struck by an eastbound passenger train of the Baltimore & Ohio at Doe Gully, W. Va., on that day. The victims were workmen for contractors engaged on the Magnolia improvement, and they were running from a blast. In getting away from the danger of the blast, and at the same time avoiding a westbound freight train, they ran in the path of an eastbound passenger.

The Canadian minister of railways announced at Ottawa this week that a resolution will be introduced in the House of Commons providing for a great railway subsidy programme, the principal feature of which is a cash grant of $15,640,000 to the Canadian Northern. This will be divided into three parts, one of $6,400 a mile to the Canadian Northern Ontario towards the construction of the line from Toronto to Ottawa, not exceeding 250 miles, another of $12,000 a mile towards construction of the line from Ottawa to Port Arthur, not exceeding 910 miles, and another subsidy of $12,000 a mile towards construction of the road from Edmonton, Alberta, to the British Columbia boundary in the Yellowhead Pass, not exceeding 240 miles.

With the summer time table, going into effect this week, the Pennsylvania Railroad announces four new through passenger trains between New York and western points. Westbound these trains leave New York as follows: Pittsburgh day express 9:25 a. m., Commercial express 10:04 a. m., Panhandle limited 12:04 p. m., Chicago express 6.30 p. m. The last mentioned is a section of the St. Louis 24-hour train. The names of through trains are changed as follows: The Chicago Special will be known as the Metropolitan express; the Pennsylvania limited (hereto fore running to Chicago, Cincinnati and St. Louis) will only go to Chicago; the Keystone express will be a new name for the Chicago and St. Louis express, starting at 2.04 p. m., and the second section of this train will be called the Panama-Pacific express; the Chicago limited will be known as the Manhattan limited.

The Minnesota Federation of Commercial Clubs at its seventh annual convention, at St. Paul, Minn., May 15, adopted a resolution: "That it is the conviction of this federation that more railroad construction, rather than more railroad legislation, is the great need of this state at the present time; that the legislature should not interfere with the freedom of action and initiative on the part of the carriers, and the laws tending to increase the cost of railroad service, without affording a compensating revenue, be condemned, and that this federation believes there should be at this time a sincere, state-wide effort for the encouragement of railroad extension, with special reference to the construction of lines that will permit the settlement of unoccupied areas, and the building up of a sentiment that will abate anti-railroad prejudice and create between the railroads and the business interests of this state, a pleasant working relation and a fellowship backed by fairness on both sides."

The committee of railroad presidents which has been formed to deal with the subject of valuation of property, under the recent federal law, conferred with the Interstate Commerce Commission in Washington on Tuesday of this week. A statement given out by the commission following the conference says that there was a general exchange of tentative views, but no determination of important points. "A cordial spirit of co-operation was manifested by the railroads," giving promise of the avoidance of many controversies that otherwise would arise, and promising also economy in the work and avoidance of needless duplication. The following railroad officers participated in the conference: Presidents Rea, of the Pennsylvania; Brown, of the New York Central; Willard, of the Baltimore & Ohio; Loree, of the Delaware & Hudson; Underwood, of the Erie; Baer, of the Reading; Finley, of the Southern; Emerson, of the Atlantic Coast Line; Harahan, of the Seaboard Air Line; Johnson, of the Norfolk & Western; Chairman Kruttschnitt, of the Southern Pacific; President Winchell, of the St. Louis & San Francisco; Vice-President Storey, of the Santa Fe; Presidents Bush, of the Missouri Pacific; Mudge, of the Rock Island, and Gardner, of the Northwestern; Vice-President Holden, of the Burlington, and Chairman Trumbull, of the Chesapeake & Ohio.

Automobile Record.

At the "bowl" course in Brooklands, England, May 27, W. G. Scott and L. G. Hornsted ran an automobile 914 miles, 1,920 ft., in 12 hours; or at the rate of 76.20 miles an hour, breaking all records for periods of seven hours and over.

British Railway Accidents in 1912.

The accident report of the British Board of Trade shows that in the calendar year 1912, the casualties due to train accidents amounted to 867, namely, 20 passengers and 6 employees killed, and 683 passengers, 154 employees and 4 other persons injured. The number of passengers killed is 6 larger than in the preceding year. Accidents of other kinds bring the total number of persons killed, in connection with the movement of trains, up to 1,011, and of injured to 8,700. Adding casualties in which the movement of cars or engines were not concerned, we have a total of 1,118 persons killed and 32,620 injured.

Banker Favors Rate Increase.

John J. Mitchell, president of the Illinois Trust & Savings Bank, Chicago, is quoted in a newspaper interview on the railway situation as follows:

"I fail to see, however, how we can have any of the old-time prosperity until the railroads are better treated than they have been and get what is their due. For years all their costs have been forced up and their revenues have been forced down. They are the largest employers of labor in the country and the treatment accorded them has not been fair. But I think there are better times in store for them.

"There is less opposition now to the 5 per cent. advance in freight rates which the eastern roads are asking than there was. If it is granted it will be a great help. Another would be a decision favoring the railroads in the Minnesota rate case. That and the increase in freight rates would go a long way in helping to re-establish the credit of the railroads and would enable them to secure the funds required for the important work they have on hand."

Railway Committees Confer with Shippers on Rate Advance.

The eastern railways that are negotiating with the Interstate Commerce Commission for 5 per cent. advance in freight rates have appointed a number of committees of traffic officers to confer with the shippers in many of the most important business centers affected, in the endeavor to secure their co-operation. A committee composed of George F. Randolph, vice-president of the Baltimore & Ohio; George D. Dixon, vice-president of the Pennsylvania, and J. M. Fitzgerald, president of the Western Maryland, conferred with the committee of the Merchants' and Manufacturers' Association of Baltimore for this purpose, on May 16, and another committee composed of W. C. Maxwell, general traffic manager of the Wabash; William Hodgdon, freight traffic manager of the Pennsylvania Lines; George H. Ingalls, freight traffic manager of the New York Central lines west; W. B. Biddle, vice-president of the St. Louis & San Francisco; B. C. Stevenson, vice-president, Toledo, St. Louis & Western, and C. L. Thomas, freight traffic manager of the Baltimore & Ohio Southwestern, held a conference with the transportation committee of the Business Men's League of St. Louis on May 23. Similar conferences were held on May 20 with representatives of the Illinois Manufacturers' Association at Chicago and with representatives of the shippers' organizations at Indianapolis on May 20. A committee will visit Boston.

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Master Boiler Makers' Association.

Among the exhibitors at the convention of the Master Boiler Makers' Association, held at the Hotel Sherman, Chicago, May 26-29, were the following:

American Arch Company, New York.—Displaying Security brick arch and Gaines locomotive furnace. Represented by Le Grand Parish, G. M. Bean, J. T. Anthony, Jno. P. Neff, Chas. Coons, W. L. Allison, F. G. Boomer, M. K. Tate, Geo. Wagstaff, J. M. Horine, C. E. Miller, C. F. Pfeiffer and G. C. Denney.

American Flexible Bolt Company, Pittsburgh, Pa.—Displaying boiler stay-bolts. Represented by C. A. Seley.

Burden Iron Company, Troy, N. Y.—Displaying engine and staybolt iron and Burden rivets. Represented by L. H. Pearsall, Fred Gardner, J. G. Kirby, F. L. Nicholson, M. C. Beymer, E. S. Richardson and A. W. Whitehford.

Carbon Steel Company, Pittsburgh, Pa.—Displaying firebox and boiler steels, nickel and nickel crown alloy steels. Represented by E. K. Harris, H. W. Tennell and J. P. Williams.

A. M. Castle Co., Chicago.—Displaying Luken pressed steel cover plates. Represented by L. M. Henoch, W. B. Simpson, C. M. Chamberlain, A. G. Castle and George Boyer.

Champion Rivet Company, Cleveland, Ohio.—Displaying Victor rivet and M. C. B. knuckle pins. Represented by D. J. Champion and H. H. S. Bateman.

Chicago Pneumatic Tool Company, Chicago.—Displaying new type electric drill for heavy flue rollers, pneumatic and electric tools. Represented by C. E. Walker, Jno. Campbell, Michael O'Connor, T. G. Smallwood, J. W. McCabe, Edward Aplin, Pete Flavin, J. L. Canby and C. Priddy.

Cleveland Pneumatic Tool Company, Cleveland, Ohio.—Displaying Bowen hose couplers, Cleveland ball bearing air drills. Represented by H. S. Covey and C. J. Albert.

Cleveland Steel Tool Company, Cleveland, Ohio.—Displaying punches, dies, rivet sets and chisel blanks. Represented by R. J. Verming, V. D. Gilmore and W. S. Barnes.

Dearborn Chemical Company, Chicago. Represented by C. B. Hennessey, A. W. Cruch, J. F. Franey, J. D. Purcell and J. H. Cooper.

J. Faessler Manufacturing Company, Moberly, Mo.—Displaying boiler flue expanders, flue cutters, etc. Represented by J. W. Faessler, C. F. Palmer, G. R. Maupin and F. E. Palmer.

Flannery Bolt Company, Pittsburgh, Pa.—Displaying Tate flexible staybolt. Represented by J. A. Flannery, B. F. D. Stafford, Tom R. Davis, Wm. Wilson, Thos. Lenby and Geo. Howard.

Globe Seamless Steel Tubes Company, Chicago.—Displaying Globe seamless steel tubes. Represented by Lewis Davies and Geo. Thuse.

Hilles & Jones, Wilmington, Del.—Displaying catalogs and circulars of their output. Represented by Wm. H. Connell, Jr.

Inland Steel Company, Chicago.—Displaying open-hearth rivets. Represented by Herbert L. Hart.

Independent Pneumatic Tool Company, Chicago.—Displaying new turbine drill and other pneumatic tools. Represented by Jno. B. Hurley, Robt. T. Scott, Jno. P. Bourke, Harry Tinney, Geo. Wilson and Fred Seas.

Ingersoll-Rand Co., New York.—Displaying Little David riveting hammers and drills. Represented by Chas. Dougherty, J. P. Gillies, L. J. Davis and J. B. Rathbun.

Jacobs-Shupert U. S. Firebox Company, New York.—Displaying Jacobs-Shupert sectional firebox. Represented by C. B. Moore, G. H. Fearsall, M. C. Beymer, A. W. Whitford, C. L. Bean, J. C. Reid, Fred Gardner, J. L. Nicholson, F. W. Peterson and J. G. Kirby.

Liberty Manufacturing Company, Pittsburgh, Pa.—Displaying Cyclone tube cleaners. Represented by Chas. G. Hughes and S. A. Bockius.

Locomotive Superheater Company, New York.—Displaying section of superheater flue, set in firebox and front, showing pressers and rollers for superheater flues. Represented by Gilbert E. Ryder, C. A. Schaff and Jno. Bell.

Lovejoy Tool Works, Chicago.—Displaying boiler tube expanders, beading tools and boiler shop small tools. Represented by W. H. Danzell and T. H. Lovejoy.

Mudge & Co., Chicago.—Displaying spark arrester. Represented by S. S. Lawson and J. J. Winchell.

Christopher Murphy & Co., Chicago.—Displaying Carter's staybolt iron and O'Neill rapid tube cutter. Represented by Christopher Murphy.

Oxweld Railroad Service Company, Chicago.—Displaying oxy-acetylene welding and cutting apparatus. Represented by C. B. Noore, G. H. Pearsall, M. C. Beymer, W. B. Whitford, F. W. Peterson, J. C. Reid, Fred Gardner, J. L. Nicholson and J. G. Kirby.

Parkesburg Iron Company, Parkesburg, Pa.—Displaying Parkesburg charcoal iron boiler flues, charcoal iron staybolt flues and welding and swelling of same. Represented by Geo. Thomas, C. L. Hampton, H. C. Hunter, J. H. Shaw, W. H. Stevens and L. P. Mercer.

Pittsburgh Steel Products Company, Pittsburgh, Pa.—Displaying cold drawn seamless steel boiler tubes. Represented by Chas. R. Phillips and Cyrus K. Ring.

Joseph T. Ryerson & Son, Chicago.—Displaying model punch in operation, drills, tube expanders, etc. Represented by J. T. Hender, J. T. Corbett, A. M. Mueller, J. P. Moore, C. E. Pynchon, Geo. Merrill and L. H. Bryan.

Sturmond & Werzel Electric Welding Company, New York.—Displaying electric welders. Represented by L. S. Smith and G. S. Stuart.

Scully Steel & Iron Company, Chicago.—Displaying everlasting blow-off valve used by 36 leading railroads; also drop light for over two years' 200,000 working. Represented by Geo. Mason, Jr., Geo. A. Cameron, Andrew Verschuur and W. I. Jones.

The Pearsall Company, New York.—Displaying high speed drills, sectional roller expanders, reamers, etc. Represented by G. H. Pearsall, Fred Gardner, J. G. Kirby, F. L. Nicholson, M. C. Beymer and E. S. Richardson.

Vulcan Engineering Sales Company, Chicago.—Displaying Hanna riveter. Represented by Jas. T. Lee, J. T. Georgeson and W. B. Hoelster.

United States Graphite Company, Saginaw, Mich.—Displaying Mexican boiler graphite. Represented by H. C. Woodruff, J. G. Drought and J. W. Downes.

Worth Bros. & Co., Coatesville, Pa.—Displaying steel plates and iron tubes. Represented by B. A. Clements and C. A. Keenan.

M. M. and M. C. B. Enrollment Committee.

The work of the Enrollment Committee of the M. M. and M. C. B. conventions to be held at Atlantic City, N. J., June 11-18, has been arranged and will differ from the practice in recent years. Two new rules have been adopted as follows:

Badges for members of the M. M. or M. C. B. associations or special guest badges will not be given to any but the rightful owners. No member of the Railway Supply Manufacturers' Association will be permitted to take one for delivery except upon the owner's written order and the receiver must sign for said badge.

No badges will be issued to members of the M. C. B. association except on the payment of a fee of one dollar ($1.00); M. M. and special guest badges will be issued to those entitled to them free of all charge until noon, Saturday, June 14, at which time M. M. badges will be withdrawn and a charge of one dollar ($1.00) made for all special guest badges, except that a member of the M. M. association taking out a special guest badge and paying the fee of one dollar will be given his M. M. badge gratis; likewise members of the M. M. association who are also members of the M. C. B. association can get their M. M. badge by paying for the M. C. B. badge.

The work of the committee has been so arranged that enrollment will be possible at almost any time of day throughout the conventions. The committee has been divided into three shifts, each of which will report for duty according to a regular schedule so that although the committee will be represented during a much greater part of the time than has previously been the case the individual members will not have longer hours than before. The system of enrollment will be the same as that used in 1912 and the members of the Railway Supply Manufacturers' Association will be enrolled as heretofore.

The committee is made up as follows: F. N. Bard, Barco Brass & Joint Co., Chicago; P. S. Ball, Magnus Metal Co., Atlanta, Ga.; C. W. Beaver, Yale & Towne Manufacturing Co., New York; Harold A. Brown, *Pocket List of Railroad Officials*, New York; E. Bjerregaard, *Official Guide*, New York; Charles H. Gayetty, Quaker City Rubber Co., Philadelphia, Pa.; R. F. Moon, Westinghouse Electric & Manufacturing Co., Philadelphia, Pa.; H. G. Newman, The H. W. Johns-Manville Co., New York; L. T. Sawyer, Commercial Acetylene Railway Light & Signal Co., New York; Benjamin A. Smith, W. H. Coe Manufacturing Co., Providence, R. I.; F. H. Smith, Gold Car Heating & Lighting Co., New York; J. A. Stevens, F. W. Devoe & C. T. Raynolds Co., New York.

International Railway Fuel Association.

Among the exhibitors at the convention of the International Railway Fuel Association held in Chicago, May 21-24, were the following:

Dickerson Manufacturing & Supply Company, Clinton, Ill.—Bull's eye water gages. Represented by C. Dickerson.

Goodman Manufacturing Company, Chicago.—Photographs of electric coal cutting machines and electric mining locomotives. Represented by F. S. Mott and H. H. Small.

Hawkes Boiler Company, Chicago.—Model of Hawkes boilers. Represented by C. W. Hawkes and H. E. Wallis.

Link Belt Company, Chicago.—Photographs of coal tipple, coal crushers, chain retarding conveyors, coaling stations and locomotive cranes. Represented by J. C. Nellegar.

Locomotive Superheater Company, New York.—Photographs of Schmidt superheaters. Represented by G. E. Ryder, F. A. Schaff, W. G. Tawse, R. M. Osterman and W. Boughton.

Manistee Iron Works, Chicago.—Model of Continental chain grate stoker for stationary boilers and Rees Roturbo centrifugal pump. Represented by Henry Vick.

Mudge & Co., Chicago.—Mudge-Slater spark arresters. Represented by B. W. Mudge, S. S. Lawson and J. J. Winchell.

National Graphite Lubricator Company, Scranton, Pa.—Model of graphite lubricator and photographs showing installations. Represented by L. S. Waters.

Ogle Construction Company, Chicago.—Model of automatic all-steel locomotive coaling station. Represented by R. A. Ogle and C. F. Bledsoe.

Parsons Engineering Company, Wilmington, Del.—Photographs of Parsons system of combustion in locomotive fireboxes showing elimination of smoke. Represented by W. H. Savery.

Roberts & Schaefer Co., Chicago.—Photographs of Holmen coaling stations in concrete, steel and wood. Represented by C. P. Ross, E. E. Barrett, Frank Schroeder, James Shannon and W. R. Roberts.

G. L. Simonds & Company, Chicago.—Dean arch tube cleaner, Vulcan soot cleaner for water and fire tube boilers, Eclipse smoke indicators, Hayes gas analyzing instruments and draft gages. Represented by F. A. Mordhall.

T. W. Snow Construction Company, Chicago.—Photographs of coaling stations. Represented by T. W. Snow, R. A. Blake and M. D. Miller.

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U. S. Graphite Company, Saginaw, Mich.—Mexican boiler graphite. Represented by H. C. Woodruff, J. G. Drought and J. W. Eviston.

George D. Whitcomb Co., Rochelle, Ill.—Photographs of gasolene motors for mine haulage. Represented by J. H. Coley.

Association of Railway Telegraph Superintendents.

Among the exhibitors at the convention of the Association of Railway Telegraph Superintendents, held at the Hotel Statler, St. Louis, May 20-23, were the following:

Automatic Electric Company, Chicago.—Private branch exchange telephone systems, standard Keith line switch type board, individual connection type board, telephone train despatching selector system. Holtzer-Cabot motor-generator sets, and Keystone brand supplies. Represented by J. H. Finley.

Bunnell & Co., Inc., New York.—Goldbug vibrating transmitters and C. Q. A. relays. Represented by J. J. Ghegan.

Central Electric Company, Chicago.—Indirect lighting system, and demonstration of Alexalite system of illumination, Okonite wire and tapes, Columbia lamps, Maxolite weather proof reflectors, etc. Represented by J. Lorenz and G. M. Cox.

Thomas A. Edison, Inc., Orange, N. J.—Primary battery sets. Represented by E. E. Hudson, F. J. Lepreau and P. A. Grarrity.

Electric Time Recorder Company, Chicago.—Mastron time system, embracing master mechanisms, secondary clocks, time recorders, etc. Represented by Andrew Nilson and F. W. Straub.

Gottschalk Waterproof Sanitary Transmitter Company, New York.—Waterproof transmitters. Represented by W. J. Lowrie, Jr.

Hall Switch & Signal Company, New York.—Telephone arms and Gill and Sandwich selectors. Represented by W. E. Harkness, J. L. Moore and W. L. Cook.

National Electric Specialty Company, Chicago.—Vacuum lightning arresters.

National India Rubber Company, Bristol, R. I.—Represented by A. P. Eckert.

Railway Electric Manufacturing Company, Chicago.—Alternating current selectors. Represented by H. O. Rugh.

Remington Typewriter Company, New York.—Typewriter with a Wahl adding and subtracting machine. Represented by M. K. Deale.

Western Electric Company, New York.—Selector apparatus, wireless telegraph set for emergency purposes, vacuum protectors, telegraph and telephone jack boxes, and two types of Thompson-Levering Wheatstone bridges. Represented by G. K. Heyer, R. F. Spamer, R. N. Hill, J. A. Kiek, E. V. Adams and G. E. Cullinan.

Railway Signal Association.

The next meeting of the Railway Signal Association will be held at Hotel Astor, Broadway and Fourty-fourth street, New York, on June 11 and 12. Reports will be presented by Committees 2, 3, 4, 5, 6, 8 and 10. Committee No. 2 will submit proposed standard drawings of switch layouts, with different arrangements of facing point locks and detector bars. Committee No. 3, Power Interlocking, will submit specifications for the installation of vitrified clay conduit, and will propose reconsideration of action taken in 1911 on circuit plans for electric interlocking. Committee No. 4 will submit specifications for d. c. interlocking relays and for vibrating highway crossing alarm bells; and will propose changes in the existing specifications for d. c. relays. Committee No. 5 will propose additions to and revisions of the information now on record concerning the manual block system, including three drawings. Committee No. 6 will submit drawings of six new standards; crank stands, pipe carrier side, details and assembly of pipe carriers; assembly of bolt lock, and position of detector bar and location. Committee No. 8 will propose additions to the existing specifications for electric railway signaling; including impedance bonds and single phase track transformer; also for switch boards.

Committee No. 10 will submit specifications for lead type stationary storage battery.

J. E. Saunders will present a paper on selection of motor generators for use as frequency converters, 60 to 25 cycles, and another on 25 cycle versus 60 cycle a. c. power for railway signaling.

Signal Appliance Association.

There will be a meeting of the Signal Appliance Association at the Hotel Astor, New York, on June 11, in connection with the meeting of the Railway Signal Association which will be held at the same place, June 11-12.

The Signal Appliance Association has extended to the members of the Railway Signal Association an invitation to participate in an excursion on the afternoon of June 11 around the water front of New York, both North and East rivers, thence down the coast to Rockaway Point and landing at Coney Island for a shore dinner. The boat, which has been specially chartered for the occasion, will not leave Coney Island for New York until late in the evening.

Western Railway Club.

Officers of the Western Railway Club have been elected as follows: President, Henry Larue, formerly of the Rock Island Lines; first vice-president, W. B. Hall, Union Railway Equipment Co., and second vice-president, E. W. Pratt. Three new directors were also elected as follows: C. J. Olmstead, Westinghouse Air Brake Co.; J. H. Tinker, superintendent motive power, Chicago & Eastern Illinois, and H. H. Harvey, general car forewarder, Chicago, Burlington & Quincy.

American Society for Testing Materials.

The sixteenth annual convention of the American Society for Testing Materials will be held at the Hotel Traymore, Atlantic City, N. J., June 24-28.

Freight Rate Increases in England.

The railway companies of Great Britain have given notice that the general increase in freight rates which they have been authorized by the government to make, in consequence of the increase in wages of employees which had to be made two years ago, will be put in force July 1 next. Although the agreement with the government was made in August, 1911, the change in the law which gives the necessary authority was only completed a few weeks ago. It is said that, even after the contemplated increase, the rates will still be within the maximum tariffs prescribed by Parliament prior to 1894.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Boston, Mass. Convention, May 19, 1914, St. Louis.

American Association of General Passenger and Ticket Agents.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

American Association of Railroad Superintendents.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Electric Railway Manufacturers' Assoc.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

American Railway Association.—W. F. Allen, 75 Church St., New York. Next meeting, November 19, 1913, Chicago.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

American Railway Engineering Association.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

American Railway Tool Foremen's Association.—A. R. Davis, Central of Georgia, Macon, Ga.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—J. R. Wetherger, 11 Broadway, New York; 2d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

American Wood Preservers' Association.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

Association of American Railway Accounting Officers.—C. E. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June 16, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 112 West Adams St., Chicago.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 75 Church St., New York. Summer meeting, June 25-26, Charlevoix, Mich.

Association of Water Line Accounting Officers.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

Bridge and Building Supply Men's Association.—H. A. Nealy, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

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CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meets with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-13, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, Wednesday and Thursday, June 11-12, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—J. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—T. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—C. M. W. Richardson, first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. R. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

Albert Weil, secretary and treasurer of the Louis Lipp Co., bath tub manufacturer of Cincinnati, has been sentenced by United States Judge Hollister to serve 60 days in prison for violation of the interstate commerce law, in falsely stating the weight of freight shipped.

Train Disaster in the Congo.

A press despatch of May 20 from Boma, Belgian Congo, reports 20 passengers and 3 trainmen killed by the falling of a train into the river from a bridge 150 ft. high. The entire train fell, and no person on it was saved.

Traffic Club of New York.

At the meeting of the Traffic Club of New York, held on May 27, two resolutions were offered by the Public Affairs Committee for adoption by the club. One of the resolutions was opposed to the clause in the Sundry Civil Bill which forbids any part of the appropriation made for the enforcement of the Sherman Anti-Trust Law, to be used in the prosecution of labor or farmers' organizations and the other urged that provision be made for the continuance of the Commerce Court. Both resolutions were unanimously adopted.

Traffic Club of Chicago.

J. F. Barron, general agent of the freight department of the Union Pacific, at Chicago, addressed the Traffic Club of Chicago on May 20, giving an interesting description of methods of handling t. c. l. freight at the local stations of the Illinois Central, of which he was until recently local freight agent. He described a new method, introduced since the strike last year, known as the multiple truck system, by which 5 to 15 trucks are used for each trucker, and instead of waiting for a truck to be loaded or unloaded the trucker takes another truck and handles another load, eliminating much of the empty truck movement and the enforced idleness of the truckers a large part of the time, which prevailed under the former system. Mr. Barron said that it had been demonstrated that this plan reduces the cost of floor movement about one-third, 50 per cent. of whatever saving is made being distributed among the freight handlers in the form of increased pay. He suggested that in the absence of mechanical carriers or moving platforms in the city terminals the efficiency of freight handling could be greatly increased by the establishment of large outer sorting platforms or warehouses where outbound package freight could be assembled and consolidated, and where the floor movement could be performed by mechanical devices.

The Traffic Club will hold its first outing of the season at the Beverly Country Club on Tuesday, June 3. The program includes golf and tennis tournaments, baseball game, and bridge for the ladies.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 143-A, giving a summary of car surpluses and shortages by groups from February 14, 1912, to May 15, 1913, says:

The total surplus on May 15 was 61,269 cars; on May 1, 53,977 cars; and on May 23, 1912, 123,683 cars. Compared with the preceding period; there is an increase in the total surplus of 7,292 cars, of which 4,949 is in box, 227 in flat, 24 in coal and 2,092 in miscellaneous cars. The increase in box car surplus is in all groups, except 9 (Texas, Louisiana and New Mexico), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona). The increase in flat car surplus is in all groups, except 3 (Ohio, Indiana, Michigan and Western Pennsylvania), 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), and 10 (as above). The increase in coal car surplus is in all groups, except 2 (New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania), 7 (Montana, Wyoming, Nebraska and the Dakotas), and 10 (as above). The increase in

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miscellaneous car surplus is in groups 1 (New England Lines), 2, 3 (as above), 4 (the Virginias and Carolinas), 5, 7 (as above), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), 9 (as above), and 11 (Canadian Lines).

The total shortage on May 15 was 10,975 cars; on May 1, 14,178 cars; and on May 23, 1912, 7,482 cars. Compared with the preceding period: there is a decrease in the total shortage of 3,203 cars, of which 3,273 is in box, 826 in miscellaneous, and an increase of 403 in flat and 493 in coal car shortage. The decrease in box car shortage is in all groups, except 10 (as above). The decrease in miscellaneous car shortage is in all groups, except 9 (as above). The increase in flat car shortage is in groups 4, 5, 9, 10 and 11 (as above). The increase in coal car shortage is in groups 2, 4, 5, 9, 10 and 11 (as above).

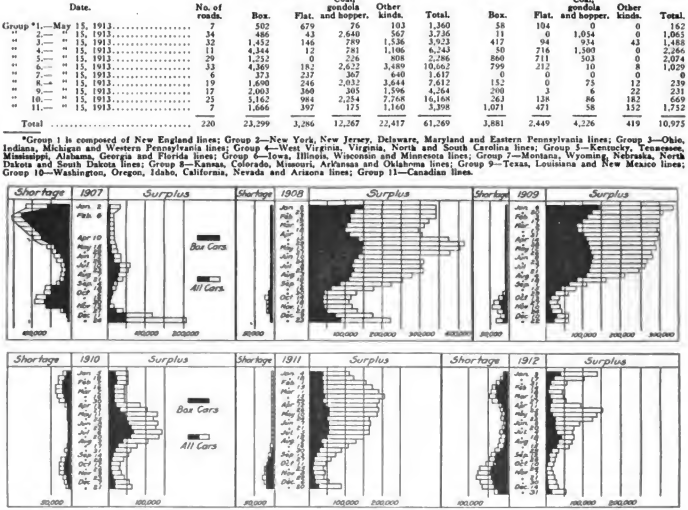
Compared with the same date of 1912: there is a decrease in the total surplus of 62,414 cars, of which 767 is in flat, 58,801 in coal, 2,847 in miscellaneous, and an increase of 1 in box car surplus. There is an increase in the total shortage of 3,493 cars, of which 963 is in box, 831 in flat, 1,577 in coal and 122 in miscellaneous cars.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report, and a diagram shows total hi-weekly surpluses and shortages from 1907 to 1913.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses—Box.	Surpluses—Flat.	Surpluses—Coal, gondola and hopper.	Surpluses—Other kinds.	Surpluses—Total.	Shortages—Box.	Shortages—Flat.	Shortages—Coal, gondola and hopper.	Shortages—Other kinds.	Shortages—Total.
Group *1.—May 15, 1913	7	502	679	76	103	1,360	58	104	0	0	162
" 2.— " 15, 1913	34	486	43	2,640	567	3,736	11	0	1,034	0	1,045
" 3.— " 15, 1913	32	1,452	146	789	1,536	3,923	417	94	934	43	1,488
" 4.— " 15, 1913	11	4,344	12	781	1,106	6,243	50	716	1,300	0	2,266
" 5.— " 15, 1913	29	1,252	0	226	808	2,286	860	711	503	0	2,074
" 6.— " 15, 1913	33	4,369	182	2,622	3,489	10,662	799	212	10	8	1,029
" 7.— " 15, 1913	6	373	237	367	640	1,617	0	0	0	0	0
" 8.— " 15, 1913	19	1,690	246	2,032	3,644	7,612	152	0	75	12	239
" 9.— " 15, 1913	17	2,003	360	305	1,596	4,264	200	3	6	22	231
" 10.— " 15, 1913	25	3,162	994	2,254	7,768	16,168	561	138	86	182	669
" 11.— " 15, 1913	7	1,666	397	175	1,160	3,398	1,071	471	58	152	1,752
Total	220	23,299	3,286	12,267	22,417	61,269	3,881	2,449	4,226	419	10,975

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

Summary of Revenues and Expenses of Steam Roads in March.

The Bureau of Railway Economics' summary of revenues and expenses and comments thereon for March are as follows:

The railways whose returns are included in this bulletin operate 222,086 miles of line, or about 90 per cent. of the steam railway mileage in the United States. Total operating revenues for the month of March, 1913, amounted to $241,048,818. Compared with March, 1912, the total operating revenues show an increase of $9,864,272. These total operating revenues per mile of line averaged $1,085 in March, 1913, and $1,051 in March, 1912, an increase of $34 or 3.2 per cent. Freight revenue per mile increased 1.2 per cent. and passenger revenue per mile 10.3 per cent.

Operating expenses amounted to $178,234,167. This was $14,104,236 more than for March, 1912. These operating expenses per mile of line averaged $803 in March, 1913, and $747 in March, 1912, an increase of $56 per mile, or 7.5 per cent.

Net operating revenue amounted to $62,814,651. This was $4,239,964 less than for March, 1912. Net operating revenue per mile of line averaged $283 in March, 1913, and $305 in March, 1912, a decrease of $22 per mile, or 7.3 per cent.

Taxes for the month of March amounted to $10,418,258, or $46.91 per mile, an increase of 7.7 per cent. over March, 1912.

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Operating income averaged $235 per mile of line, and in March, 1912, $261, thus decreasing $26, or 9.9 per cent. Operating income for each mile of line for each day in March averaged $7.57, and for March, 1912, $8.41.

The operating ratio for March was 73.9 per cent., which is comparable with 74.4 per cent. in February, 1913, and 71.0 per cent. in March, 1912.

The railways of the eastern district show a decrease in total operating revenues per mile of line as compared with March, 1912, of 1.8 per cent., the railways of the southern district show an increase of 5.8 per cent., and the railways of the western district an increase of 8.5 per cent. Operating expenses per mile increased 7.6 per cent. on the eastern railways, 5.7 per cent. on the southern railways, and 8.6 per cent. on the western railways. For the eastern railways net operating revenue per mile decreased 25.0 per cent., for the southern railways it increased 6.2 per cent., and for the western railways it increased 8.5 per cent. The increase in taxes per mile was 7.8 per cent. in the eastern district, 6.9 per cent. in the southern district, and 8.0 per cent. in the western district. Operating income per mile decreased 31.3 per cent. in the East, while it increased 6.6 per cent. in the South, and increased 9.4 per cent. in the West.

Comparison of the returns for the nine months of the fiscal year with those of the corresponding months of the previous fiscal year reveals an increase in total operating revenues per mile of 9.4 per cent., an increase in operating expenses per mile of 8.9 per cent., and an increase in net operating revenue per mile of 10.5 per cent. This net operating revenue per mile of the eastern railways increased 6.5 per cent. as compared with the corresponding period of the previous year, that of the southern railways increased 5.9 per cent., and that of the western railways increased 16.3 per cent.

When the returns for the three months of the calendar year 1913 are compared with those of the corresponding months of 1912, they show an increase in total operating revenues per mile of 8.3 per cent., an increase in operating expenses per mile of 8.2 per cent., and an increase in net operating revenue per mile of 8.6 per cent. This net operating revenue per mile decreased 1.0 per cent. in the eastern district as compared with the corresponding period of the previous year, increased 16.4 per cent. in the southern district, and increased 16.0 per cent. in the western district.

The diagram shows the variations in operating revenues, operating expenses, and net operating revenue per mile for the separate months of the calendar year 1912 and of the calendar year 1913 to date. The following table shows the per cent. of operating revenues consumed by each class of expenses:

PER CENT. OF TOTAL OPERATING REVENUES.

	March,		Fiscal year ended June 30,		Calendar year ended December 31,	
	1913.	1912.	1912.	1911.	1912.	1911.
Maintenance of way and structures.	12.6	10.6	12.7	12.9	12.8	12.7
Maintenance of equipment	17.7	16.8	15.8	15.5	16.0	15.7
Traffic expenses	2.2	2.1	2.2	2.2	2.0	2.1
Transportation expenses	38.8	39.0	35.9	35.5	35.5	35.4
General expenses	2.6	2.5	2.5	2.5	2.4	2.5
Total operating expenses	73.9	71.0	69.1	68.6	68.7	68.4

INTERSTATE COMMERCE COMMISSION.

The commission suspended from April 15 until October 15, certain revised pages of the tariff of the Canadian Pacific, which would advance rates on paper from Brownville Junction, Me., to Akron, Ohio.

The commission has suspended until October 14, certain tariffs which contain advances in rates on wheat from Kansas City, Mo., and other points to Edwardsville, Ill., Lawrenceville, Ill., and other points.

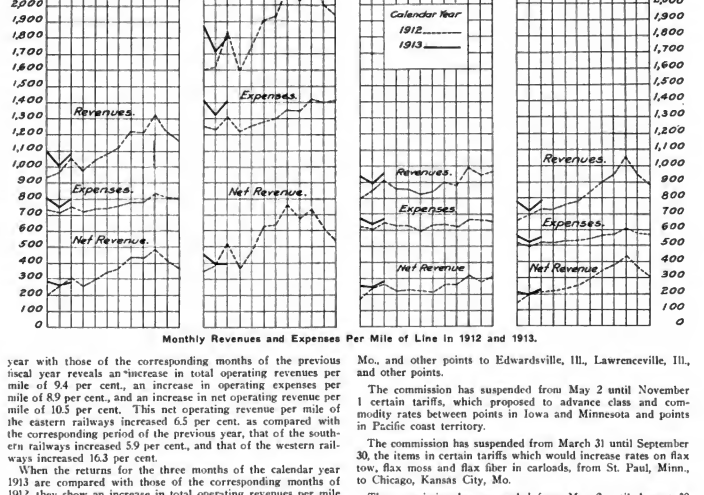
The commission has suspended from May 2 until November 1 certain tariffs, which proposed to advance class and commodity rates between points in Iowa and Minnesota and points in Pacific coast territory.

The commission has suspended from March 31 until September 30, the items in certain tariffs which would increase rates on flax tow, flax moss and flax fiber in carloads, from St. Paul, Minn., to Chicago, Kansas City, Mo.

The commission has suspended from May 2 until August 30 the item in a supplement to Agent F. A. Leland's tariff, which contains advanced rates on cotton seed and cotton seed products from points in Texas to New Orleans, La.

The commission has suspended from May 10 until September 6 the supplement to the tariff of the Alabama Great Southern which advances rates on logs, c. l., from stations located on the Alabama Great Southern to Chattanooga, Tenn.

The commission has suspended from May 1 until August 29 the schedules contained in certain tariffs, which proposed to



Monthly Revenues and Expenses Per Mile of Line in 1912 and 1913.

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advance rates for the transportation of butter and eggs from Topeka, Kan., to Memphis, Tenn., and other points.

The commission has suspended from March 31 to September 30, certain tariffs which would increase rates on lumber from Memphis and other points to New Orleans and other destinations.

The commission has suspended from May 1 until November 1 the schedules contained in a supplement to the tariff of the Delaware & Hudson, which proposed to eliminate milling-in-transit privileges extended to shipments of corn milled or mixed at Oneonta, N. Y.

The commission has suspended until July 17 the schedules contained in certain tariffs, which proposed to cancel joint through class and commodity rates from and to stations on the Bangor & Aroostook on shipments routed via the Maine Central.

The commission has suspended from May 5 until September 2 the schedules contained in a supplement to Agent W. P. Emerson's tariff, which contain advances in class and commodity rates between New Orleans, La., and other points in the south and points in Illinois.

The commission has suspended from May 1 until November 1 certain schedules in a supplement to Agent C. H. Griffin's tariff, which proposed to advance charges for the refrigeration of carload shipments of fruits, vegetables, etc., between points in Colorado and Utah.

The commission has suspended until October 14, certain tariffs, containing new regulations governing the switching of coal and coke from the lines of certain carriers to certain stations on the Chicago, Milwaukee & St. Paul located within the limits of the Chicago switching district.

The commission has suspended from May 5 until September 2 the operation of the schedules in a supplement to the tariffs of the Southern Pacific, which propose to increase by $2 per 2,000 lbs. rates on lumber from certain points in California to El Paso, Tex., and other points.

Reparation Awarded.

G. L. Jubitz, assignee, v. Southern Pacific et al. Opinion by the commission:

The commission decided that the rate of $3.094 per gross ton for the transportation of coke from Wilkeson, Wash., to Salem, Oregon, was unreasonable to the extent that it exceeds $2.55 per gross ton, and prescribed that rate for the future. (27 I. C. C., 44.)

Complaint Dismissed.

E. I. DuPont DeNemours Powder Co. v. Pennsylvania Railroad et al. Opinion by Commissioner Harlan:

As the shipment involved in this case was delivered to the consignee on June 18, 1907, and as the complaint was not filed until July 15, 1909, the complaint is barred by the period of limitation fixed in the act. (27 I. C. C., 59.)

Milburn Wagon Co. v. Toledo, St. Louis & Western et al. Opinion by the commission:

In this case the complainant alleges that the rating of freight vehicles with springs, in carloads, in the Southern classification is unreasonable. The Southern classification now provides a second class rating with a minimum of 8,000 lbs. for 36 ft. cars and the complainant seeks to have the Southern classification so amended as to provide a fourth class rating with a minimum carload weight of 12,000 lbs. The commission decided that the present rating was not shown to have been unreasonable. (27 I. C. C., 63.)

Break-Bulk Rates on Grain.

In re investigation and suspension of advances in break-bulk rates by carriers for the transportation of grain and grain products from Milwaukee, Manitowoc, and Kewaunee, Wis., to Boston, Mass., New York, N. Y., Philadelphia, Pa., Baltimore, Md., and other points. Opinion by Commissioner Meyer:

The respondents failed to meet the burden of proof which the statute places upon them as to the reasonableness of the proposed advances in local, joint, and proportional break-bulk rates, domestic and export, on grain and grain products from Milwaukee, Manitowoc, and Kewaunee, Wis., to points in trunk line territory east of Niagara frontier, and the commission ordered them to cancel the suspended tariffs. (27 I. C. C., 78.)

Live Stock Rates Reduced.

Rock Spring Distilling Company v. Illinois Central et al. Opinion by Commissioner Meyer:

The complainant contends that the rates on cattle between Owensboro, Ky., and Kansas City, Mo.; East St. Louis, Ill.; Chicago and New York are unreasonable, compared with the rates from the same points to Evansville, Ind.; Louisville, Ky., and Cincinnati, Ohio. Reparation is asked. The present rate from East St. Louis to Owensboro is 21.7 cents per 100 lbs. The commission found that this rate was unreasonable to the extent that it exceeds 15 cents per 100 lbs. with a minimum weight of 20,000 lbs. and prescribed that rate for the future. The commission also decided that in the future the rate from Chicago to Owensboro should not exceed $32 per car.

The commission found that the present rate from Owensboro to New York via Louisville was excessive, but no order could be issued, as the complainant had not joined as party defendants the carriers participating in the rates from Evansville to New York. Reparation was denied. (27 I. C. C., 54.)

Joint Rates on Plaster and Gypsum Rock.

In re investigation and suspension of advances in rates by carriers for the transportation of plaster, gypsum rock, stucco, plaster board, from Blue Rapids and Irving, Kan., to points in Arkansas, Kansas and Missouri. Opinion by Commissioner Harlan:

The defendant proposes to cancel joint through rates on plaster and gypsum rock from Blue Rapids and Irving, Kan., to destinations in Arkansas and Missouri. The cancellation of these rates would result in advances ranging from 2 cents to 7 cents per 100 lbs. The complainant asks the commission to require the defendant to continue to maintain the joint through rates now in effect. The commission found that the motive of the St. Louis & San Francisco in cancelling these joint through rates was to compel the consumers on its lines to purchase the commodity in question from the manufacturers whose plants were located along its lines, as it would then secure the entire revenue instead of sharing it with connecting lines on shipments from points of origin not on its own lines. The commission decided that this practice discriminated against the manufacturers who were not located on the lines of the St. Louis & San Francisco and ordered the defendant to withdraw the tariff which would cancel the joint through rates. (27 I. C. C., 67.)

STATE COMMISSIONS.

The Railroad Commission of Montana has issued an order making general reductions in freight rates on fruit and vegetables; and will hold a hearing on the subject on June 10.

The Missouri Public Utilities Commission has announced its construction of the anti-pass section of the act creating the commission, ruling that passes issued before July 1 can be used after that date only by persons excepted in the act.

The Illinois Central and the Yazoo & Mississippi Valley have filed a suit in the federal district court at Baton Rouge, La., attacking the constitutionality of the recent order of the Louisiana commission governing the flagging of trains. Among other points it is contended that by these rules the commission attempts to regulate interstate commerce.

COURT NEWS.

The International & Great Northern has asked the Texas Supreme Court for a rehearing on its recent decision when it issued an injunction to restrain the removal of the company's shops from Palestine, Tex.

The Chicago, Milwaukee & St. Paul has filed an appeal to the United States supreme court from a decision of the Wisconsin supreme court which upheld the Wisconsin law requiring that the upper berth in a sleeping car be kept closed unless it is sold.

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The Colorado & Southern has appealed to the United States Supreme Court from the decision of the Colorado Supreme Court sustaining the Colorado Railroad Commission's action in ordering the road to restore service on its branch running over Boreas Pass.

In the federal court at Atlanta, Ga., May 23 in the case of the Georgia State Railroad Commission against the Seaboard Air Line, a decree, signed by Judge Newman, sustained the commission in its order requiring the construction of a connecting track at Lawrenceville, between the Seaboard Air Line and a branch of the Southern Railway.

The supreme court of the United States in a case against the Delaware, Lackawanna & Western has decided that a track laborer on that road is engaged in interstate commerce, and therefore that an injury to him comes under the federal law regulating compensation for injuries. It appears that at the time the man was injured he was hurt or endangered by two trains, one of which was not engaged in interstate traffic; and that because of this situation the railroad company denied the application of the federal law. The circuit court of appeals for New Jersey decided in favor of the road, but this opinion is now reversed. Justices Lamar, Holmes and Lurton dissented from the opinion of the majority.

Hours-of-Service Law Applies to Unwritten Train Orders.

The decision of the circuit court of appeals, at New Orleans, in the suit against the Houston Belt & Terminal Company, in the case of a towerman who conveyed oral train orders by telephone, was noticed in the *Railway Age Gazette*, May 16, page 1109. The head notes of this decision, in full, are as follows:

1. If a towerman gives to another towerman information over the telephone that trains have started, on receipt of which the second towerman must throw switches, line up tracks, and hold trains as a matter of duty and without discretion on his part, it is evident that these towermen use the telephone to despatch, report, transmit, and deliver orders pertaining to or affecting train movements.

2. An order affecting train movements may be given by a wave of the hand or the flash of a lantern, and its disobedience might cause as dire consequences as the failure to obey a written message.

3. To limit the word "orders" as used in the proviso in section 2 of the act to technical "train orders" emanating from the train despatcher's office would be to pervert the plain meaning of the statute.

4. Necessarily an order affecting train movements can be given by any subordinate having to do with trains and switches, such as a towerman.

5. The Government is not bound to negative the exception as to "case of emergency." The railroad must plead and prove facts which constitute such a defense.

The towermen in this case occupied towers about three quarters of a mile apart, near the main station in Houston. The line between the two towers is double track. From the testimony it appears that the time interval system is in use, and that actual operation of the space interval by the towermen takes place chiefly in cases where it is necessary to move trains on one track or the other in a direction opposite to the current of traffic.

As to the fifth point in the head note the court says:

"The railroad contends that the rulings of the court were correct because plaintiff did not negative that the acts and conduct of the defendant complained of came within the exception of the act, which reads as follows:

". . . in case of emergency, when the employees named in this proviso may be permitted to be and remain on duty for four additional hours in a 24-hour period on not exceeding three days in any week.

"The action, though for a penalty, is civil in its nature, and the pleader is not required to state his cause of action with the exactness and particularity that would be necessary in a criminal indictment. In the nature of things, in most cases arising under the act, facts bringing the case within the exception would be only within the knowledge of the railroad, and the government should not be required to allege that of which it knows nothing simply to conform to a mere technicality of pleading. If facts existed that would bring the case within the exception, they constituted a defense that the railroad should have pleaded and proved."

Railway Officers.

Executive, Financial and Legal Officers.

W. C. Logan, who recently resigned as secretary and auditor of the Wichita Valley, at Wichita Falls, Tex., has been appointed chief clerk to the auditor of the Ft. Worth & Denver City at Ft. Worth, Tex.

The officers of the Denver & Salt Lake, formerly the Denver, Northwestern & Pacific, are now as follows: Newman Erb, president; W. E. Morse, vice-president and general manager; Ward E. Pearson, treasurer; H. B. Blanchard, secretary, and E. W. Meyer, auditor and assistant secretary.

J. F. Waddell has resigned as auditor for the receivers of the Denver, Laramie & Northwestern. J. L. Terry has been appointed general superintendent and auditor for the receivers, with headquarters at Denver, Colo. The office of superintendent for the receivers is abolished. Effective June 1.

A. H. Wheatley, assistant to the president of the Alaska Northern, and E. L. Davis, general superintendent, both with headquarters at Seward, Alaska, have resigned. Their duties will be assumed by A. W. Swanitz, chief engineer and manager, and H. Tozier, superintendent, with headquarters at Seward.

H. B. Myers, assistant general freight and passenger agent and assistant auditor of the Liberty White at McComb, Miss., has resigned, to accept service elsewhere, effective June 1, and traffic matters formerly handled by Mr. Myers will in future be handled through the office of W. M. White, president and general manager.

B. L. Winchell, president of the St. Louis & San Francisco, and Thomas H. West, chairman of the St. Louis Union Trust Company, have been appointed receivers of the St. Louis & San Francisco. W. J. Jackson, vice-president and general manager of the Chicago & Eastern Illinois, and E. W. Winter, of New York, formerly president of the Northern Pacific and later until 1911 president of the Brooklyn Rapid Transit Company, have been appointed receivers of the Chicago & Eastern Illinois.

H. S. Walker, whose appointment as auditor of Morgan's Louisiana & Texas Railroad and Steamship Company and the Louisiana Western, with headquarters at New Orleans, has already been announced in these columns, was born July 19, 1878, in Princess Ann county, Va. He entered the service of the Seaboard Air Line at the local agency at Richmond, Va., in 1900, and subsequently was made chief clerk. He removed to Fernandina, Fla., in 1902, retaining his position as chief clerk at that point. He went to the Gulf & Ship Island in 1904 as agent at Gulfport, Miss., resigning in 1906 to engage in mercantile business. Mr. Walker returned to railway service in 1908 with the Southern Pacific Lines in Louisiana, and has now been appointed auditor, as above noted.

Operating Officers.

Joseph M. Boyd, assistant general air brake inspector of the Northern Pacific, has been appointed trainmaster of the Fargo division at Fargo, N. D.

R. H. Dwyer, formerly trainmaster of the Illinois Central at McComb City, Miss., and later division superintendent of the Missouri Pacific at Pueblo, Colo., has been appointed superintendent of construction of the Tela Railroad, with headquarters at Tela, Honduras.

James Daniel Beaver, who has been appointed assistant superintendent of the Pittsburg, Shawmut & Northern, with office at St. Marys, Pa., as has been announced in these columns, was born on February 5, 1875, and began railway work as an operator on the Western New York & Pennsylvania, now a part of the Pennsylvania Railroad, and was later agent, and then despatcher on the same road. He left the service of that company to go to the Plant System of railways, now a part of the Atlantic Coast Line, and in 1901 went to the Pennsylvania Railroad as despatcher, resigning in 1905, to become assistant trainmaster on the Pittsburg, Shawmut & Northern, which position he held at the time of his recent promotion as assistant superintendent of the same road.

H. W. Stanley, whose appointment as general manager of the

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Seaboard Air Line, with headquarters at Portsmouth, Va., has been announced in these columns, was born on February 13, 1874, at Petersburg, Va., and was educated at Lynchburg High School. He began railway work as a telegraph operator on the Norfolk & Western, and held various positions on the road until December, 1895, when he became chief clerk to the superintendent of the Southern Railway at Knoxville, Tenn. He went to the Seaboard Air Line in May, 1897, and has been in the continuous service of that road ever since, first as secretary to the general superintendent, and then consecutively chief clerk to the general superintendent and general manager, trainmaster, superintendent, superintendent of transportation, assistant general superintendent, general superintendent of transportation, and assistant general manager, which position he held at the time of his recent appointment as general manager of the same road as above noted.

H. W. Stanley.

J. F. Keegan, whose appointment as superintendent of the Chicago division of the Baltimore & Ohio, with headquarters at Garrett, Ind., has been announced in these columns, was born on March 29, 1870, at Cleveland, Ohio, and was educated at St. Columba's Academy, in his native town. He began railway work on November 1, 1895, with the Cleveland, Columbus, Cincinnati & Indianapolis as a telegraph operator, and in June, 1899, left that company to go to the Cleveland, Lorain & Wheeling, now a part of the Baltimore & Ohio, as telegraph operator and car distributor. From September, 1891, to May 15 of the following year, he was train despatcher of the same road at Uhrichsville, Ohio, and was then chief despatcher of the Baltimore & Ohio at Cleveland. From September, 1903, to September, 1906, he was assistant trainmaster of the same road first at Cleveland and then at Wheeling, W. Va. In September, 1906, he was promoted to trainmaster at Parkersburg, W. Va., and in December, 1910, was transferred in the same capacity to Keyser, W. Va. On March 15, 1911, he was appointed division superintendent of the same road at Wheeling, and in October, 1911, was made superintendent of the Monongah division at Grafton, W. Va., which position he held at the time of his recent appointment as superintendent of the Chicago division, as above noted.

J. F. Keegan.

Traffic Officers.

H. Beardshew has been appointed traveling agent of the Kansas City, Mexico & Orient, with headquarters at Pittsburgh, Pa.

John S. Hickey has been appointed soliciting agent of the Central of Georgia, with office at Chicago, succeeding George B. McGill, resigned.

H. B. Weatherwax has been appointed industrial agent of the Delaware & Hudson, with office at Albany, N. Y., succeeding J. H. Shoemaker, resigned.

H. C. Bush, who recently resigned as traffic manager of the Colorado Midland, has been appointed traffic manager of the Idaho & Washington Northern, with office at Spokane, Wash.

J. A. Morgan has resigned as commercial agent of the St. Louis Southwestern at Paragould, Ark., to become traffic manager of the National Cooperage Association, with headquarters at St. Louis, Mo.

W. S. Merchant, traveling passenger agent of the St. Louis & San Francisco, with headquarters at Cincinnati, Ohio, has been appointed division passenger agent at that place, succeeding J. F. Govan, who has been appointed general agent of the passenger department of the Chicago & Eastern Illinois.

W. I. Jones having been promoted to assistant general freight agent, in charge of solicitation, of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, the position of assistant general freight agent, in charge of coal traffic, is abolished. C. E. Warner is appointed coal traffic agent, with headquarters, St. Louis, Mo. Effective June 1.

L. D. Knowles, general agent of the Missouri Pacific, and the St. Louis, Iron Mountain & Southern, at Pittsburgh, Pa., has been promoted to assistant general freight agent, with headquarters at Omaha, Neb., succeeding C. E. Wagar, resigned. C. C. McCarthy, general eastern freight agent, at New York, succeeds Mr. Knowles, and J. B. Trimble, assistant general freight agent at St. Louis, Mo., succeeds Mr. McCarthy.

The following appointments on the Illinois Central are announced, effective May 15: C. C. Kunz, commercial agent at Dubuque, Iowa, in place of M. S. Beals, promoted; Ben Stone, traveling freight agent, with office at Bloomington, Ill., succeeding J. H. Lipsey, resigned to engage in other business; C. L. Netherland, traveling freight agent, with headquarters at Ft. Dodge, Iowa, in place of Mr. Stone; J. F. McMahon, traveling freight agent, with headquarters at Waterloo, Iowa, succeeding J. Rosenzweig, resigned to engage in other business; L. Huekels, contracting freight agent at Dubuque, vice J. F. McMahon, promoted; J. F. Ward, contracting freight agent at St. Louis, Mo.; J. B. Russell and B. E. George, contracting freight agents at Chicago.

Arthur Tipton Stewart, whose appointment as general freight agent of the Missouri Pacific, with office at Kansas City, Mo., has already been announced in these columns, was born May 11, 1872, at Humboldt, Kan. He received a high school education at Independence, Kan., and began railway work July 1, 1890, as stenographer for the Chicago, Rock Island & Pacific at Topeka, Kan. He went to the St. Louis Southwestern September 1, 1891, as secretary to the general manager, and in June of the following year he was made secretary to the freight traffic manager of the Missouri Pacific. Ten years later, on May 1, 1902, he was promoted to assistant general freight agent, and in September, 1908, he was appointed assistant to the vice-president in charge of traffic. In January of the present year Mr. Stewart was made assistant to the general traffic manager, with headquarters at St. Louis, Mo., and his recent promotion as general freight agent, as above noted, is effective on June 1.

A. T. Stewart.

Edward Henry Calef, whose appointment as general freight agent of the St. Louis, Iron Mountain & Southern, with headquarters at St. Louis, Mo., has already been announced in these columns, was born May 26, 1867, at St. Louis. He began railway work January 29, 1884, as messenger in the freight claim

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department of the Missouri Pacific, and from October, 1893, to May, 1894, was chief clerk in the overchange division of that department. He was then for two years traveling freight claim adjuster, and from June, 1896, to November, 1897, was live stock agent for Indian Territory. The following year he was in the freight traffic department, and in December, 1898, was made chief clerk to the assistant general freight agent of the St. Louis, Iron Mountain & Southern at St. Louis. From November, 1899, to March, 1905, Mr. Calef was commercial agent at Sedalia, Mo., on the latter date being made division freight agent at Little Rock, Ark. In September, 1908, he was promoted to assistant general freight agent at St. Louis, which position he held until his appointment on May 20 as general freight agent, as above noted.

C. E. Perkins, who on June 1 became assistant general traffic manager of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with headquarters at St. Louis, as announced in our issue of last week, was born in 1871 in Chicago. He began railway work in 1891 as office boy in the freight office of the Kansas City, Fort Scott & Memphis, at Kansas City, Mo. After five years of service with that road, principally as freight clerk, he went to the St. Louis & San Francisco as chief clerk to the general agent at Kansas City. In 1897 he was made chief tariff clerk for the Kansas City, Pittsburg & Gulf, now known as the Kansas City Southern. He was afterwards made chief clerk in the freight department, and later was appointed assistant general freight agent. For a time he was stationed at Texarkana, Ark., as assistant general freight agent and also as general freight agent of the Texas line of that road. In 1906 he was again transferred to Kansas City as assistant general freight agent, and in March, 1909, he went to the St. Louis, Iron Mountain & Southern as assistant general freight agent at St. Louis. He was made general freight agent of the Iron Mountain on January 1, 1910, and is now promoted to assistant general traffic manager of the Missouri Pacific system, as above noted.

C. E. Perkins.

Engineering and Rolling Stock Officers.

William J. Ridley has been appointed road foreman of engines of the Fargo division of the Northern Pacific at Fargo, N. Dak.

William H. Dyer has been appointed master mechanic of the Georgia & Florida, with headquarters at Douglas, Ga., succeeding E. C. Hanse, assigned to other duties.

R. G. Knight has been appointed roadmaster of the Northern Pacific at Staples, Minn., succeeding Philip McGuire, who has been retired and pensioned by the company.

G. A. Ziehlke has been appointed signal supervisor of the Kansas division of the Union Pacific, with headquarters at Kansas City, Mo., succeeding Frank W. Pfleging, promoted.

E. D. Jackson, assistant engineer of the Baltimore & Ohio at Baltimore, Md., has been appointed engineer of the Philadelphia division, with headquarters at Philadelphia, Pa., succeeding C. C. Cook, transferred to the Pittsburgh division.

E. C. Carter, chief engineer of the Chicago & North Western has been assigned to special duties in connection with valuation of property of the company and until further notice is relieved from active duties of his office, which will be discharged by W. H. Finley, assistant chief engineer.

Joseph McCabe, whose appointment as master mechanic of the Shore Line division of the New York, New Haven & Hartford with headquarters at Harlem River, N. Y., has been announced in these columns, was born on December 6, 1863, at New Rochelle, N. Y., and was educated in the public schools of his native town. He began railway work on August 11, 1881, with the New York, New Haven & Hartford and in 1885 was appointed fireman and later was made engineman. In December, 1902, he was promoted to road foreman of engines, and in January, 1907, was made master mechanic, becoming general road foreman of engines later in the same year. In April, 1912, he was appointed master mechanic of the Western division, and now becomes master mechanic of the Shore Line division of the same road as above noted.

Frank W. Pfleging, signal supervisor of the Kansas division of the Union Pacific at Kansas City, Mo., has been appointed signal engineer, with headquarters at Omaha, Neb., succeeding J. C. Young, deceased. Mr. Pfleging was born May 27, 1877, at Terre Haute, Ind. After graduating from high school he took the electrical engineering course at Rose Polytechnic Institute, graduating in June, 1901, with degree of B. Sc. Between the junior and senior years he was employed by the Chicago & Eastern Illinois as signal repairman, and in July, 1901, he went with the Union Pacific, where he was employed successively as draftsman, maintainer, foreman of interlocking, signal foreman, general signal foreman, until January 1, 1903. On the latter date he was made signal supervisor, with headquarters at Cheyenne, Wyo., and in February, 1912, he was transferred to Kansas City, Mo., in a similar capacity. His promotion to the position of signal engineer, as above noted, becomes effective on June 1.

F. W. Pfleging.

Purchasing Officers.

Lewis Mims, superintendent of the Sunset-Central Lines of the Southern Pacific at Lafayette, La., has been appointed fuel and timber agent of those lines, with headquarters at Houston, Tex., effective June 1.

L. B. Wood, general storekeeper of the Sunset-Central Lines of the Southern Pacific, will also assume the duties of purchasing agent, with headquarters at Houston, Tex., effective June 1. R. S. Stephens, who has held the position of purchasing agent for 25 years, has been retired on account of failing health and placed on the pension list of the company.

Special Officers.

The agricultural, industrial and immigration departments of the St. Louis Southwestern Lines have been consolidated, with W. R. Beattie in charge as agricultural and industrial commissioner, W. J. Doyle, heretofore in charge of the industrial and immigration department, has been assigned to other duties. P. T. Cole, L. E. Saupe and C. C. Rockenbach have been appointed assistants to Mr. Beattie, with such duties as may be assigned them by him. Headquarters, St. Louis, Mo.

OBITUARY.

Edwin O. Miller, commercial agent of the Chicago, Rock Island & Pacific at Lincoln, Neb., died in that city on May 20, aged 65 years.

Hon. George G. Crocker, chairman of the Boston Transit Commission, and for 20 years a member of that body, the commission which supervised the construction of the Boston subways, died at his home in Cohasset, Mass., May 26, at the age of 69. Mr. Crocker was chairman of the Massachusetts State Railroad Commission for four years, 1887-1891. He was graduated from Harvard College in 1864, and from the Harvard Law

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School in 1866. He was a man of high character and has been a member of the state legislature six terms, during one of which he was president of the senate.

Alexander Forsyth, superintendent of shops of the Chicago, Burlington & Quincy at Aurora, Ill., died on May 19, at the St. Charles hospital, Aurora, aged 68 years. Mr. Forsyth was born in April, 1845, in Cumberland county, England. His entire railway service was with the Chicago, Burlington & Quincy, with which road he commenced work in 1869 as a machinist. From October, 1880, to October, 1881, he was general foreman at Beardstown, Ill., and then became master mechanic at that point. In January, 1887, Mr. Forsyth was transferred to Aurora as master mechanic, which position he held until March, 1906, when he was appointed superintendent of shops.

Archibald Guthrie, of the railroad contracting firm of A. Guthrie & Company, of St. Paul, Minn., died in Chicago on May 15, aged 69 years. Mr. Guthrie began railway work in July, 1866, with the St. Paul & Pacific laying track, and was with that road and the St. Paul, Minneapolis & Manitoba successively as clerk in freight office, brakeman, conductor, purchasing agent, and assistant superintendent, until July, 1881, when he was made superintendent of the Northern division at Barnesville, Minn. Subsequently Mr. Guthrie was consulting engineer, and later he became associated with Foley Brothers, railway contractors, until 1897, when he engaged in business for himself. He was also a member of the firm of Guthrie, McDougall & Company, railway contractors, of Portland, Ore.

Robert S. Seibert, president of the East Broad Top Railroad & Coal Company, died on May 24, at Oak Lane, Pa. He was born on May 9, 1856, and began railway work in January, 1874, as a telegraph operator on the Pennsylvania Railroad. The following October he became agent and operator of the East Broad Top, and in May, 1877, was made trainmaster of the same road. In November, 1881, he became train despatcher on the Chicago & Eastern Illinois, and in March, 1886, went to the West Shore as train despatcher, and was later trainmaster on the same road. In May, 1888, he was on the Denver & Rio Grande, and in October, 1891, was appointed superintendent of the Pueblo Union Depot Company. The following year he was made general manager of the Nevada Southern, and in 1896 became general manager of the California Eastern. From January, 1900, to July, 1902, he was also vice-president of the same road. He returned to the service of the East Broad Top Railroad as general manager in July, 1903. From November, 1903, to January, 1911, he was president and general manager, and since January, 1911, had been president of the same company.

Frank H. Myers, formerly division superintendent of the Chicago, Milwaukee & St. Paul, who died suddenly at his home in Minneapolis, Minn., on April 8, of apoplexy, was born September 5, 1876, at Adeline, Ill. When fifteen years of age he learned telegraphy, beginning railway work in September, 1894, with the Chicago, Milkaukee & St. Paul, with which company he remained until his death. He was operator and agent until 1900, and then for one year was division operator. From 1901 to 1905, he was assistant train despatcher, and the following two years was chief train despatcher. In 1907 he was made assistant superintendent of the Chicago terminals, and in May, 1908, he was promoted to the superintendency of the Prairie du Chien and Mineral Point divisions at Milwaukee, Wis. He was transferred to Minneapolis, Minn., in October, 1910, as superintendent of the River, Iowa & Minnesota, Wabash and Chippewa Valley divisions, which position he held at the time he died.

F. H. Myers.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The International Great Northern has ordered 10 consolidation locomotives from the American Locomotive Company. The dimensions of the cylinders will be 22 in. x 30 in., the diameter of the driving wheels will be 57 in., and the total weight in working order will be 217,000 lbs.

CAR BUILDING.

The International & Great Northern is in the market for 200 coal cars.

The Chesapeake & Ohio has ordered 2,000 coal cars from the Standard Steel Car Company.

The Lehigh Valley is in the market for 1,000 forty-ton box cars and 1,000 fifty-ton coal cars.

IRON AND STEEL.

The Missouri, Kansas & Texas has ordered 330 tons of bridge material from the Wisconsin Bridge Company.

The Kansas City Southern has ordered 7,000 tons of rails from the Illinois Steel Company.

General Conditions in Steel.—A great deal of attention is being directed to the course of the steel industry in Germany. Prices have been declining abroad and there is likely to be a very heavy falling off in output of steel during the summer months. Many cancellations are reported. So far as the American steel industry is concerned the week opens with very little change. There has been no increase in orders, and prices are stationary. Mills continue to operate full, but smaller specifications indicate a slowing up within the next month or two unless there is a material change in the situation for the better.

Proposed Portuguese Railroad.—It is proposed to build a railroad in Portugal, from Estremoz, through Souzel, Fronteira, Alter do Chao, and Portalegre, crossing the Eastern Railway and extending to Castello de Vide, on the Caceres branch. When the line yields 5 per cent. net on the cost of construction, the concessionaire must begin an extension from Castello de Vide to the Beira-Beixa line. Free transportation of all necessary construction materials will be granted by the government railways. The usual cost of labor in railway construction work in Portugal is about as follows: Laborers, $0.47 a day; masons, $0.75; stone workers and carpenters, $0.94; bosses, $1.41.

Transportation of Dogs in England.—For some time past negotiations have been proceeding between the Railway Clearing House and the National Canine Defence League with respect to the conditions under which dogs are conveyed by rail and steamer. The railway companies have now advised the National Canine Defence League that animals tendered for conveyance in packages which are obviously too small for them will be refused. The companies decline to undertake the provision of food, but have agreed to the suggestion of the league that they should endeavor to arrange for the dogs to be given water wherever practicable, if the senders will indicate this requirement on the labels.

Proposed Line for China.—The governor of Fukien province, China, has requested the Swatow Chouchowfu Railway to revive the project of a railway to connect Chouchowfu with Amoy, which was under discussion some years ago. The governor suggests that Fukien province subscribe half the necessary capital, the balance to be raised in Kwangtung. This project was originally mooted by Mr. Chang, a director of the Swatow Chouchowfu Railway, who proposed to float a joint stock company in Swatow, but when he died it was dropped. If the money can be raised and the line built it will serve rather to tap the country lying between Amoy and Swatow than to act as a means of communication between the two ports which are already connected by regular steamship services.

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Supply Trade News.

The Roberts & Schaefer Company, Chicago, has been awarded a contract by the Cleveland, Cincinnati, Chicago & St. Louis to build five large Holmen coaling plants at Paris, Ill., Lynn, Ind., Lilly, Ill., Anderson, Ind., and Dayton, Ohio.

The "Dracar," made by the Drake Railway Automotrice Company, Chicago, has been selected by the French government for service in connection with the government arsenals and the port of Brest. The Paris office of the company will supply five cars.

J. Campbell Hopkins has been appointed manager of the railway department of the National Oil Gas Generator Company, Chicago. Mr. Hopkins has, for a number of years, been connected with steam railways in the capacity of consulting engineer and internal combustion engine expert.

Allan S. Barrows, for several years western representative of the Pantasote Company, New York, will shortly retire from that position to become vice-president and general manager of the Cassava Products Company, and will be located at Good Hope, Falmouth, Jamaica, British West Indies.

The Forsyth Brothers Company, Chicago, has transferred all right and title in its Forsyth draft gear, buffing device, radial device, truck actuated device and yoke, and the Chaffee centering device to the Waugh Draft Gear Company, Chicago, and all future negotiations and correspondence relating to these devices should be carried on with the Wendell & MacDuffie Company, general sales agents, 165 Broadway, New York.

C. W. Pank, manager of the St. Louis, Mo., office of Fairbanks, Morse & Company, Chicago, has been made general director of sales of that company, with office in Chicago. L. Norvell, manager of the railway supplies department of the same company, with office in St. Louis, has been made manager of the St. Louis office, succeeding Mr. Pank; and F. O. Roy has been made manager of the railway supplies department, with office in St. Louis, succeeding Mr. Norvell.

TRADE PUBLICATIONS.

QUEEN & CRESCENT ROUTE.—The general passenger department has issued an attractive booklet describing scenes along its route, entitled "From the Window."

WRECKING CRANES.—The Industrial Works, Bay City, Mich., has issued a large illustrated folder describing a wrecking crane of 150 tons capacity manufactured by the company.

CHICAGO & NORTH WESTERN.—The passenger department has issued an illustrated booklet on "The Lakes and Resorts of the Northwest," giving information concerning hotels and rates, also a booklet entitled "Summer Vacation Tours," describing the personally conducted all-expense tours to the west, managed by the department of tours of the North Western and the Union Pacific.

AIR COMPRESSORS.—The Chicago Pneumatic Tool Company has issued bulletin No. 34-L, containing general engineering information of value to users of compressed air. It includes tables, giving efficiencies of air compression at different altitudes, densities of gases and vapors, mean effective pressures and horse power, loss of pressures due to friction in pipes, also information for intending purchasers, showing the data required for intelligent estimates. Views of various types of compressors are given, as well as illustrations showing the interior of the company's compressor plant at Franklin, Pa.

GREEK RAILWAY PLANS.—The Greek government is at present giving great attention to the question of improving communication in eastern Macedonia and Epirus, and proposes to link up the railway system in southwest Macedonia with Salonika by enlarging and extending the lines in Thessaly. To this purpose the line from Volo, in Thessaly, to Kalabaka, on the Turkish frontier, will be extended to Grevena and thence to Sorovitch, where it will join the Salonika-Monastir Railway. A branch line will connect Grevena and Janina, the route chosen being via Meizovo or Konitza.

Railway Construction.

ATLIN RAILWAY.—Application is being made in Canada for incorporation to build from a point on the southern end of Atlin lake, B. C., or near the town of Atlin, southern to a point on the Taku river at the international boundary, and from a point on that line easterly to the southern end of Teslin lake. Smith & Johnston, Ottawa, are solicitors for the applicants.

BRADENTOWN, MANATEE & ARCADIA.—This company is planning to build a line, it is said, from Bradentown, Fla., southeast via Manatee to Arcadia, about 55 miles. Rights of way are now being secured and it is expected that construction work will be started during July. J. G. Barkley, Tampa, Fla.; C. B. Jenkins, Charleston, S. C., and A. W. Jones, Augusta, Ga., are interested.

BRULE LAKE.—An officer writes that surveys have just been finished and the company expects to begin work at once from a point on the Grand Trunk Pacific east of Brule lake at mileage 996 west of Winnipeg, Man., north six miles to the property of the North Alberta Coal Company. The work will be difficult. The line which is being built to carry coal will have maximum grades of 2 per cent. G. G. S. Lindsey, president, and James McEvoy, chief engineer, Toronto. (April 18, p. 925.)

DE QUEEN & EASTERN.—An officer of this company which operates a line from De Queen, Ark., east to Dierks, 27 miles, writes that the company owns the Texas, Oklahoma & Eastern, operating a line from Valliant, Okla., on the St. Louis & San Francisco east to Broken Bow, in McCurtain county, 24 miles. The company has under consideration the question of building an extension in the near future between De Queen and Broken Bow, 25 miles, connecting the two lines. The extension of the De Queen & Eastern from Dierks northeast to Hot Springs, about 70 miles, which has been under consideration for some time, will probably be built next year.

EL PASO & SOUTHWESTERN.—An officer is quoted as saying that construction work will be started soon on a branch from Whitewater, N. Mex., to the Burro mountains to provide an outlet for the mines of the Burro mountain district.

FORT SMITH, SUBIACO & EASTERN.—This company, which operates a line from Paris, Ark., east via Subiaco to Scranton, 14 miles, will build an extension, it is said, from Scranton east to Dardanelle, about 25 miles.

KANAWHA & MICHIGAN.—According to press reports this company is making plans to build under the name of the Middleport & Northwestern, a branch line from Middleport, Ohio, northeast to Marietta, about 50 miles.

LEHIGH & NEW ENGLAND.—An officer writes regarding the report that a contract has been given to the Reed Construction Company, to build a five mile spur line south to Bath, Pa., that the company is about ready to let a contract to build from Snyder, Pa., to Catasaqua. The work on this five mile line includes handling about 160,000 cu. yds. (May 16, p. 1115.)

LEHIGH VALLEY.—A contract has been given to the John F. Dolan Construction Company, New York, to build the extension of the Seneca Falls branch from Seneca Falls, N. Y., east to Cayuga Junction. (April 25, p. 974.)

MERIDIAN & MEMPHIS.—An officer writes that this road is now in operation from Meridian, Miss., northwest to a point about 22 miles from Meridian, and that the line through to Union, in all 32 miles, will probably be put in operation about the middle of June. (March 14, p. 529.)

MIAMI & SOUTH FLORIDA.—Application has been made for a charter in Florida, it is said, to build from Palm Beach, Fla., south via Miami, and Homestead to Detroit, about 100 miles. The company will have a capital of $500,000 and headquarters at Miami. H. C. Roome, president.

MIDDLEPORT & NORTHWESTERN (Electric).—Incorporated in Ohio, with headquarters at Columbus, to build an electric line via Meigs, Athens and Washington counties to Marietta. The incorporators include D. N. Postlewaite and J. C. Nickert.

NEW YORK SUBWAYS.—The New York Public Service Commission, First district, has asked for bids on June 24, for the

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construction of section No. 4 of the Broadway-Fourth Avenue rapid transit railroad. This line will be operated by the New York Municipal Railway Corporation (Brooklyn Rapid Transit) under the Dual System contracts. The Broadway subway is now under construction from Trinity Place and Morris street, in the borough of Manhattan, to a point in Broadway midway between Houston and Bleecker streets. Section No. 4 extends from this point north under Broadway to a point 390 ft. north of the southerly line of Fourteenth street. It will be a four-track subway, and the section includes a local station at Eighth street and half of the express station at Union Square. Bids are wanted for the construction only and are not to include the laying of tracks, or the interior work in stations.

The Northeastern Construction Company, New York, will probably be given a contract to build a 400-ft. subway from the Fourth avenue subway, Brooklyn, as now completed, to the lower track level of the Manhattan bridge at its hid of $596,400.

OKLAHOMA, NEW MEXICO & PACIFIC.—It is understood that contracts are to be let soon to build from Ardmore, Okla., west via Lone Grove, and Hewitt to Waurika, thence southwest to Byers, Tex., about 70 miles. J. L. Hamon, president, Lawton, Okla. (February 21, p. 373.)

ORANGE-NORTHEASTERN.—An officer writes that contracts for building the first ten miles from Natchitoches, La., south were to be let on May 28. The plans call for building from Orange, Tex., in a general northeast direction along the east side of the Sabine river to Merryville, La., thence via Leesville to Natchitoches. J. Tansy, St. Louis, Mo., has been given a contract for some of the work, which calls for handling about 25,000 cu. yds. to the mile. The maximum grades will be 1 per cent. and the maximum curvature 3 degrees. The company has taken over the Natchitoches Railway, a lumber road, also the Lutcher Moore lumber road, and these lines will form part of the system. J. Alphonse Prudhomme, president, and A. R. Carver, chief engineer, Natchitoches, La. (March 21, p. 692.)

ROME & GADSDEN.—This company will ask for charter in Alabama to build from Gadsden, Ala., northeast to Rome, Ga., about 60 miles. J. B. Wadsworth, president, J. M. Garvin, first vice-president, Rock Run, Ala.; J. N. King, second vice-president, Rome; J. P. Smith, treasurer, Center, and L. S. Daniels, secretary, Rome, Ga.

TAMPA & GULF COAST.—An officer is quoted as saying that $750,000 of bonds have been sold and the proceeds will be used for building an extension to St. Petersburg, Fla., and to other west coast towns. Surveys have been under way for some time, and it is understood that construction will be started at once.

TEXAS, OKLAHOMA & EASTERN.—See De Queen & Eastern.

RAILWAY STRUCTURES.

ARDENDALE, ONT.—See Norwood.

CLEVELAND, OHIO.—The Pennsylvania Lines have received bids for moving the old Euclid avenue station and reconstructing it with a number of additions.

LEXINGTON, KY.—An officer of the Louisville & Nashville writes that some of the bridges are now being reconstructed between Lexington and Jackson, on the Lexington & Eastern. The railway company will build the masonry with its own forces, and contracts for the superstructures have been let to the Louisville Bridge & Iron Company.

NORWOOD, ONT.—The Railway Commissioners of Canada have authorized the Canadian Pacific to construct a bridge on the Toronto subdivision, Ontario division near Norwood station; also a bridge on the Havelock subdivision of the Ontario division near Ardendale station.

ST. LOUIS, MO.—The Terminal Railroad Association of St. Louis has awarded a contract to the St. Louis Unit Construction Company for the erection of a $60,000 station building at Third street and Washington avenue.

SPRINGFIELD, MASS.—The Boston & Albany will put up an addition to its freight house 60 ft. long, the new part to be two stories high and to be fitted up for the offices.

Railway Financial News

BOSTON & ALBANY.—The New York Public Service Commission has authorized this company to issue $3,637,000 bonds, to be guaranteed principal and interest by the New York Central & Hudson River, to refund a like amount of bonds maturing October 1, 1913.

BOSTON & MAINE.—In addition to the $12,000,000 one-year 6 per cent. notes mentioned as having been sold to J. P. Morgan & Co., New York, last week, the company has sold $5,000,000 of these notes, thus making $17,000,000 one-year 6 per cent. notes sold to J. P. Morgan & Co. in all. In a letter in regard to the additional $5,000,000 Boston & Maine notes President Mellen says that $2,500,000 of the proceeds will be used for payment to the New York, New Haven & Hartford for advances due about June 2, and the remainder will be used for improvements now under way which could not be discontinued without serious loss.

BROOKLYN RAPID TRANSIT.—A quarterly dividend of 1½ per cent. has been declared on the stock, thus placing it on a 6 per cent. annual basis, as compared with the former annual basis of 5 per cent.

CANADIAN PACIFIC.—Baring Brothers & Company, London, have sent a letter to holders of the first mortgage 5 per cent. bonds, due July 1, 1915, offering to redeem these bonds at 102 on June 25, and to pay on July 1 the July 1 coupon.

DENVER & SALT LAKE.—This company has increased its capital stock from $10,000,000 to $35,000,000.

DETROIT, TOLEDO & IRONTON.—Judge Sater, of the United States district court, has confirmed the sale made on April 17, of the Ohio Southern division of the Detroit, Toledo & Ironton for $1,550,000.

LARAMIE, HAHN'S PEAK & PACIFIC.—The bondholders' protective committee asks deposits of the first mortgage 6 per cent. bonds due July 1, 1929, under an agreement which provides that if the committee holds a majority of the $240,000 bonds outstanding, it may sell them as a block for not less than 95, and also that the committee shall prepare a plan of reorganization.

LEWISBURG & TYRONE.—This property, which includes about 85 miles of road, is to be sold on June 16, under foreclosure of the mortgage securing $488,000 4½ per cent. bonds, all of which are owned by the Pennsylvania Railroad.

MISSOURI, KANSAS & TEXAS.—White, Weld & Company, and Brown Brothers & Co., both of New York, are offering $1,-900,000 Missouri, Kansas & Texas equipment trust 5 per cent. notes of June 1, 1913, maturing semi-annually to June 1, 1923, at prices to yield from 5½ per cent. on specific maturities December, 1914, to June, 1917, and 5½ per cent. on equal amounts of each maturity or on specific maturities December, 1917, to 1923. These notes are secured on new standard equipment costing $2,376,000, 20 per cent. of the purchase price having been paid by the railway company in cash.

NEW YORK CENTRAL & HUDSON RIVER.—See Boston & Albany.

NEW YORK, NEW HAVEN & HARTFORD.—See Boston & Maine.

PITTSBURGH & SHAWMUT.—This company is to pay off $750,000 of the $3,250,000 equipment and first lien collateral trust 6 per cent. notes, due June 1, 1913, and arrangements have been made with the Guaranty Trust Company and Rhodes & Co. to extend the remaining $2,500,000 to June 1, 1914, at 6 per cent., the collateral remaining the same. The bankers are offering the new issue subject to the option of the holders of the old issue for extension at 99½, yielding 6½ per cent. Holders of the old issue who agree to an extension will receive $7.50 in cash for each $1,000 note extended.

ST. LOUIS SOUTHWESTERN.—Stockholders of the Texas company are to vote on the question of buying the property and franchises of the Stephenville, North & South Texas under the law recently passed by the legislature permitting the merger of certain roads in Texas.

SOUTHERN PACIFIC.—The attorney-general of the United States has stated definitely that unless the Central Pacific is separated from the Southern Pacific he will bring another suit to compel this action.

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Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico $6.00
Canada 6.00
Foreign Countries (excepting daily editions) 8.00
Single Copies ..... 15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,150 copies were printed; that of these 8,100 copies, 6,600 were mailed to regular paid subscribers and 360 were provided for counter and news companies' sales; that the total copies printed this year to date were 196,400—an average of 8,026 copies a week.

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*Illustrated.

IT now seems certain that the full crew law passed by the Missouri legislature at its last session will not go into effect until the people of the state have had a chance to pass on it. As already noted in these columns, the railways have been circulating a petition asking for a referendum vote on the measure; and they have now secured the number of signatures requisite to having it put on the referendum ballot. Save for this appeal to the people the law would have gone into effect on June 24. The referendum vote will not take place until October, 1914, and the initiative petition renders it inoperative until after that time. The Missouri law applies to crews of both passenger and freight trains. It prohibits any railway from operating any passenger, mail or express train wholly within the state that is not equipped with a crew consisting of at least an engineer, fireman, conductor and flagman, or to operate any passenger, mail or express train of six cars or more that is not equipped with a crew consisting of at least an engineer, fireman, conductor, flagman and brakeman. As to freight trains, it prohibits the operation of any train composed of less than 40 cars without a crew consisting of at least an engineer, fireman, conductor, flagman and brakeman, or any train composed of 40 cars or more that does not have behind the engine a crew consisting of at least a conductor, flagman and two brakemen. Freight trains doing local switching, or loading and unloading local freight, must also have crews behind the engine consisting of at least a conductor, flagman and two brakemen. The law does not apply to railways less than 45 miles long, or to relief or wrecking trains, nor is it operative during strikes of men in train service. The most expensive provision, of course, is that requiring crews including at least a flagman and two brakemen on all trains 40 or more cars long. The railways have estimated that compliance with the act would increase their annual operating expenses more than $500,000, this estimate being based on the number of trains on which they would have to put an additional brakeman and on the average wages paid to this class of employees. The referendum law gives ample time for full discussion of the important questions raised by such legislation as this.

THE first comprehensive telpherage system installed in this country for handling L. C. L. merchandise at freight houses was that which has been in use in the Missouri, Kansas & Texas double-deck freight house at St. Louis, Mo., since 1911. The management has now decided to take out this system and substitute for it a trucking system, using elevators. Without in any way suggesting agreement or disagreement with the reasons which have influenced the M. K. & T. in their decision to abandon the telpherage system, it is interesting to enumerate the principal of these reasons. Of course, the immediate cause was the fact that the expenses since the establishment of the telpherage system, which was described at some length in the *Railway Age Gazette* of June 23, 1911, page 1647, had been steadily mounting until at present they are considerably over 50 cents a ton. This is exclusive of interest charges on the plant itself. The reasons given for these increases in costs are first, that it was never feasible to carry out the scheme for which the telpherage system was originally designed. This scheme was that the telphers should pick up a loaded truck on one platform and move it to any other platform in the building. It was found absolutely impossible to operate the telphers in this way, where the weights of loads and character of merchandise vary so widely, and where the time consumed in loading and unloading trucks was so different for different characters of loads. The telphers got in each other's way and the congestion and confusion was fatal to quick and accurate handling. The telphers at the present time are being operated parallel to the platform only and after the freight is lowered through the hatch ways to the lower floor of the freight house it has to be trucked from there to the proper car door, which may be on some other platform. This, of course, comes very nearly adding the expense of operating the telpherage system to the expense that would be incurred in any case in trucking the freight. This impracticability of using the telpherage system in the way in which it was intended would probably in itself have been sufficient to lead to the decision to abandon it.

A SECOND objection has been found. In theory it would seem that the larger the truck load that could be handled the greater the economy, and under the telpherage system a large two-ton truck on four wheels, setting up 4 to 6 in. above the floor, is used. In practice the time consumed in loading from the platform on to this truck all sorts of articles, some so heavy as to be impossible of loading by one man, and unloading these same articles again outside the car—for it was found that

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in properly loading the car the large truck could not be wheeled into it after the first few bundles of freight had been stowed—was so great as to more than offset the theoretical economy of the larger truck. The first difficulty, that of the design, may, of course, be simply due to the design of the particular plant installed at St. Louis and may not be a valid reason against the adoption of telpherage systems by railroads at other or differently designed freight houses. The second objection is more nearly fundamental. The experience of one set of men in charge of one particular telpherage system is by no means enough on which to base a conclusive opinion as to the possibilities of the telpherage system, but, as was previously pointed out, it is interesting. The system which is to replace the telpherage system will be that of hand trucking, with elevators carrying the loaded trucks from the upper floor to the lower one where the cars are loaded. It is believed from experience that a man with a hand truck can handle nearly all of the varieties of packages which are sent in L. C. L. lots. The idea is to eliminate so far as possible all waiting by the truckers. A man will pick up his two-wheel hand truck load, take it to the proper elevator, run the truck on to the elevator, pick up an empty truck and go back for another load. The elevators are designed for four hand trucks and the trucker on the lower level will take a loaded truck from the elevator, run it to the car door or into the car, drop it and pick up an empty truck and run it back on to an elevator.

BEGINNING June 23 the number of express trains daily, except Sunday, each way between New York and Boston will be increased to 18, the Boston & Maine having announced that its new Bondsville route will be opened on that day, with two through trains, starting from both termini at about 11 a. m. and 11:30 p. m. Ware, Barre, Oakdale and Hudson—is any New York traveler able to locate these towns accurately on the map?—will then become express stations. Also Waltham, the home of J. O. Fagan. The trains will run through in six hours, the distance being about the same as via Worcester or via New London (232 to 234 miles). The 18 trains will start from New York at 8:00, 8:14, 9:15, 10:00, 10:02, 10:50, 12:00, 1:00, 1:02, 2:00, 3:00, 4:00, 5:00, 5:33, 11:10, 11:33, 12:00 midnight, and 1 a. m. The "Air Line" through Middletown, which once was exploited as the *only* rational route for New York-Boston travelers who really desired to properly economize their time, must now feel exceedingly small and disheartened. Not one of the 18 trains goes through Middletown. Lines running through large cities, with the facilities of double track, possess advantages which outweigh a matter of 20 miles in distance as surely as a ton of coal outweighs a mile of telegraph wire. Providence, New London, Hartford, Springfield and Worcester have long since secured these advantages. The smaller places above named will now get the advantage of through trains, not by their bigness, but by the bigness of Mr. Mellen's plans for utilizing the Central Massachusetts division of the Boston & Maine. He proposes also to run through cars three times a day from Northampton south through Holyoke, 18 miles to Springfield and thence east to Boston, and vice versa, so that citizens of Northampton or Holyoke who have the hardihood to use the Boston & Albany will, no doubt, henceforth be hard to find. An old-time phrase is brought to mind in the declaration of Vice-President Campbell, of the New Haven road, that the Boston & Albany will have to yield that part of the traffic between Springfield and Boston "to which the Boston & Maine is fairly entitled." It will be "entitled," of course, to all it can get, by giving good service and low prices. However, old style methods of securing "title" to traffic have been largely done away with, and the coming strife will be very dignified and orderly, no doubt. The new link from Bondsville to Springfield, 16 miles long, is termed by Mr. Mellen a "bridge"; its local traffic will be too small to count. The line has cost $4,000,000, or $250,000 a mile; and even at that the trains will have to use about two miles of the Boston & Albany main line at Springfield.

SOME DISPUTED POINTS IN RAILWAY VALUATION.

4—Intangible Values.

UNDOUBTEDLY the most difficult items to appraise properly are those intangible elements commonly grouped under the term, "going value." Much attention has been paid to these items in the valuation of public utility properties, and the courts have often decided that a company is entitled to a valuation that shall include an allowance based on the fact of its existence as a going concern. In railway valuations the practice with reference to intangible values has varied, largely because of the different purposes of the valuations and also because of the difficulty in arriving at these values. The organization for the soliciting and transportation of business gives an old line a market value in excess of one of the same physical value which has just been completed. Again, the strategic position of the Pennsylvania in Pittsburgh, of the New York Central in New York City, of the Burlington at several large centers of the other Hill lines at Seattle, is reflected in the earnings of these roads. Many other considerations of a similar nature might be enumerated.

In the Michigan valuation, made in 1900 for the purpose of taxation, $35,814,043 was allowed for the non-physical or intangible values. This figure was arrived at by capitalizing at 7 per cent. the average surplus for the period of ten years next preceding the valuation, which was equivalent to a net income of 6 per cent. after the payment of a tax of 1 per cent. In other words, this valuation took into consideration the effect of the earning power of a road upon its market value. In Wisconsin no allowance was made for intangible values, although subsequently in the hearing in the two-cent fare cases, the Railroad Commission conceded that these values existed and should be taken into consideration in deciding upon the reasonableness of rates.

In Washington, this subject was considered at length and interesting conclusions were drawn. The density of population tributary to the line; the density, class and permanency of traffic; the facilities for doing business; the grades and curvature; fuel supply and other conditions affecting operating expenses—were all considered. In the cases of the Northern Pacific and Great Northern in Washington, it was shown that the business would naturally tend to increase and the market values were estimated at about 1 per cent. above the cost of reproduction in the case of the Northern Pacific, and between the cost of reproduction and the depreciated value in the case of the Great Northern. The market value of the Oregon Railroad & Navigation Company was likewise estimated at more than 20 per cent. in excess of the cost of reproduction. On the other hand, the Bellingham Bay & Great Eastern being dependent for traffic almost entirely upon forest products, one-half of which had been removed at the time of the valuation, the market value of this road was estimated at slightly less than half its cost of reproduction new.

In New Jersey the tax law under which the valuation was made provided that all intangible elements, including the increased cost of land when used for railway purposes, should be valued in one group. The method adopted was similar to that used in Michigan, the surplus being capitalized at 7.896 per cent. (6 per cent. plus a tax rate of 1.896 per cent.). The total intangible value for all roads was fixed at $75,841,600, or 20 per cent. of the total valuation. As this amount was practically equivalent to the amount deducted for depreciation, it left the present value, including intangible values, practically equal to the cost of reproduction new or about the same result as was arrived at in Michigan.

On the other hand, in the Minnesota valuation, and in the Massachusetts valuation of the New Haven, no cognizance was taken of intangible values. In the Massachusetts valuation, however, Professor Swain discussed the value to the New Haven of its perpetual trackage rights over the New York Central & Hudson River from Woodlawn into the Grand Central Terminal, and placed this at $6,000,000. For the purpose of his valuation,

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however, which was to justify the securities of the New Haven, this item was omitted from the totals, as no capital had been issued against these trackage rights.

THE ST. LOUIS & SAN FRANCISCO AND ITS BANKERS.

THE rather sudden creation of the receivership of the St. Louis & San Francisco brings up some rather interesting questions in regard to the relations between railroad companies and their bankers. The policy of the various railroad companies in this respect has differed widely. The New York Central & Hudson River, when there was a rumor that it was about to change its bankers a few years ago, made the positive statement that J. P. Morgan & Co. had been and would continue to be its sole bankers. The Southern Railway likewise apparently has the fixed policy of selling its securities through Morgan & Company. On the other hand, the Pennsylvania Railroad has not hesitated in the past to award an issue of new securities to any strong banking syndicate which would pay the price, which the Pennsylvania directors considered fair. E. H. Harriman at one time, objecting to the price which Kuhn, Loeb & Company asked for their services as underwriters in the sale of Union Pacific securities, sold these securities directly to bankers and investors in Europe and the United States.

Some of the main facts in the history of the St. Louis & San Francisco's banking relations in the last two and a half years, insofar as it has been made public, are substantially as follows: In January, 1911, Speyer & Co., New York, bought from the railroad $7,000,000 15-20 general lien 5 per cent. bonds, offering them to the public at 87, yielding the investor 6¼ per cent. Before the end of the month it was announced that the bankers had disposed of all of their holdings. In April of the same year Speyer & Company sold 35,000,000 francs ($7,000,000) of these 15-20 year general lien 5's to French bankers; the price which the company received for its bonds not being made public, but the offering price in France to private investors being considerably higher than 87, the offering price of the bonds sold in this country in January. Later in April, 1911, the company paid off $4,000,000 4½ per cent. notes, and during that same month a syndicate was formed, headed by William Salomon & Co., New York, and G. H. Walker & Co., St. Louis, Mo., to underwrite an issue of New Orleans, Texas & Mexico division first 5 per cent. bonds, of which $5,000,000 were taken by these bankers at this time. In May, 1911, the company sold $2,500,000 2-year 5 per cent. notes dated June 1, 1911, to F. S. Moseley & Co., New York and Boston, which notes were offered to the public on a basis to yield 5½ per cent., and which notes are the ones which the railroad company has now found itself unable to refund. In July, 1911, the railroad company called for payment $4,000,000 notes callable in 1911, but not due until 1912. In August, 1911, Speyer & Company bought $3,000,000 equipment trust notes, the selling price of which was not announced at the time. In September, 1911, the Guaranty Trust Company bought and offered to the public at par $1,776,000 5 per cent. equipment notes, and later in the same month the "Frisco Refrigerator Line" was formed, which bought a certain amount of equipment and presumably issued securities through some bankers to pay for this.

In October, 1911, it was announced that the Frisco had acquired a part interest in the New Orleans, Mobile & Chicago, and a little later it was announced that a trackage agreement for which the Frisco had been negotiating with the Missouri Pacific and the St. Louis, Iron Mountain & Southern had fallen through, and that a trackage agreement had been made with the Louisville & Nashville, which had taken an interest in the New Orleans, Mobile & Chicago. In December, 1911, Speyer & Company bought from the railroad and offered to the public at 89, yielding 6½ per cent., $2,553,000 15-20 year general lien 5 per cent. bonds. Later in the same month the railroad company announced that it intended to build its own line from Port Barre, La., to a connection with its New Orleans-Houston line, apparently in consequence of the failure previously mentioned to make trackage arrangements with the Gould lines. In January, 1912, $3,122,000 15-20 year 5 per cent. bonds were listed on the New York Stock Exchange, and additional bonds were sold in France. In April, 1912, William Salomon & Co., and G. H. Walker & Co., offered at 95 $12,300,000 New Orleans, Texas & Mexico division first 5's, and at this time it was announced that in all this syndicate had bought $28,300,000 of these bonds, the railroad company at that time paying off $8,000,000 notes. In May Speyer & Company sold $3,000,000 additional 15-20 year 5's in France, and at that time it was announced that in all 100,000,000 francs ($20,000,000) of these bonds had been sold in France. It was in May that the decision of the lower courts was confirmed deciding that the railroad company could not issue certain of its bonds for general purposes which had been set aside for refunding purposes. In August Speyer & Company bought $2,250,000 "Frisco Construction Company" 5 per cent. equipment notes, and in September the Salomon-Walker syndicate took from the company $2,600,000 2-year 6 per cent. notes secured by New Orleans, Texas & Mexico bonds. In November the Salomon-Walker syndicate offered to the public at par $1,000,000 Quanah, Acme & Pacific 6 per cent. bonds guaranteed as to interest by the Frisco, and also carrying a guarantee of redemption by July 15, 1921, at 105 by the Frisco.

It is sometimes true that a railroad company suffers in its operation through interference in management by its bankers. It is also sometimes true that a railroad company has to pay a price which its directors may consider too high if it deals always with one banking house. It may quite possibly have to pay a somewhat higher price to this banking house if it offered its securities for competitive bidding. On the other hand, railroad securities have never, so far in the history of the United States, been sold successfully on a large scale and over an extended period without the co-operation of banking interests. There is another fact which has to be taken into consideration. If one banking house is the recognized agent through which a railroad company is to sell its securities, the credit of that railroad company becomes of vital interest to the bankers. This has its drawbacks, as has already been mentioned, when it leads to interference with the management. In times of stress, however, when money is hard to obtain, the fact that the bankers have sold to their clients the securities of a road of which they are the recognized agents makes it morally imperative for these bankers, insofar as they can, to protect their clients, and in so doing necessarily tide over, if possible, the railroad company.

Here is where the difficulty lay in the St. Louis & San Francisco case. Speyer & Company claimed that they were perfectly willing to help further finance the Frisco, but that they were not willing to bear the entire burden. It is significant that the notes which the company was unable to refund were an issue sold to an outside banking firm. The bankers' first duty, of course, is to their customers who have trusted in their judgment in making their investments. It is quite possible that in the case of the St. Louis & San Francisco the bankers believed that the best interests of their clients could only be preserved through permitting the road to go into the hands of a receiver and so disentangle itself from certain of its obligations, such as the guarantee of dividends on the C. & E. I. stock. Of course, other explanations of the rather sudden receivership can be offered. One thing, however, appears to be clear: the interests of all parties can best be conserved by a continuance of the effective and economical operation of the railroad. In the interests of the security holders and of the public served by the Frisco, no financial disagreements ought to be permitted to interfere in any way with the best possible operation of the railroad as a railroad.

Through an unfortunate inadvertence the phrase "unlike the receivership of the Missouri Pacific," etc., was used in the editorial in the *Railway Age Gazette* of May 30, discussing the receivership of the St. Louis & San Francisco. Of course no receiver has been appointed for the Missouri Pacific, and the ref-

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erence to it in this connection was a complete mistake which we keenly regret.

THE PRESS AND PROPOSED ADVANCES IN FREIGHT RATES.

THE tone adopted by the newspapers in discussing the proposed advance of 5 per cent. in freight rates in eastern territory is a striking and conclusive proof of a great change in the attitude of the public toward the railways which has occurred within the last few years. When the railways sought to advance their rates in 1908, and in 1910, they were severely criticised by the press both for this and for the general policy of many of their managements. The petition of the eastern roads for an advance in rates which has just been filed with the Interstate Commerce Commission has been received in an entirely different spirit. Newspapers which three years ago denounced the railway managements for faults of omission and commission, now frankly concede that in recent years most of the managements have been doing their best to operate economically, and at the same time meet the reasonable demands of the public. Publications which then flatly opposed any advance in rates as being unnecessary and unwarranted, now grant that the floods and other adverse natural conditions from which the roads have suffered, the general advances in wages that they have had to make, the rise that has occurred in the rate of interest that they must pay, the decline that has come in the value of their securities, and the brake that has been put on new construction and permanent improvements, have changed the entire situation and made the petitions for higher rates appear much more reasonable than did the similar petitions formerly presented. The following quotations are typical of what the newspapers are saying:

Philadelphia *Public Ledger:* "When the Interstate Commerce Commission takes up this freight rate request it is bound by every instinct of national welfare to consider it in the broadest possible way. The pastime of bullying railroads has ceased to be popular, because it is too dangerous. The commission can do the country a very exalted service by dealing justly with the railroads without any unnecessary delay."

Chicago *Tribune:* "The resort of the Frisco and the Chicago & Eastern Illinois railroads to receivership, while it is not to be interpreted as significant of railway conditions in general, emphasizes the heavy pressure under which railway management has been raising a voice of protest and warning. . . . This has had, thus far, a less serious effect upon the general business situation than might have been expected, but it is now more important to consider whether the country's vital interest in ample and efficient transportation does not demand some prompt relief of conditions making for the return economies referred to. This relief, it would seem, must come if at all in the form of a reasonable but sufficient advance of freight rates. When this demand was made by the railroads two years ago the public opposed it because it was felt that the railroads had not made a case and did not come into court, as it were, with clean hands. . . . Since that time the railroads have placed themselves in a rather better position. They have by no means removed all the grounds for fair objection to their finance, their administration or their politics. But reforms have been instituted and economies achieved and there has been a desirable and profitable toning up of policy from the point of view of the public service."

Chicago *Inter Ocean:* "The most obvious remedy for the relief of the railroads is an increase in their rate charges. When this increase was proposed by the railroads a few years ago there was a general outcry in opposition. Has not the time arrived when it is plain that a small increase in rates will avert more serious conditions?"

Saturday Evening Post: "For three years railroad expenses have been quite steadily increasing in a ratio greater than the increase in revenue. Advance in wages recently secured by firemen and engineers will, of course, still further augment expenses. Other wage advances will be demanded. One of the strongest railroad bond issues ever brought out in this country was offered to the public only last month at better than 4½ per cent., and only a portion of it was taken. Roads of first class financial standing are paying 5½ and 6 per cent. on short-term notes for capital to meet their requirements. Weak lines are paying pawnbrokers' rates. There is no reason to presume that labor, supplies and capital will cost less. The presumption is the other way. We do not think it should be the policy of the government that the roads are never under any circumstances to be granted an increase in rates. They are entitled to an impartial judgment on the facts, and we have no doubt they will get it."

New York *Evening Mail:* "It is not merely the falling prices of railroad securities in the stock market that signal the danger of the present iron policy of restricting railroad rates. The refusal of the public both here and in Europe, to invest money in new bonds or other securities of the foremost and best-managed American railroads, save at almost prohibitive prices, shows that we have passed the line of prudence and reason in restricting the profits of our transportation systems."

Philadelphia *Record:* "The interests of the railroads and the public are identical, for one cannot suffer serious losses without the other being greatly affected. The present situation calls for fair and just treatment of the railroads if future trouble is to be avoided."

New York *Tribune:* "The public is interested not only in seeing that the railroad workers receive a living wage. It is interested even more vitally in seeing that the railroads receive a living wage. The railroads must earn enough for their own upkeep. They must earn enough to have a surplus to put into non-dividend paying improvements, for the public demands them. They must earn enough to grow as the country grows."

New York *American:* "The granting of the eastern railroads' application for (5 per cent.) higher freight rates would have immediate and marked effect in restoring confidence in railroad securities. Not a few railroad bonds are now at panic prices, while stocks in several prominent instances are at the lowest levels in recent years. The costly floods and the adoption of higher wage scales have aggravated the situation."

New York *Herald:* "Unless they are promptly permitted to increase their charges they cannot continue to supply efficient service even on the present basis, and are assuredly unable at this time to comply with the unreasonable demands of employees, involving further enormous increase of operating cost."

Philadelphia *Bulletin:* "It is to be recognized that the general railroad business of the country is not in a condition to stand further increases of expenses without being granted a right to additional earning power."

Boston *Post:* "The public will have to chip in a bit for the increased pay to employees, and we believe it is perfectly willing to."

St. Joseph (Mo.) *Gazette:* "Restrictive conditions have been overplayed in some states. Railroad expansion is most completely at a standstill. Let us take stock of the results of the restrictive and hampering legislation we have subjected the railroads to for a generation, and see if it is not barely possible that we have overdone it."

Perth Amboy (N. J.) *Evening News:* "It is not surprising that the railroads have announced their intention of asking the Interstate Commerce Commission for the right to increase rates, and we believe the public will sanction granting the same."

Springfield (Mass.) *Republican:* "Much has been made of the claim that greater efficiency in running railroads would increase their revenues, but unless we are to assume the grossest kind of laxness hitherto, this alone would not produce earnings sufficient for the emergency. We cannot be justified in regulating railroads to death. The railroads are likely to find the Interstate Commerce Commission much more favorably disposed than once toward some measure of relief."

Dallas (Tex.) *News:* "The argument which the railroads make is pretty well linked together, and the links, to the superficial view, at least, appear to be made out of something like flawless metal. It is for the commission to determine whether they are or not. At least they make out good enough prima facie case to entitle their request to deliberate and unbiased consideration."

The change in the attitude of the press reflects the change that has taken place in the attitude of the public. The change in the attitude of the public has been brought about, first, by more circumspect and efficient management of railways, and, second, by the policy followed by the railways in recent years of frankly and squarely meeting in public discussion every issue affecting them that has been raised. As the Chicago *Tribune* says, "the case for the railroads has been pressed through legitimate publicity, and public opinion unquestionably is more favorable than it has been for many years." This more favorable attitude on the part of the public could not have been brought about without full and earnest presentation and defense of the railways' case to the public; but it is also emphatically true that it could not have been brought about if the railways had not had a good case to present and defend; and they had so good a case chiefly because their managements have been doing in recent years very few things that invited just criticism.

NEW BOOKS.

Principles of Irrigation Engineering. By Frederick H. Newell and Daniel W. Murphy. Size 6 in. x 9 in., cloth binding, 293 pages, 16 plates and 54 figs. Published by McGraw-Hill Book Co., New York. Price $3.

The authors of "Principles of Irrigation Engineering" are respectively the director and engineer in charge of drainage of the United States Reclamation Service, which stamps their writing with a degree of authority. The book is intended to cover not only the construction and operation of irrigation works, but the broader question of the feasibility of constructing such systems. It is designed to interest the statesman concerned with questions of public welfare and the capitalist seeking an investment, as well as the engineer who is called upon to plan the engineering work

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THE AUTOMATIC TRAIN STOP PROBLEM.*

Exposition of the Difficulties Encountered in Adapting Automatic Stops to Miscellaneous Railroad Service.

By A. H. Rudd,
Signal Engineer, Pennsylvania Railroad.

Automatic stops are not a "cure-all" for the dangerous features of railroad operation. They will not prevent derailments due to failures in rolling stock, track or bridges, or to excessive speed, washouts or landslides. . . . . They *may* prevent collisions and excessive speed over short crossovers. While some automatic-stop systems have indicators in the engine cabs, none gives indications for diverging routes. Should the apparatus fail, the engineman would be without any signal system until repairs were made, probably at the *end of his run*, unless the engine were immediately side-tracked as disabled and another substituted.

It follows, therefore, that, for safe operation, none of our present safeguards may be abandoned. We cannot save in the maintenance of track or structures, reduce our policing nor relax our vigilance in any degree. Our men must still be keyed up to watch their track and signals. We can effect no saving in cash or brains. The automatic stop must, if installed, be used solely as an adjunct to our present systems. The engine runner should be constantly alert and should watch his track for obstructions which cannot be anticipated by advance information. A [visual] cab signal constantly taking his attention from the outside observation is not only useless, but a positive detriment. The engineman is not an automaton and the installation of anything tending to lessen his feeling of responsibility would be most unwise, to put it mildly.

Cab signals should not be used either with or without automatic stops. In order to get the safest and best operating results the handling of the train must be left absolutely and entirely with the engineer as long as he properly controls it. He must know that it is so left to him, but that any lapse on his part will be checked and discipline imposed; that the automatic stop is not to do his work for him, but, like the smashboard and derail, is provided as an additional efficiency test. The safe handling of air brakes requires considerable skill; their frequent application by mechanical means not under control of the engineman would be very detrimental, causing discomfort to passengers and possibly serious freight wrecks. The automatic stop should be inoperative as long as the engineman properly functions. . . . . .

For the past six months the Pennsylvania Railroad reports show 99.74 per cent. efficiency in observing fixed signals at stop. The percentage of *accidents* resulting from the twenty-six-one-hundredths of one per cent. of failure to observe stop signals is not available. The disregard of a stop signal does not in itself result in accident; in most cases, no disaster follows. It is readily seen that such accidents constitute a small proportion of our totals.

On the Pennsylvania Railroad over $4,500,000 has been appropriated for construction and maintenance of signals in 1913. Of this appropriation, nearly $3,000,000 is for new work, which would be required even if automatic stops were installed, and similar sums will be required for a long term of years; though the road is more advanced than the majority.

P. J. Simmen has published a study of the causes of train accidents as reported by the Interstate Commerce Commission, in which he says that 64.8 per cent were preventable by a complete signal system, assuming of course that such system includes an automatic stop. What part of this percentage would the stop *per se* have prevented which would not have been avoided by the block system and other necessary signals, assuming, of course, that the stop was always effective? We can only guess! But one point stands out glaringly—that, in 4½ years, with all the signals in use in this great country, only 46 accidents are shown to have resulted from disregard of semaphore signals at stop (and some of these may have been dwarf signals for slow movements), and one to "dead engineer," a total of 47 or 8.4 per cent., while the balance of the 64.8 per cent. or 56.4 per cent. would have been avoided by the installation of fixed signals *which are needed* under any conditions; less, of course, whatever percentage of these new signals might have been over-run. Were all these 46 signals which were over-run properly located? Were they provided with distant signals? We know some were not. If the fixed signal system were complete, would they have been over-run? We might speculate indefinitely. . . . Not over nine per cent. of the big accidents which attract so much attention *might* be prevented by automatic stops, but if the signal system were complete and efficiency tests were regularly and adequately carried on, 55 per cent. of these accidents would be eliminated without the use of automatic stops. In fact, taking the Pennsylvania Railroad record as a criterion, the figures would be nearer 60 per cent.; it being acknowledged that 35 per cent. are not preventable by any signal system. And it should be remembered that a stop will not prevent an accident caused by a train, after properly stopping or being automatically stopped, speeding up and passing the next signal at too great speed.

An automatic stop cannot be located at the distant signal or between the distant and the home, for, if an engineman has obeyed the distant signal and is approaching the home prepared to stop, he is doing his duty and should not be interfered with. It must, therefore, be located at the home signal, but must be so located that, if a train passes it at highest speed, it may be stopped before it has reached the danger point, preferably with a service application. The automatic stop therefore must be located at a stop signal at least 4,000 ft. from another stop signal placed at the danger point.

If a movement is to be made over a short crossover, the brake must, in ordinary operation, be applied 4,000 ft. away and again at the crossover and the stop released in each case. Long crossovers must be handled as now, or else stops, as indicated above, must be made whenever movements are to be made diverging from the main straight route. At railroad grade crossings one train must be braked 4,000 ft. away if another train is to cross; and the same is true at junctions. This would be particularly burdensome where they were scheduled to connect for the transfer of passengers. In manual block territory, additional power-operated signals would have to be provided at each interlocking and block station.

In automatic territory the present rule is "stop and proceed." To continue such operation, means must be provided to enable engineemen to release after the stop has operated or to make it ineffective after a train has stopped according to rule. This device must be inaccessible to the engineman until train has stopped, as, otherwise, it might be used wrongfully. In fact, it might be well to require the co-operation of two men to release the brakes. This inaccessibility will impose delay at each stop and proceed signal, particularly onerous in congested districts; in many cases requiring additional tracks to handle passenger traffic promptly.

In the case of freight trains, the chance of pulling apart if brakes are released while trains are running at slow speed after heavy application is recognized. A stop should, therefore, be made and as the train line opened by the stop could not be closed for an appreciable length of time, the air would probably be entirely exhausted, so that the time required to pump up 80 or 90 cars must also be considered. Furthermore, the application of the emergency brake to a slow moving train, especially freight,

*From *The Signal Engineer*; abridged.

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might produce a more serious accident than if the train were not stopped; endangering not only the train so stopped, but those on adjoining tracks. Separate freight lines might be the cheapest and most satisfactory remedy.

In certain districts—for example, between Summit avenue, Jersey City, and Manhattan Transfer—we were forced to devise means by which electric trains could be operated at short intervals and close together while providing sufficient advance warning to stop heavy steam trains. This is accomplished by displaying four indications, viz., (1) "proceed," (2) "pass next signal at medium speed," (3) "prepare to stop at next signal" and (4) "stop and proceed." By this method information is given for three blocks in advance, but trains may be operated only a block apart. The introduction of automatic stops with two "stop" and one "caution" signal back of each train would, in the rush hours, reduce the capacity of this line to one-third of the existing arrangement. This would mean four additional tracks across the Meadows. These additional signals and tracks will not help at grade crossings and junctions nor in terminals—in fact, will give relief only for straight-away following movements; indeed, the introduction of automatic stops would require an entire rearrangement of existing signals at a tremendous cost.

Automatic stops are impracticable in large terminals and at busy junctions and crossings. While they might be used in congested districts approaching such points, the cost of additional tracks and signals must be added to the cost of installing the apparatus on the ground and equipping all locomotives. . . . Money available could be more advantageously expended on visual signals and other safeguards which are still needed and which would prevent more accidents than would automatic stops. It is, of course, impracticable to equip each car with a stopping device—detached cars would not be affected by its operation. Apparatus must be so arranged that the leading engine on entering the block will not apply the brakes on the second engine of a double header or on a pusher engine; and so that switching movements will not be affected by it. . . .

Stops using electric contacting devices are not reliable, although they may have satisfactorily met certain demonstrative tests, and no stop having contacting devices of any kind is desirable. There remain a few other types which may be but are not yet fully developed to meet steam road conditions. . . . It may be said that some of the automatic stops have been tested with perfect success during winter months. But the exact conditions that will throw the whole system out of operation may not occur in several winters. The difficulty in keeping trains moving during winter storms is great enough without having them stopped by wholesale failures of an automatic device.

The installations in our tunnels at New York, on the Manhattan Subways, etc., are successful, but simply because the exceptional conditions existing at these particular locations make the problem an easy one.

An automatic stop located at the proper point for fast trains would require slow trains to stop at an unnecessary distance from the danger point. Unnecessary stops of heavy freight trains, or stops far short of the points where stops are really necessary, have a serious effect on the operation of a busy road. It takes time to start such trains and get them up to speed. The problem with which many railroad men are struggling is to keep the slow freight trains moving rather than to get them stopped.

With an engine switching at the point where an automatic stop is located to stop trains moving toward a danger point some distance away, the conditions may be such that the stop must be "set" to stop any train that may approach; at the same time the stop should not interfere with the switching movements which do not dangerously approach that point. The stop must stop a train that might be wrecked at an open switch and not stop the train that is to go on the siding at that same switch; must stop a train that might collide with another and not stop an engine that has to be coupled to a train.

If any safeguard other than the expansion of the fixed-signal system is decided to be necessary, and the money can be obtained, an automatic stop *per se* should not be considered, but attempts should be made to develop a continuously controlled speed controller without contacting devices, if possible; so arranged as to leave the control of the train in the hands of the engineman until and unless he exceeds a safe speed. . . .

The sum and substance of the matter is that automatic stop devices must meet the test of approval by the judgment of practical railroad men, based on years of experience with actual railroad conditions and with appliances employing similar mechanism. . . . For the present any funds available should be devoted to the expansion and perfection of our existing block and interlocking systems, which must be provided in any event and which will eliminate the great majority of collisions; and then, if it is conclusively shown that improved discipline and pride on the part of locomotive engineers in their honorable profession such that they will, of their own accord, co-operate with the managements in their efforts to eliminate careless or incompetent men and make greater efforts to perform their duties more perfectly, all fail to produce the desired results, the general use of a speed controller should be required to check against the single kind of human failure, which is its only function.

Mr. Rudd by diagrams shows the extent to which the capacity of a railroad is decreased by introducing automatic stops and the necessary overlaps. With trains 500 ft. long, running straight away, under the automatic block system, at 60 miles an hour, and with signals spaced so as to give adequate braking distance (4,000 ft.) between the distant and the home signal, and allowing 500 ft. for the engineman to get a fair view of the distant signal the space between trains will be 9,730 ft. With automatic stops this will be increased to 13,730 ft. Running under caution signals at 20 miles an hour the space, under the present system is 4,705 ft.; with automatic stops it would be 8,705 ft. In these calculations the time allowed for a signal arm to move from one position to another is 7 seconds.

Proposed Line for Argentina.—Salvador Botey has applied to the government of the province of Santa Fe, Argentina, for a concession to build a railway from Rosario to Rufino.

Rival of the Railroads in 1832.—The subject of steam carriages on common roads is already beginning to attract great attention in this country and we are afraid will operate not a little to the disadvantage of our enterprising neighbors at Baltimore who are so entirely engrossed with railroads. The directors of the Fredericksburg and Potomac Creek Railroad Company have determined for the present, in view of this matter, merely to graduate and level their road and have sent to England to obtain a steam car to use on it. If this succeeds, a new era will have arrived, and railroads will be superseded almost entirely. Success, we say, to improvements of all kinds.—*Extract from the Alexandria Gazette, published in the American Railroad Journal of August 4, 1832.*

Proposed Russian Railway.—It is reported that the Committee for New Roads in St. Petersburg has decided to grant a concession for a railroad in the Caucasus from Borjom to Kars, with a branch line to Olti and a line to the village of Balkaya, and that its construction is practically assured. Since the plan has been approved by this committee it is said there will probably be no difficulty in obtaining approval of the other government departments, especially as the plan is favored by the high officials of the region in which the railway will be built, and by the ministry of war, the ministry of ways and communications, the ministry of finance and the ministry of commerce and industry. The majority of the members of the Imperial Duma are usually in favor of having the railways constructed by the government rather than by private enterprise, but since the Borjom-Kars railway will be built entirely by private capital (with a guarantee of the government for its revenue), the question of finances for its construction will not have to be submitted to the legislative departments.

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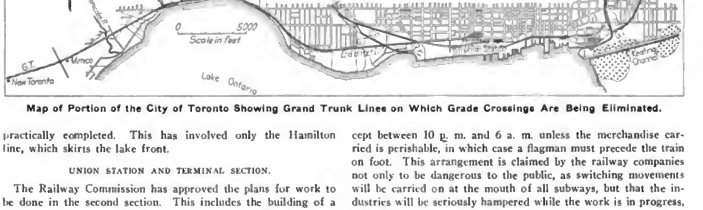
GRAND TRUNK GRADE SEPARATION IN TORONTO.

Highway Grade Crossings Are Being Eliminated and Plans Made for New Terminals Including Union Passenger Station.

Three lines of the Grand Trunk enter Toronto, Ont., from the west, converging west of the central portion of the city and running along the water front to the union station and terminal yards located within a few blocks of the business and administrative center of the city. This station is also used by some of the trains of the Canadian Pacific and the Canadian Northern.

In planning with the city and Board of Railway Commissioners for the elimination of grade crossings in the city, the Grand Trunk divided its lines into three sections: the first, west of the Canadian Pacific crossing near Strachan avenue; the second, between this crossing and a point just east of the River Don near Logan avenue; and the third, extending from this point east. The work undertaken in the first section (Part 1) is now practically completed. This has involved only the Hamilton line, which skirts the lake front.



Map of Portion of the City of Toronto Showing Grand Trunk Lines on Which Grade Crossings Are Being Eliminated.

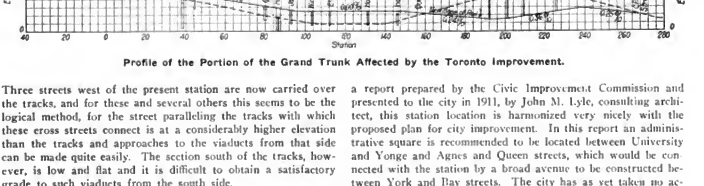
UNION STATION AND TERMINAL SECTION.

The Railway Commission has approved the plans for work to be done in the second section. This includes the building of a new union station and the rearrangement of the terminals of the Grand Trunk and the Canadian Pacific. The elimination of grade crossings through this central district, which is occupied by numerous tracks and lined with docks and warehouses along the lake, was a difficult problem, as the company disliked to elevate all its tracks to allow streets to pass under them, and the city objected to having the streets raised on overhead bridges. Three streets west of the present station are now carried over the tracks, and for these and several others this seems to be the logical method, for the street paralleling the tracks with which these cross streets connect is at a considerably higher elevation than the tracks and approaches to the viaducts from that side can be made quite easily. The section south of the tracks, however, is low and flat and it is difficult to obtain a satisfactory grade to such viaducts from the south side.

The plan as approved calls for the elevation of all through tracks and some yard tracks with overhead street crossings at Bathurst, Spadina and John streets, subways at all streets between York and Princess, and a steel viaduct 600 ft. long to carry all tracks over Berkeley and Parliament streets at the junction of the Grand Trunk and the Canadian Pacific on the east station approach.

East of Church street there are so many industries located close to the south side of the elevated line, which are now reached by individual grade crossings, that a new street will have to be laid out paralleling the tracks, on which these plants can face, and surface tracks will be laid along this street to be operated by the Canadian Pacific. A similar arrangement will be made for the plants north of the elevated line, the tracks on this side to be operated by the Grand Trunk. The board has ordered that no trains be operated over these surface tracks between Church and Parliament streets during May to September inclusive, except between 10 p. m. and 6 a. m. unless the merchandise carried is perishable, in which case a flagman must precede the train on foot. This arrangement is claimed by the railway companies not only to be dangerous to the public, as switching movements will be carried on at the mouth of all subways, but that the industries will be seriously hampered while the work is in progress, and, therefore, have submitted an alternative plan to the commission, showing a new location for the elevated tracks farther south, thus allowing all construction work to be completed before any alteration is made to the present facilities. All of these questions will be decided shortly by the Railway Board.

The station building will be located between York and Bay streets, facing Front street, just east of the present building. In



Profile of the Portion of the Grand Trunk Affected by the Toronto Improvement.

a report prepared by the Civic Improvement Commission and presented to the city in 1911, by John M. Lyle, consulting architect, this station location is harmonized very nicely with the proposed plan for city improvement. In this report an administrative square is recommended to be located between University and Yonge and Agnes and Queen streets, which would be connected with the station by a broad avenue to be constructed between York and Bay streets. The city has as yet taken no active steps toward carrying out this plan, however. The station will be of the through type with ten tracks. A Bush train shed will be supported on columns set in the center of 18 ft. passenger platforms, and covering, in addition to the adjacent tracks, 12 ft.

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baggage and express platforms which are provided between each pair of tracks. The passenger platforms will be reached by stairs from a transverse subway below the track level and baggage, mail and express being delivered to the narrow platforms by elevators from separate subways for each class of service. This separation of the passengers from the other business of the station should eliminate all confusion in the train shed. The passenger subway is entered from a concourse 80 ft. wide along the train shed which slopes down from the waiting room level

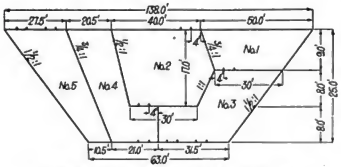
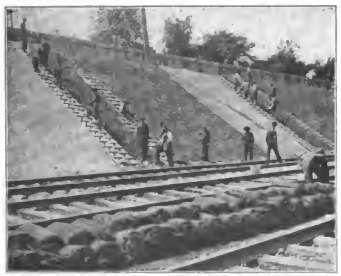


Diagram Showing Sequence of Shovel Cuttings.

on a 4.1 per cent. grade. The concourse will have exits at both ends in addition to the connection with the main waiting room alongside, although the complete details of the building have not yet been decided upon. The Canadian Pacific now expects to build a union station with the Canadian Northern in North Toronto, which will take many of its trains out of the present union station. Until a final decision as to this matter is reached, the building and yard plans are subject to some changes.

GRADE SEPARATION IN PART I.

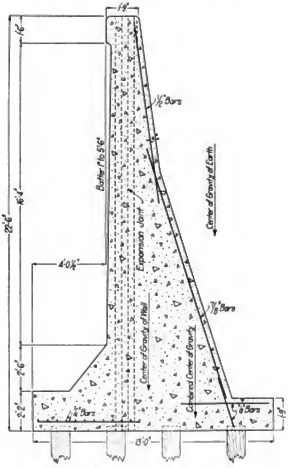
The work on the section west of the Canadian Pacific crossing was begun in August, 1910, but was seriously delayed that fall



Laying Sod on New Slope in a Cut.

by the trainmen's strike. Most of the grading was done during the summer of 1911, and the foundations for some of the subways and overhead bridges were placed. This work was resumed in the spring of 1912, and was practically completed during the summer. This work has cost about $2,000,000, of which the city paid one-third of the cost of a two-track construction, although four tracks have been laid. The excavation for foundations amounted to 75,000 cu. yds.; the grading totaled 800,000 cu. yds.; 67,000 cu. yds. of concrete and 3,100 tons of steel were placed; 7,000 sq. yds. of macadam, 7,000 sq. yds. of stone block and 4,000 sq. yds. of granolithic pavement have been laid; 10 miles of new track have been installed and 4 miles of old tracks altered; 100,000 sq. yds. of sod were required for the slopes of the new cuts.

In addition to the regular freight and passenger business which the Grand Trunk handles between Toronto and Hamilton, this piece of track carries the Toronto-Buffalo traffic of the Canadian Pacific and all freight movements into and out of Mimico yard, where the Grand Trunk handles all its classification for the Toronto district. The old double track line between Toronto station and Mimico had from 275 to 300 movements daily, which made it badly congested at times. In planning the grade separation in this district, therefore, it was thought best to make this line four track, thereby increasing its capacity to handle business and considerably simplifying the problem of making cuts as deep as 25 ft. and fills as high as 16 ft. without interrupting traffic. The two outside tracks of the new four track line will be operated for freight traffic and the inner two for passenger service.



Typical Section of Retaining Wall.

The roadbed will be brought up to the highest standard of track construction used on the system, 100 lb. rail, hardwood ties and rock ballast being used.

The accompanying profile shows the change in grade which has been made. The old line had a hump near the east end of the section and a sag west of this hump, with maximum grades of 0.7 per cent. By cutting down the hump and filling the sag, it was possible to secure a grade line having a maximum 0.4 per cent. grade and at the same time secure a balance between cut and fill which would eliminate the necessity for extensive borrow or waste. The latter feature was really the more important consideration, for the reduction in grade on these six miles of line does not allow any change in rating over the operating district and the same rise has to be overcome. Leaving the Canadian Pacific crossing, the new grade rises on a 0.25 per cent. grade for a short distance, then falls on a 0.36 per cent. grade under Dufferin, Dunn, Jameson and Dowling avenues.

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From the latter street, the grade is rising again, intersecting the old grade near Queen street, which is carried over the tracks on an overhead bridge with long approaches. West of this point, the new grade is level over Indian road, Howard, Ellis and Windermere avenues, and then rises on a 0.4 per cent. grade crossing Jane street, the Humber river, Queen street West, Salisbury avenue, Mimicoke creek and Church street. In all there are five overhead street crossings, eight subways and two waterway crossings.

EARTHWORK.

The excavation consisting mostly of blue clay and some rock on the eastern half of Part 1 was handled by three steam shovel outfits using 90 ton Marion shovels and standard gage Haskell

Looking East at Dunn Street Before Excavation Was Begun.

& Barker cars with a Lidgerwood unloader. One side of the cars was taken out and a side plow used in order to facilitate the handling of the hard and coarse material. The cut was taken out in three benches, always keeping two running tracks open for traffic. The fact that as much additional right of way would have been needed to carry the running tracks during the construction of a double track line on the new grade as has been used in making it a four track line was a strong argument in favor of the plan adopted. The additional right of way was acquired on the south of the old tracks. The accompanying

Looking East at Dunn Street While the First Shovel Cut Was Being Made.

cross section which was furnished to the shovel supervisor, and the three progress views of Dunn avenue show the method used in the excavation. The first of these views was taken before the work was started. In the second, the running tracks have been shifted to the extreme northern edge of the right of way, and a steam shovel is finishing the first cut along the south right of way line. The next cut was made under the track which is seen in the center of the view, the material being loaded into trains operated in the cut on the right. Then by cut No. 3 shown in the cross section, the elevation of final subgrade was reached and the two running tracks were thrown down on this level. The remainder of the southern half of the cut marked 4 and 5 in the cross section was then removed, there being always room

Looking East at Dunn Street After the Third Shovel Cut.

for a loading track alongside the shovel without interfering with traffic on the low level. In the last view, the two tracks on the right are on final subgrade, and there remain two shovel cuts on the left to be removed.

The standard cut slope is 1½: 1, back filled, if necessary, to get a true slope. All cuts are sodded, thus materially improving the appearance of the right of way and preventing the slope from washing and filling up the ditches. The sod was bought by contract at eight cents a square yard, f. o. b. cars. It was

Dufferin Street Overhead Bridge at Entrance to Exhibition Grounds.

hauled about 35 miles and laid by company forces at a total cost of 22.71 cents a square yard, apportioned as follows:

Sod	8.00c. per yd.	Pegging	.79c. per yd.
Freight	5.00c. per yd.	Trimming slope	1.34c. per yd.
Train service	3.70c. per yd.	Incidentals	.21c. per yd.
Unloading	.39c. per yd.	Foreman	.41c. per yd.
Carrying	2.08c. per yd.		
Laying	.79c. per yd.	Total	22.71c. per yd.

As it was impossible to secure additional right of way along the Industrial Exhibition Grounds, which are adjacent to the line just west of the Canadian Pacific crossing, it was necessary to build a retaining wall along the south side of the cut at this point. The section of the wall built is shown in an accompanying

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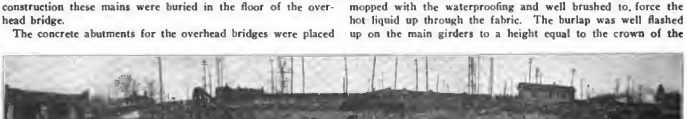
drawing. Reinforcement is provided in this wall for the footing and the inside face.

OVERHEAD BRIDGES.

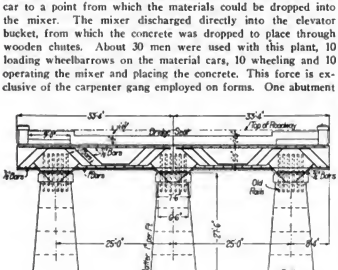
As excavation proceeded under the streets, temporary frame structures, cribbing or framed bents were erected to carry the street traffic. In several cases it was necessary to carry gas mains over the cut during construction work. At Dunn avenue, vertical sections of the pipe were inserted at each side of the right of way and the horizontal section over the cut was supported by a cable anchored to posts at each side. In the finished construction these mains were buried in the floor of the overhead bridge.

The concrete abutments for the overhead bridges were placed



Panorama of Sunnyside Crossing Showing Abutment and Footings for Steel Trestle Approach.

by a mixer outfit mounted on cars requiring only one track for its operation. The mixer car was equipped with a tower which could be dropped down to allow the car to be moved under structures and this mixer car was coupled to a hopper car and a series of material cars. The aggregate was wheeled from the material cars to a specially designed measuring box in the hopper car just back of the mixer, where the proportion of the aggregate was determined and the mixed sand and stone dropped into a small car which was pulled up an inclined track over the mixer car to a point from which the materials could be dropped into the mixer. The mixer discharged directly into the elevator bucket, from which the concrete was dropped to place through wooden chutes. About 30 men were used with this plant, 10 loading wheelbarrows on the material cars, 10 wheeling and 10 operating the mixer and placing the concrete. This force is exclusive of the carpenter gang employed on forms. One abutment



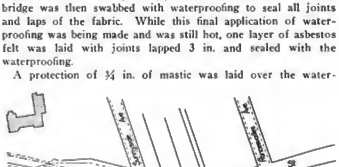
Elevation of Abutment for Sunnyside Overhead Highway Crossing.

containing about 900 cu. yds. was placed in 10 working days by this plant. The concrete used in abutments was a 1: 2½: 5 mixture.

The standard overhead highway bridges are of the through plate girder type. The floor beams which carry I-beam stringers are suspended from the girder webs continued through the bottom flanges at connection points. Two six ft. sidewalks are supported outside the girders on brackets from the floor beams. An ornamental lattice fence is provided outside of each sidewalk. The floor system is encased in concrete which continues above the stringers at the center line of the street, thus draining water to special waterproofed channels along the main girders. The spans vary from 66 ft. to 100 ft. and are carried on concrete abutments, all of which are 60 ft. face to face.

The waterproofing is by the membrane method, applied as follows: The smooth surface of the concrete was treated with a coat of concrete primer applied cold. A few minutes later when the primer had set, the hot waterproofing was mopped on and three ply of 8 oz. burlap was immediately laid, each ply being mopped with the waterproofing and well brushed to, force the hot liquid up through the fabric. The burlap was well flashed up on the main girders to a height equal to the crown of the finished road. The sidewalks were waterproofed in the same manner, except that only two ply of burlap was laid. The whole bridge was then swabbed with waterproofing to seal all joints and laps of the fabric. While this final application of waterproofing was being made and was still hot, one layer of asbestos felt was laid with joints lapped 3 in. and sealed with the waterproofing.

A protection of ¾ in. of mastic was laid over the water-



Plan of Sunnyside Crossing Showing Location of New Viaduct and Station.

proofing in convenient widths and all joints sealed by ironing. The finished surface of the sidewalks is of the same material, but is of a richer mixture applied ¾ in. thick. The finished surface of the road is a 4 in. creosoted block pavement laid on a 2 in. sand cushion. To reduce the floor depth to a minimum in order to obtain an easy road grade at one bridge, the mastic protection was laid on the roadway in two layers each of 1¼ in. with lapped joints and used both as a protection to the waterproofing and a wearing surface for the roadway, thus saving the 6 in. taken up by sand and blocks. Two different waterproofing materials were used, one supplied by the Standard Asphalt & Rubber Company, the other by the Johns-Manville Company, the general specifications for each being practically the same.

SPECIAL STRUCTURES.

The Queen street grade crossing has been known as one of the most dangerous in Canada. Not unfrequently 40,000 pedestrians and 2,500 vehicles pass over this point within 24 hours. Vehicles approaching from the north were not in sight from the

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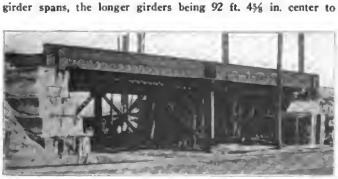
track, as the road was at a considerably higher elevation than the railway and approached the crossing on a steep grade. The new crossing is a short distance east of the old one at a point where the north bank is high enough to allow the bridge to spring from an abutment on that side almost at present ground level. On the south side a steel viaduct will carry the road from the bridge around a sharp curve to an abutment, from which a descent to the present level will be made on an earth fill having a grade of 2.17 per cent. One of the photographs shows the

Looking East from Jane Street, Showing the Elevated Section.

abutment at the end of the steel viaduct and the pedestals for the columns of this viaduct. The lake will be filled to a line outside these pedestals, using the material taken from the point of the cut between the lake and the tracks just east of the Queen street crossing. The decision to carry this street up to an overhead bridge was reached after the grade line was fixed so that the cut and fill do not balance by the amount needed in the earth embankment for the roadway approach. A portion of this, however, can be secured by widening the cut at the point next to the lake, as mentioned above.

The viaduct section of the Queen street bridge consists of 17 spans. The I-beam stringers are carried on floor beams supported directly on the steel bents. The first eight spans from the crossing are of irregular lengths varying between 22 and 23 ft. The next six spans are 25 ft. 6 in. long, and the last three are respectively 25 ft. 6 in., 27 ft. and 28 ft. The maximum height of columns is at the third bent from the crossing where the distance from the top of piers to the top of roadway at the center line of the bridge is 35.97 ft. Transverse bracing is provided to connect adjacent bents to form towers. The crossing over the four tracks is skewed 30 deg. and is made by two plate girder spans, the longer girders being 92 ft. 4⅝ in. center to



Two-Span Subway at Keele Street.

center of bearings and the shorter ones 61 ft. 3⅝ in. On account of the length of these spans, three girders are used, one being on the center line of the bridge. A double track street railway is carried over this bridge, the tracks being spaced 10 ft. 2⅞ in. center to center. The roadway is 60 ft. wide and a 9 ft. sidewalk is carried along both sides on brackets from the floor beams. The street railway rails are carried on short sections of wooden ties under each rail, the ties resting directly on the I-beam stringers. The concrete casing, waterproofing and pavement are the same as used on the standard highway bridges.

The abutment at the end of the viaduct is of a special design, shown in one of the accompanying drawings. There are three columns 10 ft. 9 in. by 19 ft. at the bottom and 6 ft. 6 in. by 6 ft. 4.5 in. at the top, carried on footings 14 ft. by 24 ft. which support a transverse beam of reinforced concrete 66 ft. 8 in. long, 6 ft. 2 in. deep and 6 ft. thick, the bridge seat being 27.68 ft. above the top of footings. The back wall is carried up 1 ft. 9 in. above the bridge seat. The columns are battered 3 in. per foot on the front face and are stepped in 1 ft. 3 in. at intervals of 5 ft. on the back face, the sides being battered 1 in. per foot. The tops of these columns are bonded to the cross beam by old rails 8 ft. long, spaced 1 ft. center to center and extending into the top of the columns for half their length. There is no other reinforcement in the columns. In addition to the bond, the cross beam is reinforced with 1 in. bars in the lower plane of reinforcement which are bent up to resist shearing stresses and ⅞ in. bars in the upper plane of reinforcement.

As a suburban station is maintained at the Queen street crossing, a new station design was arranged to harmonize with the proposd highway bridge. This building is on the original ground level above the tracks near the intersection of King and Queen streets and is connected with the track level by a foot bridge spanning the first two tracks and connecting with a stairway which leans down to a passenger platform 450 ft. long between the two middle tracks. There is also a baggage elevator in one

Four-Span Subway Carrying Omen Street West Under the Grand Trunk.

end of the station which connects with a baggage-way at track level. Driveways are provided to connect the station with the streets so that carriages can approach without difficulty. The building itself is of stone and brick of a type not uncommon for such structures.

The Humber river is crossed on a four track deck girder structure of two 100 ft. spans designed for Cooper's E50 loading. The old bridge was a double track, single span, through truss on masonry abutments. A slight change in line was made to permit the construction of most of the new bridge south of the old one. The new concrete pier and all of the two abutments, except the north wing walls, were built and the south half of the new bridge was erected without disturbing the old bridge. Traffic was turned over the new bridge, the old bridge was dismantled and the wing walls of the new abutments were then completed over the old masonry. The north half of the new bridge was then erected.

Although all the foundations were made by driving 60 ft. piles to refusal through clay and sand strata, a peculiar settlement of the east abutment occurred after the new bridge was in service. The first sign of settlement was a crack which developed at the junction with the old masonry. Shortly after, a distinct settlement of the back end of the abutment could be seen. It is a well-known fact that in the vicinity of Toronto are found some of the finest examples of the glacial period in existence, each

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recession being indicated by alternate strata of clay, sand and sometimes peat. It was found upon examination that a 10 ft. layer of peat, 35 ft. below the surface, must be flowing or compressing, thus allowing a gradual settlement. It was decided to drive a number of rows of piles around the south edge of the foundation in order to compact the supporting strata and stop the trouble. This apparently served its purpose, for the settlement ceased until a continued rainy spell came, when the back end began to sink again. A further examination indicated that the piles driven around the site were sinking at the same rate as the abutment, but it was noticed that the movement was gradually decreasing and it has now entirely ceased after a maximum settlement of 3 ft.

The other stream crossing is over Mimicoke creek near the western limits of the work. A single span double track deck truss bridge was replaced by a four track deck plate girder structure, the girders being erected outside the trusses in such a way as to keep the bridge open for traffic.

EMBANKMENT AND SUBWAYS.

West of the Queen street crossing (Sunnyside) there is a continuous fill to Mimico, the western end of the work. The traffic was first diverted to two temporary tracks along the north right of way line laid on an embankment which had been raised to the height of the old two track grade. One track in the unused portion of the right of way was then raised on a trestle to the height of the new grade. This trestle was filled and the banks were widened from this fill. When the embankment was wide enough to permit it, two running tracks were diverted to their final position on the higher elevation and the remaining fill necessary to make the embankment of four track width was completed. This fill was allowed to take its natural slope, except at one point, where adjoining buildings made it necessary to put in a short length of retaining wall on the north side.

The standard subway used on this work consists of half through girders between tracks with 20 in. 65 lb. I-beams set transversely and carried from the girders by means of web connections. These I-beams and supporting girders are encased in concrete of a 1 : 2 ½ : 5 mixture to protect the steel and carry the ballasted track. This concrete is waterproofed in the same manner as the highway bridges described above. The mastic is applied in two ⅜ in. layers and is carried up to flashing angles on the main girders. The joints in the mastic are arranged to drain the water to the ends of the bridge. A 2 in. cement mortar coat is provided over the waterproofing upon which the ballast is laid. The street width face to face of abutments is 60 ft., a single support on the center line of the street being provided. These supports consist of steel bents on concrete pedestals.

The first plans for separating grades in Toronto were made and work on Section 1 was started under the direction of Howard G. Kelley, vice president, formerly chief engineer, and this work was completed under the direction of H. R. Safford, chief engineer. J. R. W. Ambrose was engineer of grade separation in direct charge of the work in the field. G. A. Mitchell, supervisor of bridges and buildings at Toronto, handled the construction of the bridges, and D. McCooe, superintendent of grade separation, directed the company forces handling the grading. The Canadian Bridge Company and the Canada Foundry Company fabricated the steel work.

NEW RAILROADS IN SICILY.—The Italian government has recently definitely ordered the construction of two further sections of the complementary narrow-gage railroads provided for by the royal decree of July 12, 1906. One six-mile section to run from San Carlo to Caltabellotta via Burgio, in the province of Girgenti, will cost $225,000. The other eight-mile section to connect the town of Gibellina, province of Trapani, with Belice, province of Girgenti, will cost $478,640. It is understood that tenders are being filed with the Direzione Generale delle Ferrovie dello Stato at Rome.—*Consular Report.*

TRAIN ACCIDENTS IN APRIL.[1]

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of April, 1913:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
*2.	Lehigh Valley	Buffalo.	rc.	F. & F.	0	4
25.	Louisville & Nash.	Corbandale.	bc.	P. & P.	1	10
26.	Illinois Central	Duquoin.	rc.	P. & F.	0	2
27.	Chi. St. P. M. & O.	Baldwin.	bc.	P. & F.	2	5
28.	N. Y. N. H. & H.	Quincy.	bc.	P. & F.	0	12

Derailments.

Date.	Road.	Place.	Cause of Derailm't.	Kind of Train.	Kil'd.	Inj'd.
7.	Wabash	Wolcottville.	b. rail.	P.	1	1
8.	Wabash	Kinloch.	b. rail.	P.	0	20
10.	Union Pacific	Ascalon, Col.	snow.	P.	1	7
20.	C. C. C. & St. L.	Evansville.	exc. speed.	F.	1	5
22.	Baltimore & Ohio	Ravenna.	unx.	P.	0	4
27.	Rutland	Beldens.	unx.	P.	..	8

The trains in collision near Buffalo, N. Y., on the 2nd were westbound freights. A long freight train drawn by two engines running at good speed ran into the rear of a preceding coal train. Four trainmen were slightly injured. The wreck took fire from one of the engines and 12 cars were burned up. The cause of the collision was improper flagging and excessive speed. The collision occurred on a freight line where trains are required to run under control.

The trains in collision near Corbandale, Tenn., on the morning of the 25th, were northbound passenger No. 104 and southbound passenger No. 101. A mail clerk was killed and 7 trainmen and 3 passengers were slightly injured.

In the collision near Duquoin, Ill., on the 26th, a passenger train ran into the rear of a preceding freight, wrecking the caboose. The engineman and fireman of the passenger train were slightly injured by jumping off.

The trains in collision at Baldwin, Wis., on the night of the 27th, were eastbound passenger No. 2 and a westbound extra freight. Both engines were wrecked and three cars of the passenger train and five of the freight were badly damaged. The engineman and the baggageman of the passenger train were killed and five passengers were injured, none seriously. The collision was reported as due to misunderstanding of orders on the part of the freight.

The trains in collision near Quincy, Mass., on the 28th were a southbound passenger and a northbound work train. Both engines were badly damaged. The passenger train was heavily loaded and the work train carried sixty laborers. Ten of the laborers and two passengers were injured.

The train derailed near Wolcottville, Ind., at 3 o'clock on the morning of the 7th was westbound passenger No. 7, and the engine and baggage car were overturned. The engine lodged in 7 ft. of water. The engineman was killed, and the baggageman injured. All of the passengers escaped with slight injuries. The cause of the derailment was a broken rail.

The train derailed near Kinloch, Mo., on the night of the 8th was eastbound passenger No. 2, and three passenger cars were overturned and ditched. Seventeen passengers and three other persons were slightly injured.

The train derailed near Ascalon, Colo., on the night of the 10th was eastbound passenger No. 110, drawn by two engines. It was derailed in a snow drift in a cut, and the leading engine was overturned. The engineman of the second train was killed, and 3 trainmen, 3 mail clerks and one passenger were slightly injured. The snow drift was about 2 ft. deep, and the pilot

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[1]Abbreviations and marks used in Accident List:

rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——sce, obst, Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running—— P. or Pass., Passenger train——F. or Fr., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire—— Dagger, One or more passengers killed.

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of the engine was bent down so as to derail the front truck.

The train derailed near Evansville, Ind., on the 20th, consisted of an engine, one passenger car and a caboose, the engine running backward. While moving at about 20 miles an hour the train went off the track and the cars fell down a bank. The man running the engine was killed and several other employees were injured. The cause was excessive speed and defective track, damaged by flood. The conductor and engineman had absented themselves and the fireman was in charge. He was killed.

The train derailed near Ravenna, Ohio, on the 22nd was westbound passenger No. 11. Two sleeping cars were overturned, and four passengers were injured.

The train derailed near Beldens, Vt., on the 27th was northbound passenger No. 65. The tender and five cars were ditched. Eight passengers were slightly injured. The cause of the derailment was not determined.

Canada.—The derailment of a passenger train on the Central Vermont near St. Lambert, Quebec, April 13, was reported in the *Railway Age Gazette* of April 18. Six passengers and one employee were killed and 30 passengers and two employees were injured. The cause of the derailment is said to have been excessive speed, 35 to 40 miles an hour, when the engine was running backward.

PROPER AIMS IN TRAINING FOR RAILWAY SERVICE.*

By H. G. Hetzler,
President, Chicago & Western Indiana.

In deciding upon the kind of service that one will devote attention to, the aim should be, if possible, to select that which will be congenial, and for which the individual is seemingly best qualified, as it would be a mistake to choose for a life's business a work that is distasteful and into which it would be hard to throw one's best thought and energy. There is really no easy road to what is termed "success." Advancing in railroad service is no exception to this rule. The work is exacting and sometimes discouraging, but I want to assure you that the field is a splendid one.

During the past few years the civil engineers have been busy studying methods and schemes to increase the efficiency of the railroads and at the same time reduce the cost of operation. Improvement has been made in many cases where lines have been relocated so as to reduce the grades and improve the alignment; terminals have been changed and enlarged so as to facilitate the movement of traffic through them. The mechanical engineer has been just as active, and splendid development has been wrought in motive power and car equipment. The electrical and signal engineers, by their endeavors, have not only aided in efficiency, but have also to a marked degree increased the safety of operation. Nevertheless, the opportunities for the future engineer in the service are unbounded.

The development of our country will demand, in order to meet its requirements, the addition of thousands of miles of track, together with the equipment and facilities necessary to operate them. Laws and regulations have been and constantly are being imposed by state and nation upon railroads, which give rise to many new conditions.

The increase in population, with the consequent increase in the value of property, which are the conditions in our growing cities, add their share to the difficulties encountered. These and many other conditions indicate that the engineer of the future should aim not only to be familiar with strictly engineering problems, but also to keep in touch with the desires of the public and endeavor to comply with them, and at the same time obtain the best results from a railroad viewpoint.

The railroad service is made up of various departments, each differing from the other in its requirements. They are, however, so thoroughly dependent, one upon another, that if for any reason one department does not come to the required standard the entire service is affected more or less by this weakness. Therefore, one should, in addition to being familiar with his own department, understand in a general way the requirements of the other departments, in order to thoroughly co-operate with and bring about the best results, not only for the railroad but for one's self. I can best illustrate this by a personal experience.

Some years ago I was employed in the maintenance of way department of a railroad when a vacancy occurred in another branch of the service which would have been a promotion for me if I had obtained the appointment. The superintendent, thinking that I might feel disappointed on account of not receiving the promotion, called me to his office and said he would have liked very much to give me the position but because I apparently had not been thinking of any department but my own, he did not believe I was in shape to be transferred to the other department. This certainly was a new viewpoint for me, and I immediately commenced to study not only my own work, but at the same time to become familiar with the work of the other departments, and I assure you that although I was disappointed at the time, the disappointment proved to be a benefit.

On entering the service of a railroad, one becomes a part of a large force of employees working in various occupations. It should be the aim to keep in such a frame of mind and thought as to enable one to work hand in hand with brother employees for the improvement of the service. One cannot advance materially in the service without becoming a leader of men, and to become a leader, one must not fail to co-operate with and hold the esteem of one's fellow workers.

A railroad being a public service institution, its prosperity (just as in the case of an individual or business concern) depends to a large extent upon its standing in the community served. Therefore the aim should be to serve the public in such a manner if possible as to warrant its approval.

It is difficult to point out the particular aims that apply more especially to railroad service than to other work, but I will feel that I have partially succeeded if you carry in mind those I have mentioned, which can be summarized as follows:

Endeavor in entering the service to choose the department that will be congenial and for which one feels best qualified.

Keep in touch with the demands of the public.

Master the details of your chosen department and become familiar with the requirements of the other departments.

Co-operate with your fellow workmen and the public.

*Abstract of an address at the Railway Conference at the University of Illinois, Urbana, Ill., on May 9, 1913.

NEW LINE FOR FRENCH EQUATORIAL AFRICA.—A line 360 miles long will soon be built from Pointe Noire on the Atlantic coast, just south of Loango, French Equatorial Africa, to Brazzaville, on Stanley Pool. This year the government proposed to vote $17,000,000 for the construction of this line and the betterment of the ports at either terminus. It will take some eight years to build.—*Mining and Scientific Press.*

HAICHOW-LANCHOW RAILWAY, CHINA.—Two detachments of engineers are now locating the Haichow-Lanchow Railway. For the present the line is to be built only to Lanchow, but a further extension is contemplated to Suchow in Kansu. This is one of the most important railway projects which China has ever undertaken. It will open up a vast territory through the greater part of which there are no navigable waterways. This statement applies particularly to the provinces of Shensi and Kansu, foreign imports into which, and the exports therefrom must be carried on the backs of animals or of men over difficult mountain paths at great expense and with much loss of time. The projected line will cross two other provinces—Honan and northern Kiangsu, the first of which is served in some degree by the Peking-Hankow and the Kai-feng-fu-Honan-fu railways, and the second by the Grand Canal and the Tientsin-Pukow Railway.

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COMBUSTION IN LOCOMOTIVE PRACTICE.

Not Thoroughly Understood and Presents Wonderful Possibilities from the Standpoint of Increasing Boiler Efficiency.

By J. T. Anthony.

American railroads use about 135 million tons of coal annually, at a cost of some 240 million dollars, or 12 per cent. of their total operating expense. Managers and motive power officers, the country over, are well aware of the fact that a large part of this coal is wasted through imperfect combustion, and their efforts to locate the cause and apply a remedy have, in many cases, resulted in the fireman's exaltation to the position of "chief goat." Too often has he been held responsible for a condition of affairs for which he was little or in no wise to blame.

Volumes have been written about methods of firing; about "bright, light and level fires"; about "cross firing"; about "single scoop firing"—all of them good methods and useful, maybe, when it is possible to follow them, but none of them sufficient to approximate perfect combustion in the firebox of a modern locomotive. During recent years the public has been waging an earnest fight against the smoke nuisance, and the railroads have been forced to give the matter serious attention, but most of the attention has been directed to the firemen in the form of instructions, and not enough attention has been given to the design and equipment of a locomotive firebox that can be fired by the average fireman, with an ordinary grade of coal, under every day conditions and without making smoke.

Bituminous coal, which is used almost exclusively for locomotive purposes in this country, is not a homogeneous substance and cannot be successfully treated as such. This fact has been appreciated by some engineers in designing furnaces for stationary power plants; but locomotive designers and builders have for the most part either ignored the characteristics of their principal fuel or have been influenced by the limiting conditions of weights, clearances and possible complications in firebox construction, to such a degree that they have done comparatively little along this line, and today the fire brick arch of Security type is the only device that is used to any extent as an aid to combustion in locomotive fireboxes.

Bituminous coal consists principally of fixed carbon which burns on the grate with little or no flame, and volatile matter which burns above the fuel bed with a long flame. In order to approximate perfect combustion in the firebox of our modern, high-powered locomotive, with ordinary firing, it is essential that the following provisions be made:

First, a secondary air supply above the fire.

Second, an intimate mixture of the volatile matter and the air.

Third, flame-way or combustion chamber space sufficient to allow all gases to be completely burned before reaching the back flue sheet.

In an ordinary locomotive firebox all the air is supplied through the grate. As this air comes in contact with the glowing coals of carbon at the bottom of the fuel bed, it gives up its oxygen, two parts of which readily unite with one part of carbon to form carbon dioxide. The carbon dioxide thus formed passes on up through the fuel bed and unless accompanied by an excess of air, on coming in contact with the glowing carbon it gives up part of its oxygen and is reduced to carbon monoxide. When the carbon monoxide thus formed is brought in contact with oxygen or air which is heated to a sufficiently high temperature, it will be completely burned to carbon dioxide; otherwise, the gases may be chilled and pass off unburned, at a loss of about 10,000 heat units per pound of carbon, since carbon burned to carbon dioxide generates 14,600 heat units, while only about 4,400 B. t. u. are produced when carbon is incompletely burned to carbon monoxide.

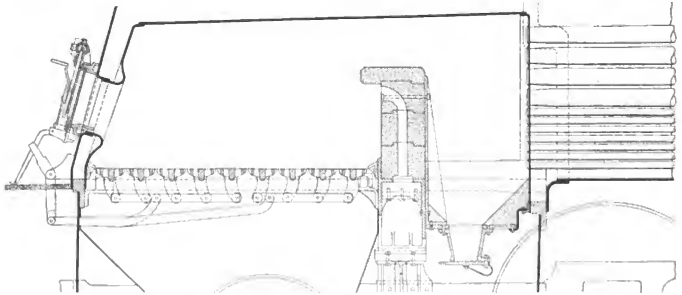

Fig. 1—Gaines Combustion Chamber Applied to a Pacific Type Locomotive.

Bituminous coal contains from 25 to 50 per cent. volatile matter which, being rich in hydrogen, has a very high heat value, generating from 12,000 to 21,000 heat units per pound of gas. These volatile hydro-carbons, principally of the methane series, are driven off at a comparatively low temperature, when green coal is thrown on the fire, and if supplied with a sufficient quantity of heated air (or oxygen) will readily ignite. If there is no excess air above the fuel bed they pass off unburned, producing smoke and leaving behind a deposit of soot in the firebox and tubes. If there is a partial supply of air, the hydrogen, having greater affinity for oxygen than the carbon, takes up the available oxygen from the air forming steam, while the carbon is set free and either passes off in fine particles as smoke and soot or

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combines with an insufficient quantity of oxygen to form carbon monoxide.

This shows the vital necessity for air above the fire, air being the medium through which oxygen is supplied; but an excess of oxygen alone is not sufficient, for flue gas analyses often show incomplete combustion with large excess of oxygen. It is important that the air be heated, as hydrogen will not combine with oxygen below about 600 deg. F., nor carbon with oxygen below 800 deg. F.

When air at atmospheric temperature is admitted into the firebox it has to be heated up to the igniting point before its oxygen is available for combustion, and if it enters in a large shaft, as through an open fire door, it is possible for it to flash through the firebox and into the flues before the igniting temperature is reached, in which case it hinders rather than aids combustion, and at the same time endangers the flues.

It is necessary to have an *intimate* mixture of the volatile matter and the air in order that *every particle* of carbon and hydrogen contained in the former may come in contact with the required amount of oxygen contained in the latter. In no other way can perfect combustion be obtained, yet this is a point that has been largely neglected up to the present time.

It is very apparent that the flame-way or combustion chamber space should be long enough to give the gases *time* to mix and burn completely before striking the flue sheet, for the flames are extinguished on entering the small fire tubes and combustion ceases. The advantage of a combustion chamber has been appreciated by many and used to some extent; but most roads have, in the past, refrained from the use of the common, water-leg type of combustion chamber on account of the complications in construction and maintenance costs.

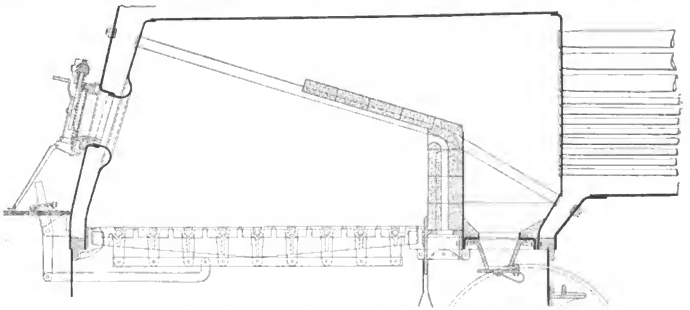

Fig. 2—Gaines Combustion Chamber Combined with the Security Arch.

THE SECONDARY AIR SUPPLY.

The amount of air needed above the fuel bed depends upon the composition and per cent. of volatile in the coal, the rate of combustion, the efficiency of the gas mixing devices and the volume of the firebox and combustion chamber. That the composition and per cent. of volatile matter influences the air supply is very apparent. Since all the volatile matter burns above the fire, the per cent. of air required above the fire will vary with the amount of volatile in the coal and on the proportion of hy-

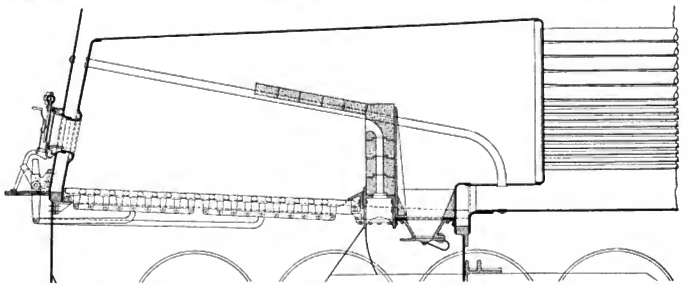

Fig. 3—Gaines Furnace with a Barrel Combustion Chamber as Applied to a Mallet Locomotive.

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drogen and carbon in the gases, other things being equal, as a pound of hydrogen requires about three times as much air for complete combustion as a pound of carbon.

As the rate of combustion increases, the fire usually becomes thicker and this increase in thickness of the fuel bed, by offering more resistance to the passage of air, tends to reduce the air supply above the grates at a time when it needs to be increased, owing to larger volume of volatile gases being distilled and to the increase in the amount of carbon monoxide reduced from carbon dioxide in passing up through the thicker bed of coals.

The efficiency of a gas mixing device has a direct bearing on this secondary air supply. If it were possible to get a perfect mixture of the combustible gases with the air, the theoretical amount of air required would be sufficient to assure each molecule of methane, carbon monoxide, hydrogen or other combustible meeting with its needed oxygen; but in actual practice such a condition is impossible and it becomes necessary to supply an excess of air in order that each molecule of combustible gas may readily find its mede of oxygen in the short time available, for the gases linger in the firebox only the fractional part of a second even under medium rates of combustion, and when the rate is high the time is almost nil.

Increase in firebox and combustion chamber volume promotes combustion by lengthening the flame path and giving the gases more time to mix and burn. If the firebox is shallow and the combustion chamber restricted, the flame-way and time are reduced, so it becomes necessary to increase the speed of combustion in order to burn the gases completely before they enter the fire tubes, and this can only be accomplished by increasing the air supply. When a volume of combustible gas is brought in contact with oxygen or air heated to the proper degree, a chemical reaction (combustion) begins with a high velocity, but as the reaction continues the velocity becomes less and less and combustion becomes more difficult. This is due to the fact that as combustion proceeds the amount of burned gas increases while the unburned gas and oxygen decrease, and the mass of burned gas (or product of combustion) mixing with the combustible gas and oxygen tends to separate them, makes their union difficult, and retards combustion. From this well established law of "mass action" we learn that "the speed of a chemical reaction (combustion) increases with the weight of the reacting substance in a unit of volume," though not always in direct proportion. Thus we see that an increase in air supply is all that is needed to increase the velocity of combustion, and the law holds true for solids as well as gases. We see it illustrated in every-day practice at the blacksmith's forge, in our domestic heaters and in a locomotive firebox.

A pound of carbon when burned will give off 14,600 heat units. The amount of heat given off is unaffected by the speed of combustion if the combustion is perfect, but when we wish to increase the degree of heat or raise the temperature it is necessary to increase the speed of combustion, and this is accomplished by supplying more air, or increasing the draft.

What has been said in the preceding paragraphs relates to hand-fired furnaces, but the general principles hold true for stoker firing as well. It should be stated, however, that stokers of the under-feed type have an advantage over other methods of firing in eliminating smoke. This is due to the fact that the coal is fed in slowly and heated up gradually, which results in the light-hydrocarbons being slowly driven off while the heavy "tarry" hydrocarbons, which are the principal smoke producers, are left behind and burned on the grates. With over-feed stokers or hand-firing the green coal is thrown in on top of a white hot fitel bed, is heated up instantly and the volatile matter being driven off rapidly, carries with it a large part of the tarry hydrocarbons, which pass off partly unconsumed, producing smoke, as it is impossible to hold them in the firebox until combustion is complete. With hand-firing a part of the finely powdered coal is also unavoidably lost, as it is caught up by the stream of cold air rushing through the open fire door and carried out of the firebox before combustion takes place. This condition can be helped by providing suitable baffles.

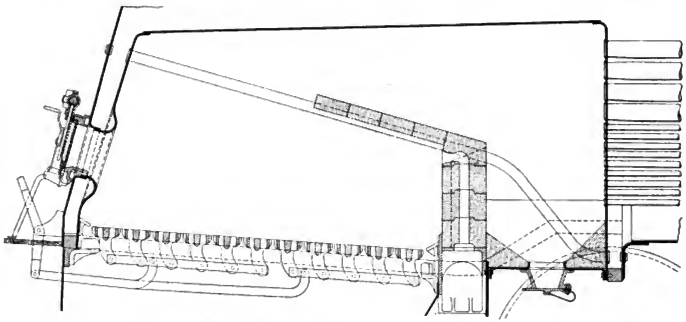

Fig. 4—Gaines Furnace as Used on a Locomotive with Large Diameter Drivers.

THE EFFECT OF EXCESS AIR.

While it is generally admitted that an excess of air is desirable as an aid to complete combustion, the objection is often raised that the excess oxygen carries with it a large per cent. of inert nitrogen which dilutes the products of combustion, absorbs heat and lowers the temperature to such an extent that the gain in combustion is more than offset by the heat losses.

It is true that the temperature falls as the air supply increases; but temperature is not the only factor that enters into the case. The heat generated on the grate of a locomotive is imparted to the firebox surface largely by radiation; that is, the heat travels directly from the fuel bed to the firebox sheets without the aid of any material agency such as the gases of combustion, and the quantity of heat so imparted depends on the temperature and area of the fuel bed, other things being equal. Since air

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is practically unaffected by the action of radiant heat, it is possible that the introduction of the desired quantity of it above the fuel bed could be accomplished with little or no effect on the quantity of radiant heat imparted to the firebox heating surface.

A large part of the heat that passes out of the firebox with the gases of combustion is imparted to the fire tube heating surfaces by convection; that is, by the action of the small particles of heated gas striking against the tubes, giving up their heat and being replaced by other heated particles—a continuous interchange of cooled particles next to heating surface for heated ones from the body of the gas.

From the definition it is evident that the rate of heat transfer by convection depends on the activity or rate of interchange of the particles of gas. An interesting theory in regard to this was advanced by Professor Reynolds in a paper read before the Literary and Philosophical Society of Manchester in 1874. This was afterwards elaborated upon by Professor John Perry and has more recently received quite a bit of attention at the hands of Professor Breckenridge and others interested in the tests conducted by the government at the St. Louis fuel testing plant.

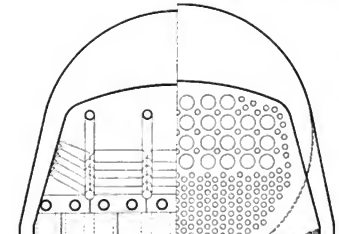

Fig. 5—Showing the Air Ducts Opening into the Firebox and the Method of Applying the Combustion Chamber Floor.

According to this theory the rate of heat transfer from the hot gases to the fire tube is "proportional to (1) temperature differences of the gases and the metallic surface; (2) density of the gases; (3) velocity of the gases parallel to the metallic surface, and (4) specific heat of gases at constant pressure. A large number of steaming tests of coals conducted by the U. S. Geological Survey gave results that seem to prove the correctness of this theory, and it has been treated quite fully in bulletins issued by the Department of the Interior.

Factor 1 is self-evident. It is also plain in studying factor 2 that since the molecules of heated gas give up their heat by striking against the metal tube, the amount of heat given off will depend on the number of blows struck. This in turn depends on the number of molecules in a unit volume of the gas, or the density of the gas. As the temperature increases, the gases expand and the number of molecules per unit of volume decrease; hence any gain by increase in temperature is partly neutralized by decrease in density.

The vital importance of the velocity of the gases (factor 3) is proved in every day locomotive practice. When we wish to increase the capacity of our boiler we burn more coal; that is, we put a larger mass of gas through the tubes and thereby increase the velocity. "If twice the mass of gas is put through the tube per second, at the same initial temperature, very nearly twice as much steam will be generated." This is due to the fact that as the molecules of gas strike the metal of the tube and give up their heat they become more or less "bound" by the attraction of the metal and entangled with the soot film, and there is soon built up a film of cold non-conducting gas. In order to keep up the heat transfer it is necessary that the cold molecules of gas be replaced by the hot ones, and this is accomplished by the action of the hot molecules which are flying back and forth perpendicular to the surface of the tube, the dislodging and scrubbing effect of which is proportional to the velocity of the body of the gas parallel to the heating surface.

Equal volumes of all gases under the same conditions of temperature and pressure contain the same number of molecules, but since different gases on cooling give off varying amounts of heat per degree of temperature drop—have different specific heats at constant pressure—it is evident that the same number of blows struck by the molecules of different gases will result in different amounts of heat transfer; hence factor 4.

According to the tentative formula proposed by Professor Perry the rate of heat transfer from the gases to a unit area of fire tube per second is proportional to the product of the above four factors. This being the case, it is evident that any decrease in temperature, due to increasing the air supply, is partly neutralized by an increase in the volume (velocity) and density of the products of combustion, and the product of the four factors decreases but little as the air supply is increased—the specific heat being taken as a constant (.24) without serious error.

A pound of carbon requires about 11.6 lbs. of air for complete combustion, theoretically, but any attempt to fire a locomotive with the air supply cut down to this point would result in a heavy fuel loss due to incomplete combustion. With 100 per cent. excess air complete combustion can readily be obtained, resulting in a saving of from 15 to 25 per cent. in fuel, which more than offsets the approximately 5 per cent. loss in heat absorption due to the excess air—this loss in heat absorption being confined almost entirely to the flue surface which takes up from 50 per cent. to 60 per cent. of the heat utilized by the boiler. Perhaps 100 per cent. excess air is more than could be recommended in every day practice, this depending largely on the manner of introducing the air, the efficiency of the mixing devices, combustion chamber space, etc.; but this amount has been used in both stationary and locomotive practice with good results, and there are instances on record where boiler efficiencies as high as 84 per cent. have been obtained with 120 per cent. excess air.

Road tests on a Pacific type locomotive equipped with a Gaines furnace, of the type shown in Fig. 1, gave results that seem to check with what has been said above. With a rate of combustion of 57 lbs. per square foot of grate per hour, the flue gas analyses showed 116 per cent. excess air with an average of .015 per cent. carbon monoxide. Under these conditions the front end temperature was 465 deg. F., while the over-all efficiency of the boiler reached 80 per cent.—the equivalent evaporation per square foot of heating surface being 11.35 lbs. per hour.

It is possible that the efficiency in the above case was partly due to the fact that with perfect and smokeless combustion the heating surface was kept free from all soot accumulation, it being well established that the resistance to heat transfer from the gases to the water is due largely to the non-conducting films of soot and scale.

All locomotives equipped with the furnace mentioned above have been singularly free from accumulations on the fire side of the heating surface. The increase in air supply, resulting in high velocity of gases through the tubes, keeps them swept clear

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of all fine particles of ash or cinders that carry over, and makes frequent fire blowing unnecessary.

THE GAINES LOCOMOTIVE FURNACE.

Primarily, a fuel bed of bituminous coal is a gas producer, and in order to get all the heat available out of the coal it is necessary to make provision for burning the combustible gases above the fuel bed. To successfully accomplish this requires:

First: A secondary supply of heated air above the fuel bed.
Second: A thorough mixture of the air and combustible gases.
Third: Sufficient flame-way or combustion chamber space.

These are the theoretical requirements. The practical man asks, How can these desired results be obtained without excessive cost and firebox complications? Can any device be installed that will turn the trick and yet be thoroughly mechanical in construction, easy to maintain, and foolproof in operation?

Profiting by several years' experience with locomotives equipped with Wooten type fireboxes, with fire brick bridge walls built across the mouth of barrel combustion chambers, F. F. Gaines, superintendent of motive power of the Central of Georgia, designed and patented a locomotive furnace of the type shown in Fig. 1. This consists essentially of a fire brick bridge wall extending across the firebox, forming a combustion chamber between the wall and fire sheet, the tubes being shortened and the firebox lengthened sufficiently to admit of this application, while the grate remains normal. The bridge wall is carried by a casting extending across the firebox and secured to the mud-ring at each side by studs. This casting also supports the grate frames; the back stays in the rear, which prevent the wall from toppling, are likewise bolted to it. The floor of the combustion chamber is made of cast or wrought iron plates, protected with fire brick to prevent burning out. In order to take care of cinder accumulation in the combustion chamber a spark hopper is provided in the center, the floor being given sufficient pitch to cause all accumulation to drain out when the hopper is opened. The bridge wall is built up of special fire brick of such size as can be easily handled, and in these brick are cored air passages matching the openings in the carrier casting. The size and number of the air ducts vary according to the character of the fuel, area of grate and rate of combustion, as these factors determine the amount of air needed above the fuel bed.

When the locomotive is operating the wall becomes white hot, with the result that the outside air, being forced through the air duets, under the influence of the pressure drop in the firebox, is heated up quite appreciably before being discharged into the firebox. As it issues from the ducts near the top of the bridge wall the heated air comes in contact and mixes with the combustible gases that are forced to pass up over the top of the wall. Combustion begins the instant the air comes in contact with the gases and the reaction continues until the combustible gases are all burned to carbon dioxide, or the flames are extinguished on entering the tubes. (In case the combustion chamber space is limited and the flame-way is short, the air supply should be large in order that combustion proceed rapidly and the flames burn out completely before striking the flue sheet.)

In Fig. 1 the wall is shown extending up to within 15 inches of the crown sheet, as in practice it has been found desirable to carry the wall as high as possible without obstructing the draft; this increases the baffling effect and promotes the mixture of the air and gases. Aside from its aid to combustion, this wall also offers complete protection to the flues. The combustion chamber being made thoroughly air tight, it is very evident that it would be impossible for any cold air to reach the flues through a hole in the fire or through an open fire door, for air entering through either of these places would be forced to pass up over the wall and come in contact with the flames, hot gases and incandescent brick, thereby being heated up and rendered harmless before reaching the flues.

The first locomotive equipped with this device has been in service about four years and it has proved an unqualified success in improving the steaming qualities, saving fuel, reducing smoke and cinder nuisance and prolonging the life of the flues. The success of the first installation was followed by the application of the device to a number of other locomotives on several Eastern roads. All locomotives so equipped have given good service and in several ways have shown to advantage over similar engines equipped with arches, but the fact that arches of the security type were giving good service and possessed many advantages over other devices, could not be lost sight of, and after some trials the Gaines combustion chamber and Security arch were combined—the combination as shown in Fig. 2 being known as the Gaines locomotive furnace.

This combination is ideal in every respect, possessing all of the advantages of the Gaines wall and Security arch, with none of the disadvantages. The arch tubes add to the effective firebox heating surface and increase the circulation, both of prime importance. The addition of the arch back of the wall doubles the flame-way without increasing the length of the firebox, increases the effectiveness of the heating surface at the back of the firebox, increases the mixing of the air and combustible gases and on account of the longer flameway gives the gases longer time to burn, thereby reducing the amount of excess air required.

It is often impossible to apply arch tubes to fireboxes with shallow throat sheets on account of the lack of firing clearance, and in many cases it is impossible to keep the bottom tubes open because of slag and cinders going over on top of the arch and plugging them up. The bridge wall does away with these troubles. A deep throat sheet is no longer necessary for firing clearance under the arch, and any cinders or slag that pass over the bridge wall fall into the hopper from which they are easily drained at the end of the run.

A locomotive furnace of the type shown is especially adapted to overfeed stoker firing, providing, as it does, a flash wall to fire against, with an arch to baffle and hold the fine particles of coal in the firebox until they are mixed with the heated air and burned, thereby eliminating smoke and cinders and keeping the flues and tubes free from all accumulation.

The application shown in Fig. 1 is admirably adapted for locomotives in bad water districts where it is impossible to maintain arch tubes. It is effective in fuel economy, eliminates smoke and cinders and protects the flues. It is shown on a Pacific type locomotive, but can be easily applied to any other type.

The Gaines locomotive furnace is shown in Fig. 2 as applied to a Mikado locomotive, and, as pointed out, this possesses several advantages over the type shown in Fig. 1. It is equally well adapted to the Pacific, consolidation, switcher or Mallet locomotives.

The Gaines furnace applied to a Mallet locomotive firebox with a barrel combustion chamber is shown in Fig. 3. While this type of combustion chamber is not necessary with the Gaines furnace, it was used in this case to reduce the excessive length of flues and to balance the weights on drivers, it being impossible to carry the mud-ring forward to the flue sheet without interfering with the reversing gear. The barrel combustion chamber has met with much opposition in the past owing to its complications and cost of maintenance, but in recent years much of this trouble has been eliminated by the liberal use of flexible stays and by welding the seams. The large dead water space beneath the barrel has also been a source of much trouble, but this may be easily overcome by applying arch tubes as shown. Here the five 3½ in. tubes add 70 sq. ft. to the effective firebox heating surface, evaporate about 4,000 lbs. of water per hour, and produce quite a circulation in an otherwise dead water space, thereby reducing the variations in temperature around the barrel, making the expansion and contraction uniform and eliminating leaky seams and stays. A study of the illustration brings out the fact that the application of this furnace permits of great flexibility in design and location of the firebox with respect to the wheel arrangement.

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The conventional type of firebox on an Atlantic, Pacific or Mikado locomotive is always located back of the rear driver, this construction being necessary in order to get the deep throat that is required to keep the grate line well below the bottom flues. On large Pacific and mikado locomotives, excessive flue lengths or the use of barrel combustion chambers necessarily follow this practice. In trying to keep the center line of the boiler as close as possible to the rails, the builders are forced to bring the firebox down close to the top of the frames and trailer wheels; this results in shallow ash-pans that burn out easily, complicated wheel housings, and, very often, insufficient air openings.

On consolidation and Mallet locomotives, the firebox being located above the drivers, the grates are placed as low as the wheels will permit—scant attention being paid to the ash-pan—while the required firing clearance between the grates and bottom flues is obtained by raising the center of the boiler to the necessary height.

The Gaines furnace, by its method of construction and application, does away with most of the bad features mentioned above. Fig. 1 shows the grates of a Pacific type locomotive raised up on a line with the belly of the boiler, the mud-ring being carried forward above the drivers and cradled in the center, the depth of the throat being reduced to a minimum. This permits of the boiler being brought lower on the frames without impairing the ash-pan. It might appear that the reduction in firebox depth, by reducing the volume and heating surface, would lower the efficiency, but firebox volume is valuable only in so far as it increases the flame-way, and depth can be sacrificed if the length of the firebox gives the flame-way desired. The amount of radiant heat imparted to the firebox heating surface depends, as stated before, on the temperature and extent of the radiating bodies; and since the firebox receives the larger part of its heat by radiation it is evident that the extent of the heating or evaporating surface is of secondary importance.

In Fig. 2 the firebox of a Mikado locomotive is carried forward above the rear drivers; this location of the back flue sheet reduces the flues to a reasonable length without the aid of a barrel combustion chamber. The shallow throat permits the boiler to be kept well down on the frames without crowding the ash-pan, while at the same time a firebox volume, much in excess of the ordinary, is obtained.

On the Mallets shown in Fig. 3, the grates are also located above the belly of the boiler. This construction allowed the boiler to be lowered 6 or 8 in. without harm to the ash-pan, while a firebox of exceptionally large volume and long flame-way was obtained.

Where drivers of very large diameter are used a construction similar to that illustrated in Fig. 4 can be employed to good advantage. Here a firebox of normal depth is maintained, while that part of the mud-ring around the combustion chamber is carried up and over the drivers, being dropped in the front center sufficiently to take care of the throat sheet. While a little unusual, this firebox construction presents no difficulties and no trouble has been experienced with locomotives so equipped. It will be noticed that the front of the mud-ring is directly above the pedestal and that the firebox is unsupported at this point, the weight of the grates, furnace and firebox being transferred to the frames back of the rear driver through the furnace bearer and frame brace; the boiler expansion is taken care of by a sliding connection between these castings. This feature is illustrated in Fig. 5, which also shows the air ducts opening into the firebox and the method of applying the combustion chamber floor.

SUMMARY.

While the locomotive has been greatly improved in general design and refinement of details during the last few years, but little attempt has been made to improve the evaporative efficiency of the locomotive boiler. The demand for more steam, following the increase in size of cylinders and rise of pressure, has been met by increasing the size of the boiler and not by increasing its evaporative power, although the superheater, by improving the quality of the steam, has reduced the demand on the boiler.

It is possible that future builders will be forced to pay much attention to the design of a furnace that can be fired by the average fireman in such a manner as to get all of the available heat out of the coal, and to arrange the heating surface so as to readily absorb the heat made available. With our present design of firebox and boiler, an evaporation of about 52 lbs. per square foot of firebox heating surface, and 8 lbs. per square foot of tube heating surface has been obtained. An evaporation of 90 lbs. per square foot from experimental boilers in laboratory practice, without injury to the plates, would seem to indicate that the practical limit has not yet been reached.

The firebox has been correctly called the "business end" of the locomotive. If a big business is desired a big firebox with ample grate area and long flame-way is necessary. A large grate covered with a white-hot fire—in conjunction with a mass of incandescent brick work, properly arranged, and a long combustion chamber filled with flames—gives a very extensive radiating surface from which the heat readily passes to the surrounding firebox sheets.

The increased heating surface on the modern locomotive boilers has been obtained by increasing the number and length of the flues, and the fact that the front end temperatures on locomotives with tubes 20 to 24 ft. in length are but little, if any, lower than the temperatures on locomotives with tubes from 12 to 16 ft. long, would seem to indicate that the heating surface gained by excessive flue lengths is largely "conversational"—nice to talk about, but of little practical value. Shorter tubes and longer fireboxes and combustion chambers would probably improve the steaming qualities of the boiler, while an increase in the velocity of the gases over the heating surfaces, and an increase in the circulation of the water around the heating surfaces will result in increased evaporation until the point of "critical velocity" is reached.

The problem of increasing boiler efficiency should be attacked from the firebox end. First, get a furnace with which it is possible to approximate perfect combustion with ordinary firing, thereby making available all of the heat contained in the coal, and then locate and distribute the heating surface so as to readily absorb the heat made available—a difficult problem, but worthy of study and effort.

ACCIDENT BULLETIN NO. 45.

The Interstate Commerce Commission has issued Accident Bulletin No. 45, containing the record of railway accidents in the United States during the three months ending September 30, 1912. The number of persons killed in train accidents was 288 and of injured, 4,598. The total number of casualties of all classes including "industrial accidents" amounted to 3,109 killed and 51,331 injured. These are summarized as follows:

TABLE NO. 1—CASUALTIES TO PERSONS—STEAM RAILWAYS.

Causes	Passengers (classes *a*, *b*, and *bb*)		Employees (including employees not on duty)		Other persons (trespassers and non-trespassers)		Total persons	
	Kil'd	Inj'd	Kil'd	Inj'd	Kil'd	Inj'd	Kil'd	Inj'd
Train accidents.								
Collisions	74	1,101	71	869	12	21	157	1,991
Derailments	14	1,313	75	730	30	66	119	2,109
Miscellaneous train accidents, including boiler explosions...	...	20	11	473	1	5	12	498
Total	88	2,434	157	2,072	43	92	288	4,598
Other than train accidents.								
Accidents to roadway or bridges not causing derailment (189)	...	...	1	2	...	...	1	2
Other accidents (classes C-3 to C-12 inclusive)	68	2,313	661	12,129	1,977	3,405	2,706	17,847
Total	156	4,747	819	14,203	2,020	3,497	2,995	22,447

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Causes	Passengers (classes *a*, *b*, and *bb*)		Employees (including employees not on duty)		Other persons (trespassers and non-trespassers)		Total persons	
	Kil'd	Inj'd	Kil'd	Inj'd	Kil'd	Inj'd	Kil'd	Inj'd
Industrial accidents to employes.								
While working on tracks or bridges..	...	...	47	6,574	...	...	47	6,574
At stations, freight houses, engine houses, etc., where no moving railroad car or engine is involved...	...	...	17	6,266	...	...	17	6,266
In and around shops.	...	...	17	13,831	...	...	17	13,831
On boats and wharves.	...	...	6	439	...	...	6	439
At other places.....	...	...	27	1,774	...	...	27	1,774
Total	...	...	114	28,884	...	...	114	28,884
Grand total	156	4,747	933	43,087	2,020	3,497	3,109	51,331

TABLE NO. 1A.—COMPARISON WITH FORMER RECORDS.

Item	Bul-letin 45	Bul-letin 44	Bul-letin 41
Passengers killed in train accidents.....	88	14	65
Passengers killed, all causes.....	156	52	116
Employees (on duty) killed in train accidents..	153	99	107
Employees (on duty) killed in coupling.....	32	46	42
Employees (on duty) killed, total (Table 1a)...	712	554	626
Total passengers and employees (items 2 and 5, above)	868	606	742
Other persons killed (including trespassers, non-trespassers, and employees not on duty), all causes	2,127	1,696	2,016
Employees killed in industrial accidents.....	114	93	131
Grand total (items 6, 7, and 8).....	3,109	2,395	2,889

This table shows a noticeable increase in every item, in the quarter under review, over the corresponding item in the preceding bulletin, with the exception of item 4, "Employees killed in coupling," which shows a decrease of 14 killed. Compared with the same period of the preceding year all items show increases with the exception of two—employees killed in coupling and in industrial accidents. The large number of passengers killed in train accidents will be understood when it is recalled that in the quarter under review occurred the disastrous wrecks at Corning, N. Y., Wilpen (Ligonier) Pa., and Western Springs, Ill. Of the 2,020 "other persons" killed 1,663 were trespassers, of whom 39 were killed in train accidents; 313 were riding on cars or attempting to do so, and 1,254 were struck or run over by trains. This last item (1,254) is 50 per cent. larger than the number of *injured* in the same class.

The total number of collisions and derailments in the quarter now under review was 3,935 (1,537 collisions and 2,398 derailments), of which 171 collisions and 298 derailments affected passenger trains. The damage to cars, engines, and roadway by these accidents amounted to $3,366,401. This sum is greater than that reported in this quarter since 1907, as will be seen by Table No. 2.

TABLE NO. 2—COLLISIONS AND DERAILMENTS.—STEAM RAILWAYS.

Classes	Number	Damage to road and equipment	Number of persons Kil'd	Inj'd
Collisions, rear	245	$330,074	72	431
Collisions, butting	164	209,357	55	783
Collisions, trains separating	140	52,814	1	53
Collisions, miscellaneous	988	443,794	29	724
Total	1,537	$1,136,039	157	1,991
Derailments—				
Due to defects of roadway.....	510	$418,486	14	614
Due to defects of equipment.....	1,124	859,085	22	317
Due to negligence.....	131	82,214	8	100
Due to unforeseen obstruction.....	104	222,169	28	247
Due to malicious obstruction.....	18	14,455	1	49
Due to miscellaneous causes.....	511	633,953	47	782
Total	2,398	$2,230,362	119	2,109
Total collisions and derailments.....	3,935	$3,366,401	276	4,100
Total for same quarter of—				
1911	3,034	$2,533,170	189	3,776
1910	3,130	2,871,501	303	3,352
1909	2,751	2,316,014	180	3,341
1908	2,567	1,950,408	176	2,729
1907	4,279	3,603,696	309	4,534

Derailments due to defects of roadway and to defects of equipment are divided into sub classes, eight for roadway and 13 for equipment, and these are totaled in Tables 2a and 2b.

A new table, No. 1b, shows what may be called a surgeon's classification of the injuries which are classified by causes in the principal table of the bulletin. For example, of the 4,230 passengers injured in class *a*, 12 suffered the loss of a leg (or both legs), 10 sustained fractured skulls, 20 were scalded or burned, etc.

Three other new tables, 4a, 5a, and 8a, subdivide the causes of miscellaneous accidents on or around trains; of cases where trainmen strike overhead bridges, etc., and of miscellaneous accidents on or around trains.

Twenty pages of the bulletin are taken up with summaries of the reports, made by the chief inspector, on accidents which were investigated during the quarter. These accidents are as follows:

Delaware, L. & W.	East Corning, N. Y.	July 4..Rear collision
Ligonier Valley	Ligonier, Pa.	July 5..Butting collision
Illinois Central	Courtland, Miss.	July 12..Derailment
Chicago, R. & Q.	Western Springs, Ill.	July 14..Rear collision
Southern	Vasser, Tenn.	July 17..Derailment
N. Y. N. H. & H.	Stonington, Conn.	July 25..Rear collision
Denver & Rio Grande	Pueblo, Colo.	July 31..Derailment
Chicago, M. & P. S.	Keechelus, Wash.	Aug. 12..Derailment
Cincinnati, H. & D.	Antioch, Ill.	Aug. 25..Derailment
Northern Pacific	Hot Springs, Wash.	Aug. 30..Butting collision
Chicago & N. W.	Lyndhurst, Wis.	Sept. 1..Derailment
Chicago, St. P. M. & O.	Hustler, Wis.	Sept. 2..Derailment
Southern	Holton, Ga.	Sept. 5..Derailment
Rutland	Bennington, Vt.	Sept. 7..Butting collision
N. Y. C. & St. L.	Erie, Pa.	Sept. 10..Derailment
N. Y. C. & H. R.	East Rochester, N. Y.	Sept. 15..Rear collision
Louisville & Nashville	Kinerton, Ky.	Sept. 20..Collision—misplaced switch
Pittsburgh, Shawmut & N.	Niles, N. Y.	Sept. 22..Butting collision
Kansas City Southern	Air Line Junction	Sept. 26—Butting collision

Electric railways reporting to the commission (not included in the foregoing statistics) had 107 persons killed during the quarter and 1,362 injured; and there were 52 collisions and 25 derailments. Train accidents are charged with eight fatalities; 4 passengers and 4 employees. The total number of passengers killed from all causes was 10 and of employees 19 (6 in industrial accidents). The number of trespassers struck or run over by cars was 57; 38 killed and 19 injured.

A TRAIN (?) DESPATCHER.

Fifteen thousand cars were handled in the yards of the Buick Motor Company, of Pontiac, during the year, inclusive of the thirteen trainloads of Buicks sent to the west. Outgoing cars numbered 7,600, and incoming freight 8,000 carloads.

The company has comparatively recently installed a new system whereby a despatcher is put in charge of all inter-factory deliveries [by means of motors running in the streets]. He sits all day with a telephone receiver clamped to his ear, directing the drivers from one loading station to the next. There are 22 motor trucks and ten horse-drawn vehicles always on the job, and it is estimated that the system saves the company in the neighborhood of $100,000 a year.

Four switch engines are kept all day, and two all night, shunting cars and making up trains in the Buick yards. Three transfer cars are kept busy at the motor building for loading during the day, and at night they are rolled up to the dock at the assembly plant.—*Michigan Manufacturer.*

RAILROAD CONSTRUCTION IN AFRICA.—The Benguella railroad, which has as its goal the Katanga copper belt, in the extreme southern section of the Belgian Congo, is, as projected, about 1,225 miles long. Of this, 425 miles, from the Katanga copper belt to the Belgian Congo frontier, is to be built by Belgian capital. The Atlantic end of this railroad was opened to traffic on September 17, 1912, for 270 miles from Lobita bay. By July, 1913, it should reach Bihi and have 325 miles of railroad under operation. Upon arrival at Huambo, a little over one mile above sea-level, the most difficult part of the line will have been finished. Should capital be found for the completion of this road, it will be a most valuable adjunct to the exploitation of the Katanga copper belt, since it will give a short-line competitor to the railroads from the south.—*Mining and Scientific Press.*

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WHY FREIGHT RATES SHOULD BE INCREASED.*

Expenses Have Advanced, Interest Rates Have Risen and the Railways Require Larger Earnings for Proper Development.

By Daniel Willard,
President Baltimore & Ohio Railroad.

The subject of railroad freight rates is such a large one that it would be quite impossible to discuss it at all satisfactorily within the proper limits of a letter, but a brief history of the Eastern advance rate case, otherwise known as Interstate Commerce Commission case No. 3,400, and some reference to subsequent developments in that connection, may be of interest.

In 1910 the railroads operating within what is known as official classification territory—which may be roughly described as that part of the United States bounded on the north by Canada, on the east by the Atlantic ocean, on the south by the Ohio and Potomac rivers and on the west by the Mississippi river—filed new freight tariffs, which provided for an increase of certain freight rates, chiefly those known as class rates, and the advance varied from 10 to 20 per cent.

At the request of the Interstate Commerce Commission the date when the increased rates should become effective was postponed by the carriers, and a hearing was ordered by the commission so that the railroads might have opportunity to present their case and those opposed equal opportunity to present theirs. Extended hearings were had, and as a result of it all the commission in its decision, handed down early in 1911, found, first, that the railroads had failed to establish a necessity for increased revenue.

Second, it was suggested that even though a necessity had been established, it was doubtful if the plan proposed was the right way in which to obtain such revenue. And it was further pointed out that there was a depression of all kinds of business at that time, and that the carriers ought not to expect to raise their rates when business was generally dull.

However, the commission also said, among other things, that should it come about that their views were not sustained by future developments, and should it appear at any time that there was a real necessity on the part of the carriers for increased revenue, in order that they might be in position to provide such facilities as the public required, they would, upon request, give the matter further consideration. They said they would not hesitate, under such circumstances, to authorize such rates as would be reasonable.

The carriers accepted the situation and, I am confident, made strenuous efforts to meet the conditions imposed upon them with rates then in effect. Rigid economies were enforced and vigorous efforts were made to obtain greater efficiency of operation in all departments.

In a number of important instances, since the decision above referred to, dividends have been reduced. In at least three cases receivers have assumed charge of the property.

During the first two years immediately following the decision—that is, 1911 and the early part of 1912—the commerce of the country showed little, if any, increase. But during the latter part of 1912 and the early part of 1913 there has been marked activity in business of all kinds, and the gross earnings of the railroads generally for the year ending June 30, 1913, will probably be the largest in their history. It might be thought from this that they should now be able to show sufficient surplus above interest and dividend requirements to justify such further capital expenditures as may be necessary. A careful study of the facts, however, I believe will show that this is not the case.

First of all, the rates which were in effect in 1910 have not in the aggregate been maintained—that is to say, while certain increases have been made during that time, decreases also have come about. The net result has been, for example, a reduction in the earnings of the Baltimore & Ohio Company on the freight business handled by that company in October, 1912, of more than $100,000 when compared with what they would have been in October, 1909. In other words, if the same rates, classifications and conditions had been in effect in 1912 that were in effect in 1909 the Baltimore & Ohio Railroad Company would have received in October, 1912, more than $100,000 more than it did receive for the business actually handled in that month.

Not only has the general basis of rates been reduced—to some extent because of orders of the Interstate Commerce Commission, and perhaps, to an equal or greater extent by commercial conditions or influences which are beyond the power of the carriers to resist—but during the same period expenses have also very greatly increased, as explained below.

THE HEAVY INCREASES IN EXPENSES.

Again in the case of the Baltimore & Ohio, the wage increase of 1910 amounted to approximately $2,500,000 per year, when applied to the number of men at that time employed. The increases which have been granted—either voluntarily or by virtue of arbitration awards—within the last twelve months have resulted in adding between $800,000 and $900,000 more to our expenses each year. Further, as is well known, the conductors and trainmen now are engaged in taking a strike vote for the purpose of enforcing their demands, which call for an increase, I understand, of approximately 17 per cent.

Prices of various kinds of material also have advanced since 1910, notably in the case of fuel coal, ties and equipment. The coal bill of the Baltimore & Ohio Railroad amounts to, approximately, $6,000,000 per year, and within the last two years, there has been an advance in the price of coal of upward of 10 per cent.

The increase in price of ties, while not so great in the aggregate, will be large. The prices asked and paid for locomotives and freight and passenger cars are higher today than was the case three years ago for equipment of the same kind.

Furthermore, legislation of various kinds—both state and federal—has had an important influence upon expenses. The so-called full crew bill, which has become a law in many of the States, requires the railroads to employ one extra man on all trains of more than a certain length, although the railroad managers unanimously believe the law to be unnecessary and unwise. But regardless of whether such laws are wise or not, the expense is the same and must be met.

The hours of service law, boiler inspection law, laws in various States prescribing standards of construction for caboose cars, laws with reference to the construction of postal cars, revised orders with reference to safety appliances upon new equipment, as well as upon existing equipment; laws with reference to grade separation, etc., etc.—all have tended to very greatly increase the cost of operation; and further, the public demands, expects and receives a higher standard of service in all directions than has ever been the case before.

This results, for instance, in the running of a greater number of passenger trains than the business itself would justify over the lines where the traffic is light; and also in a higher standard of freight service—that is to say, carriers are required to furnish cars more promptly, and to move them with less delay. While no one recognizes better than the railway executives that the service is not always satisfactory, and is frequently not such as they would like to furnish, I believe it is, nevertheless, a fact that, upon the whole, it is on a more satisfactory basis today than ever before, but this all means greater expense in operation.

*An article in the Philadelphia *Public Ledger*.

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RISE IN INTEREST RATE AN IMPORTANT FACTOR.

Another very important element is the rate of interest which railways are obliged to pay upon new capital raised for improvements and betterments. It may be argued that the interest basis on all investments has been raised within recent years, and that the very best securities pay higher rates today than ever before, and that the railroads are not peculiar in this respect. But, even so, they are still required, in common with others, to pay a much higher rate of interest than was the case some five or ten years ago.

Ten years ago if a railroad company with well established credit decided to increase its capital for improvement purposes —we will say $1,000,000—it was customary to assume that the interest charge on that account would be approximately $40,000 per year. Under existing conditions, the interest charge would be between $50,000 and $60,000 per year as a minimum, and, in some cases, even in excess of $60,000. This item alone, as you will see, becomes very important when large systems—like the Baltimore & Ohio—are spending upward of $20,000,000 a year, and ought to do so, for betterments, extensions and new equipment.

Taxes have increased largely during the last three years. In the case of the Baltimore & Ohio Company, the increase in that one item since 1909 amounts to more than $900,000 a year. I think it is perhaps not a matter of common knowledge, although one of public record, that the American railroads, as a whole, pay each year in taxes more than $120,000,000.

The various influences which I have mentioned all have tended to reduce the margin between income and outgo. And it has become so narrow that the railroads—many of them, at least—do not feel justified in further increasing their capital charges, because the burden assumed by so doing might seriously interfere with their ability to maintain reasonable payments upon existing capital issues.

The result is that the railroads generally in official classification territory are very rapidly coming to a stop so far as matters of capital expenditures are concerned. Inasmuch as few, if any, are able to provide for new additions and improvements out of surplus earnings, it is quite certain that the railroads in the territory referred to will not be able to keep pace with the growing commerce of the country.

On that account many have felt that a moderate advance in freight rates is not only justified, but actually ought to be made at this time. Also that in view of the changes which I have referred to, the Interstate Commerce Commission would be disposed today to grant the request which the railroads contemplate making—that they be allowed to advance all freight rates in official classification territory 5 per cent.

It was suggested before, in the case known as No. 3,400, that if the railroads had established the fact that they needed additional revenue at that time, the method which they proposed for obtaining it was not the right or best way, in that it imposed increases of from 10 to 20 per cent. upon some rates, and made no increase whatever upon certain others.

It was argued, and with much force, that the relation of rates which then existed had come about through a long period of competition and regulation, and that anything which tended to disturb that relationship should be avoided, if possible. The carriers recognize the force of that argument, and, in the present instance, have recommended that the increased revenue be obtained by advancing all rates an equal amount—that is to say, 5 per cent. If this were done, it is believed that commercial conditions would be very little, if at all, disturbed thereby.

BUSINESS CONDITIONS NOW FAVORABLE.

It also was argued in the previous case, that, even if the carriers did desire additional revenue at that time, the same condition was more or less true with all other business. That is to say, it was a period of commercial stagnation, and it was said that the carriers ought to raise their rates, if at all, during a time of commercial activity, and not when business was dull. The force of that argument also was recognized.

The volume of business which is being handled today is probably greater than at any other time in the history of the country, and profits are supposed to be upon a generally satisfactory basis. If that is true, it would seem that business ought to be able to stand, with very little discomfort, the small advance in freight rates now proposed.

This proposed increase has been considered and advocated chiefly by the officers directly in charge of the properties involved—men who, in nearly all instances, have spent their lives in the railway service, who are now salaried officers of such corporations, and who realize fully that they occupy the dual position of trustee for the owners of the properties, and also that of semi-public officials responsible to the public for the proper maintenance and operation of the properties in their charge. It would seem that their opinion in a matter of such grave importance to the country as a whole ought to be given serious consideration.

Personally I have the utmost confidence in the intelligence, fairness and patriotism of the gentlemen who constitute the Interstate Commerce Commission. I entertain no doubt whatever that when the matter reaches them they will eventually decide it in light of all the facts presented.

I believe, however, that the right solution of this case is of such importance and of such vital interest to all concerned that there ought to be, and I indulge the hope that there will be, no such general opposition to the proposed advance this time, as developed in the previous case.

The public is constantly letting it be known, and properly so, that it desires to ride in steel coaches; that it wants, when it travels, the protection of the electric automatic block; that it wants to be properly provided with cars of suitable kind when it has freight to ship, and that also it wants its freight moved promptly and with regularity to its destination, and the public is no more anxious to have all the things above mentioned, than I, as chief executive of the Baltimore & Ohio Company, am anxious to furnish them. But such things are expensive, and cannot be furnished unless the money is available; and it is not available at this time.

A 5 per cent. increase on all freight rates in official classification territory, if granted, would probably increase the gross revenue of the carriers involved upward of $40,000,000 per year, and while that sum seems large of and by itself, it is not large when considered in connection with the whole matter. It would mean an increased average charge on all the business handled in the territory referred to of approximately 5 cents per ton; and, if I mistake not, the 5 per cent. increase which is now requested will fall short of what is reasonably necessary, unless some of the influences which have tended to increase so greatly operating expenses in recent years should in some manner be checked.

I have outlined above, in a general way, my reasons for believing that the 5 per cent. increase as requested should be granted. It is hardly necessary that I should add that the carriers expect to be able to produce ample and specific evidence to support the general statements which I have made, and I feel confident of their ability in this instance to fully sustain the burden of proof which rests upon them.

I wish to call attention again, by way of emphasis, to the fact that the men who are representing the railroads in this particular movement will be affected very little, if any, in a personal way by the outcome of this issue. They are, by virtue of their positions, the trustees of the properties, and they are also, in a very proper sense, semi-public officials charged with important public duties to perform. Should their request for increased revenue in the present instance be denied, as was the case in 1910, they will continue as they have in the past, to fulfill their obligations to the public as best they may, while at the same time not unmindful of the proper responsibility resting upon them as the fiduciary agents of those whose money has been invested in railway securities with the proper expectation of a fair and reasonable return.

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I do not believe the American people, as a whole, desire to be unfair to the railroads or to those who have invested either their earnings or their inheritance in railway securities.

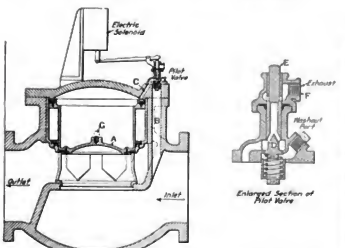
RAILROADS NOT A COMPLETED INSTITUTION.

If the railroads were a completed institution, and if further additions and extensions were unnecessary, the whole subject would present an entirely different phase. But they are not completed, nor will they ever be completed, so long as the commerce of the country continues to grow, and conservative estimates have shown that the roads interested in this particular case will probably be required for some years to come to raise in some manner each year for additions and betterments a sum well upward of $500,000,000.

It is absolutely out of the question to think of providing such a sum from the surplus earnings of the roads, nor would such a policy be advocated or desired. Undoubtedly it is desirable that a considerable portion of that sum should come from each year's surplus. But much the larger part must be realized from the sale of new securities. In order that there may be a sale, it is necessary that there must also be some one to buy, and it should be remembered that the act of buying is one of purely voluntary action. But people will not buy railroad securities—which is another way of saying that they will not invest their money in railroads—unless they believe they will receive as good return upon the money so invested as they would if it were invested in some other line of undertaking with similar risk and responsibility.

ELECTRICALLY OPERATED WATER SERVICE VALVE.

The water service valve shown in the illustration is operated by means of an auxiliary or pilot valve controlled by an electric solenoid. The illustration shows the valve in an open position and in order to close it the auxiliary valve must be opened either by means of the solenoid or by moving it by hand. When the auxiliary valve is opened, water passes through the passage *B*, through the auxiliary valve and the passage *C* to the chamber above the main valve *A*. As the upper surface



Water Service Valve Controlled by an Electric Solenoid.

of the valve *A* is greater than the lower, the difference in the pressure closes the valve. When the solenoid is released the auxiliary valve closes and the valve *D* opens, permitting the water above the valve *A* to pass through the port *C*, raise the valve *E* and escape to the atmosphere through the exhaust port *F* and the pressure of the water below the valve *A* opens it. The restricted passage of the water from above the main valve acts as a cushion to prevent it from opening too quickly and at the same time air is drawn in through the ports *G*, which acts as a cushion to prevent the valve slamming when closing. This valve is manufactured by the Golden-Anderson Valve Specialty Company, Pittsburgh, Pa.

CONVERTIBLE SEAT FOR COMPARTMENT CARS.

Sleeping car berths are not as wide as could be desired because of the limitations placed on the width of the cars, and the necessity of providing sufficient aisle space. In compart-

Seat End in Position for Extending Berth.

ment cars, however, where there is a separate passageway through the car outside the compartments, there is no objection to using the aisle for extending the berths, and some of the compartment sleeping cars running in the Twentieth Cen-

Seat End Locked in Position for Day Travel.

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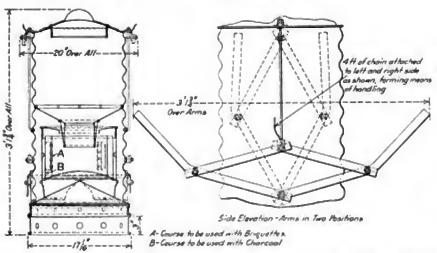
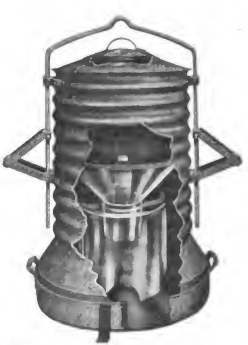
tury Limited are equipped with a device for this purpose. The seat ends are hinged so that they can be swung down and supported by an angle brace and form a horizontal extension of the seat. When the two seats are pulled out, as is ordinarily done in making up a lower berth, a filler is placed between the two ends after they have been lowered, thus forming a full size bed. In traveling long distances passengers frequently become tired and wish to rest during the day, and with this type of seat the end may be swung down at any time and a comfortable couch provided on which a person may stretch out at full length.

This extension seat was invented by Mrs. R. C. Smith, Chicago, Ill., and the patents are controlled by the Pullman Company.

BAXTER CHARCOAL CAR HEATERS.

A charcoal heater that is inexpensive to operate, and one that has given efficient service in extremely low temperatures, is shown in the accompanying illustrations. The outside shell is made of corrugated metal and forms the body of the heater, supporting the magazine at the top and creating a radiating surface around the fire pot of such area as will insure all boxes and packages not catching fire should they fall against it. A positive lock on the base secures the fire pot to the shell, preventing the hot coals from being emptied from the heater into the car in the event of accident. The hasp on this lock is provided with slots for two positions, permitting the fire pot and its grate to be varied in its distance from the feed spout of the magazine, thus creating a simple means of regulating the rate of combustion by changing the thickness of fire without altering the inlet draft passage areas.





Baxter Charcoal Car Heater for Perishable Freight.

The heaters are started by means of an igniter or "starter," which is made of blotting paper saturated in a solution of potassium nitrate and then pressed into the shape of a pie plate, being provided with a hole in the center. These starters are placed on the grate and a lighted match is applied to the edge of the hole in the center of the igniter, which burns without a flame; the magazine is then replaced and the supply slide opened. The heater is then in full operation.

A report on one of these heaters in use on a Canadian road tells of a carload of potatoes, passing through temperatures of 38 to 42 deg. below zero, being received when the outside temperature was 38 deg. below in perfectly good condition. A carload of beer, passing through temperatures of from 28 to 36 deg. below, was received with an inside temperature of 60 deg. above with the thermometer registering 35 deg. below outside of the car.

These heaters are manufactured in three sizes; the No. 1 or the large size is designed for use in protecting less than carload business, in which service the car door on local trains is not only opened often, but is frequently allowed to remain so for many minutes, thus requiring the generation of considerable heat in a short time to again raise the temperature in the car to the proper degree. The No. 2 heater is designed to fit into the ice bunkers of refrigerator cars, and is provided with an automatic brace, as shown in one of the illustrations, which locks it fast in the center of the bunker. Two of these heaters are used with each car, one in each bunker. The No. 3 is a heater designed to meet the requirements of breweries where a suspended heater is preferable. These heaters are in a size between the No. 1 and No. 2, and are provided with heavy hooks which fasten into the screw-eyes applied to the carlines, thus suspending the heater out of the way of the kegs which are rolled on the floor of the car. The No. 2 heater will operate 36 hours without refilling, at a cost of 15 cents for the charcoal; the other heaters will operate up to 96 hours without refilling. It will be noted from the drawing that briquettes may also be used. An additional feature of the charcoal heater is the giving off of the carbon monoxide gas which not only helps to preserve any fruit or vegetable freight carried, but also kills any animal life that may be confined in the car, such as rats, mice, tarantulas, etc. For this reason the car should be opened a few minutes before any person is allowed to enter.

These heaters are in service on 15 railroads, including three of the larger systems of this country. They are made by the Klauer Manufacturing Company, Dubuque, Iowa.

SURVEYS FOR AFRICAN RAILROAD.—The surveys for the railroad from Lusambo, on the Sankuru river, to Bukama, on the Upper Congo river, are finished, and work will presumably begin upon the arrival of the Cape-to-Cairo railroad at Bukama in 1914 or 1915. The route will probably be changed, however, as further surveys are being carried on with the idea of fixing the western terminus at N'Dolo on the Lower Congo railroad near Leopoldville. The proposed new route touches Luebo, Luluabourg, Kanda Kanda, and Mutambo, Mukulu, and not Lusambo, joining the Cape-to-Cairo railroad at Lubende, some 15 miles south of Bukama. The line as outlined would be about 1,250 miles long.—*Mining and Scientific Press.*

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General News.

A. B. Garrettson, president of the Order of Railway Conductors, was re-elected at the annual meeting of the brotherhood in Detroit last week.

On June 1, the Chicago & Alton abolished the practice of allowing train "butchers" and news agents on its trains. News agents will be permitted to canvass trains during stops at important points.

The Denver & Rio Grande and the New York, New Haven & Hartford are distributing among their agents and employees booklets, pointing out the advantages of courtesy, by Elbert Hubbard.

George Bradshaw, Highland, N. Y., formerly chief safety agent of the New York Central, has just finished a safety inspection of the shops, yards and other works of the Buffalo, Rochester & Pittsburgh; and has delivered a number of "safety-first" lectures to the employees of the road.

Following the recent action of the New York, New Haven & Hartford at its large car shops, the Boston & Maine has made a reduction of about 1 hour a day in the working time in the shops throughout its lines. It is expected that the short-time schedule will be kept in force several weeks.

The New Mexico Corporation Commission has asked the attorney general to give his opinion on the matter of compelling the Chicago, Rock Island & Pacific to comply with the provisions of statutes of New Mexico by filing articles of incorporation. The Chicago, Rock Island & El Paso, and the Chicago, Rock Island & Choctaw companies have filed their articles of incorporation with the state, but the commission seems to feel that this is not sufficient.

The Brooklyn Rapid Transit Company, operating surface and elevated street railways in Brooklyn, N. Y., announces an increase in the pay of employees, to take effect July 4 next, which will amount to from 4 to 15 per cent., the increases varying according to length of service and the records of individuals for efficiency. About 6,000 men will enjoy the benefit of this increase, and the additions to the pay roll will amount to several hundred thousand dollars a year.

The monorail extending from Bartow station on the New York, New Haven & Hartford, New York City, to Belden's Point, about 2 miles, has been given up. The company operating it, which is controlled by the Interborough Rapid Transit Company, has been reorganized, and a standard gage surface electric railroad will be put in operation over this route. The monorail was operated for passenger business a considerable length of time, but it has not given satisfaction.

The number of freight cars moved over the Middle division of the Pennsylvania Railroad in the month of May was 185,876, the heaviest movement on record. The number of cars is less than the number moved in May, 1907, but, in consequence of the large increase in the number of cars of high capacity, the amount of freight moved was greater than in the earlier period. As compared with May, 1912, the total number of cars increased about 15,000; and the increase over May, 1911, was 30,000.

The length of the lines of the Delaware, Lackawanna & Western operated by the block system is 739 miles. This is 75 per cent. of the total of the passenger lines operated by the company. An officer of the road calls attention to the fact that this percentage is not stated in the report issued by the Interstate Commerce Commission which was reprinted in the *Railway Age Gazette* of May 16, page 1059. The percentage of passenger *tracks* worked by the block system is 83.3, not 46.6, as stated in the report.

The O'Brien Construction Company has removed its machinery and fixtures from the line of the Southern New England Railway, an agreement having been reached between the officers of the railway and the contractors for the cancellation of their contract. It appears that the legislature of Rhode Island passed an act authorizing the lease of the road to the Central Vermont but that the governor vetoed it. John S. Murdock, vice-president of the railway company, says that there is now no hope of obtaining money until the legislature shall again meet.

A school for railroad department secretaries of the Y. M. C. A. will be conducted at Lake Geneva, Wis., July 12 to 25, at which several lectures will be given on the subject of "Safety First." Among the lecturers will be L. F. Shedd, general safety supervisor of the Rock Island lines; L. Wilbur Messer, general secretary of the Y. M. C. A.; John F. Moore, general secretary of the railroad department at New York; W. N. Northcott, general secretary of the railroad department at Chicago, and A. G. Knebel, international secretary of the railroad department.

The Canadian Pacific has raised its shopmen's pay 10 per cent.; this is the result of negotiations which have been in progress at Montreal for the past two weeks between delegates of the federated shop trades and the officers of the railway. All the employees of the mechanical and car departments on the company's eastern lines, some 9,500 in number, will benefit by the increase. Time and a half will be allowed for overtime and for work on legal holidays. The men affected by the changes, which went into effect June 2, and will continue for one year, are machinists, boilermakers, blacksmiths, brass workers, buffers, sheet metal workers, steamfitters, plumbers, general car builders and carmen, employed in the district between Port Arthur and St. John.

On the occasion of the celebration of the semi-centennial of the state of West Virginia, at Wheeling, in the week beginning June 15, the Baltimore & Ohio will make a display of locomotives illustrating the history of the steam engine in railroad service from the year 1827, when the road was begun. A number of old engines will be shown in operation under their own steam. The Hempfield yard of the road in Wheeling is directly opposite the City Hall and the railroad exhibition will be a prominent feature of the celebration. This exhibit of locomotive history will be under the direction of Major J. G. Pangborn, who directed the preparation of the great historical display of locomotives for the Baltimore & Ohio at the World's Fair in Chicago, in 1893.

D. F. Jurgensen, engineer of the Minnesota Railroad & Warehouse Commission, in a paper which is to be read before the Mississippi Valley States Convention on Railroad Valuation at Des Moines, Iowa, June 6, draws attention to what he considers an opportunity for the state railroad commissioners of the various states to aid the public in what he characterizes as "in reality a contest between the carriers and the public, with the Interstate Commerce Commission as the court or umpire to represent the public." He calls attention to the fact that at the coming valuation hearings in the question of land values, the railroads only will be represented, that the Interstate Commerce Commission will not itself be familiar with the facts, and suggests that since the state railroad commissioners are thoroughly familiar with the facts, they should represent the public in this "contest."

Electrification and Terminal Discussion in Chicago.

The Chicago city council committee on railway terminals on June 2 voted to recommend for passage an ordinance requiring the railways of Chicago to operate their trains by motive power "other than steam, or that will not produce smoke or noxious gases," after July 1, 1915, under a penalty of $200 for each offense. This action was taken after a series of hearings at which officials of the Chicago Association of Commerce and the executive officers of the principal railways had asked the committee to postpone consideration of the ordinance until the conclusion of the thorough investigation now being made by the association's committee on Smoke Abatement and Electrification of Railway Terminals. A report of this investigation, which has been under way for two years is promised by January 1, 1914.

At the hearings officials of the Association of Commerce and engineers of the investigating committee have explained in detail the work which has been carried on under the direction of the late H. G. Burt as chief engineer. The aldermen were apparently influenced by an attack on the Chicago Association of Commerce made by Alderman Long, who introduced the ordinance, and who declared that the association was aiding the railways in a policy of delay. Nearly three years ago a committee of the association made an investigation, the details of which have never been made public, and reported a finding that electrification was "both practicable and feasible." The railways

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were informed of the report, and at the instance of the association's officers the present committee was formed on which the railways are represented by only four members out of 17, and the railways agreed to finance a thorough investigation by competent engineers. The investigation has cost $250,000 to date, and Hugh Patterson, electrical engineer of the committee, said at one of the hearings that it would require another year to complete the investigation along the lines mapped out, but that the report could be prepared by the first of next year by curtailing a part of the work.

The council committee on railway terminals temporarily postponed its consideration of the subject of the location of new terminals, pending its decision on the electrification question, but the matter continues to arouse a lively public discussion. Mayor Harrison has announced that he is in favor of the plan proposed by the union station roads for a new station between Jackson and Adams streets, as described in the *Railway Age Gazette* of May 23, and the west side property owners at several meetings have protested vigorously against any plan of moving the terminal south to Twelfth street, as proposed by the City Plan Commission. A committee of the Western Society of Engineers has suggested to the committee that it employ competent engineers to assist it in the consideration of the entire problem. The *Chicago Tribune* has opened its columns to the presidents of all roads entering Chicago for a discussion of the station problem, and articles have been presented by Messrs. Delano, of the Wabash; Miller, of the Burlington; Markham, of the Illinois Central; Gardner, of the Chicago & North Western; Worthington, of the Chicago & Alton; Earling, of the Chicago, Milwaukee & St. Paul, and Wood, of the Pennsylvania Lines.

The City Club has announced a series of discussions on the subject at noonday luncheons during this week and next, at which the advocates of the various plans will have an opportunity to present their views. The speakers announced include E. R. Graham, of D. H. Burnham & Company, the architects for the union station; Darius Miller, president of the Burlington; Walter D. Moody, managing director of the Chicago Plan Commission; Jarvis Hunt, Irving K. Pond and Allen B. Pond, architects, who have submitted independent plans, and F. A. Delano, receiver of the Wabash.

The Request for Higher Freight Rates.

The circular in which the Michigan Manufacturers' Association invites its members to express their views on the subject of a 5 per cent. horizontal advance in freight rates, deserves the sanest consideration of the members of the association. The directors of the association have tentatively endorsed the request. It seems probable that a horizontal advance will prove least burdensome and disturbing in the event that an advance has to be made. It cannot seriously disturb any competitive conditions, because it will fall evenly upon all classes of competitors and producers. With the tremendous advance in the item of taxes alone, now consuming 12.36 per cent. of the net operating revenues of the entire railroad system of the country, it would seem that government, which is the recipient of the taxes, should allow a commensurate return, from that standpoint alone, from the operations of the railroads.

This paper has devoted a great deal of its space to the discussion of the relations of the railroads and the people, and we believe that the arguments put out have met with a good deal of response. From the best study this paper can make of the subject the advances are quite necessary to the maintenance of the railroad establishment on its present plane of efficiency, and to the attraction of the new capital required to make the necessary additions to mileage and to facilities.—*Michigan Manufacturer.*

Flash Light Signals to Stop Motorists.

The Lehigh Valley has in use at a highway crossing at South Plainfield, N. J., a signal to warn wayfarers of the approach of trains, which gives both a visual and an audible indication; and the visual indication at night is given by means of an acetylene flash light. This device is furnished by the Commercial Acetylene Company, 80 Broadway, New York City, and the light was noticed in these columns in connection with the report of the last annual meeting of the Railway Signal Association (*Railway Age Gazette*, October 18, 1912, page 730). The signal at South Plainfield, like a number of others on the Lehigh Valley, is in the shape of a Hall "banjo" (disk signal), having been converted from a signal formerly used as an automatic block signal. Toward the highway the light shows white when no train is approaching, and red when the track should not be crossed. The regulation of the intermittent action of the light is so adjusted that there are about 60 flashes a minute, each flash lasting about 2-5 of a second. We have spoken of the light as a warning for motorists, but, of course, it shines for all, both great and small. As flash lights are not visible elsewhere on the highways of New Jersey, persons approaching this crossing are warned in the most striking manner possible, that they are approaching a railroad crossing.

American Railroad Employes' and Investors' Association Discontinued.

At a meeting on April 15, the executive committee of the American Railroad Employes' and Investors' Association, having considered carefully all the conditions, the work accomplished and probable future needs and support by the membership, concluded that it is not desirable to continue the general work of the association. Accordingly further operations of the general organization and officers were ordered suspended as of June 1, 1913.

In taking this action the committee voiced its satisfaction with the work accomplished and the intention not to prejudice continuation of its branches locally where desired or further work along the lines of the movement in territories where deemed expedient. All application fees collected from employees since June 1, 1912, will be refunded.

In making this announcement the general officers of the association expressed to the members their sincere appreciation of the support and co-operation which has been rendered.

The association was organized in September, 1906, at a meeting in Chicago attended by the executive officers of the principal western railways and the chief officers of the railway brotherhoods for the purpose of promoting harmony between railways and their employees, and "to cultivate and maintain between its members such a spirit of mutual interest and such concern on the part of all of them for the welfare and prosperity of American railways as will best promote their successful and profitable operation for the benefit alike of their employees, investors and the public."

P. H. Morrissey, former grand chief of the Brotherhood of Railroad Trainmen, who has been president of the association since its organization, with office in Chicago, has, as stated elsewhere, been appointed assistant to vice-president H. E. Byram of the Chicago, Burlington & Quincy.

Master Boiler Makers' Association.

Officers of the Master Boiler Makers' Association have been elected as follows: President, T. W. Lowe, Canadian Pacific; first vice-president, J. T. Johnson, Atchison, Topeka & Santa Fe; second vice-president, Andrew Greene, Cleveland, Cincinnati, Chicago & St. Louis; third vice-president, D. A. Lucas, Chicago, Burlington & Quincy; fourth vice-president, J. B. Tate, Pennsylvania; fifth vice-president, C. P. Patrick, Erie; treasurer, Frank Gray, Chicago & Alton.

List of Exhibitors of the Track Supply Association.

The Track Supply Association will hold its exhibit at the Auditorium Hotel, Chicago, September 9-12, 1913, in conjunction with the thirty-first annual convention of the Roadmasters' and Maintenance of Way Association. The following supply concerns have already taken space: Rampao Iron Works; The P. & M. Co.; The Rail Joint Co.; Lackawanna Steel Co.; Fairbanks-Morse Co.; Pennsylvania Steel Co.; National Lock Washer Co.; Elliott Frog & Switch Co.; The Railway Equipment & Publication Co.; Associated Manufacturers Co.; American Hoist & Derrick Co.; Fairmont Machine Co.; Simmons-Boardman Publishing Co.; *Railway Age Gazette; Signal Engineer;* The Joyce-Cridland Co.; Louis Blessing; James C. Barr; Q & C Co.; M. W. Supply Co.; The American Guard Rail Fastener Co.; Crerar-Adams & Co.; Templeton, Kenly & Co., Ltd.; Indianapolis Switch & Frog Co.; Union Switch & Signal Co.; Hayes Track Appliance Co.; Verona Tool Works; The

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National Malleable Castings Co.; Haggard & Marcusson Co.; Positive Rail Anchor Co.; Carnegie Steel Co.; William Harton, Jr. & Co., Inc.; Hubbard & Co.; The Hobart Allfree Co.; Hall Switch & Signal Co.; Mudge & Co.; Southern Railway Supply Co.; The Railroad Supply Co.; Sellers Manufacturing Co.; Ajax Forge Co.; Beaver Dam Malleable Iron Co.; Keystone Grinder & Manufacturing Co., Pittsburgh, Pa.; Northwestern Motor Car Co., Eau Claire, Wis.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held on June 4, two papers were presented for discussion as follows: The Philosophy of Engineering, by Maurice G. Parsons, Jun. Am. Soc. C. E.; and The Elevation of the Tracks of the Philadelphia, Germantown & Norristown Railroad, Philadelphia, Pa., by Samuel Tobias Wagner, M. Am. Soc. C. E. The latter paper was illustrated with lantern slides. These papers were printed in the *Proceedings* for April and May respectively.

Special Libraries Association.

The fifth annual convention of the Special Libraries' Association will be held at the Hotel Kaaterskill, Catskill Mountains, N. Y., June 24-26.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 19, 1914, St. Louis.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—H. G. McConnaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, November 19, 1913, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wenlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June 16, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—F. W. Drew, 112 West Adams St., Chicago.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York. Summer meeting, June 25-26, Charlevoix, Mich.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evens, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—F. S. Keller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY LIGHTING ASSOCIATION.—H. Schofield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, Wednesday and Thursday, June 11-12, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Telegr. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Franenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. D. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. T. Saunders, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. R. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosewarn, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

Beginning June 15, the Pennsylvania Railroad will grant stopover privileges quite generally at Harrisburg, Pa. One-way limited tickets will carry a ten-day privilege.

Beginning Monday, June 9, the Metropolitan Line will run passenger steamers direct from New York to Boston and from Boston to New York, starting from each port daily, including Sundays, at 5 p. m. The vessels to be used are the Massachusetts and the Bunker Hill, large and fast steamers. These vessels are oil burners and they have wireless telegraph apparatus.

By agreement of representatives of the railways, shippers and the Texas Railroad Commission it has been decided that the Texas commission shall institute a test suit against some of the railways terminating at Galveston, to determine the respective jurisdictions of the Texas and interstate commissions as to traffic passing over the wharves at Galveston, and destined to interior points in Texas. The question is raised with reference to the action of the roads in filing tariffs with the Interstate Commerce Commission canceling the absorption of loading charges at the Galveston wharves after June 2. The Texas commission immediately gave notice of a proposal to offset this by a horizontal reduction of two cents per 100 lbs. in the rates.

Car Location.

The accompanying table, which is taken from car location bulletin, No. 6 of the American Railway Association, gives a summary of freight car location by groups on May 1, together with surpluses and shortages on the same date.

Car Location on May 1, 1913.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	87,800	677,115	272,218	202,916	171,884	478,071	17,380	150,298	33,271	130,071	131,704	2,357,718
Home Cars on Home Roads	41,905	371,719	93,917	107,373	79,987	301,875	5,426	74,754	15,172	73,254	83,980	1,249,362
Home Cars on Foreign Roads	45,895	305,396	178,301	95,543	91,897	176,196	11,954	75,544	18,099	56,817	47,724	1,108,356
Foreign Cars on Home Roads	55,570	310,635	215,143	94,160	79,158	180,678	10,660	64,902	22,725	52,717	52,054	1,148,402
Total Cars on Line	97,475	682,354	309,060	201,533	169,145	482,553	16,086	139,656	37,897	125,971	136,034	2,397,764
Excess or Deficiency	9,675	5,239	31,842	*1,383	*2,739	4,482	*1,294	*10,642	4,626	*4,100	4,330	40,046
Surplus	1,256	6,053	1,067	5,574	962	8,203	1,464	5,728	4,111	17,420	2,189	53,977
Shortage	634	1,192	1,802	2,598	2,581	1,458	0	755	260	311	2,224	14,178
Shop Cars—												
Home Cars in Home Shops	4,154	34,162	15,701	10,570	12,372	23,451	712	8,517	1,774	5,253	4,317	120,988
Foreign Cars in Home Shops	1,267	9,558	6,692	2,528	2,581	4,644	576	2,098	751	2,725	749	34,169
Total Cars in Shops	5,421	43,725	22,393	13,098	14,953	28,095	1,288	10,615	2,525	7,978	5,066	155,157
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	47.73	54.90	33.88	52.91	46.54	63.14	31.22	49.74	45.60	56.32	63.76	52.99
Total Cars on Line	108.67	100.77	111.39	99.32	98.41	100.94	92.55	91.16	113.90	96.85	103.29	101.70
Home Cars in Home Shops	4.73	5.05	* 5.66	5.21	7.20	5.24	4.10	5.67	5.33	4.04	3.28	5.20
Foreign Cars in Home Shops	1.69	1.41	2.42	1.24	1.50	1.04	3.31	1.39	2.26	2.09	.57	1.47
Total Cars in Shops	5.82	6.46	8.08	6.45	8.70	6.28	7.41	7.00	7.59	6.13	3.85	6.67

*Denotes deficiency.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended from May 1 until November 1 certain tariffs, which proposed to advance rates for the transportation of various commodities between Missouri river points.

The commission has suspended until September 29 the schedules in certain tariffs which would advance rates on brick c. l., from Athens and other points in Ohio to Huntington, W. Va. For example, the present rate on brick from Athens, Ohio, to Huntington, W. Va., is $0.80 per 2,000 lbs.; the proposed rate, $1.15 per 2,000 lbs.

The commission has suspended from May 30, until September 27, certain tariffs, which proposed to advance rates on lumber from shipping points on the Southern Railway in Tennessee, North and South Carolina and Georgia to Virginia cities, eastern seaboard and interior eastern points. The advances proposed range in amount from ½ cent to 5 cents per 100 lbs.

The commission has suspended from June 1 until September 29 certain schedules in Agent W. H. Hosmer's supplements, which proposed to increase rates on scrap iron and old rails between St. Paul and Duluth, Minn., and Chicago, St. Louis, Mo., and points taking same rates. The proposed increase in the scrap iron rates amounts to from ½ cent to 2 cents per 100 lbs., and that in the old rail rates from 1.7 to 3.6 cents per 100 lbs.

The commission has suspended from May 15 until September 12 certain tariffs, which proposed to advance from 1½ to 2½ cents per 100 lbs., charges applicable to shipments of structural iron and steel stopped in transit for fabrication at fabrication points throughout Central Freight Association territory, excepting certain fabrication points located in Illinois. Under the present tariff provisions, a carload of structural iron or steel, viz., beams, plates, tees, bolts, bars, etc., shipped from Pittsburgh to Chicago may be stopped at Toledo, Ohio, to undergo further process of manufacture and then be forwarded to destination at the Pittsburgh-Chicago rate plus 1½ cents per 100 lbs. The suspended tariffs proposed to increase this charge one cent per 100 lbs. Some of the fabrication points affected are Buffalo, N. Y.; Zanesville, Ohio; Toledo, Columbus, Mt. Vernon, and Muncie, Ind.

Coal Rates Within the Chicago Switching District.

In re investigation and suspension of new regulations and passages governing the switching of coal and coke in carloads from connecting carriers destined to certain points on the Chicago, Milwaukee & St. Paul, located within the limits of the Chicago switching district. Opinion by Commissioner Clements:

Coal consigned to stations on the Chicago, Milwaukee & St. Paul in Chicago is delivered to that road at Galewood, a point within the switching limits of Chicago. Hitherto, the St. Paul has received for its service from Galewood, $4 per car of 60,000 lbs. and under, out of the joint rate from the mines, and ten cents a ton for any excess over that weight from the shipper. The St. Paul now asks 20 cents per ton for this service. The carriers to Galewood refuse to absorb more than $4 per car, so the increase would fall entirely on the shippers. The commission decided that the proposed increased rates had not been justified and ordered the defendant to cancel the suspended tariffs. (27 I. C. C., 71.)

Rates on Pulp Wood Reduced.

Pulp and Paper Manufacturers' Traffic Association, Chicago, Milwaukee & St. Paul, et al. Opinion by Chairman Clark:

The commission decided that the rates on pulp wood in carloads from points in Minnesota to points in Wisconsin and the upper peninsula of Michigan, were unreasonable and prescribed maximum rates for the future from points in Minnesota to the gateways and to the junction points en route to the gateways, applicable upon shipments destined to points in Wisconsin and the upper peninsula of Michigan. (27 I. C. C., 83.)

Rates on Anthracite Coal Reduced.

Wayne R. Brown v. Boston & Maine et al. Opinion by Commissioner Meyer:

The complainant contends that the rates on anthracite coal

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from various mining points in Pennsylvania to Scotia, N. Y., are unreasonable and discriminatory against Scotia in favor of Schenectady, N. Y. Scotia is situated on the north bank of the Mohawk river, opposite Schenectady, and is connected with that city by a bridge. At present the rates on the prepared sizes, which constitute the bulk of the complainant's trade, are 20 cents higher to Scotia than to Schenectady, except on shipments moving via Mechanicville, in which case the difference is 5 cents. The 5 cents differential is held to be reasonable by the complainant, but cannot be taken advantage of on account of the increased cost of the coal at the mine from which the shipments move via Mechanicville. The complainant showed that on a large number of commodities freight rates to Scotia were the same as those to Schenectady. The defendants maintained that Schenectady was given lower rates than Scotia on account of water competition, which did not exist at Scotia. The complainant stated that the new barge canal would occupy the whole of the Mohawk river between Scotia and Schenectady, thus providing water transportation for Scotia as well as Schenectady. The commission decided that the rates complained of were unreasonable and discriminatory and prescribed reasonable rates for the future. (27 I. C. C., 47.)

STATE COMMISSIONS.

The newly established public service commission of West Virginia consists of the following four members, appointed by the governor on May 31: Virgil L. Highland, Clarksburg; Howard N. Ogden, Fairmont; Wade C. Kilmer, Martinsburg; Charles H. Bronson, Huntington.

A meeting of members of the state railway commissions of Missouri, Iowa, Kansas, Oklahoma, and possibly some other states, is to be held at Des Moines, Iowa, on June 6, for the purpose of deciding whether these states shall accept the physical valuation of railway property to be made by the Interstate Commerce Commission, or whether the states shall make their own valuations. The law requiring the commission to make the valuation requires that it be distributed by states.

The Minnesota Railroad & Warehouse Commission has found that questions of railroad signaling have become so important that it has deemed it necessary to appoint a signal engineer, and Wilfred Kearton, hitherto supervisor of signals on the Northern Pacific, has been appointed to that office. He will report to the chief engineer of the commission. Mr. Kearton was born in Maryport, England, June 2, 1866. He came to this country in 1884, and in 1886 went to work for the Union Switch & Signal Company. In 1887, he took a position as signal repairman on the Pennsylvania Lines west of Pittsburgh at Liverpool, Ind. With the exception of three years, during which he was occupied in signal work on British railways, Mr. Kearton remained with the Pennsylvania Lines until 1910, being signal supervisor at Pittsburgh for several years. In 1910, he went to the Northern Pacific as construction inspector, with office at St. Paul; and he had charge of the installation of automatic block signals on the St. Paul and the Minnesota divisions. Since February, 1912, he has been supervisor on the eastern district.

COURT NEWS.

The third court of civil appeals at Austin, Tex., has rendered a decision holding constitutional the act of the legislature in 1909, authorizing the railroad commission to order the construction of union passenger stations. It is held that unless the findings of the commission are clearly unjust and unreasonable they should not be disturbed by the courts.

The Texas law designed to compel railway companies to maintain sheds for the protection of workmen engaged in repairing cars at all repair points except those where merely light repairs are made, has been declared invalid by the judge of the district court, in sustaining a demurrer of the International & Great Northern, on the ground that the law does not define the term "light repairs."

The appellate division of the Supreme Court of New York decides that a commission merchant in New York City, sued by the Pennsylvania Railroad for an undercharge on a freight bill, is not liable, the goods having gone out of his hands and the owner having been settled with. The shipment in question consisted of two carloads of peaches, from Georgia, in 1907. The bill, $488, for freight and icing, was paid; but subsequently the railroad found that a mistake had been made and demanded $3.45 additional. On refusal to pay this sum the suit was brought. A carrier is bound to collect the full lawful charges; but it does not follow that the consignee is liable; the contract was made, not with him, but with the consignor. Where a consignee accepts goods, he becomes obligated, by an implied contract, to pay the charges; but if the carrier induces him to accept the goods on the theory that the freight charges are as stated in the bill, it does not follow that the consignee is liable for an undercharge subsequently discovered. Presumptively the consignee is the owner of the goods, but this presumption is not conclusive; and in this case the consignee was not the owner. He was innocent of any intent to participate in an evasion of the law.

What Is Included in Interstate Commerce?

The decision of the United States Supreme Court in the case of Pedersen, a track laborer on the Delaware, Laekawanna & Western, who was held to have been engaged in interstate commerce, was noticed in the *Railway Age Gazette*, page 1201. The full text of this opinion, which was delivered by Justice Van Devanter, shows that the decision hinged on the question whether a man carrying bolts to be used in repairing a bridge was engaged in interstate commerce the same as though he had been actually at work using the bolts.

The road was engaged in interstate and intrastate commerce. Pedersen was an iron worker repairing a bridge. In carrying a sack of bolts to the place where they were to be used he had to pass over a temporary bridge, where he was run down and injured by an intrastate passenger train, of the approach of which its engineman negligently failed to give any warning. The first court held that the injury was not within the terms of the federal act. The Circuit Court of Appeals held that although this ruling was wrong, the plaintiff was not entitled to recover under the federal law, because he was not employed in interstate commerce. The Supreme Court holds that bridges are indispensable to interstate commerce; that the carrier must keep them in repair, and that this work of repair is so closely related to commerce as to be in practice and in legal contemplation a part of it. The law proceeds on the theory that the carrier must exercise due care to prevent or correct any defect in its cars, engines, machinery, tracks, roadbed, etc. The act of taking the bolts to the point where they were to be used is to be deemed a part of the work of repair. It was a minor task, but essentially a part of the larger one, as is the case when an engineman takes his engine from the roundhouse to the track on which are the cars which he is to haul in interstate commerce.

Justice Lamar dissented, and in this was joined by Justices Holmes and Lurton. Justice Lamar is unable to assent to the proposition that a man carrying bolts to be used by him in repairing a railroad bridge is employed in interstate commerce. This work was not a part of commerce, but an incident which preceded it. A line must be drawn between those employees who are employed in commerce and those engaged in other departments of the carrier's business. If a man on his way to repair a bridge is engaged in interstate commerce, then the man in the shop who made the bolts to be used by him in repairing the bridge is likewise so engaged. If the shopmen are to be included, then we must include the paymaster and the bookkeeper of the shop. The hours of service law shows the intent of Congress; that law applies only to those engaged in the movement of trains. The safety appliance law refers, not to machines in the shop, but to cars and locomotives, which are the immediate instruments of transportation.

PROPOSED BRIDGE OVER THE GANGES RIVER.—The East Indian and Bengal and North Western Railways have under consideration the question of bridging the Ganges at Mokameh. The points between them are being gradually settled. The ferry now in operation at Mokameh is worked by the Tirhoot State Railway.

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses					Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Chicago, Terre Haute & Southeastern	351	$109,434	$17,963	$130,980	$21,297	$31,794	$1,013	$46,833	$7,519	$110,456	$20,524	—$238	$10,000	$10,291	—$47,665
Oahu Railway & Land Co	101a	63,298	23,763	97,469	7,769	7,768	642	23,946	4,618	44,743	52,726	—5,857	6,500	40,369	7,253
NINE MONTHS OF FISCAL YEAR, 1913.															
Chicago, Terre Haute & Southeastern	351	$1,274,742	$161,513	$1,472,866	$230,363	$287,999	$27,800	$475,256	$68,835	$1,090,253	$382,613	—$1,251	$90,000	$290,862	—$121,919
Oahu Railway & Land Co	101a	610,338	205,486	875,294	79,461	56,652	5,430	190,869	41,056	373,468	501,826	9,090	53,516	456,200	58,151
MONTH OF APRIL, 1913.															
Alabama & Vicksburg	143	$109,849	$14,209	$155,307	$24,648	$30,855	$3,432	$56,400	$5,366	$120,761	$34,546	—$155	$5,200	$29,091	$28,683
Alabama Great Southern	309	294,705	79,193	412,660	52,956	105,789	12,046	153,426	12,574	341,791	70,869	—1,004	14,427	55,388	—31,749
Ann Arbor	292	112,579	38,314	162,236	25,109	32,292	4,023	62,536	7,353	131,365	41,431	$18	13,000	28,349	—2,279
Atchison, Topeka & Santa Fe	8,247	5,141,955	2,013,496	7,979,927	1,010,393	1,001,427	166,072	2,309,297	177,562	4,964,756	3,015,171	.....	339,915	2,675,256	—285,580
Atlantic & St. Lawrence	167	115,000	47,800	177,127	20,268	21,983	3,955	89,590	4,077	139,873	37,304	.....	16,152	21,152	16,256
Atlantic Coast Line	4,615	2,253,608	736,439	3,236,584	404,020	456,170	48,842	1,148,789	80,454	2,138,275	1,098,309	.....	112,000	986,309	—44,497
Baltimore & Ohio System	4,415	6,056,928	1,021,452	7,567,379	1,051,371	1,558,254	176,487	3,051,461	178,126	6,016,199	1,550,980	—72,386	349,488	1,129,106	—988,543
Baltimore & Ohio Chicago Terminal	22	76,625	1,998	146,899	17,064	20,317	937	69,484	4,628	112,620	34,279	$48	16,051	19,076	9,065
Bangor & Aroostook	631	278,569	45,410	338,009	43,279	49,113	2,636	113,271	14,223	222,521	115,488	—668	10,500	104,320	10,886
Bessemer & Lake Erie	204	557,853	25,443	593,066	98,641	156,377	8,293	156,462	9,468	429,261	163,805	.....	35,000	130,807	—103,216
Buffalo, Rochester & Pittsburgh	574	679,675	84,033	793,195	119,454	170,638	12,099	275,166	18,760	596,108	197,087	—910	19,000	177,177	82,273
Carolina, Clinchfield & Ohio	247	201,638	13,488	219,073	17,021	22,966	6,559	37,152	11,667	93,265	123,768	.....	8,000	115,708	26,923
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	13,259	1,143	14,830	936	79	1,277	3,179	936	6,409	8,421	.....	1,500	7,921	2,121
Charleston & Western Carolina	341	127,570	24,596	159,903	31,294	19,273	3,523	64,956	4,608	124,154	35,749	.....	5,000	30,749	—715
Chicago & Alton	1,026	715,816	315,248	1,120,682	219,078	283,032	48,374	489,018	38,126	1,077,528	43,154	—4,286	45,200	—6,332	—182,441
Chicago & Eastern Illinois	1,273	924,748	181,105	1,203,932	139,791	232,159	26,897	504,116	37,036	938,999	274,923	—1,193	55,000	218,731	5,271
Chicago & Northwestern	7,976	4,077,852	1,475,798	6,212,476	1,014,956	937,459	112,194	2,015,990	147,640	4,336,319	1,876,157	2,291	293,000	1,585,448	—245,144
Chicago, Burlington & Quincy	8,197	4,596,960	1,529,156	7,081,703	1,203,716	1,293,033	117,091	2,419,725	216,609	5,749,571	1,332,028	9,939	278,987	1,043,102	—210,821
Chicago Great Western	1,496	722,273	230,018	1,035,514	154,925	174,580	43,638	446,531	34,504	854,178	181,336	686	36,983	145,039	5,513
Chicago Junction	12	.....	.....	176,006	18,392	5,550	944	82,648	4,495	112,029	63,977	.....	3,704	60,273	13,126
Chicago, Milwaukee & St. Paul	9,592	5,246,478	1,233,161	7,166,906	917,824	1,232,448	149,785	2,934,614	132,335	5,372,006	1,794,900	—7,943	315,962	1,470,995	323,265
Chicago, Rock Island & Gulf	477	191,035	52,112	261,163	31,722	44,660	10,240	112,722	8,233	207,572	53,588	—509	7,935	45,144	5,639
Chicago, St. Paul, Minneapolis & Omaha	1,744	811,921	351,016	1,249,322	178,134	190,825	26,813	521,062	34,053	950,887	298,435	—2,454	67,499	228,572	—64,075
Cincinnati, New Orleans & Texas Pacific	337	373,374	114,019	530,246	76,802	102,527	22,848	240,954	10,424	503,628	161,613	—127	29,000	132,446	—55,043
Colorado Midland	336	75,052	13,957	99,692	21,830	36,963	9,083	55,824	5,711	127,411	—27,714	—1,274	8,000	—37,488	—30,053
Cumberland Valley	162	246,401	50,913	308,608	50,479	38,445	5,079	96,636	7,572	198,211	110,397	65	5,702	104,760	20,351
Delaware, Lackawanna & Western	958	2,432,415	630,209	3,262,012	502,463	394,102	74,372	1,006,812	71,319	2,153,209	1,128,772	33,272	165,000	996,994	940,457
Detroit & Mackinac	411	80,636	26,159	113,843	11,949	15,499	3,097	37,257	2,745	70,547	43,296	—143	8,379	34,774	—8,119
Detroit, Grand Haven & Milwaukee	191	123,000	31,000	193,389	27,004	43,595	3,546	109,179	6,898	186,018	4,771	—83	2,953	1,735	42,781
Duluth, Mesabe & Northern	356	259,045	37,484	302,021	79,570	68,232	1,996	94,165	11,260	255,223	46,798	—957	15,361	30,480	42,781
Duluth, South Shore & Atlantic	637	194,968	73,810	285,109	48,759	41,354	8,246	117,764	7,558	223,681	61,428	—1,129	18,000	42,299	7,944
El Paso & Southwestern Co	981	583,535	106,190	722,411	118,599	99,632	17,319	212,367	26,745	474,662	247,749	—1,519	35,000	211,230	—58,405
Elgin, Joliet & Eastern	821	1,012,665	65	1,092,415	121,527	187,667	5,305	328,435	17,171	660,155	432,260	.....	49,350	382,910	30,733
Florida East Coast	644	225,417	170,527	483,530	58,960	67,734	6,672	178,302	10,366	316,936	166,384	—1,462	18,500	146,417	—49,127
Grand Rapids & Indiana	578	273,532	118,527	433,447	70,445	86,929	11,852	193,297	17,060	380,083	43,364	—79	23,640	19,645	—45,877
Grand Trunk Western	347	449,000	165,000	632,444	67,573	111,133	21,804	243,043	14,582	552,555	99,885	—2,530	29,827	67,482	—88,866
Gulf & Ship Island	308	129,947	30,328	172,289	28,224	25,917	3,104	44,253	8,341	109,839	62,450	.....	8,699	53,751	5,090
International & Great Northern	1,160	553,505	157,308	772,939	109,369	136,268	27,395	363,836	34,442	693,310	79,629	—1,487	30,000	48,142	—10,925
Kanawha & Michigan	127	205,207	27,370	238,448	34,553	52,842	2,185	75,089	6,270	171,439	67,009	34	9,317	57,526	41,279
Long Island	399	297,568	526,621	864,561	136,132	112,332	11,850	405,615	25,305	691,254	193,307	29,524	61,532	151,299	19,141
Louisville & Nashville	4,919	3,554,190	979,072	4,859,132	1,006,510	990,616	104,676	1,647,336	99,935	3,888,975	970,157	14,858	159,242	825,773	—255,676
Maine Central	1,206	613,536	246,484	914,441	132,704	139,870	8,161	369,253	25,082	675,070	239,371	—5,015	47,291	187,065	28,625
Midland Valley	323	85,041	36,096	128,547	29,968	24,905	2,550	44,106	6,387	107,916	20,631	4,985	5,964	19,652	—12,784
Minneapolis & St. Louis	1,586	537,735	131,524	705,335	89,968	78,632	18,787	301,327	19,947	509,591	196,734	1	33,033	163,702	56,655
Minneapolis, St. Paul & Sault Ste. Marie	3,926	2,133,063	492,912	2,760,197	393,435	345,942	50,101	879,275	62,602	1,630,765	1,129,432	—5,682	161,600	962,050	112,658
Missouri Pacific	3,930	1,496,527	376,233	2,004,746	243,995	325,586	60,522	937,208	71,557	1,638,838	419,908	—3,822	86,600	329,486	—9,981

Average mileage operated during previous period—a 99; 1 8,201; 2 4,536; 3 4,434; 4 628; 5 572; 6 7,951; 7 9,074; 8 9,570; 9 358; 10 342; 11 624; 12 902; 13 841; 14 630; 15 586; 16 4,727; 17 1,204; 18 3,764; 19 3,918.

— Indicates Debits, Losses and Decreases.

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Operating expenses—Maintenance—Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Monongahela	65	$179,598	52,799	$134,455	$19,346	$7,943	$291	$26,188	$2,683	$55,851	$78,604	.....	$3,000	$75,604	$10,435
Nevada Northern	168	121,490	12,577	136,015	17,412	7,175	3,002	31,852	4,637	69,869	66,166	.....	6,551	61,615	—8,300
New Orleans Great Northern	283	115,544	28,761	155,891	21,856	10,065	2,973	47,235	6,058	88,179	67,712	—$65	2,334	65,313	23,797
New York, Chicago & St. L.	1,987	813,989	113,260	958,681	135,266	145,529	44,002	441,005	20,105	786,500	172,174	1,452	37,990	138,722	—44,482
New York, Philadelphia & Norfolk	112	262,951	37,936	322,842	24,776	62,327	4,459	148,931	13,898	254,441	68,431	.....	8,000	60,431	—8,632
Norfolk Southern	562	235,866	55,522	311,330	37,208	35,121	4,016	98,075	10,759	185,179	126,351	—546	7,510	118,295	2,249
Northern Central	473	846,650	189,364	1,106,125	163,261	256,872	16,024	549,662	25,143	1,001,962	104,363	378	42,284	62,457	55,751
Northwestern Pacific	402	102,210	144,942	271,804	39,221	44,950	3,572	113,248	13,153	214,144	57,660	.....	13,050	44,610	9,648
Oregon Short Line	1,938	1,150,203	261,261	1,647,256	179,742	211,142	29,016	439,793	47,016	955,240	691,536	—1,456	98,152	591,928	—202,761
Pennsylvania Co.	1,781	3,709,192	756,309	4,869,304	1,045,431	997,053	82,926	1,982,472	116,833	4,224,715	644,589	—4,708	251,995	387,886	—56,148
Pennsylvania *Railroad*	4,075	11,073,608	2,776,280	14,830,380	2,860,401	3,240,596	204,635	5,374,124	354,451	11,234,209	3,596,071	—129,025	585,682	2,830,459	—142,148
Pere Marquette	2,330	978,213	276,429	1,376,231	276,661	255,358	31,574	570,989	32,604	1,167,188	209,043	3,113	33,905	179,681	—5,748
Philadelphia, Baltimore & Washington	713	857,059	695,004	1,761,907	298,904	361,062	33,841	766,154	47,946	1,507,887	254,020	.....	50,611	203,709	—114,997
Pittsburgh, Cincinnati, Chic. & St. Louis	1,427	2,053,575	658,657	3,041,566	934,589	766,864	61,656	1,276,704	77,258	3,117,141	—75,575	—302	141,472	—217,554	887,133
Rutland	468	159,926	85,876	283,691	42,799	66,459	7,360	121,601	6,581	244,800	38,891	.....	12,667	21,284	—38,192
St. Joseph & Grand Island	319	82,759	26,549	120,872	40,063	19,562	4,926	51,015	5,930	121,496	—624	683	6,244	—6,185	—4,374
St. Louis, Iron Mountain & Southern	3,365	2,006,133	482,485	2,692,879	399,967	378,920	57,846	873,013	69,933	1,779,679	918,150	—6,088	127,115	784,927	193,342
San Antonio & Aransas Pass	727	253,632	102,508	385,790	84,908	59,492	6,759	163,864	11,658	306,681	49,399	.....	10,000	39,399	8,434
Seaboard	3,006	1,470,362	431,021	2,145,833	210,619	286,282	61,948	809,909	57,742	1,426,500	719,333	—3,238	77,000	639,095	57,384
Tennessee Central	294	99,699	33,726	141,915	25,114	13,883	5,077	43,962	6,711	94,690	47,225	.....	4,265	42,960	20,376
Toledo, Peoria & Western	248	53,739	33,160	93,483	18,518	26,722	2,490	40,343	3,462	91,535	1,948	.....	5,906	—3,958	3,771
Toledo, St. Louis & Western	451	327,193	23,469	371,964	43,318	45,036	14,878	131,769	9,606	240,167	131,857	.....	14,200	117,657	9,021
Union Pacific	3,357	2,629,156	764,982	4,231,597	370,265	343,392	102,388	1,148,434	124,196	2,478,720	1,342,877	—9,118	137,072	1,196,687	16,188
Union R. R. of Baltimore	9	130,795	24,797	157,756	10,039	.....	1,299	5,751	2,734	19,823	137,933	.....	5,557	132,496	33,094
Union R. R. of Pennsylvania	31	.....	.....	338,246	60,992	113,680	105	152,874	2,548	330,119	8,127	—3,551	8,500	—3,924	—72,171
Vandalia	827	583,951	180,062	853,213	214,083	188,146	22,430	358,939	19,388	802,976	50,237	.....	30,316	19,921	13,681
Virginian	171	90,613	38,293	141,222	22,854	29,275	2,193	56,351	5,004	114,992	26,285	—314	4,900	21,071	24,535
Virginian	503	470,991	26,695	510,567	65,386	107,592	4,893	116,031	9,293	298,195	212,372	6,233	17,600	201,005	66,743
West Jersey & Seashore	356	144,972	240,362	411,124	86,263	87,395	16,209	211,308	14,233	415,408	—4,284	—3,633	27,309	—35,025	—124,214
Yazoo & Mississippi Valley	1,374	588,830	155,408	812,219	232,339	145,424	14,155	340,963	27,879	806,779	11,440	1,598	32,000	—22,962	108,396

TEN MONTHS OF FISCAL YEAR, 1913.

Alabama & Vicksburg	143	$1,048,927	$405,908	$1,561,577	$240,531	$290,016	$35,876	$539,622	$55,984	$1,162,029	$399,548	—$1,878	$58,986	$338,684	$74,346
Alabama Great Southern	309	2,260,270	1,003,191	3,453,671	534,777	598,231	126,689	1,148,434	124,196	2,478,720	1,342,877	—9,118	137,072	1,196,687	16,188
Ann Arbor	292	1,150,476	461,484	1,728,617	336,085	230,301	41,105	624,328	73,317	1,205,126	523,481	—3,880	135,998	383,603	—90,670
Atchison, Topeka & Santa Fe	8,242	54,550,612	21,231,505	80,201,266	11,149,906	13,240,280	1,718,562	23,745,990	1,634,744	54,079,536	26,121,730	.....	3,399,076	25,322,734	2,260,169
Atlantic & St. Lawrence	167	1,069,890	291,828	1,508,463	246,857	218,635	45,657	772,016	39,450	1,322,615	185,848	.....	117,329	68,519	87,196
Atlantic Coast Line	4,615	30,707,765	7,646,089	39,589,746	4,005,764	4,567,451	$18,382	10,630,407	773,154	20,598,178	10,089,568	.....	1,192,890	8,897,478	490,077
Baltimore & Ohio—System	4,455	66,028,998	12,770,144	83,823,248	11,260,335	15,218,255	1,657,866	30,854,279	1,681,907	60,771,022	22,800,226	—719,923	2,514,165	19,566,085	—96,563
Baltimore & Ohio Chicago Terminal	27	.....	19,791	1,480,964	190,590	236,896	7,630	694,772	47,136	1,176,939	304,025	8,233	177,078	135,680	69,232
Bangor & Aroostook	231	2,012,940	522,965	2,681,772	445,651	348,292	22,510	955,125	123,672	1,906,009	773,278	—1,335	105,000	667,441	—288,246
Bessemer & Lake Erie	201	6,537,419	308,285	6,956,507	815,060	1,323,454	91,637	1,745,144	110,363	4,135,658	2,820,849	.....	160,000	2,660,849	189,559
Buffalo, Rochester & Pittsburgh	574	7,649,116	933,410	8,915,411	1,230,681	1,794,482	116,852	2,951,709	187,570	6,281,299	2,634,112	—5,685	178,000	2,450,227	185,738
Carolina, Clinchfield & Ohio	247	1,849,616	149,298	2,042,506	141,403	210,711	67,922	356,509	82,349	858,984	1,183,522	.....	80,000	1,103,522	233,447
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	115,194	16,118	135,602	8,970	882	10,216	26,526	4,799	51,893	81,709	.....	5,000	76,709	12,072
Charleston & Western Carolina	341	1,242,072	401,464	1,625,818	290,069	251,441	32,997	617,385	47,047	1,230,962	386,856	.....	50,000	336,856	—29,926
Chicago & Alton	1,026	8,392,763	3,507,417	12,748,937	2,003,758	2,984,551	438,767	4,874,241	338,196	10,639,513	2,109,414	—24,615	395,100	1,686,699	—938,074
Chicago & Eastern Illinois	1,275	10,078,991	2,474,859	13,571,006	1,611,166	2,805,733	257,631	5,160,895	409,214	10,744,679	2,826,327	22,363	411,044	2,437,646	2,852,506
Chicago & Northwestern	7,976	45,525,073	17,161,398	69,149,871	8,794,182	9,831,897	1,141,909	27,147,259	1,313,632	48,223,874	20,925,997	9,058	3,010,000	17,925,047	3,858,450
Chicago, Burlington & Quincy	9,129	54,131,508	18,342,786	79,583,138	9,144,527	13,301,536	1,295,808	25,282,580	2,146,367	51,170,818	28,412,320	—121,649	2,831,000	25,459,640	25,459,641
Chicago Great Western	1,496	8,144,514	2,620,693	11,618,530	1,340,839	1,692,175	462,715	4,642,260	344,298	8,483,767	3,165,763	1,048	355,725	2,811,086	756,978
Chicago Junction	12	.....	.....	1,650,246	172,990	107,143	11,372	805,808	37,143	1,134,665	515,582	.....	19,273	496,314	44,740
Chicago, Milwaukee & St. Paul	9,850	57,496,742	15,234,596	79,114,108	8,367,277	11,540,413	1,583,242	29,827,209	1,967,747	53,380,108	26,733,970	116,638	3,166,394	23,684,164	8,600,230
Chicago, Rock Island & Gulf	427	2,119,355	592,069	2,888,035	329,520	281,154	102,854	1,036,016	81,610	1,631,154	1,056,881	—6,029	72,875	977,977	198,838

Average mileage operated during previous period—[1] 562; [2] 473; [3] 402; [4] 1,762; [5] 4,760; [6] 4,018; [7] 1,467; [8] 3,315; [9] 3,070; [10] 3,537; [11] 475; [12] 1,201; [13] 4,536; [14] 4,434; [15] 628; [16] 572; [17] 7,951; [18] 9,074; [19] 9,570.

— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

TEN MONTHS OF FISCAL YEAR, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses					Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance—Way and structures.	Maintenance—Of equipment.	Traffic.	Transportation.	General.	Total.				
Chicago, St. Paul, Minneapolis & Omaha.	1,744	$9,191,155	$4,191,267	$14,328,173	$1,755,272	$1,879,774	$284,895	$5,741,260	$307,239	$9,998,440	$4,329,733	—$7,154	$697,200	$3,625,379	$484,512
Cincinnati, New Orleans & Texas Pacific.	337	6,653,452	1,543,581	8,639,503	828,192	1,984,847	231,130	2,501,775	194,029	5,739,973	2,899,530	—9,271	287,600	2,595,659	118,011
Colorado Midland	388	1,217,264	215,397	1,368,220	200,306	346,103	73,313	664,939	56,931	1,341,586	198,066	—2,397	85,600	110,169	—64,161
Cumberland Valley	162	7,215,163	581,224	7,928,427	515,761	354,800	44,900	968,630	81,749	1,965,840	962,587	384	59,835	903,136	163,690
Delaware, Lackawanna & Western	958	24,600,493	6,704,147	33,556,538	3,920,071	5,141,359	672,940	10,368,489	664,395	20,767,204	12,789,334	490,684	1,418,340	11,861,078	2,436,407
Detroit & Mackinac	411[9]	673,051	287,889	1,033,292	140,564	144,631	23,009	370,613	28,612	707,429	325,863	883	86,710	240,027	28,292
Detroit, Grand Haven & Milwaukee	291	1,258,907	536,784	2,002,541	279,719	291,440	68,922	1,097,227	40,854	1,987,162	95,379	—3,597	65,264	26,518	200,244
Duluth, Missabe & Northern	356[10]	5,479,670	366,130	5,918,968	730,993	774,898	28,345	1,268,554	130,982	2,963,282	2,992,786	15,216	284,670	2,723,332	330,382
Duluth, South Shore & Atlantic	662[11]	1,830,305	791,332	2,761,239	550,597	335,544	74,418	1,122,338	99,653	2,202,550	558,689	3,154	129,914	381,929	—116,804
El Paso & Southwestern Co	948[12]	5,964,109	937,324	7,220,259	864,587	966,361	142,949	1,988,816	262,594	4,225,306	2,994,953	—18,653	308,952	2,667,348	416,611
Elgin, Joliet & Eastern	82[13]	10,180,180	122	10,593,077	1,147,282	1,690,541	49,409	3,141,675	177,470	6,196,377	4,296,700	.....	306,623	4,490,077	1,262,621
Florida East Coast	642[14]	2,084,372	1,686,476	4,293,491	641,496	886,420	86,896	1,535,097	172,369	2,962,388	1,331,103	—13,118	164,000	1,153,985	208,092
Grand Rapids & Indiana	578[15]	2,754,189	1,502,368	4,620,803	615,818	745,169	115,565	1,065,176	157,302	3,597,030	1,023,773	—74	237,282	785,917	—480
Grand Trunk Western	347	3,937,840	1,835,089	6,159,249	691,770	874,285	215,586	2,682,291	156,897	4,625,279	1,533,969	—16,565	298,771	1,218,533	—32,375
Gulf & Ship Island	308	1,272,541	343,704	1,740,141	240,896	305,320	28,113	459,366	82,577	1,116,522	623,619	.....	69,402	554,217	55,635
International & Great Northern	1,160	7,020,574	2,115,159	9,748,834	1,276,655	1,336,389	264,096	4,043,492	322,634	7,243,266	2,505,568	—19,476	300,000	2,186,092	.....
Kanawha & Michigan	177	2,303,972	340,908	2,803,972	310,228	223,613	78,562	1,178,502	85,157	1,751,464	1,052,508	—121	89,386	832,745	—1,230
Long Island	399	2,898,150	5,997,822	9,344,991	1,274,900	1,088,665	141,654	4,143,827	246,448	6,895,494	2,449,397	447,690	590,502	2,306,585	291,226
Louisville & Nashville	4,910[16]	25,191,309	10,791,263	40,726,295	8,543,189	9,486,101	1,046,268	14,457,297	1,141,748	34,660,519	13,065,776	11,726	1,553,417	11,522,486	—1,383,750
Maine Central	1,206[17]	5,967,417	4,916,470	9,449,430	1,400,236	1,343,427	94,346	3,606,388	251,472	6,697,869	2,757,561	—35,244	444,844	2,271,473	170,370
Midland Valley	373	810,943	399,357	1,278,247	311,739	219,573	26,270	427,523	56,898	1,042,003	236,244	6,813	59,669	183,388	—71,403
Minneapolis & St. Louis	1,586	6,211,538	1,559,888	8,234,701	1,031,654	1,028,832	180,200	3,207,281	208,221	5,656,188	2,578,513	—337	317,100	2,261,076	1,112,265
Minneapolis, St. Paul & Sault Ste. Marie	3,976[18]	19,993,234	5,527,271	26,896,268	2,634,527	3,266,349	532,644	8,443,021	565,925	15,442,466	11,453,902	115,729	1,464,668	10,104,963	2,047,356
Missouri Pacific	3,926[19]	17,222,793	4,278,132	23,031,929	3,443,869	3,443,869	619,716	7,991,924	688,854	18,625,748	4,627,451	—31,923	1,655,346	2,940,182	2,061,461
Monongahela	65	1,358,610	25,548	1,402,304	160,692	103,173	3,411	267,225	20,543	555,044	847,260	.....	23,643	823,617	240,916
Nevada Northern	165	1,170,742	148,187	1,354,869	150,044	158,559	3,873	306,895	36,605	655,976	698,893	.....	62,910	635,983	47,650
New Orleans Great Northern	283	1,051,421	298,657	1,463,311	220,633	131,718	25,116	437,934	65,936	888,137	574,954	—589	22,052	552,313	142,533
New York, Chicago & St. Louis	564[20]	4,914,211	1,269,867	10,143,000	1,268,214	1,195,567	151,567	4,531,669	178,168	7,205,340	2,837,719	—17,209	329,583	2,490,927	1,490,782
New York, Philadelphia & Norfolk	112	2,388,453	415,273	3,031,362	243,498	549,239	41,411	1,334,750	128,696	2,299,594	733,768	.....	79,400	654,368	17,919
Norfolk Southern	362	1,918,796	667,221	2,815,121	344,809	365,773	47,015	884,946	148,569	1,790,832	1,024,289	—10,463	75,098	938,728	68,777
Northern Central	47[21]	8,307,772	2,029,078	11,052,617	1,367,059	2,246,903	169,604	5,328,265	269,244	9,372,075	1,680,542	5,162	416,663	1,269,501	245,566
Northwestern Pacific	40[22]	1,187,762	1,011,220	3,028,684	433,803	409,553	36,109	1,124,585	130,526	2,134,576	894,108	.....	126,732	767,376	103,468
Oregon Short Line	1,930[23]	13,471,168	4,063,137	18,560,272	1,947,849	2,680,308	305,868	4,714,391	1,040,538	9,067,034	9,067,034	1,500	1,224,179	7,843,705	1,173,189
Pennsylvania Co.	1,751[24]	41,083,703	8,126,223	54,189,745	8,856,063	10,115,348	837,263	19,305,223	1,020,854	40,134,751	14,054,994	—42,085	2,436,242	11,576,667	1,283,114
Pennsylvania *Railroad*	4,025[25]	110,323,518	30,369,221	150,667,140	19,678,990	32,062,977	1,961,900	54,243,220	3,540,111	111,427,198	39,239,842	—1,126,115	6,111,927	32,001,802	1,899,241
Pere Marquette	2,330	10,070,568	3,402,912	14,681,235	2,339,517	2,472,596	331,790	6,070,473	350,474	11,464,850	3,216,385	56,599	490,767	2,782,217	730,863
Philadelphia, Baltimore & Washington	713	8,629,291	7,072,556	17,469,173	2,886,053	3,140,256	294,919	7,311,359	448,673	14,081,263	3,387,910	.....	537,258	2,850,652	—301,545
Pittsburg, Cincinnati, Chic. & St. Louis	1,472[26]	8,931,912	3,268,826	13,496,561	1,640,654	2,141,226	207,314	4,120,440	272,047	8,531,883	8,344,943	—8,142	1,403,650	6,941,293	—1,182,684
Rutland	468	1,653,734	1,008,580	3,056,226	375,183	621,249	82,670	1,232,253	66,246	2,377,601	678,625	.....	147,588	531,037	—127,907
St. Joseph & Grand Island	319	860,577	326,516	1,306,976	244,443	194,942	48,656	599,417	55,766	1,173,336	133,640	—313	61,529	74,424	—29,176
St. Louis, Iron Mountain & Southern	3,165[27]	21,354,681	5,456,569	28,821,797	4,666,557	4,176,587	566,552	9,033,627	706,812	19,170,135	9,701,662	—45,253	936,120	8,720,289	1,448,450
San Antonio & Aransas Pass	727	2,976,227	1,175,725	4,364,358	696,955	529,916	61,490	1,869,791	109,762	3,867,454	1,296,904	.....	113,000	1,181,904	160,187
Seaboard	3,083[28]	13,986,037	4,453,520	20,310,456	2,635,613	2,811,750	533,232	5,749,241	573,638	14,083,494	6,426,962	—21,442	802,000	5,603,520	721,065
Tennessee Central	294	962,284	359,065	1,399,510	281,166	145,316	36,920	478,728	71,517	1,033,647	365,863	.....	42,640	323,217	120,970
Toledo, Peoria & Western	240	638,651	403,465	1,152,887	200,733	249,998	24,308	476,774	34,973	986,790	216,097	.....	52,400	163,692	15,180
Toledo, St. Louis & Western	451	3,069,930	793,370	3,575,371	451,321	462,308	129,300	1,256,071	90,359	2,389,359	1,186,012	.....	147,800	1,038,212	223,056
Union Pacific	3,575[29]	30,652,806	8,781,812	43,403,389	4,757,152	5,405,154	1,142,525	11,280,009	1,149,693	25,734,533	19,668,473	—42,000	1,978,836	17,647,637	2,514,778
Union R. R. of Baltimore	9	1,236,643	234,522	1,498,392	94,655	.....	9,614	52,942	27,452	185,663	1,302,734	.....	55,930	1,246,784	223,854
Union R. R. of Pennsylvania	41	.....	.....	3,738,165	329,290	867,644	1,120	1,437,106	38,718	2,731,862	1,009,498	15,057	68,250	956,305	29,294
Vandalia	827	6,462,578	1,993,518	9,391,033	1,319,957	1,680,122	251,870	3,543,078	190,413	7,184,440	2,206,583	.....	308,533	1,898,050	385,072
Vicksburg, Shreveport & Pacific	171	882,517	440,745	1,443,181	276,826	257,317	33,219	470,160	51,244	1,098,966	354,215	—4,264	61,434	288,517	58,484
Virginian	503[30]	4,477,651	761,403	4,965,568	615,191	913,157	52,350	1,148,625	86,287	2,818,110	2,047,458	59,912	173,900	1,931,470	510,319
West Jersey & Seashore	356	1,542,611	3,402,442	5,275,200	892,106	827,961	146,133	2,209,690	133,702	4,119,591	1,155,609	—41,942	278,134	855,533	188,289
Wabash Mississippi Valley	1,374	6,436,943	2,197,472	9,242,934	1,767,159	1,360,932	149,967	3,245,078	267,589	7,290,735	2,012,179	2,874	370,000	1,645,053	83,774

Average mileage operated during previous period—[9] 358; [10] 342; [11] 624; [12] 902; [13] 841; [14] 630; [15] 586; [16] 4,727; [17] 1,204; [18] 3,764; [19] 3,918; [20] 562; [21] 473; [22] 402; [23] 1,762; [24] 1,760; [25] 4,018; [26] 1,467; [27] 3,115; [28] 3,070; [29] 3,537; [30] 475. Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

NINE MONTHS OF FISCAL YEAR, 1913.

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total, inc. misc.	Maintenance—Way and structures.	Of equipment.	Operating expenses—Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Alabama Great Southern	309	$2,597,915	$982,719	$3,920,992	$458,821	$859,732	$116,644	$1,251,865	$86,057	$2,773,119	$1,147,873	—$4,948	$131,787	$1,011,138	$52,197
Arizona Eastern	366	1,543,950	341,386	1,991,550	223,863	152,934	23,485	504,287	76,926	981,513	1,010,035	967	80,542	930,460	328,654
Ann Arbor	292	1,037,897	422,970	1,563,881	170,977	209,009	37,081	561,090	65,964	1,064,161	482,050	—4,397	125,369	352,284	—91,362
Belt Ry. Co. of Chicago	21	.....	.....	2,491,216	142,030	317,233	4,497	1,025,340	48,993	1,537,993	853,223	.....	70,518	787,705	76,287
Butte, Anaconda & Pacific	46	794,138	106,611	983,051	119,391	197,883	6,330	486,160	26,305	836,069	146,782	.....	18,639	128,143	—33,681
Central Vermont	411	2,026,810	847,251	3,113,945	358,087	548,787	73,531	1,570,742	76,813	2,647,960	465,985	1,403	127,398	364,990	—129,989
Chicago & Eastern Illinois	1,273	9,104,233	2,293,234	12,467,060	1,345,363	1,220,754	220,754	4,636,678	372,177	9,315,679	3,151,404	—22,091	396,044	2,676,269	—439,350
Chicago & Erie	570	3,259,057	548,930	4,203,441	728,321	905,611	188,662	1,185,611	100,524	4,108,949	94,492	—7,036	118,685	—31,229	—304,482
Chicago Junction	12	.....	.....	1,424,241	161,592	140,432	10,432	723,160	12,849	1,052,632	451,609	.....	15,369	436,240	31,813
Cincinnati, New Orleans & Texas Pacific	337	6,080,118	1,429,362	7,700,255	731,309	1,782,320	208,782	2,255,821	173,616	5,171,348	2,528,907	—7,094	258,600	2,463,213	203,053
Cleveland, Cincinnati, Chic. & St. Louis.	2,014[5]	17,801,161	6,090,140	25,955,443	2,921,144	4,866,939	637,291	10,133,893	515,014	19,074,281	6,881,162	—13,835	931,643	5,936,684	580,845
Delaware & Hudson Co. R. R. Dept.	854[5]	15,247,460	2,379,906	18,241,916	1,431,124	2,605,304	211,251	6,204,912	504,940	10,961,731	7,280,185	—68,487	454,966	6,756,732	534,439
Detroit & Toledo Shore Line	75	1,017,407	.....	1,021,004	113,218	55,231	11,071	367,741	21,167	616,428	532,576	.....	47,628	484,948	56,155
Detroit, Toledo & Ironton	441	1,066,567	119,767	1,282,256	290,031	207,757	24,029	639,933	47,191	1,208,941	73,315	—11	52,000	21,304	—134,095
Georgia	307	1,536,492	672,045	2,376,932	263,218	454,053	103,766	1,175,281	74,148	2,070,468	306,464	.....	26,829	279,635	—419,409
Georgia, Southern & Florida	395	1,065,250	651,187	1,964,315	233,115	362,239	69,794	786,900	83,887	1,535,935	428,380	—126	101,413	326,841	—39,233
Hocking Valley	353	4,910,162	797,975	5,985,863	576,819	1,191,198	79,853	1,798,491	125,572	3,671,932	2,011,930	.....	350,100	1,661,830	309,557
Houston, East & West Texas	191	730,172	271,101	1,060,218	220,101	134,965	18,961	351,965	34,053	760,045	300,173	.....	32,239	267,934	—12,154
Houston & Texas Central	789	3,518,275	1,451,125	5,252,200	741,015	1,012,442	157,203	1,789,892	111,823	4,070,755	1,251,475	—10,953	173,894	1,067,128	194,744
Indiana Harbor Belt	105	.....	.....	2,412,461	277,826	283,590	22,360	1,069,120	60,301	1,713,207	699,254	17,379	50,054	666,579	145,774
International & Great Northern	1,160	6,467,070	1,957,851	8,975,895	1,167,286	1,200,121	236,701	3,657,656	288,193	6,549,957	2,425,938	—17,988	270,000	2,137,950	.....
Lake Erie & Western	906[5]	3,646,350	677,164	4,734,252	646,129	834,591	107,792	1,741,415	104,743	3,434,670	1,139,582	.....	183,120	956,452	106,443
Lehigh & Hudson	97	1,268,710	36,840	1,356,681	164,955	208,028	11,942	490,837	38,115	905,857	450,824	.....	36,000	414,824	11,223
Louisiana & Arkansas	255	1,029,392	181,814	1,257,438	197,053	191,480	21,972	337,423	44,170	792,098	465,340	.....	37,402	427,938	88,131
Louisiana Ry. & Navigation	351	1,113,354	219,766	1,421,124	200,143	171,759	53,321	571,249	60,729	1,056,701	369,423	.....	46,300	322,923	—32,125
Louisiana Western	208	1,136,280	525,123	1,736,328	213,624	311,735	65,494	534,180	51,148	1,176,181	560,147	804	68,436	492,515	144,691
Louisville, Henderson & St. Louis	200	2,581,172	482,675	3,180,086	452,237	594,377	89,370	1,353,662	84,047	2,573,693	606,393	2,128	57,000	551,521	106,237
Maine Central	1,206[5]	5,353,881	2,669,987	8,534,989	1,267,542	1,203,557	86,184	3,239,135	226,391	6,022,799	2,512,190	—30,229	397,554	2,084,407	141,745
Michigan Central	1,817	17,091,150	6,497,615	26,292,291	2,671,965	4,067,326	596,566	9,533,755	465,853	17,335,211	8,957,080	18,691	1,015,985	7,959,786	41,967
Missouri, Kansas & Texas System	3,817[5]	16,563,971	7,181,093	25,260,438	3,416,640	3,095,938	562,481	9,252,094	780,836	17,107,989	8,152,439	—50,048	974,867	7,127,524	2,380,761
Mobile & Ohio	114	7,584,167	1,123,088	9,249,101	1,079,881	1,734,290	341,407	3,303,117	288,129	6,746,824	2,502,277	—13,430	270,125	2,218,722	81,113
Morgan's La. & Tex. R. R. & S. S. Co.	404	2,495,505	864,787	3,563,150	644,898	552,802	119,719	1,508,710	101,552	2,927,171	635,979	—17,085	167,538	431,356	—436,244
New Orleans, Mobile & Chicago	547	1,506,942	268,702	1,877,132	299,268	320,886	24,312	718,340	73,941	1,324,747	552,385	—769	47,239	504,377	50,515
New Orleans, Texas & Mexico	283[5]	962,498	160,532	1,210,238	207,344	107,527	30,496	535,380	57,665	938,412	271,826	.....	17,721	254,105	72,013
New York, Susquehanna & Western	154[5]	1,483,212	429,470	2,173,030	239,029	273,278	37,338	929,084	43,864	1,503,253	669,777	—27,637	140,982	501,158	—26,400
Northwestern Pacific	401	1,085,557	1,467,279	3,256,800	394,582	364,603	32,537	1,011,337	117,373	1,920,432	836,448	.....	119,682	722,766	93,870
Peoria & Northern Texas	479	1,412,877	879,140	1,937,162	220,493	228,719	30,511	618,442	58,456	1,217,619	719,543	.....	45,234	674,309	222,090
Peoria & Eastern	352	2,063,414	546,777	2,780,265	334,761	523,062	81,468	1,047,035	51,497	1,987,823	792,442	.....	99,948	692,494	114,041
Pere Marquette	2,330	7,977,353	3,126,463	13,303,290	1,450,402	2,317,219	800,215	4,999,491	275,870	10,797,681	3,007,342	57,486	457,693	2,607,137	236,611
Pittsburgh & Lake Erie	223[5]	12,921,224	1,290,615	14,743,119	1,462,205	2,180,928	125,444	3,300,438	236,672	7,269,987	7,475,432	—2,657	314,389	7,158,386	1,670,865
Richmond, Fredericksburg & Potomac	88[5]	1,103,230	763,431	2,131,836	218,482	245,289	26,393	770,735	60,918	1,322,817	809,019	—1,449	6,631	800,939	185,863
St. Joseph & Grand Island	319	780,818	299,967	1,188,105	244,480	175,380	43,732	338,412	49,836	1,051,840	136,265	656	55,265	81,636	—23,725
St. Louis, Brownsville & Mexico	511	1,413,332	692,122	2,131,371	241,277	231,780	24,000	1,213,114	84,095	1,794,453	437,040	.....	51,547	385,493	—86,413
St. Louis, San Francisco & Texas	244	644,614	272,265	1,189,037	197,851	144,180	22,846	491,495	50,169	905,541	283,496	.....	9,661	273,833	115,142
St. Louis Southwestern	906[5]	5,097,253	1,172,078	6,597,502	701,806	905,946	266,667	1,552,970	235,318	3,661,927	2,935,575	—7,018	224,814	2,703,743	461,751
San Pedro, Los Angeles & Salt Lake	1,133[5]	4,729,072	2,336,069	7,605,724	830,568	1,289,503	278,635	1,751,176	5,023,653	2,582,071	—15,301	305,897	2,260,873	1,508,052
Southern in Mississippi	281	1,183,589	440,269	1,666,253	253,602	184,743	21,011	484,827	37,573	986,256	679,997	36,324	54,410	588,263	118,692
Southern Kansas of Texas	125	937,825	164,914	1,145,427	89,414	233,185	30,301	346,528	32,836	722,259	423,168	.....	19,186	403,982	234,842
Tennessee Central	704	1,460,503	525,139	1,957,395	258,051	131,142	51,843	444,826	64,802	938,952	318,618	.....	36,382	282,236	106,595
Texas & New Orleans	458	2,091,870	880,943	3,176,754	637,281	700,538	73,877	1,239,765	108,879	2,760,340	416,414	220	115,496	301,138	18,913
Toledo & Ohio Central	443	3,491,834	483,532	4,121,121	612,816	769,522	61,871	1,454,717	82,874	2,981,300	1,139,821	—6,796	192,606	940,419	—66,129
Toledo, Peoria & Western	248	629,912	270,305	1,059,404	182,215	223,276	21,818	386,436	31,510	845,255	214,149	.....	46,500	167,649	18,951
Ulster & Delaware	129	501,772	289,676	833,217	108,984	117,055	11,781	355,237	23,468	616,824	217,213	611	29,700	188,124	—5,254
Virginia & Southwestern	240	1,167,278	132,225	1,335,081	202,539	307,214	17,389	369,156	31,166	927,464	407,617	.....	51,564	356,053	—54,406
Wabash	2,513	16,304,425	5,479,917	24,074,628	3,009,467	4,045,463	765,315	10,048,451	579,292	18,447,967	5,626,661	—37,510	671,612	4,917,539	669,883
Washington Southern	36	341,132	273,595	962,939	119,455	115,238	10,942	379,053	25,703	650,391	312,548	—2,003	30,645	279,900	—23,237
Western Maryland	543	4,646,586	736,874	5,647,461	813,958	704,455	141,181	2,448,662	120,074	4,220,330	1,327,131	.....	180,000	1,147,131	—578,292
Western Pacific	937	3,305,466	976,436	4,619,849	691,470	396,597	258,581	1,801,529	226,465	3,374,987	1,244,862	—8,557	199,648	1,036,657	508,324
Western Ry. of Alabama	133	586,346	420,068	1,092,719	175,543	195,877	53,342	299,146	51,356	775,264	317,455	158	43,428	274,185	11,549

Average mileage operated during previous period—[1] 2,012; [2] 852; [3] 353; [4] 886; [5] 1,204; [6] 3,399; [7] 277; [8] 152; [9] 215; [10] 83; [11] 510; [12] 843; [13] 1,116. —Indicates Deficits, Losses and Decreases.

Railway Officers.

Executive, Financial and Legal Officers.

W. B. Patterson has been appointed assistant auditor of the Chicago, Indianapolis & Louisville, and W. E. Lawson has been appointed freight claim agent, with headquarters at Chicago, succeeding D. C. McNiff, transferred to other duties. The settlement of overcharge and loss and damage freight claims is now under the jurisdiction of the accounting department.

B. L. Winchell and Thomas H. West, receivers of the St. Louis & San Francisco, announce that from May 29, and acting for and under the direction of the receivers, W. C. Nixon, with the title of chief operating officer, will have charge of the maintenance and operation of the physical property; W. B. Biddle, with title of chief traffic officer, will have charge of all traffic and development matters; and A. Douglas, with title of chief accounting officer, will have charge of the books and accounts.

P. H. Morrissey, who has been president of the American Railroad Employees' and Investors' Association since January 1, 1909, has been appointed assistant to the vice-president in charge of operation of the Chicago, Burlington & Quincy, with headquarters at Chicago. Mr. Morrissey was born September 11, 1862, at Bloomington, Ill., and was educated in the public schools of that city, graduating from high school in 1879. He began railway work in 1879 as call boy in the locomotive department of the Chicago & Alton at Bloomington, and the following year entered the train service as a passenger brakeman. Subsequently he was freight brakeman and freight conductor. He left active railway service in 1890 to assume the position of Viee Grand Master of the Brotherhood of Railroad Trainmen, which organization he had joined in February, 1885. He continued in that capacity until August 1, 1895, when he became Grand Master, which office he retained until January 1, 1909. While serving as Grand Master of the Brotherhood of Railroad Trainmen in 1903, Mr. Morrissey attracted a great deal of favorable notice by his action in a controversy between the Wabash and its employees. Judge Adams of the United States Circuit Court had issued an injunction restraining the brotherhood as an organization from ordering a strike, and when the men were planning to ignore the injunction, Mr. Morrissey insisted on their respecting the order of the court while it remained in effect. The injunction was dissolved, but meanwhile an amicable settlement of the dispute was reached. He has been a leading advocate of the plan of conducting labor negotiations by groups, and has always been insistent on the inviolability of labor agreements. He was also one of the prominent advocates of the Erdman act. During the past four years Mr. Morrissey has served as arbitrator in a large number of wage controversies between railways and employees. In 1910, with Interstate Commerce Commissioner E. E. Clark, he arbitrated the demands of the conductors and trainmen on the New York Central & Hudson River, making an award which was later adopted by other lines. He also represented the enginemen in the arbitration proceedings begun in eastern territory in May, 1912, and arbitrated the demands of the enginemen, firemen, conductors and trainmen on the Coal & Coke Railway, under the Erdman act in 1911. He has served in numerous lesser wage arbitration proceedings, at times being the representative of the employees, and at other times, acting as sole arbitrator for both parties.

P. H. Morrissey.

Operating Officers.

J. H. Milton, superintendent car department of the Chicago Terminal division of the Chicago, Rock Island & Pacific, has had his jurisdiction extended over the entire Rock Island system.

W. R. Mann, chief despatcher of the Houston & Texas Central, has been appointed assistant superintendent, with headquarters at Ennis, Tex., in place of J. F. Sugrue.

R. C. Watkins has been appointed acting superintendent of the Galveston, Harrisburg & San Antonio, with office at San Antonio, Tex., succeeding J. E. Taussig, granted leave of absence.

J. F. Sugrue, assistant superintendent of the Houston & Texas Central at Ennis, Tex., has been appointed superintendent of the Lake Charles & Northern, with headquarters at DeRidder, succeeding John K. Fahey, resigned.

John D. Patterson, formerly superintendent of terminals of the Louisville & Nashville, at Atlanta, Ga., has been appointed general superintendent of the Panama Railroad, with headquarters at Colon, Panama, succeeding J. A. Smith, resigned.

The general headquarters of the Third district of the Chicago, Rock Island & Pacific, including the system south of Caldwell, Kan., in the states of Oklahoma, Texas, Arkansas, Louisiana and Tennessee, will be moved on June 15 from Ft. Worth, Tex., to El Reno, Okla. C. W. Jones is general manager of this district.

J. W. Knightlinger, assistant superintendent of Morgan's Louisiana & Texas Railroad & Steamship Company and the Louisiana Western Railroad at New Orleans, La., has been appointed superintendent, with headquarters at Lafayette, La., succeeding L. Mims, assigned to other duties. Mr. Knightlinger is succeeded by J. K. Fahey, heretofore superintendent of the Lake Charles & Northern.

William Lyneh, trainmaster of the Texas & Pacific at Bunkie, La., has been appointed superintendent of the Rio Grande division, with headquarters at Big Spring, Tex., succeeding A. G. Whittington, resigned, to become superintendent of the San Antonio division of the International & Great Northern, with headquarters at San Antonio, in place of John R. Jones, assigned to other duties. J. M. Thompson succeeds William Lyneh.

William Thomas has been appointed trainmaster of the First district, Albuquerque division, of the Atchison, Topeka & Santa Fe Coast Lines at Gallup, N. M., in place of L. M. Shipley, who has been transferred to the Second district of that division as trainmaster, with office at Winslow, Ariz., in place of A. R. Woods, acting trainmaster. Mr. Woods has been made trainmaster of the First district, Arizona division, at Needles, Cal., to succeed C. G. Fluhr, who has been transferred to Fresno, Cal., as trainmaster of the First and Visalia districts in place of J. A. Christie, promoted.

Phil. Carroll, assistant general superintendent of the Southern district of the Missouri Pacific system, has been made superintendent of the Missouri division, extending from St. Louis, Mo., to Hoxie, Ark., with headquarters at Poplar Bluff, Mo., succeeding J. Cannon, and the former position has been abolished. Mr. Cannon has been transferred to the Eastern division, extending from St. Louis to Kansas City, with office at Sedalia, Mo., in place of A. J. Alexander, who is made superintendent of the Colorado division, with headquarters at Pueblo, Colo., this division extending from Hoisington, Kan., to Pueblo, Colo. T. A. Shea, whom Mr. Alexander succeeds, has been appointed superintendent of the Valley division, which extends from Little Rock, Ark., to Ferriday, La., and Monroe, and will have headquarters at McGehee, Ark. He succeeds C. M. Alexander, resigned. Effective June 1.

J. M. Scott, whose appointment as superintendent of the Monongah division of the Baltimore & Ohio, with headquarters at Grafton, W. Va., has been announced in these columns, began railway work as an operator on the Chesapeake & Ohio in 1891. The following year he went to the Cincinnati, Hamilton & Dayton as an operator, and was promoted to train despatcher in 1895, becoming trainmaster of the same road in 1903. He was appointed superintendent in 1905, remaining in that position until August, 1910; he then went to the Kansas City Southern, and on January 1, 1911, left that company to take a position with the Indiana State Railroad Commission. On August 5, 1912, he

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was appointed supervisor of transportation of the Baltimore & Ohio, and in January, 1913, became assistant superintendent of the Cumberland division at Keyser, W. Va., which position he held at the time of his recent appointment as superintendent of the Monongah division of the same road, with headquarters at Grafton, as above noted.

Traffic Officers.

William F. Nagle has been appointed traveling freight agent of the Lehigh Valley, with office at South Bethlehem, Pa., succeeding E. G. Baumer, deceased.

J. H. Bingham has been appointed traveling freight agent of the Missouri Pacific and the St. Louis Iron Mountain & Southern, with office at Indianapolis, Ind.

George T. Bell, assistant passenger traffic manager of the Grand Trunk and the Grand Trunk Pacific, at Montreal, Que., has been appointed passenger traffic manager of both these companies, succeeding W. E. Davis, deceased.

A. W. Crowther has been appointed general freight and passenger agent of the Sugarland Railway, with headquarters at Sugarland, Tex., succeeding C. A. Davis, resigned.

J. W. King, traveling freight agent of the St. Louis, Iron Mountain & Southern at San Antonio, Tex., has been appointed district freight agent of the International & Great Northern at that place.

T. H. Wilhelm, assistant general freight agent of the Chicago, Rock Island & Gulf, has been appointed general freight agent, with headquarters at Ft. Worth, Tex., succeeding J. C. McCabe, deceased. M. J. Dowlin succeeds Mr. Wilhelm.

W. A. Scrivner, division freight agent of the Texas & Pacific at El Paso, Tex., has been appointed traffic manager of the Aransas Harbor Terminal Railway, Aransas Pass Channel & Dock Company and Port Aransas Transportation Company at Aransas Pass, Tex.

Henry P. Anewalt, whose appointment as general freight agent of the Atchison, Topeka & Santa Fe Coast Lines has already been announced in these columns, was born January 3, 1868, at Allentown, Pa. He graduated from the high school in Allentown in 1884, and began railway work the following year as clerk and cashier in the local freight office of the Atchison, Topeka & Santa Fe at Kansas City, Mo. He was later successively chief clerk in the commercial office and contracting agent at that place, and subsequently became general freight and passenger agent of the Santa Fe, Prescott & Phoenix at Prescott, Ariz., until April, 1905. He was then appointed assistant general freight agent of the Coast Lines of the Atchison, Topeka & Santa Fe, with office at San Francisco, Cal. He remained in this position until June 1, at which time he was promoted to general freight agent of the Coast Lines, with headquarters at Los Angeles, Cal., as above noted. Mr. Anewalt's entire railway service has been with the Atchison, Topeka & Santa Fe system.

H. P. Anewalt.

J. M. Ball, district freight agent of the International & Great Northern at San Antonio, Tex., has been appointed general cotton agent, with headquarters at Houston, Tex., and will have charge of matters relative to the transportation of cotton, cotton seed and cotton seed products.

H. A. Fidler having resigned as division freight agent of the Detroit, Toledo & Ironton at Ironton, Ohio, the position is abolished. E. C. Brooks is appointed general agent at that place, and will have supervision of operation in the Ironton district and charge of traffic in the territory formerly under the jurisdiction of the division freight agent.

J. C. Valentine, traveling freight agent of the Texas & Pacific at Shreveport, La., has been appointed commercial agent of the International & Great Northern at Dallas, Tex., succeeding Cooper Nott, transferred. C. H. Lewis has been appointed traveling freight agent, with headquarters at St. Louis, Mo., in place of C. B. Fox, who will succeed Mr. Valentine as traveling freight agent of the Texas & Pacific.

Wilmer C. Stith has been appointed traffic manager of the Terminal Railroad Association of St. Louis, with headquarters at St. Louis, Mo., succeeding J. L. Penney, assigned to other duties, effective June 1. Mr. Stith was born at St. Louis, June 21, 1858, and began railway work in August, 1877, as messenger in the general freight office of the St. Louis, Iron Mountain & Southern. He was employed in various capacities in that office, which was afterwards combined with the general freight office of the Missouri Pacific system until September, 1886, when he was made assistant general freight agent of that system. From January, 1890, to January, 1892, he was general freight agent of the Kansas City, Fort Scott & Memphis at Kansas City, Mo. Mr. Stith returned to the Missouri Pacific system on the latter date as general freight agent, and in December, 1899, was promoted to freight traffic manager. He resigned in April, 1908, to become traffic manager of the Waters-Pierce Oil Company, where he remained for about three years. For the last two years he has been engaged in special traffic and transportation work, the past ten months of which have been spent with the Terminal Railroad Association of St. Louis.

W. C. Stith.

Engineering and Rolling Stock Officers.

F. G. Glover has been appointed electrical engineer of the Rock Island lines, with headquarters at Chicago, succeeding F. E. Hutchison, resigned.

Charles Hansel, consulting engineer, New York, has resigned as chief engineer of the Cincinnati Union Depot & Terminal Company, effective June 1.

R. B. Elsworth, assistant signal engineer of the New York Central & Hudson River, at Albany, N. Y., has been appointed engineer maintenance of signals, succeeding J. M. FitzGerald.

G. O. Huckett, road foreman of the Chicago, Burlington & Quincy at Wymore, Neb., has been appointed master mechanic of the Sterling division, of the same road, with headquarters at Sterling, Colo., in place of H. M. Barr, resigned, effective June 1.

Charles Yoder, assistant engineer of the Lake Shore & Michigan Southern at Cleveland, Ohio, has been appointed assistant engineer of track of the Lake Shore & Michigan Southern and the Dunkirk, Allegheny Valley & Pittsburgh, with headquarters at Cleveland.

V. D. Simar, having resigned as chief engineer of the Duluth, South Shore & Atlantic and the Mineral Range, all matters pertaining to engineering, bridges and buildings will be handled by E. R. Lewis, assistant to the general manager, with headquarters at Duluth, Minn.

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P. J. Carter, who resigned last year as office engineer of the Gulf, Colorado & Santa Fe, at Galveston, Tex., to pursue post graduate work at the University of Wisconsin, has recently been appointed office engineer of the western lines of the Atchison, Topeka & Santa Fe, and his headquarters will be at Amarillo, Tex.

G. S. Goodwin, assistant mechanical engineer of the Rock Island Lines, has been appointed mechanical engineer in charge of locomotive design, with headquarters at Chicago, and E. G. Chenoweth has been appointed mechanical engineer in charge of car design, with headquarters at Chicago, succeeding C. A. Seley, resigned, who had charge of both departments. G. W. Lillie succeeds Mr. Goodwin as assistant mechanical engineer at Silvis, Ill. Effective June 1.

L. Jutton, whose appointment as division engineer of the Madison division of the Chicago & North Western, with headquarters at Madison, Wis., has already been announced in these columns, was graduated from the University of Illinois in civil engineering in 1902. For about a year afterwards he was engaged in structural steel work, and in September, 1903, he entered the employ of the Chicago & North Western. He held various positions in the bridge department, and at the time of his recent promotion, as noted above, he was general inspector of bridges, with office at Chicago.

F. H. Hanson, whose appointment as assistant master car builder of the Lake Shore division of the Lake Shore & Michigan Southern, with headquarters at the Collinwood shops, Ohio, has been announced in these columns, began railway work on August 9, 1891, as transfer man on the Lake Shore & Michigan Southern, at Elkhart, Ind. The following year he was made fireman, and in September, 1893, was appointed baggage man at Elkhart. He was subsequently car inspector, night foreman and general foreman at the same place, and in September, 1908, became division general foreman at Collinwood, Ohio. He remained in this position until January 16, 1912, when he was appointed supervisor of materials at Cleveland, which position he held at the time of his recent appointment as assistant master car builder of the same road as above noted.

Edward Douglas Jackson, whose appointment as division engineer of the Baltimore & Ohio, with headquarters at Philadelphia, Pa., has been announced in these columns, was born on July 1, 1882, at Front Royal, Va., and was educated at the Virginia Military Institute. He began railway work on July 1, 1902, with an engineering corps of the Baltimore & Ohio, and in August, 1906, was appointed assistant division engineer at Pittsburgh, Pa. From January, 1907, to April, 1909, he was assistant engineer of the same road at Baltimore, Md., and then to February, 1910, was engineer of the Chicago division. He was appointed assistant engineer in the operating department, with headquarters at Baltimore, in February, 1910, and in November, 1911, was made assistant engineer maintenance of way, at Baltimore, which position he held at the time of his recent appointment as engineer of the Philadelphia division of the same road, with headquarters at Philadelphia, Pa.

OBITUARY.

Napoleon Bonaparte Lasier, general baggage agent of the Baltimore & Ohio Chicago Terminal Railroad, died at his home in Chicago on May 27.

Joseph G. Cutler, roadmaster of the Northern Pacific at Walla Walla, Wash., died in the latter city on May 29, aged 55 years. Mr. Cutler was born at Cambridge, Mass., and was graduated from Lawrence Scientific School at Harvard University. He began railway work in 1881 as rodman for the New York West Shore & Buffalo. He was then with the Canadian Pacific, Boston Hoosic Tunnel & Western and Burlington & Missouri River until 1888, when he was made resident engineer of the Washington & Columbia River. In 1893 he was appointed chief engineer, and in 1895, also treasurer, of that road, and later, when the Northern Pacific acquired the Washington & Columbia River, he was made an assistant superintendent. Subsequently he became roadmaster of the branch from Pasco to Walla Walla.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE SOUTHERN RAILWAY is making inquiries for 15 mikado locomotives and 10 Pacific type locomotives.

THE TRINITY RIVER LUMBER COMPANY has ordered 1 mogul locomotive from the Baldwin Locomotive Works.

THE COAST FISH, OIL & FERTILIZER COMPANY has ordered 1 four-wheel switching locomotive from the Baldwin Locomotive Works.

THE LOUISIANA RAILWAY & NAVIGATION COMPANY has ordered 3 ten-wheel locomotives from the Baldwin Locomotive Works.

CAR BUILDING.

THE UNION RAILROAD is making inquiries for 296 freight cars.

THE SOUTHERN RAILWAY is making inquiries for 400 fifty-ton hopper cars.

THE ATLANTIC COAST LINE is in the market for 100 flat cars and 25 caboose cars.

THE CAROLINA, CLINCHFIELD & OHIO is making inquiries for a number of coal cars.

THE INTERNATIONAL & GREAT NORTHERN has ordered 1,000 freight cars from the American Car & Foundry Company.

THE LEHIGH VALLEY, mentioned in the *Railway Age Gazette* of May 30, as being in the market for 1,000 box cars and 1,000 coal cars, has ordered 1,000 coal cars from the Standard Steel Car Company, and is negotiating with the Pullman Company for 1,000 box cars.

IRON AND STEEL.

THE CORDOBA CENTRAL, Argentina, has ordered 10,000 tons of rails from the United States Steel Corporation.

THE NORTH COAST has ordered 2,500 tons of bridge material from the American Bridge Company.

THE NORFOLK & WESTERN has ordered 3,000 tons of bridge material from the United States Steel Corporation.

GENERAL CONDITIONS IN STEEL.—The conditions in the steel industry show no change. Orders have been small and there have been some slight reductions in prices on the part of independent companies to induce consumers to enter the market. The larger companies have, however, shown no desire to take new orders at a sacrifice in prices. A revival in the buying movement is not expected until the early part of next month, as the tariff question will not be definitely settled until that time. It is also believed that consumers will have more confidence in the promising crop outlook in the early part of July, and this should be an important factor in inducing them to place heavy orders.

INDO-CHINESE RAILWAY CONNECTION PROPOSED.—The Burma Chamber of Commerce, backed by those of Liverpool and Manchester, have again moved in the matter of linking up the Indian with the Chinese railways. The route most favored is the one by the Southern Shan States line from Thazi to Taunggyi and into China via Kengtung, as it would pass through fertile land besides affording the easiest route into China.

NEW RAILWAYS FOR CEYLON.—The 17-mile extension railway from Ratnapura to Pelmudulla in Ceylon will soon be completed; in the words of the governor, this line "follows generally the valley of the We-ganga river and taps a large country planted in rubber in the Dele and Watapola districts. It also serves the rich districts of Rakwana and Balangoa." From the present terminus at Kahawatte surveys are being made to Madampi to the south and also one from Mahawatte to Opanaiki. The two extensions to Rakwana and Galangoa are also under consideration. All these lines, when completed, will open out a very fertile country.

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Supply Trade News.

The Orenstein-Arthur Koppel Company, Koppel, Pa., has made the Canadian Fairbanks-Morse Company, Ltd., Montreal, Que., its agents for Canada.

G. Haven Peabody has been appointed to represent the Lima Locomotive Corporation in the west, with headquarters at 520 McCormick building, Chicago.

The Baldwin Locomotive Works has awarded a contract to the H. A. Strauss Co., Chicago, for the heavy concrete construction work on the new plant at East Chicago, Ind.

The D. & A. Post Mold Company, Three Rivers, Mich., has moved into new and enlarged quarters, necessitated on account of the growth of the business, which has recently included several large railway orders.

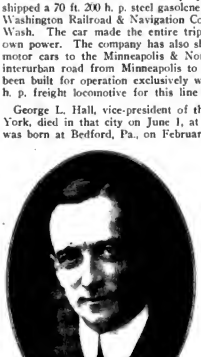
The Raymond Concrete Pile Company, New York, has received a contract for placing Raymond concrete piles for the foundations of the train shed for the new union passenger station at Kansas City, Mo.

The Roberts & Schaefer Company, Chicago, has received a contract from the Indiana Harbor Belt Railway to build two large reinforced concrete coaling plants at Chicago. The contract price is about $32,000.

A. C. Moore, general manager of the Safety Car Heating & Lighting Company, New York, has been made vice-president of that company, with office in Chicago. Mr. Moore will have entire charge of the western business of the company.

The McKeen Motor Car Company, Omaha, Neb., has just shipped a 70 ft. 200 h. p. steel gasolene motor car to the Oregon-Washington Railroad & Navigation Company, at North Yakima, Wash. The car made the entire trip of 2,000 miles under its own power. The company has also shipped two 55 ft. gasolene motor cars to the Minneapolis & Northern Railway, a 22-mile interurban road from Minneapolis to Anoka, Minn., which has been built for operation exclusively with McKeen cars. A 200 h. p. freight locomotive for this line will be delivered shortly.

George L. Hall, vice-president of the Q & C Company, New York, died in that city on June 1, at the age of 46. Mr. Hall was born at Bedford, Pa., on February 25, 1867, and graduated from Princeton University in 1889. For several years he was in the engineering department of the Pennsylvania Railroad, and was later connected with the Baltimore & Ohio. Mr. Hall was afterwards president of the National Railway Materials Company, which position he resigned to become vice-president of the Q & C Company.



G. L. Hall.

The Electric Storage Battery Company, Philadelphia, Pa., has received an order from the Atchison, Topeka & Santa Fe, for 62 sets of the Chloride Accumulator to be used for car lighting, in conjunction with a recent order given by that road to the company for axle lighting generators. These batteries are standard on the Santa Fe.

A conference of the chief inspectors of Robert W. Hunt & Co., having in charge the inspection of rails and fastenings at the various mills of the United States, was held in Pittsburgh on May 13 and 14. At the meeting various matters were discussed relative to the inspection of rails, joints, bolts, spikes and tie plates, the idea being to bring the inspectors into closer contact, with a view to harmonizing and systematizing the work to the end that more consistent action and results would be attained. Samples of the various types inspected, specifications and report blanks were on exhibition, and the different points were thoroughly discussed. The meeting was in charge of D. W. McNaugher and C. W. Gennet.

TRADE PUBLICATIONS.

FROGS.—The Railway Appliances Company, Chicago, has issued an illustrated folder describing the Fewings Wrecking Frogs.

MACHINERY.—MacGovern & Company, Incorporated, New York, has issued a new catalog of electrical and steam machinery, cars and car equipment.

CHICAGO, BURLINGTON & QUINCY.—The freight department has issued in booklet form a schedule of package cars from St. Louis, with a description of the company's package car service.

SIGNALING.—The Union Switch & Signal Company has just issued bulletin No. 66, describing in detail its apprenticeship course. The bulletin is illustrated with a large number of very fine views of the various departments of the company's works.

JOINT PIPE.—The National Tube Company, Pittsburgh, Pa., has issued a 40-page booklet describing Matheson joint pipe, and including numerous half-tones showing installations and methods of laying and joining the pipe. Among the advantages enumerated in the text are the reduced weight of this pipe as compared with cast iron, the additional strength against bursting, the reduction in lead required for joining, the adaptability of the pipe to sharp curves and the advantages of the burlap and tar coating. The booklet is artistically arranged, and the cuts are finished in duotone.

CONCRETE CONSTRUCTION.—The Unit Construction Company, St. Louis, has issued an attractive illustrated booklet on the unit method of construction for reinforced concrete buildings. Unit construction is a patented method of assembling materials and erecting reinforced concrete buildings. It differs from the ordinary method of reinforced concrete construction in that all concrete is cast in forms on the ground in the shape of individual units, which are seasoned and then assembled in place in the building as provided for in the design. The book contains illustrations showing a large number of examples of this type of construction in various large buildings throughout the country.

OPPORTUNITY FOR RAILWAY CONCESSION IN ECUADOR.—The Ecuadorian government has practically canceled its contract with Edward Morley for constructing the line from Cuenca, in the southeastern portion of Ecuador, to Huigra. It seems that Mr. Morley has not been able to secure the funds to complete this work. Here is still a good opportunity for some American firm. This road is much needed, and the firm coming forward with the funds to do the work will certainly receive every reasonable concession from the government.—*Consular Report.*

PASSENGER IRREGULARITIES IN VICTORIA.—The Victorian Railway Commissioners intend to rigidly enforce the regulations in respect to the prosecution of persons traveling on the railways without tickets and those who use first with second class tickets, etc. This particular form of offence is assuming alarming proportions. An idea of the extent of the habit may be gaged from the fact that in 1910 there were 2,094 pasengers traveling with out-of-date tickets and occupying first class compartments with second class tickets. In 1911 the number had increased to 2,919, while in 1912 it rose still higher to 3,599. According to the records for the first three months of 1913 the number is steadily increasing. In January 470 instances were detected, in February 402, and March 499. If this average is maintained the number of punishable offences will have amounted to about 6,000 by the end of the year. The principal excuse of those who travel in a higher class than their ticket provides is that of "overcrowding." Until the electric service is actually started overcrowding will be unavoidable during the rush hours. The offenders in this class will, therefore, receive less punishment than those who travel without a ticket.

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Railway Construction.

ALABAMA ROADS.—An officer of the Tidewater Securities Corporation, with headquarters at Birmingham, Ala., writes that this company has been organized with $100,000 capital, to promote, finance and construct the following: Birmingham & Gadsden.—Under this name a company is to be organized with a capital of $1,500,000, to build a railroad from Gadsden, Ala., southwest to Birmingham, 60 miles; the Birmingham & Tidewater is to be organized with a capital of $1,500,000, to build a railroad from Birmingham to the Warrior river, 30 miles; the Tidewater Navigation Company is to be organized with $1,500,000, to equip a line of steamboats and barges to operate a line on the Warrior and other rivers south to Dauphin Island, a distance of 438 miles, and the Dauphin Island Railway & Harbor Company has been organized with $1,500,000 capital to develop Dauphin Island as a port and terminal for transportation lines. This company owns Little Dauphin Island and has grants from the United States government to build a railroad and to dredge the harbor. These four projects will provide a route between the Birmingham district and the Gulf. They will be constructed separately, and will be operated as separate units, also as a through line.

BIRMINGHAM & GADSDEN.—See Alabama roads.

BIRMINGHAM & TIDEWATER.—See Alabama roads.

BURRO MOUNTAIN.—See El Paso & Southwestern.

CANADIAN NORTHERN.—This company has filed with the city authorities of Toronto, Ont., revised plans for a western entrance into the city. The plans call for the construction of a four-mile line, and include the construction of a 2,360-ft. tunnel to be 30 ft. wide and about 25 ft. deep, from a point just south of Davenport road, east of St. Clarens avenue, to a point just east of Talbot avenue. The tunnel will be built for two tracks with a center wall running through its entire length. The tracks will be depressed to the west and bridges erected over the streets, and the Humber will be crossed on a high level bridge. The new plans were made to avoid crossing a number of streets at grade and the Grand Trunk yards north of St. Clair avenue. The company has asked the Railway Commission of Canada to approve the plans.

CANADIAN NORTH WESTERN.—The House of Commons Railway Committee has passed the bill received from the Senate incorporating this company with $15,000,000 capital to build a railway 1,800 miles long from Winnipeg, Man., to Lethbridge, Alberta, thence to Pas, Man., and back to Winnipeg. H. Dewalden C. Montague of Beaulieu, Que.; F. W. Baker and H. E. Brittain, of London; W. F. Morgan, Jr., New York, and Toussaint Brosseau, Montreal, Que., are incorporators. (March 14, p. 529.)

CHICAGO & WESTERN INDIANA.—It is announced that work will be started at once on the elevation of the tracks in Chicago between Seventy-first and Eighty-third streets, in accordance with the ordinance of 1908. This will give the Western Indiana an elevated track from Twenty-second street to Eighty-third street. The tracks of the Belt Railway are also to be elevated from Wood street to Wallace street, making a total of about three miles for the two lines.

CLEVELAND AKRON SHORT LINE (Electric).—An officer writes that the plans call for building from Cleveland, Ohio, south via Brooklyn, Independence, Brecksville, Richfield, Ira, Old Portage and Akron to Barberton. Henry F. Chapman, president, and W. E. Hawley, chief engineer, Cleveland.

CORINTH & NORTHEASTERN.—Incorporated in Mississippi, it is said, to build from Corinth, Miss., northeast to the Tennessee river near Hamburg, Tenn., about 18 miles. A. Rubel, G. A. Hazard, R. L. Young and W. E. Small are directors.

CUMBERLAND VALLEY.—An officer writes that bids have been asked for 87,000 yds. of excavation work in connection with a revision of the grade between the Potomac river and Berkeley Station, West Va., a distance of 8 miles. Bids will probably be asked for a single track bridge in the near future, to be built over the Potomac river to replace the present bridge.

DAUPHIN ISLAND RAILWAY & HARBOR COMPANY.—See Alabama roads.

EL PASO & SOUTHWESTERN.—An officer writes that a grading contract has been given to Chadwick & Dayo, Tucson, Ariz., to build under the name of the Burro Mountain from section 34, township 19 south, to section 22, township 19 south, in New Mexico, about 14 miles. The company will carry out the bridge work and track laying with its own forces. The grading involves handling about 20,000 cu. yds. to the mile, maximum grades will be 2 per cent., maximum curvature 10 deg. (May 29, p. 1205.)

GADSDEN, BELLEVUE & LOOKOUT MOUNTAIN.—An officer writes that grading work has been started on the first section from Fisk street, Gadsden, Ala., to Noccalula Falls, 3.1 miles. Address C. J. Virgin, New Orleans, La.

GRAND MARAIS & NORTHWESTERN.—An officer writes that the prospects of building this line are good, and the company expects to let contracts about October 1. The projected route is from Grand Marais, Minn., west to a connection with the Duluth & Northern Minnesota, about 50 miles. A number of branch lines are also included in the plans. The line will be built to carry iron ore and forest products. Arthur Mitchell, president, Duluth, Minn. (May 16, p. 1115.)

GREAT NORTHERN.—An officer writes that a contract has been given to Grant Smith & Co., for grading and tunnel work on a change of line a quarter of a mile long in the Cascade mountains, state of Washington, replacing two 10 deg. curves with one 5 deg. curve, and piercing a 1,200-ft. double track tunnel. The railway company will carry out the track laying. There will also be a 900-ft. double track combination snowshed. (April 25, p. 973.)

KANSAS CITY, KAW VALLEY & WESTERN (Electric).—An officer writes that contracts will be let in 60 days for work on a line from Kansas City, Kan., west, via Bonner Springs to Lawrence, 40 miles. O. K. Williamson, chief engineer, Bonner Springs, Kan.

LEHIGH VALLEY TRANSIT.—An officer writes that work is now being carried out on a part of the line between Allentown, Pa., and Philadelphia, removing the present track from a highway to a private right-of-way. A contract for this work has been given to the Allen Engineering & Contracting Company, Netcong, N. J.; it includes work on a section of about 3½ miles north of Quakertown, also on ½ mile south of Sellersville, and on about 3½ miles between Souderton and Lansdale. There will be one steel viaduct about 270 ft. long and 40 ft. high, and several small bridges ranging in length from 20 ft. to 50 ft. The new line will have easier curves and grades than the existing line. All the necessary right-of-way for a double track line has been secured, although only single track will be laid at the present time. (May 9, p. 1052.)

MINNEAPOLIS, MERRILL & MARINETTE.—Incorporated in Wisconsin with $400,000 capital, to build from Merrill, Wis., to Antego, also to build from Merrill to Prentice Junction, in all 75 miles. J. N. Potter, L. V. Anderson, A. H. Wright, E. F. King, E. C. Harding and C. Solum, all of Merrill, are incorporators.

MOBERLY, HUNTSVILLE & RANDOLPH SPRINGS (Electric).—An officer writes that contracts were to be let on May 29, for building from Moberly, Mo., via Huntsville to Randolph Springs, 12 miles. The maximum grading will be 3 per cent. C. H. Dameron, president, and John J. Mundinger, chief engineer, Huntsville. (January 3, page 38.)

NORTH AND SOUTH CAROLINA ROADS.—Plans are being made to build a line from Rockingham, N. C., south to Cheraw, S. C., about 25 miles. William Gillispie, Cheraw, may be addressed.

OREGON ROADS.—According to press reports a contract has been given to Olson Brothers, of Seaside, Oregon, to build a logging line in Clatsop county, Oregon, from a point near Gearhart Park, east to the Lewis and Clark river. It is said that the work will be started at once. M. J. Kinney is back of the project.

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PENNSYLVANIA SYSTEM.—The record of the mileage of the road on December 31, 1912, shows that the total length of the main line on the lines east of Pittsburgh, Pa., and Erie is 5,333 miles of first track, with 1,888 miles of second track, 551 miles of third track, 483 miles of fourth track, and 4,587 miles of company's sidings, a total of 12,842 miles. There was an increase of 4 miles of first track, 17 miles of second track, 2 miles of fourth track, and 43 miles of company's sidings, a total increase of 66 miles. On the Pennsylvania lines west of Pittsburgh and Erie, the mileage is 3,103 miles of first track, 1,347 miles of second track, 216 miles of third track, 130 miles of fourth track, and 2,577 miles of company's sidings, a total of 7,373 miles. During the year there was an increase of 5 miles of first track, 5 miles of third track, 9 miles of fourth track, and 51 miles of company's sidings, and a decrease of 5 miles second track, a total increase of 65 miles. The mileage of the Vandalia Railroad is 927 miles of first track, 106 miles of second track, 8 miles of third track, and 682 miles of company's sidings, a total of 1,723 miles. The grand total of all lines, including those operated by and associated in interest with the Pennsylvania Railroads, is 11,644 miles of first track, 3,652 miles of second track, 803 miles of third track, 631 miles of fourth track, and 8,635 miles of company's sidings, a total of 25,695 miles. Of this 6,338 miles of first track is east of Pittsburgh and Erie, and 5,306 miles is west of Pittsburgh and Erie.

PEORIA, CANTON & GALESBURG (Electric).—An officer writes that contracts will probably be let in June to build from Peoria, Ill., west to Farmington, 25 miles, thence northwest to Galesburg, an additional 25 miles. Horace Clark, president, Peoria, and L. L. Summers & Co., chief engineers, Chicago. (May 9, p. 1052.)

PHILADELPHIA & READING.—An officer writes that a contract has been given to C. P. Bower, Reading, Pa., for the grading and masonry work on a new low-grade freight line in Philadelphia from a point between the Germantown branch crossing of the Richmond branch, and Clarissa street bridge over the Richmond branch. The new line is being built to improve the conditions at Wayne Junction station, and will eliminate the heavy grades on the existing yard tracks south of the station.

QUANAH, ACME & PACIFIC.—This company has completed work on the extension from Paducah, Tex., west to Roaring Springs, 42 miles, and has been authorized by the State Railroad Commission of Texas to issue $300,000 of bonds on the extension. Surveys are now being made, it is said, for the extension west across the Panhandle of Texas to Roswell, N. Mex. It is understood that the line will eventually be extended from Roswell southwest to El Paso, Tex. (February 21, p. 374.)

TEMPLE, NORTHWESTERN & GULF.—This is the new name of the Temple & Northwestern, which has about four miles of track laid from Temple, Tex. The new company has a capital of $100,000, with headquarters at Temple, and plans to build from a point four miles west of Temple northwest via Gatesville to Dublin, thence northeast to Dallas. The incorporators include J. H. Thompson, J. Lane, R. O. Faires and W. A. Vinson, all of Houston, and J. H. McGregor, of Temple. (February 28, p. 412.)

TIDEWATER NAVIGATION COMPANY.—See Alabama roads.

VIRGINIAN RAILWAY.—An officer writes that a contract for the construction of a tunnel for two tracks and revision of alinement through Jennys Gap between Lester and Slab Fork in Raleigh county, W. Va., has been let to W. W. Boxley & Co., Roanoke, Va. In regard to double tracking the line for a distance of four miles, with additional side tracks for the storage of coal, no contract has been let for this work.

RAILWAY STRUCTURES.

BALTIMORE, MD.—President Samuel Rea of the Pennsylvania Railroad has submitted plans to the city authorities of Baltimore for improvements to the Northern Central Railway terminals in the valley of Jones' Falls, north of Bath street. It is proposed that the Calvert street facilities should be used for freight service exclusively, but if the city favors the retention of a passenger service, the railway company will later include as part of the plan such facilities as would adequately accommodate the local passenger traffic, and at the same time interfere as little as possible with the development for freight purposes. In that event, it would be necessary to elevate such passenger facilities alongside of Calvert street and over the freight tracks down to a new terminus on the north side of Bath street at Calvert street, and there put up a building suitable both for freight and passenger service, the latter on the upper level. It would also be necessary to arrange the freight houses so that in the future their second stories may be utilized as well as the first stories at the track level. The plans for this terminal, exclusive of passenger facilities, contemplate a four-track connection from the Union station down the valley of Jones' Falls. They also include enlarged freight sheds and carload delivery tracks, and to carry out this work would necessitate the vacation of a large number of streets. The plan also calls for the construction of an overhead bridge 50 ft. wide, south of Madison street, extending from Calvert to Constitution. The necessary properties involved in this new development, not previously owned by the Northern Central, have been acquired or are in process of acquisition, at an estimated cost of over $1,000,000.

BERKELEY, W. VA.—See Cumberland Valley under Railway Construction.

KANSAS CITY, MO.—The Kansas City Southern is planning the erection of a six-story office building.

PENSACOLA, FLA.—An officer of the Gulf, Florida & Alabama writes that bids will probably be asked for this fall to build a two-story passenger station and office building at Garden and Coyle streets in Pensacola. The building is to be 45 ft. wide x 150 ft. long; it will have brick walls, stucco covered, and reinforced concrete floors. The cost of the improvements will be about $50,000.

PITTSBURGH, PA.—The West Penn Railroad has plans made for building a large freight station at North Side, Pittsburgh. To carry out the improvements it will be necessary to erect overhead bridges over two streets.

TEMPLE, TEX.—The Atchison, Topeka & Santa Fe is preparing to begin work shortly on the erection of a new freight depot, transfer sheds and platforms.

TORONTO, ONT.—The plans for extensive railway improvements in Toronto, long the subject of controversy, are again changed in a bill introduced in the Canadian Parliament by Hon. Frank Cochrane. The parties in interest are the Grand Trunk and Canadian Pacific Railways and the Toronto Harbor Commissioners. The plan for a four-track viaduct has been abandoned, and the Railway Commission will issue an order for a six-track viaduct, close to the water's edge. The bill authorizes the different parties concerned to expropriate property between the tracks and the water. It provides that the railways, for the purpose of the viaduct and connected works or for carrying out any agreement in respect thereto, and approved by the Railway Commission, may expropriate: "All or any land and lands covered by water in the city of Toronto, lying within the district south of the existing right of way of the Canadian Pacific, from Yonge street east to the line of Berkeley street, and south of the existing right of way of the Grand Trunk from the Berkeley street line, east to Cherry street and extending out to the present Windmill line; and also a strip of land south of the Windmill line and extending to Cherry street."

WINOOSKI, VT.—Bids are wanted until June 10, by J. M. Morrison, engineer and superintendent of structures of the Central Vermont, at St. Albans, Vt., for a bridge to be built at Winooski, Vt., near Burlington, for the Central Vermont and the towns of Colchester and South Burlington. The proposed design is a reinforced concrete arch and viaduct for carrying the highway over the Winooski river and over the Central Vermont tracks. The estimated cost is $20,000.

PROPOSED LINE FOR INDIA.—At the last annual meeting of the Mysore Planters' Association, a resolution was passed urging on the secretary of state the necessity for bringing force to bear on the government of India to sanction the construction of the section, running from the Mysore frontier to Mangalore, a distance of but 50 miles. The Mysore state is rapidly developing railways within its boundaries.

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Railway Financial News

BALTIMORE & OHIO.—The Public Service Commission of Maryland has approved an issue of $10,000,000 equipment trust 4½ per cent. certificates, maturing in ten annual instalments.

CHICAGO, ROCK ISLAND & PACIFIC.—White, Weld & Company, New York, have bought and are offering $4,410,000 5 per cent. equipment notes, series H, maturing $441,000 annually from July 1, 1914, to July 1, 1923, at prices to yield 5½ per cent. for equal amounts of each maturity. These equipment notes are a direct obligation of the C. R. I. & P. Railway (old company) and are secured by 50 mikado locomotives, 30 six-wheel switching locomotives, 30 Pacific type locomotives, 2 mountain type locomotives, 1,500 forty-ton steel underframe box cars, 500 steel gondola cars, 50 caboose cars and 72 steel passenger train cars, costing $5,521,000, of which the railway paid 20 per cent. in cash.

GRAND TRUNK PACIFIC.—The Canadian government has agreed to lend, at 4 per cent., $15,000,000 to the Grand Trunk Pacific, which loan is to be guaranteed principal and interest by the Grand Trunk. The agreement is subject to ratification by the Canadian parliament.

KANSAS CITY, FORT SCOTT & MEMPHIS.—See St. Louis & San Francisco.

MISSOURI PACIFIC.—United States representative Neely, of Kansas, has requested President Wilson to have the attorney general begin proceedings against the Missouri Pacific to recover $4,500,000 for government aid said to have been extended to the Missouri Pacific in 1862.

NATIONAL RAILWAYS OF MEXICO.—Kuhn, Loeb & Company, Speyer & Company, and Ladenburg, Thalmann & Company, all of New York, have bought from the railroad company and are offering to the public $26,730,000 2-year 6 per cent. secured gold notes. The offering price to the public is 97. These notes are part of an authorized issue of $29,160,000, which is to be secured by the pledge pro rata as notes are issued of $24,800,000 National Railways prior lien 4½ per cent. bonds and $17,000,000 National Railways general mortgage 4 per cent. bonds, which 4 per cent. bonds are guaranteed principal and interest by the Mexican government. The proceeds of the sale of these notes was used by the company to pay the $10,000,000 notes which matured June 1, 1913, and further proceeds will be used to take up $13,000,000 notes due November 15, 1913. A part of the security for the new notes is now deposited as security for the $13,000,000 notes due November 15.

NEW ORLEANS, MOBILE & CHICAGO.—A protective committee for the first and refunding mortgage 5 per cent. bonds, consisting of John W. Platten, chairman; Robert Fleming, James G. Cannon, F. W. Scott and T. N. Strothers, has been formed. The St. Louis & San Francisco and the Louisville & Nashville jointly are understood to control this road.

PERE MARQUETTE.—Judge Landis, of the United States district court, has given permission to the Bankers Trust Company, New York, to bring foreclosure proceedings under the mortgage securing the $17,295,000 improvement and refunding first mortgage bonds. This suit is to be consolidated with that of the American Brake Shoe & Foundry Company, under which Frank W. Blair was appointed receiver.

ST. LOUIS & SAN FRANCISCO.—The following is a list of the protective committees which have been formed for various classes of St. Louis & San Francisco securities:

For the general lien 15-20 year 5 per cent. bonds of the St. L. & S. F., Speyer & Company, New York, ask the deposit with the Bankers Trust Company, New York.

For the refunding 4 per cent. bonds of the St. L. & S. F., Frederick Strauss, of J. & W. Seligman & Co., chairman; James N. Wallace, president of the Central Trust Company; A. J. Hemphill, president of the Guaranty Trust Company; Edwin G. Merrill, president of the Union Trust Company; Harry Bronner, of Hallgarten & Company; Charles W. Cox, of Robert Winthrop & Company; Breckenridge Jones, president of the Mississippi Valley Trust Company of St. Louis.

For the New Orleans, Texas & Mexico first mortgage 5s, Willard V. King, president of the Columbia-Knickerbocker Trust Company, chairman; Stedman Buttrick, of Estabrook & Company, Boston; Lewis L. Clarke, president of the American Exchange National Bank; C. A. de Gersdorff, of William Salomon & Co.; Lewis B. Franklin, vice-president of the Guaranty Trust Company; A. Lichtenstein, of Heidelbach, Ickelheimer & Company; C. S. W. Packard, president of the Pennsylvania Company for Insurances on Lives & Granting Annuities, of Philadelphia. George E. Warren, of New York, is secretary of the committee.

For 2-year 6 per cent. debenture notes due September, 1914: H. E. Cooper, vice-president of the Equitable Trust Company, chairman; Charles T. Rhodes, vice-president of the Girard Trust Company of Philadelphia; T. A. Whelen, Jr., of Whelen, Duer & Lanahan, of Baltimore, with A. Ludlow Kramer, of 37 Wall street, as secretary.

For the trust certificates for Chicago & Eastern Illinois stock and stock itself: 1. For trust certificates representing either common or preferred stock of the C. & E. I.—Henry H. Porter, Alvin W. Krech and Harry A. Vernet, committee, with Richard R. Hunter, secretary, request immediate deposit of trust certificates and also stock certificates with the Equitable Trust Company, 37 Wall street, New York, depositary. 2. For trust certificates representing only preferred stock of C. & E. I.—W. Emlen Roosevelt, chairman; Horace J. Morse, Joseph Walker, Jr., Otto T. Bannard, W. P. Bliss and W. Redmond Cross, committee, with George E. Roosevelt, secretary, 30 Pine street, New York. Holders either of C. & E. I. preferred stock or stock trust certificates issued for the same will be asked to deposit with the New York Trust Company, 26 Broad street, New York, as depositary.

For the Kansas City, Fort Scott & Memphis bonds: E. V. R. Thayer, chairman; F. L. Higginson, Francis R. Hart, Alfred D. Foster and Frank H. Damon, secretary, 50 State street, Boston.

The Interstate Commerce Commission has been asked by representatives of some of the holders of St. Louis & San Francisco securities to make an investigation into the use of the proceeds of the bond sales in recent years of the St. L. & S. F.

The syndicate formed for the sale of New Orleans, Texas & Mexico 5 per cent. bonds was dissolved on June 2, and it is understood that considerable amounts of these bonds remain unsold in the hands of the syndicate members.

See also New Orleans, Mobile & Chicago.

SAN ANTONIO, UVALDE & GULF.—The Texas railroad commission has placed a valuation of $3,093,585 on the road which is now in operation from San Antonio to Carrizo Springs, with main line and branches totaling 197 miles.

UNION PACIFIC.—The directors have proposed two plans to meet the requirements of the Supreme Court's decision in regard to the sale of Southern Pacific stock, either of which they announce they are ready to carry out. The first plan provides for the sale of the $126,650,000 stock of the Southern Pacific at public auction, with a minimum price fixed, and provision made for underwriting the sale. The second plan proposes to deposit this Southern Pacific stock with a bank or trust company without, however, giving any voting power to the stock, and providing that the trustee shall issue beneficial certificates without voting power, but entitled to dividends issuing these certificates pro rata to Union Pacific stockholders. These certificates are to be exchangeable for Southern Pacific stock upon affidavit that the holder is not a holder of any Union Pacific stock. This means that the Union Pacific stockholder who receives such certificates may sell his Union Pacific stock and then be entitled to Southern Pacific stock itself or may sell the beneficial certificate to a non-holder of Union Pacific stock, who will be entitled to exchange it for Southern Pacific stock.

WABASH-PITTSBURGH TERMINAL.—The United States district court has authorized the sale of $4,000,000 new receiver's certificates. The $1,700,000 receiver's certificates due June 1 were provided for, and the balance is to be used to settle a claim of the Wabash Railroad for $2,250,000.

WABASH RAILROAD.—See Wabash-Pittsburgh Terminal.

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Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	10 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,150 copies were printed; that of these 8,150 copies, 6,684 were mailed to regular paid subscribers and 348 were provided for counter and news companies' sales; that the total copies printed this year to date were 206,550—an average of 8,607 copies a week.

VOLUME 54. JUNE 13, 1913. NUMBER 24.

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*Illustrated.

WE publish elsewhere an abstract of a recent article by J. O. Fagan dealing with the labor situation on railroads, and especially with the activities of the legislative representatives of the brotherhoods in promoting train crew and other legislation. Mr. Fagan paints his pictures in broad, long strokes, and therefore they are not always accurate in details. His comments on labor unions sound like criticisms of the unions themselves rather than of objectionable things done by them. The organization of working men is necessary under modern conditions for them to protect and promote their legitimate interests. The trouble with them is that they often seek to promote illegitimate ends or use illegitimate means to promote legitimate ends. Mr. Fagan is also somewhat too severe on public regulation in general, and regulation by the Interstate Commerce Commission in particular. Some regulation of operation is as necessary as some regulation of rates. Since some regulation of operation is necessary, the best body to which to delegate the necessary authority is the Interstate Commerce Commission. The commission often makes mistakes and is sometimes unfair, but it makes few mistakes and is very fair compared with most regulating bodies in this country. However, in its broad outlines the picture Mr. Fagan paints is true to life. It faithfully depicts the power the railway labor brotherhoods have acquired, the ruthless way that power is abused and the public's foolish and harmful attitude of acquiescence in almost everything the brotherhoods demand. However, a change is bound to come. A few years ago the captains of industry were the heroes of every newspaper and magazine writer in the country. Today there is none so low as to do obeisance to a captain of industry. Many of them abused their power, and therefore lost it. The labor leaders are riding for a similar fall. The people of the United States will not indefinitely tolerate the tyranny of labor any more than they will indefinitely tolerate the tyranny of capital.

THERE has been a good deal in the papers in this country and a good deal more in the French papers in criticism of the sale of about $3,000,000 St. Louis & San Francisco bonds through Speyer & Co. to French bankers only a comparatively short time before the St. Louis & San Francisco went into the hands of a receiver. The facts of the case are substantially these: Speyer & Co., in buying the bonds from the railroad company, were under no illusion whatsoever as to the financial condition and future requirements of the property. In reselling the bonds to the large French bankers, they were entirely frank in their representations, and it is safe to say that these bankers and the large investors who bought from the French bankers were fully cognizant of the financial condition of the St. Louis & San Francisco. The American bankers sold the bonds to the French bankers at a very small margin of profit, less than 1 per cent. The French bankers, knowing all the time the exact status of the bonds, sold them to their customers at a profit it is safe to say of over 10 per cent. If any one was not made aware of the risk taken in buying these bonds, it was the small customer of the French bankers. It would seem, therefore, that it is disingenuous, to say the least, for the French bankers to allow the blame for any risk which their customers have unwittingly taken to rest either on American railroads or on American railroad bankers.

IT is interesting sometimes to see just how "new" are some of the problems which those whose duty it is to regulate the operation of railroads are now for the first time confronted with. The latest tentative classification of operating expenses promulgated by the Interstate Commerce Commission provides for an optional charge for depreciation for each one of the material accounts in maintenance of way and structures. Thus Rails includes the cost of material and has the optional further account Rails, Depreciation of. In the 10th annual report of the Little Miami Railroad, abstracts from which are printed elsewhere, which is for the year 1852, the superintendent, W. H. Clement, had occasion to remark:

> The current expenses have been 40 per cent. of the gross receipts, which varies but slightly from last year's results, but we have not, I think, fully provided for depreciation of iron, although perhaps not 20 bars are so worn as to require rerolling, yet a general wear of the surface is going on which in time must absorb the value of the iron. The ties are also decaying, although as yet requiring no renewals. I would suggest the propriety of purchasing iron or of setting aside a fund to purchase it when needed.

Mr. Clement was a practical railroad man and did not deal in theories of railroad accounting. The Interstate Commerce Commission's depreciation "charges" under maintenance of way as now proposed, and under maintenanee of equipment, which have been in effect since 1907, are bookkeeping charges only. No actual fund either of money or materials is required. Mr. Clement seems to have been quite unaware that there could be a distinction between a charge for depreciation and an actual

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provision for it, and in this opinion he would probably be upheld by a good many practical railroad officers even today.

THE Supreme Court of the United States, in one of the decisions handed down last Monday, annuls an order which was issued by the Interstate Commerce Commission regulating the fare on an electric car line between Council Bluffs, Iowa, and Omaha, Nebraska, holding that, in the law which gives the commission its power, Congress used the term "railroad" in a restricted sense and did not mean to include "local" lines, such as street railroads. In other words, a street car line is not subject to the interstate commerce law, even when it crosses a state line and even when, as in the present case, it runs a part of the way on its own ground, moving cars at high speeds, and is virtually an interurban line, though not a long one. But, surely, such traffic is commerce, and it is interstate; and this decision, like that in the Minnesota rate case, delivered on the same day, seems likely to be notable for the importance of some of the points which it does not decide. The separation of roads, made of steel rails, into three classes, street railways, interurbans and "railroads" has caused much confusion for a dozen years past, and the full text of the present decision will be awaited with interest, for it is time that the questions were settled. Evidently the Supreme Court believes that the duty of settling it, so far as it affects interstate commerce, rests on Congress. As the decision at best will be based on arbitrary grounds, this view has a rational basis. It cannot be assumed that Congress would exclude a street railway on the ground that it is a small affair, for in the District of Columbia it has had no scruples against putting street railroads under the authority of the Interstate Commerce Commission, and has even passed acts directing the commission to take cognizance of the most petty details of car operation; so unless the attitude of congressmen has changed it does not seem likely that they will hesitate to pass a law backing up the commission in the position which it has taken in the Council Bluffs case. That case, decided November 27, 1909, and reported in the Reports, Volume 17, page 239, contains a very full statement of the reasons for and against the different uses of the term railroad and railway, many decisions being cited on both sides of the question of the meaning of "railroad" as used in federal statutes. The commission has for many years held that the term includes electric lines. The Circuit Court took the opposite view, at least so far as to grant an injunction against the commission; and then the Commerce Court (May, 1911.) sustained the commission. Judge Knapp, however, when on the commission dissented, and as a member of the Commerce Court he took no part in the case. The Supreme Court, therefore, has settled numerous delicate distinctions.

THE DECISION IN THE MINNESOTA CASE.

THE first feeling of railway men regarding the Supreme Court's decision in the Minnesota rate case will be one of disappointment. Some of the principal contentions of the expert witnesses and counsel of the railways are emphatically negatived. A closer reading of the opinion may turn this feeling of disappointment into one approaching satisfaction. Several of the principles the railways sought to have established are not upheld. But no principles are established by the decision which in the long run probably can do the roads unjust harm. On the contrary, some of the views expressed are an advance over any uttered by the Supreme Court in any previous case.

There were two vitally important questions involved. One related to the power of the states to regulate rates for hauls beginning and ending within their own border. The other related to the basis on which valuations of railways should be made. As to the first, the railways contended that the power of Congress over interstate commerce was paramount; that Congress by the passage of the Act to Regulate Commerce had asserted its paramount authority; and that therefore any regulation of rates by the states which directly or indirectly interfered with interstate rates was unconstitutional. The state of Minnesota contended, on the other hand, that the states had practically the same power to regulate state rates that Congress had to regulate interstate rates. The Supreme Court holds that under the interstate commerce act as it now stands, the states have full power to regulate intrastate rates, so long as they do not make them confiscatory. But by clear implication it says that the power of Congress over interstate commerce is so completely paramount that it may determine whether any regulation of state rates does unduly interfere with interstate rates, and "may intervene at its discretion for the complete and effective government of that which has been committed to its care." It holds, not that Congress has not the power over state regulation which counsel for the railways have attributed to it, but merely that Congress has not exercised the power. "If this authority of the state (to regulate intrastate rates) be restricted, it must be by virtue of the actual exercise of federal control and not by reason merely of a dormant federal power, that is, one which has not been exerted." The power of Congress in the premises could hardly be more clearly and broadly stated than in the following sentences:

> The interblending of operations in the conduct of interstate and local business by interstate carriers, and the exigencies that are said to arise with respect to the maintenance of interstate rates by reason of their relation to intrastate rates, are considerations for the practical judgment of Congress. If the situation has become such that adequate regulation of interstate rates cannot be maintained without imposing requirements with respect to such intrastate rates of interstate carriers as substantially affect interstate rates, it is for Congress to determine, within the limits of its constitutional authority over interstate commerce and its instruments, the measure of the regulation it should supply.

By this decision the determination of the extent to which the activities of the states in regulating rates should be restricted is found to lie not with the courts but with the people and Congress. Fortunately, there has been for some years a growing recognition of the fact that regulation of railways is a national problem, and that therefore its solution should be left to national action. Therefore it may not be impracticable to secure action by Congress to keep the regulatory activities of the states within reasonable bounds.

The court's attitute toward some of the important points involved in the determination of whether rates are confiscatory is less clear. It repeats its familiar proposition that "the basis of calculation is the fair value of the property used for the convenience of the public." It adds that the ascertainment of that value is "not a matter of formulas, but there must be a reasonable judgment having its basis in a proper consideration of all relevant facts." One of the most warmly debated and most important points regarding railway valuation for rate-making is how land used for right-of-way and terminals should be appraised. Three views have been advanced. Some have contended that land should be appraised at its original cost to the railway. The Minnesota commission, in the valuation on which it based certain of the rates involved in this litigation, held that the proper basis for appraising land used for railway purposes was its present market value. A third view, and the one pressed by the railways in this case, has been that land used for railway purposes should be appraised at what it probably would cost now to acquire it for railway purposes. Experience shows that the cost of acquisition for railway purposes is from 50 per cent. to 1,000 per cent. more than the ordinary market value. The court apparently accepts the view of the Minnesota commission that the correct basis of appraisal is the present market value. The ruling is important. While it does not uphold the railway position, it puts a quietus on the contention that railways are not entitled to benefit by the increment in the value of their real estate.

Another important point decided is that the valuation of the various elements of the property, such as rails, ties, bridges, and so on, should not be based on their cost of reproduction new, but that an allowance should be made for their depreciation after they have been in service and actually have suffered depreciation. It is difficult to escape the conclusion that where depreciation

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has actually occurred, it should be allowed for, just as appreciation should be considered where it has taken place.

Both those who have attacked railways and those who have defended them have sometimes taken extreme ground. The Supreme Court has rejected the extreme contention of both and taken middle ground on almost every proposition. While it held that the Great Northern and Northern Pacific had not proved that the rates in question were confiscatory as applied to them, it did not hold as to them that the rates were not confiscatory, and it did find that they were confiscatory as applied to the Minneapolis & St. Louis. As a practical matter, much difficulty and embarrassment are likely to be experienced in applying some of the principles laid down. For example, the Minneapolis & St. Louis, as to which it says the rates are confiscatory, competes at a good many points with the other roads involved, as to which the rates are held to be not confiscatory. The court apparently gives no clue to its idea as to what should be done about rates between competitive points which are on its own findings confiscatory as to some of the competitors, but not as to others. If the latter reduce them, so also must the former, or lose the traffic moved on them.

On the whole, it is probable that when the decision is thoroughly analyzed, it will be found to have advanced the problem of regulation of rates toward a solution which will not be destructive of the rights and interests of railways and which will at the same time be satisfactory to the public. Furthermore, it should always be borne in mind that the courts fix only the minimum below which rates cannot constitutionally be reduced, and that the law makers and public always have it within their power to keep them as much above the limit of confiscation as consideration of the public interests may indicate that they should be kept.

PERFORMANCE OF AUTOMATIC BLOCK SIGNALS.

THE records of the performance of automatic block signals given in this issue of the *Railway Age Gazette*, and in the issue of February 21, contain information of a kind never before published, except in a fragmentary fashion. To railway officers familiar with the operations of the signal department most of the facts given are already familiar, but the information will be found to have interest for these, as well as for others. Automatic block signals now fill an important place in American railroad operation, and the merits of the system, as a means both of economy and of safety, while in a general way well appreciated, are still far too little understood.

The records which we print may be taken as typical in what they show of American practice. Automatic signals depend for their serviceableness on delicate apparatus, requiring the care of well-trained men; and the perfection which is manifest today is the result of a long, slow and costly growth. Bearing in mind this fact, it is matter for decided satisfaction to be able to say that the salient fact observable in reviewing the data which have been gathered in the preparation of these articles is that on American railroads generally the signal system is managed with a high degree of efficiency. The signal apparatus is not perfect, and in the personnel there is room for improvement; but the percentage of faults and failures is exceedingly small; so small, indeed, that, in a sense, the officers in charge have got beyond questions of percentages. One careful and experienced signal engineer, being asked about the percentages of his records, and answering in a way which indicated that he had not compared the records of the different divisions of the road in much detail, explained his position by saying that it was his practice to seek a cure for every individual fault discovered. In other words, his aim is to have the signals operate perfectly, and the fact that there are two faults on one division and one fault, or three faults, on another, is immaterial; all must be attacked. The only standard that can be set up as a goal is theoretical perfection; for any empirical comparison, by records of the past, leads the statistician into such infinitesimal percentages that the mathematical criterion proves worthless. The percentage of dangerous failures is already exceedingly small, but it is to be borne in mind that a single such failure involves the possibilities of results so disastrous that no design of apparatus, quality of moral character, or efficiency of inspection can be deemed satisfactory unless and until it is as good as it is possible to make it.

Another salient fact is the value of records. The fact that statistical comparisons are not so useful as might be desired does not mean that records are useless. They are well worth keeping. Roads which keep partial or imperfect records may not be directly impairing efficiency, but they are neglecting a means of efficiency which is recognized as essential in all matters where the maintenance of high standards is considered necessary. Even if perfection were attained, it would still be desirable to keep on record the affirmative detail evidence of the fact. As long as the service anywhere is anything less than perfect, the records are of some use—at least as a definite premise for comparing the results with the results in former years. Records are necessary for establishing standards of efficiency and for use in correcting neglect or misconduct. The high degree of efficiency of which we have spoken is general, but it would not be safe to say that it is universal. And statistics have a value in spite of the fact that circumstances on one railroad are often so different from those on another that in many elements of the service a satisfactory comparison is out of the question.

Records are especially valuable for measuring the relative efficiency of different kinds of apparatus. The signaling art is still in comparative infancy and is to a considerable extent experimental. Designers and manufacturers have constantly been bringing out new patterns and introducing new principles, while yet their existing apparatus was giving a very good degree of satisfaction and could not be discarded. Though not dangerous, it does keep down the efficiency record; and records should be frequently compared for the purpose of keeping track of the degree of such inefficiency and of the rapidity with which its cause is being eliminated.

Records of signal performance being desirable, the need of uniformity in the records is obvious, and it is to be hoped that the Railway Signal Association will soon agree on a standard to which all railroads can conform. This standard should embrace all features which are essential in an exhibit of efficiency, and also all that are of interest, even though not classed as essential, in so far as they can be included without detriment to the interest of any road and without imposing burdensome labor. In the gathering of material for records, the process, as described in connection with the Baltimore & Ohio—the functions of the engineman, the station telegrapher, the despatcher, and so on—is essentially the same on all the principal roads, except that on some of them it is believed unnecessary to have printed blank forms below the signal supervisor's office. In the final summary record, for a month or a year, uniform arrangement of facts should be considered a fundamental requirement. A number of roads have forms which might readily be adopted, with slight modification, as standards, if only a concerted effort were made to that end. The signal engineer, as a matter of course, should see that adequate measures are taken for the removal of all causes of signal failures, regardless of any minute comparisons with the records of the past; but no one will deny the value of some record, and the criticism of showing too much detail, if it lies against these forms, is one easily met; the discussion of a proper form should begin with one which is too full rather than the opposite.

American railway signal departments may be generally credited with having apparatus, fixtures and appliances of satisfactory design and manufacture. Wherever the kind or quality of any piece or class of material or any mechanism is in any degree deficient, the officers in charge, cognizant of the conditions, will usually be found to be doing whatever is required in the matter of care and maintenance, and to be taking such action, looking

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toward replacement, as judicious management demands. To state the case in extreme language, by careful management good service is secured from material not the best. It must be added that in some cases good material gives good service in spite of maintenance seemingly negligent in some respects.

Taking a broad view, it may be said that the signal engineers of the railroads of this country universally aim to establish high standards and to adhere to them. Perhaps the most serious fault among them is delay in effecting improvements which are known to be essential to a satisfactory standard of efficiency. Apparatus which ought to be replaced by improved designs is in some cases tolerated apparently because the danger due to its retention is small. Maintainers not of the highest character for skill and reliability are retained because to secure better men involves a long course of selection and training and, presumably, the payment of higher wages. We speak primarily of the signal engineer, but of course in financial questions his responsibility is not exclusive; his superiors have the ruling voice, and often an overruling voice. Railway signal practice on the great majority of roads can be commended as being characterized by a high degree of efficiency; but railway safety is such a vital matter that high efficiency is not satisfactory; there is still a serious problem in the quest for the highest possible. Perfection is the only true goal.

ADVANCING RATES IN GREAT BRITAIN AND THE UNITED STATES.

WHILE the eastern railways in the United States are seeking approval by the Interstate Commerce Commission of their petition to be allowed to make a horizontal 5 per cent advance in freight rates, it is of interest to note that the English railways are in a somewhat similar position. A preliminary notice has just been issued on behalf of the railway companies of the United Kingdom to the effect that on and after July 1 their rates for merchandise traffic will, with certain exceptions, be increased by amounts which have been estimated to average 4 per cent. The proposed increases will be passed upon by the Railway and Canal Commission.

There is, however, one important difference between the situation in Great Britain and the United States. It is a practical certainty that the rates of the British railways will be advanced, while there is no such certainty about the outcome in this country. In other respects the conditions in which the English and American roads find themselves are strikingly analogous.

A general railway strike in the United Kingdom in August, 1911, was settled by an arbitration agreement after the intervention of the government for the purpose of putting an end to an industrial dispute which threatened the best interests of the country. The railways agreed to the arbitration program only upon the explicit stipulation that the ministry would recommend to Parliment the passage of a bill giving the railways the right to plead increased labor cost as a valid justification for a reasonable general increase in rates to offset such increases of pay as might have to be granted. The Royal Commission which arbitrated the wage question allowed many increases in wages and improvements in working conditions. The British traders and some representatives of the labor and socialist element put difficulties in the way of the Bill in its passage through Parliament, but it was enacted.

The significance of the promise of the government lies in the fact that by an act of 1894 the railways cannot advance rates above the level of 1892, even up to the legal maxima previously fixed by Parliament, without justifying their action before the Railway and Canal Commission on the ground of an increase in the cost of rendering the particular service involved. Under the legislation recommended by the ministry and recently passed by Parliament the companies will be relieved of the difficult task of distinguishing before the Commission the specific increases in the costs of carrying the various articles, being merely required to show that the cost of handling the entire traffic has been increased to the extent of the wage advance. This, of course, can be easily done.

The action of the British ministry in the crisis that confronted it is a striking example of political opportunism. To keep itself in power it needed labor votes, and it gave the working men an advance in wages. It also promised capital an advance in railway rates, and it acted for the good of the public generally by ending a disastrous strike.

In this country, in addition to various other increases in the cost of operation, such as taxes, advances in the cost of materials, and the additional expenses imposed by legislation, the railways have also been obliged to pay substantial and repeated advances in wages after arbitration practically forced by the government under conditions similar to those which prevailed in England. The Erdman arbitration law, which was passed at the instance of the labor brotherhoods, in no way detracts from their privilege of striking, while it practically forces the railways to submit all demands for increased wages to arbitration by placing them in an untenable position before the public if they refuse. Arbitration proceedings under this act have always resulted in compromise advances in wages which in the past two or three years have added many millions to operating costs. That the railways have been able to stand such increases in expenses for so long has, of course, been due to the general increase in the volume of traffic. The increase in gross earnings is no longer sufficient to offset the increase in expenses, and the railways therefore find themselves in the same position as the British roads.

The outcome in England seems to be a foregone conclusion because the railways are only required to justify increases in rates by increased expenses. In this country advanced rates are required to be reasonable, and the determination of what is reasonable is in the hands of the seven Interstate Commerce Commissioners.

NEW BOOKS.

Proceedings of the Fourteenth Annual Convention of the American Railway Engineering Association. Size 6 in. x 9 in.; 1,491 pages; bound in paper, cloth and half morocco. Published by the American Railway Engineering Association, Chicago. Price: paper, $6; cloth, $6.50, and half morocco, $7.

Although appearing somewhat later than last year, these proceedings are brought out within two and one-half months of the convention, this association being conspicuous for the promptness with which its proceedings appear. The volume this year contains about 250 more pages than that of the preceding year. In addition to the constitution and minutes of the business session, the reports of 21 committees are published. As in past years, most space is devoted to the report on rail, this requiring 410 pages this year and including the revised specifications for steel rails, the annual rail failure statistics and the results of several detailed studies. As in last year's proceedings, the discussions upon these reports are grouped together after the last report to simplify the work of publication. Following these discussions there appear seven monographs covering 304 pages, including "Locomotive Fuel Consumption and the Speed Diagram," by A. K. Shurtleff; "General Specifications for 150-ton, 45-ft. and 60-ft. Track Scales," by H. T. Porter; "Tests of Longleaf Pine Bridge Timbers," by H. B. MacFarland; "Bridges Over Navigable Rivers," by C. E. Smith, and "English Track on the Pennsylvania Railroad," by Jos. T. Richards. The reports included in this volume and the discussions upon them are among the best which have been presented in the history of the association and they will doubtless find a wide demand among others than members. The increasing size of the proceedings from year to year reflects the continually broadening scope of its activities. The innovation first introduced last year of printing the proceedings upon thin paper has been followed again this year. The proceedings are well printed and should make a favorable impression.

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Letters to the Editor.

THE WORKING OF THE HINE UNIT SYSTEM.

CHICAGO, ILL., June 6, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

As a matter of justice to the author of the unit system of organization, and to prevent an erroneous understanding in the minds of the multitude of railway officials who are looking for betterments in their organization, it appears a duty to make reply to the article appearing in the *Railway Age Gazette* of May 9, under the caption "A Reverie on the Unit System," by "Observation," and I therefore comment on it seriatum.

It is certainly no reflection on transportation employees to state that there are a great many of them who are derelict in their duty, as it is a well established fact that man in general is as lazy as he dare be, and one of the strong points in favor of the unit system is that it provides ample supervision so that it will not be necessary for one employee to criticize another, or hesitate to point out a duty for fear of retaliation, as scarcely a day passes without some one of the members of the official staff passing over the entire division, and their expanded authority and interest in the division as a whole rather than in their particular department so improves the situation that a better feeling is almost immediately engendered between the various employees.

The unit system is open not only to mechanical men, but to those of other departments, and becomes a part of the process of evolution by placing men gradually in advance positions with added responsibility in order to determine their ability to maintain their equilibrium under greater pressure.

As "Observation" has selected the position of master mechanic from which to draw his conclusions, we will continue to use the master mechanic for illustrative purposes in this article.

The master mechanic is responsible for proper and economical maintenance of the mechanical department, but he is not instructed by the superintendent of motive power (assistant general manager) in any matters, but gets his instructions through the division superintendent to whom he is directly subordinate, and the instructions from the superintendent need no accompanying letter from the president or general manager to strengthen them, as the superintendent and not the assistant reports direct to the superintendent of motive power (assistant general manager), and any difference of opinion is settled between these officers, doing away entirely with the disorganizing feature which formerly existed of passing the word around generally that the master mechanic was in a row with the superintendent and was going to take the matter up with the superintendent of motive power in order to have the division superintendent shown where to "head in." In order to demonstrate the lack of necessity of any subordinate division official communicating with a general officer, the originator of the unit system has omitted the name of general officers from the time card, on the assumption that it is a working time card only, used for the guidance of division employees and that it is not necessary for any division employee to know that a man of higher authority than the superintendent exists.

Under the unit organization, the master mechanic (assistant superintendent) is expected to visit outlying roundhouses as frequently as in his judgment is necessary to regulate mechanical matters, and he is permitted to do this by having a competent man, possibly a mechanical expert, having charge of the superintendent's office, of which he also has become a part, rather than leaving matters in the hands of a chief clerk with no mechanical training. The latter arrangement makes his uppermost thought during his absence from the office the necessity of returning quickly in order that his interests may be taken care of. He is not called to headquarters frequently for conferences, as the superintendent of motive power, having become an assistant general manager, is working under the same system of organization and is passing over the line frequently, discussing these matters on the ground, and with much better results than are possible at headquarters.

By having his office in the building with the superintendent, the master mechanic comes into closer touch with the entire situation, which is materially beneficial to both the company and himself, but there is nothing that demands his visiting the office once each day to handle correspondence, as experience has proven that a great deal of the correspondence formerly needing "personal attention" can, in most cases, be handled equally as well by the man on the "lid," and that a large percentage can just as well be filed (which the chief clerk has no authority to do), as to prolong it indefinitely, with very little to be accomplished except to have the last word, as the organization has now become divisional instead of departmental.

It is a foregone conclusion that the man is qualified to fill the position he is holding, otherwise the appointment would not have been his. The changing of title or issuing of circulars enlarging the scope does not add either knowledge or experience, but it does impress upon those interested the necessity of broadening out, becoming assistant superintendents in the full sense of the word, and this is just what experience has proven.

Under the departmental organization, the master mechanic would, in most cases, be indignant and consider it an encroachment upon his territory and departmental rights to feel that the division engineer, who is, in the majority of cases, an educated, college-bred man, had presumed to incorporate in his vocabulary the term "superheat," and the engineer would be equally as indignant to hear the master mechanic making mention of "superelevation," yet a complete understanding of either subject is easily within reach of the ordinary layman, and it will not be long after the introduction of the unit system until these men will be discussing these subjects and soliciting opinions each from the other on them.

One of the wisest provisions of the unit system is the prohibiting of correspondence between subordinate division officials and the general officers, as no man can well superintend a property when a large portion of his time is taken up trying to keep in touch with what arrangements have been made by his subordinate officers, "shoo-flying" his position and dealing direct, especially when the explanation of the cost of operation is one that he alone is called upon to make.

No conflict of orders or understanding should arise on account of verbal conversation between the master mechanic and the superintendent, for the superintendent is deeply interested in keeping the senior assistant posted on all points, and if these conferences take place at division headquarters, the senior assistant will no doubt be present.

It is presupposed that the organization consists of men who, if called to headquarters to confer on mechanical matters, will understand that it is not "presumably" on mechanical matters, and will not try to use this occasion to get out of their systems the bile that has accumulated on account of the division being run by the superintendent and not by some particular department head.

The above is the unit system as worked out by the originator thereof, and to follow it will increase the efficiency of superintendence at least 30 per cent., and no better proof of this assertion is required than an examination of the operating ratios of the lines now under his charge which will show from 10 per cent. to 20 per cent. less than that of the railroads in general throughout the country.

In presenting his plan, Major Hine, with his usual broad and liberal policy, gave it to the public free of cost, presenting it as a step in the right direction, requesting everyone to study it carefully, note results and improve upon it where possible. This, however, was done only in a very few cases. In some cases a chief clerk was so thoroughly intrenched that it was not deemed wise to displace him, while at the same time it was admitted that he had no qualifications that would permit of his advancement. In others, some of the department heads offered as an

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excuse for opposing the organization that their case was so different from all others, and that they would lose their identification by this change in title, yet I believe that it will be conceded that a man who has specialized in any line only to the point where his identity will be lost should his tag of identification in the way of a title be taken away from him, has not advanced sufficiently far to entitle him to much consideration, and the catering to this feeling has brought about a condition on some divisions that would justify the originator in taking determined action to dissociate his name from some abortions which are attributed to his creation.

General officers have in some cases also disliked very much to lose control of their trusted division employees, who had been their watch dogs and in most cases the chief disturbers on the division on which they operated.

The Standard Code is a success, because of its being adopted by nearly all roads; the Interstate Commerce Commission's system of accounting is a success because of the penalty for its violation; the Hine system will be equally as successful when men realize that the railway organization as a whole is of greater moment than their departments, a thing which most men cannot, or will not, see. EXPERIENCE.

CAR UNDERFRAME DESIGN.

SCRANTON, PA., May 19, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In your issue of May 16 you published an article regarding the design of steel underframes for cars by F. F. Gaines, superintendent of motive power of the Central of Georgia. I agree with Mr. Gaines that the best designs have been produced by a process of elimination and substitution, based upon repair track records as well as observation. A great deal of the trouble experienced today is the result of steel underframes built from an engineering or mathematical standpoint. The theory of tying the center sill or member in proportion to the width of its flange may be mathematically correct, but does not prove out in service. It is a common occurrence to find them buckled within 12 in. back of the body bolster. Cover plates unquestionably should be extended through the body bolsters, both top and bottom, as far as the draft rigging will permit, in connection with a wide top bolster plate which will act as a gusset plate as well as assist in carrying the vertical load, thereby protecting the car against lateral stresses and a tendency to break down the center sills at the bolsters. Mr. Gaines' views appear to me to be very sound and worthy of serious consideration in designing steel underframes for freight car equipment.

J. C. FRITTS,
Master Car Builder, the Delaware, Lackawanna & Western Railroad Co.

ENGINEER, ENGINEMAN OR ENGINE DRIVER?

NEW YORK, May 26, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In the issue of the 19th inst., of a New York journal, which, by reason of its deliberate and persistent practice in the matter to which I refer, will be recognized without being named, I find a news item, which I abridge as follows:

Prominent Engine Driver is Killed in a Wreck.

Decatur, Ind., Monday.—J. Ray Dickinson, *engine driver*, and Emery Hosler, fireman, both of Huntingdon, Ind., were killed five miles east of here when an Erie passenger train running on a temporary track ran off the rails. No passengers were killed or injured.

"Dickinson, engine driver, was a member of the last Indiana Legislature," etc.

As you are well aware, the Erie does not have any employee known as an "engine driver" in its service, and it is probable that the management of the journal referred to is equally aware of that fact, it having been respectfully informed that no railroad in the United States carries an employee so designated on its pay rolls. It, however, not only continues to invariably use this incorrect and unwarranted designation, but also, from time to time, makes a deliberate falsification of facts, by printing interviews with railroad officials, as to accidents, in which, *between quotation marks*, the official is reported as stating that the "engine driver" did thus and so, when, as a matter of fact, he spoke *correctly*, and said either "engineer" or "engineman."

I have no desire to discuss the propriety of terming the runner of a locomotive in the United States, an "engineer," and do not doubt that the term "engineman," which is in general use, is a properly descriptive one. There is, however, no warrant or excuse whatever for the misnomer, "engine driver," and it is moreover, offensive and derogatory, in view of its frequent, and in the case of the journal referred to, apparently *intended* application (like that of the word "greaser" to the former engineer officers of the United States Navy), as a term of contempt. The practice appears to me to be a piece of cheap and sloppy snobbery, and the public should recognize it as such.

J. SNOWDEN BELL.

THE IMPORTANCE OF THE STATION AGENT.

SALT LAKE, Utah, April 25, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The salary of a station agent, a subject treated in your issue of March 28, has seldom received the careful consideration which it demands as a feature of an important branch of the service. Who but the station agent is the direct representative of the company in its dealing with the public, and who has greater power to promote the interests of his company, secure business, and hold it, especially in competitive territory? The rates of pay, except at terminals and cities, have to a large extent been fixed on the basis of labor union demands, with perhaps a compromise, and the result is a schedule that is seldom entirely satisfactory to the men themselves, much less to the company which does not get the benefit which the increased salaries should bring, for the reason that to a great extent "seniority" is of no value as a standard by which to judge of the qualifications or fitness of an agent. This knowledge is only gained by personal contact with the man, observing his dealings with the public, his promptness in answering correspondence, attention to matters involving loss or damage to freight and the general appearance of his office. Superintendents seldom get well enough acquainted with their agents to learn these things. Salaries cannot be equitably based on the amount of a station's earnings, or the percentage of expense necessary to run it, for the reason that one station may handle largely carload lots, while another may handle L. C. L. and transfer; with a much lower revenue, but a greater amount of work. In many cases agents are allowed no latitude in increasing their clerical force when that is necessary to care for increased business. Sometimes after a long and tedious correspondence, during which time the office has become "snowed under," and the force demoralized; and the agent has had to devote his time to detail clerical work, when his services are needed elsewhere, he is grudgingly allowed an extra man.

Pay the agent what he is worth, as measured after acquiring a personal knowledge of the requirements of his station. Get acquainted with him, show him you have a personal interest in him, and make an occasional inspection of his premises. If he is filling the bill he will appreciate the superintendent's visit and be stimulated by it. On the other hand, if an agent is negligent or lacking in energy it is the superintendent's duty to make the visits so as to know the situation at first hand.

F. F. B.

ICHANG RAILWAY, CHINA.—Work on the Ichang railway has never been resumed since October, 1911, when it was stopped on account of the revolution. The completed work on the right of way is now in a deplorable state of disrepair and will have to be entirely renovated when work is once more resumed. The buildings are in fair condition, having been used as barracks.

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MECHANICAL STOKERS FROM OPERATING STANDPOINT

Heavy Trains Are Being Successfully Operated on Four Large Roads by Locomotives Equipped with These Machines.

The mechanical stoker for locomotives has always been considered of more interest to the mechanical than to the operating department, probably because it is purely a mechanical device. Where used it has, however, a very important bearing on operating results. There is no doubt that it has passed the experimental stage and is now on a commercial footing, and that its use will extend rapidly wherever heavy traffic has to be moved. Up to a little over a year ago stokers had been applied experimentally to a few locomotives only; there are now in regular service 342 locomotives equipped with stokers and 313 to be so equipped are on order.

It is not the intention to deal here with mechanical details. It has been through the co-operation of such roads as the Norfolk & Western, Chesapeake & Ohio, Baltimore & Ohio and the Pennsylvania with the stoker manufacturers that the mechanical difficulties have been overcome to a sufficient degree to bring the stoker to its present status, and with a continuance of this co-operation the failures due to mechanical imperfections should be reduced to a minimum in a comparatively short time. Changes in details are being made wherever experience and service indicate that they should be made, but it is unreasonable to expect that mechanical failures will ever be entirely eliminated any more than they are from the locomotive.

There seems to be a difference of opinion regarding the ability of stoker-fired locomotives to haul more tonnage than hand-fired. On the Pennsylvania Lines west of Pittsburgh the tonnage of stoker-fired locomotives on slow freight is increased 15 per cent. over that of the hand-fired locomotives, and the Baltimore & Ohio also states that it is possible to haul more tonnage with the stoker-fired locomotives. Whatever increase in hauling capacity there may be is evidently due to the more uniform steam pressure obtainable where the stoker is used and the ability of the machine to fire in an effeicient manner, enough coal to maintain the working pressure under conditions which the average fireman might not meet; for the same reason a better average speed is possible. It is generally conceded that a locomotive can be worked much harder when stoker fired than when fired by hand, as there is no question of the machine being able to apply any quantity of coal that the firebox will burn; the stoker will not, of course, increase the maximum or starting tractive effort.

No definite data is yet available as to any saving in fuel, but it is probable that a saving can be shown, owing to the more satisfactory conditions, such as a lighter fire and the keeping closed of the firebox door; the maintaining of a lighter fire also permits steam to be raised to the working pressure more rapidly than with the deep beds of coal commonly used in hand firing. Moreover the thinner fire saves approximately half the time usually occupied in cleaning and dumping the fires of hand-fired locomotives at terminals or on the road.

On the Pennsylvania system there are 155 stokers of the Crawford underfeed type in use, 153 of these being on the lines west of Pittsburgh. The accompanying table gives a performance record of the latter.

This shows that up to February 28, 1913, the stoker-fired locomotives had made 31,910 trips, of which 19,475, or 61 per cent., were trips on which the stoker fired 100 per cent. of the coal burned; and only 16.3 per cent. of the trips were below 70 per cent. stoker-fired.

The locomotives now equipped with stokers on the Pennsylvania lines west of Pittsburgh consist of 116 consolidation (2-8-0) type, 35 Pacific (4-6-2) type passenger and two six-wheel (0-6-0) switchers. It is probable that all heavy power built for this road in the future will be so equipped, and 140 locomotives are now on order which are to be stoker-fired.

Performance of the Crawford Double Underfeed Stoker on the Pennsylvania Lines West of Pittsburgh, Including All Trips of All Stokers from the Experimental Installation to February 28, 1913.

Coal fired by stoker in per cent. of total coal fired.	Number of trips.	Per cent. trips of total number of trips.
100	19,475	61.0
99	280	0.9
98	416	1.3
95—98	1,530	4.8
90—95	1,847	5.8
85—90	680	2.1
80—85	903	2.8
75—80	1,209	3.8
70—75	379	1.2
Below 70	5,191	16.3
Total	31,910	100.0

On the Norfolk and Western there are in service 40 Mallet (2-6-6-2) type locomotives fitted with the Street stoker. These locomotives have cylinders 22 in. and 35 in. x 32 in., 56 in. diameter drivers, 5,006 sq. ft. of heating surface, 72.2 sq. ft. of grate area and a tractive effort of 73,000 lbs. The weight in working order is 405,000 lbs., of which 337,300 lbs. is on the drivers. Twenty of these locomotives are working on the west end of the Norfolk division between Roanoke, Va., and Crewe, 130 miles; a profile of this section of the road is shown. Freight trains use the belt line around Lynchburg in order to avoid the dip caused by the valley of the James river. There are used at different points between Roanoke and Crewe, 4-8-0 type locomotives as helpers, the class M having a tractive effort of 40,100 lbs., and the class M-2 and M-2-c having a tractive effort of 52,400 lbs. The Mallet locomotives are known as class Z and the tonnage rating for this portion of the road is given in one of the tables.

Estimated Tonnage Rating, Class M, M2, M2c and Z Locomotives, Norfolk & Western (Norfolk Division), Between Roanoke and Crewe.

M	Roanoke to Bonsack	1,600 tons
M2	Roanoke to Bonsack	2,000 tons
M2c	Roanoke to Bonsack	2,200 tons
Z	Roanoke to Bonsack	3,000 tons
M	Bonsack to Blue Ridge	1,000 tons
M2	Bonsack to Blue Ridge	1,250 tons
M2c	Bonsack to Blue Ridge	1,440 tons
Z	Bonsack to Blue Ridge	1,850 tons
Z + M2	Bonsack to Blue Ridge	3,100 tons
Z + M2c	Bonsack to Blue Ridge	3,250 tons
Z + Z	Bonsack to Blue Ridge	3,700 tons
M2	Blue Ridge to Phoebe	1,900 tons
M	Blue Ridge to Phoebe	1,600 tons
M2c	Blue Ridge to Phoebe	2,000 tons
Z	Blue Ridge to Phoebe	3,100 tons
M2	Phoebe to Farmville	3,500 tons
M2c	Phoebe to Farmville	4,005 tons
Z	Phoebe to Farmville	5,100 tons
M	Farmville to Burkeville	2,100 tons
M2	Farmville to Burkeville	2,500 tons
M2c	Farmville to Burkeville	2,800 tons
Z	Farmville to Burkeville	3,700 tons
M2	Burkeville to Crewe	No limit
M2c	Burkeville to Crewe	No limit
Z	Burkeville to Crewe	No limit

The movement of loads in slow freight is east, the traffic being largely coal. The practice followed is to start a Mallet locomotive double headed with a class M-2 from Roanoke yard with a train of 5,000 tons, but when the Mallets are ready and there does not happen to be a full train in the yard they are started with whatever tonnage there is, with or without a helper according to the rating. With 5,000 tons the Mallet and the M-2 locomotives haul the train to Bonsack. From Bonsack to Blue Ridge a Mallet pusher is added to the train and from Blue Ridge to Phoebe the train is hauled by the two original locomotives, the M-2 class being needed for the grade from Posm to Phoebe, where it is cut off and the train proceeds to Crewe with the Mallet locomotive alone with the exception of 16 miles between Farmville and Burkeville, where a class M-2 pusher is used. One of the diagrams shows the record for part of April, 1913, of eastbound trains hauled by Mallet locomotives. This record

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Railway Construction.

BUTTE-BOISE-WINNEMUCCA.—Under this name a company has been incorporated in Idaho with $40,000,000 capital and surveys are being made, it is said, to build from a point nine miles east of Anaconda, Mont., south to a connection with the Gilmore & Pittsburgh at Armstead, Mont., and using that line to Salmon City, Idaho, thence southwest via Challis, crossing the Sawtooth divide, and via Moore's creek and the Boise river canyon to Boise City, thence through Oregon to Winnemucca, Nev., where connection is to be made with the Western Pacific, about 650 miles. It is understood that the Great Northern is back of the project, and that L. O. Leonard, Boise, has been making surveys for such a line in the interest of the Hill Lines.

CHARTIERS SOUTHERN.—An officer writes that contracts for grading and masonry were let on April 21, to Brockelhurst & Potter Co., of Providence, R. I., for the line which is being built from Van Emman on the Chartiers branch of the Pittsburgh, Cincinnati, Chicago & St. Louis, south by the valley of the Little Chartiers Creek to its head, and thence by the valley of Big Daniels Run to Mariana, all in Washington county, Pa. The work is not difficult. It is estimated that there will be about 54,000 yds. of excavation per mile and about an equal amount of embankment work. There will be about 28 bridges from 25 to 90 ft. long, and one tunnel 1,300 ft. J. J. Turner, president, and Thos. H. Johnson, chief engineer, Pittsburgh, Pa.

CHICAGO, BURLINGTON & QUINCY.—Contract has been let to Yale & Beagan, Chicago, for the grading on a new three mile double track low grade line between Kewanee, Ill., and Galva. This work involves the moving of over 400,000 yds. of earth.

CHICAGO, MILWAUKEE & ST. PAUL.—An officer writes that there has been no decision as to building the line from Hutchinson, Minn., to Montevideo, and the present prospects are that nothing will be done.

CUSHING RAILROAD.—Incorporated in Oklahoma to build a 12-mile line, it is said, from Cushing, Okla. The right-of-way has been secured, and it is expected that the line will be completed and put in operation this year. P. Arbon, C. R. Perry, Tulsa, and R. C. Jones, of Cushing, are incorporators.

DULUTH & NORTHERN MINNESOTA.—An officer writes in regard to the proposed line from Two Harbors to the head of the lakes, that it has been decided not to continue the extension of the main line for the present.

DIXIE RAILWAY.—A line is being built by the Dixie Industrial Company, of Benson, Ala., it is said, from Benson north to Alexander City, 15 miles. O. J. Pruitt & Co., Montgomery, Ala., have the contract. W. E. Benson, president and general manager, and D. B. McKenzie, chief engineer, Benson.

FALLON ELECTRIC.—An officer writes that residents along the route are grading this line. The plans call for building from Fallon, Nev., east to Stillwater, 13½ miles, and from Fallon south to Harrigan, 5 miles. About 4 miles of grade have been completed. The line will traverse a rich farm section to be opened to homesteaders this fall. C. A. Hascall, president, Fallon.

GALVESTON, HOUSTON & HENDERSON.—The directors at a meeting in Galveston, last week, appropriated $135,000, for improvements, the principal items being new side tracks, of which 10 miles will be laid on Galveston Island and two miles at Texas City Junction.

GUADALUPE VALLEY TRACTION COMPANY.—This company has filed its charter with the Secretary of State of Texas. It plans to build an interurban electric road from Austin, via Lockhart and Seguin, to San Antonio, about 100 miles. It is understood that surveys are under way. Directors are W. D. Dunlap and Walter J. Crawford, of Beaumont, Tex.; E. W. Brown of Orange, and J. M. Abbott and J. M. Abbott, Jr., of Seguin.

SAVANNAH & SOUTHERN.—This company, which operates the line from Norden, Ga., southwest to Willie, 13 miles, and 4 miles of spur lines, has given a contract, it is said, to build an extension from Norden east to Lanier, about three miles, and work is now under way. (March 28, p. 779.)

Railway Financial News.

BOSTON & MAINE.—The directors have passed the quarterly dividends. In 1913 the two quarterly dividends of 1 per cent. each were paid. In 1912 the annual dividend rate was 4 per cent. In 1911 5 per cent. was paid. In 1910, 6 per cent. Dividends have been paid since 1893.

CHICAGO & EASTERN ILLINOIS.—The committees formed to protect the interests of the common and preferred stockholders have been consolidated, and this consolidated committee now consists of Alvin W. Krech, chairman, H. H. Porter, W. Emlen Roosevelt, Gordon Abbott, W. Redman Cross, Horace J. Morice and Henry A. Vernet. The election of W. J. Jackson as president is commented on elsewhere, and, in addition to Mr. Jackson, Charles S. Holt, F. A. Hibbert, Chauncey Keep, W. H. Lyford, George H. Porter, H. N. Rose, H. H. Porter, Alvin W. Krech and Henry A. Vernet have been made directors. The *Wall Street Journal* says that the merging of the protective committees insures concerted action of the new owners of the Chicago & Eastern Illinois, and will enable them to secure at least two-thirds and probably a larger percentage of the stock for the cancellation of the contract with the St. Louis & San Francisco.

CHICAGO, MILWAUKEE & ST. PAUL.—Clark, Dodge & Co., New York, have bought from the company and are offering to the public $2,999,500 Puget Sound & Willapa Harbor 5 per cent. 5-year certificates of June 1, 1913-1918 at 98¼, yielding 5.40 per cent. on the investment. These certificates are guaranteed, principal and interest, by the Chicago, Milwaukee & St. Paul and represent ownership of a like amount (total outstanding) of the stock of the Puget Sound & Willapa Harbor. The stock is deposited under a trust agreement, which provides that the St. Paul will buy it at par on June 1, 1918.

DELAWARE & HUDSON.—The New York Public Service Commission, Second District, has authorized this company to issue $2,000,000 first and refund mortgage 4½ per cent. bonds of 1908-1943. The bonds are to be sold at not less than 95, proceeds to be used for additions and betterments.

NEW YORK CENTRAL & HUDSON RIVER.—It is understood that up to the present, holders of about $30,000,000 of the $90,578,000 New York Central-Lake Shore collateral trust 3½ per cent. bonds have given their consent to the New York Central's consolidation plan and have agreed to take new 4 per cent. bonds to be offered in exchange. The consent of holders of 75 per cent. of these bonds is necessary to make the plan operative.

NORFOLK SOUTHERN.—It is said that Fergus Reid will appeal to the Supreme Court of the United States from the decision of the North Carolina courts dismissing his suit against the Norfolk Southern to prevent the issue of $5,465,000 bonds for the purchase of the Aberdeen & Ashboro, the Raleigh & Southport and the Durham & Charlotte.

PENNSYLVANIA.—Kuhn, Loeb & Company, New York, are offering this company's general freight equipment trust gold certificates to the amount of $19,700,000, the certificates to be issued in about two weeks. These certificates draw interest at the rate of 4½ per cent. and are offered at a price to yield about 5 per cent. on the investment. They mature April 1, each year from 1914 to 1923, inclusive.

PITTSBURGH & SUSQUEHANNA.—On June 2, L. T. McFadden, chairman of the bondholders' committee and of the reorganization committee, bought in the property at foreclosure sale for $50,000. After the reorganization, it is the intention to rehabilitate the property and continue its operation. The road runs from Fernwood to Phillipsburg, Pa., 16 miles.

RUTLAND RAILROAD.—T. C. Delavan, John R. Calder and R. L. Shainwald, composing a preferred stockholders' committee of the Rutland, have sent out a circular letter to preferred stockholders asking for the deposit of stock under a stockholders' agreement, and urging minority stockholders to use every effort to get adequate protection from the court in the case of the New Haven being permitted to buy the majority stock from the New York Central & Hudson River or to prevent its purchase entirely

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Railway Age Gazette

DAILY EDITION

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Vol. 54. NEW YORK—JUNE 13, 1913—ATLANTIC CITY No. 24a.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue more than 9,200 copies were printed; that of those more than 7,200 copies, 7,048 were mailed to regular paid subscribers; 200 were provided for counter and news companies' sales; and 1,700 were printed for distribution at Atlantic City and for use as sample copies.

THE recommendation of the committee on Specifications for Cast Steel Locomotive Frames, that the maximum phosphorus and sulphur content be reduced from .06 to .05 per cent. is in accordance with the best recent practice, which is based on the experience of the majority of steel manufacturers; and the specifications as a whole should tend to the production of a better quality of cast steel frames, with a resultant decrease in the number of breakages. While the adoption of the report as recommended practice will give opportunity for improving the specifications before adopting them as standard. Should any weak point develop, the lack of discussion on the report would seem to indicate a general concurrence in the findings of the committee.

TO those who carefully listened to the address of the president on Wednesday morning and agreed with his suggestions, the report of the committee on subjects must have been a decided disappointment. Mr. Crawford said:

> "From my experience with the work of the association I cannot but agree, that entirely too much attention is devoted to material and consideration of the locomotive as a mechanical device, rather than as an instrument of transportation. The study of the general proportions, the hauling capacity, the adaptability of machine to specific work, obtaining the maximum output with minimum expense is of far more importance to the railways, and to the public, than the study of the smaller details of the machine and the minute variations in the composition of the materials used in its construction."

In the recommendations of the committee for subjects to be taken up by special committees, there are but two of the ten that can in any way be considered as coming within this classification. But one of the three subjects for individual papers is of the desired grade and none of the topical discussions. The executive committee should carefully consider the president's suggestions in making the final selection of subjects.

PLAINLY, President Crawford has little respect for some statistics and some statisticians. What conclusions your statistics lead you to depends entirely on the premises you start with and the bases on which you make them. Mr. Crawford is quite justified in insisting on more care and judgment in selecting the premises and bases. Just the same, statistics play a mighty useful part in railway operation. This is especially true in the United States, where the use of statistics for operating purposes has been developed to a high degree. Except in the case of the Northeastern no officer of an English railway can tell how many tons he is hauling on an average per car or per train, simply because ton mileage statistics are not kept. However defective are the statistics kept in this country, the American railway officer can come near as any to telling how much service he is getting out of his equipment. But there is still room for a lot of improvement.

THE advisability of discontinuing the committee on Main and Side Rods may be questioned, as there still seem to be features that require further study and investigation. The committee has restricted its report to the consideration of the rods, but there is a field for investigation regarding the proper design of crank and wrist pins, especially on large power. Special designs of crank pin bearings are now in use on passenger engines and will be more common as this class of power increases in size. The question of the proper unit bearing pressure on wrist pins is also in need of further consideration. There has been a tendency toward keeping the knuckle joints too small on the heavy power. There is also a need for further investigation as to stub-ends. It has been suggested that a specification of the material to be used for rods be included with the standards, together with the allowable unit of stress. A number of roads are still not willing to adopt the high unit recommended in the report of the committee.

MR. QUEREAU'S paper and discussion on the maintenance of electrical equipment should go far to do away with the bugaboo that undoubtedly exists as to the difficulty of the work. It appears that all of the mystifying terms that are so incomprehensible to the average steam railway man, are not to be feared, and that the real work lies in the purely mechanical operations which are familiar, in a general way, to all who have had machine or repair shop experience. The New York Central, Pennsylvania and New Haven have their repair departments organized on a purely mechanical basis. Hence, it follows that others may do likewise and that the superintendent of steam motive power may look with undisturbed equanimity on any proposals to electrify a part or a whole of the lines of which he has charge so far as the maintenance of the new form of equipment is concerned.

THE exhibits are to be open this year, for the first time at Atlantic City, on Saturday afternoon and also on Monday evening. The evening exhibit is in the nature of an experiment to ascertain if the members in any considerable numbers care to spend the evening among the exhibits on the Pier. If it is found that they do, it is quite probable that in future years arrangements will be made to keep them open for two or more evenings. Since all formal evening entertainments have been left off the program this year, there is no especial attraction to take the time and interest of most of the members and guests, and it is believed that they will be glad of the opportunity to more thoroughly and comfortably examine the tools and appliances shown by the supply companies. Even though a man is in attendance during the full sessions of both associations, if he attends the meetings with fair regularity, the actual amount of time available for inspecting the exhibition is very limited when its size is considered. In past years, if a member took an hour off during each sessions and spent all of each afternoon on the Pier, he had but a total of 22 hours to see the exhibits. This year on the same basis, he will have 29 hours. As a

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matter of fact this time is reduced by half by the time spent in greeting old friends, committee meetings, other attractions, etc. The regular attendants who have kept in close touch with the new developments each year will find this sufficient time, but the newer members and especially those who are here for but one convention, are compelled to forego full advantage of the opportunity which the supply companies have spent many thousands of dollars to provide. From every standpoint these exhibits are wonderful and full of educational possibilities. It would seem only fair to the men who have provided them that every opportunity be given the members to examine them to their satisfaction. When formal entertainments were provided, it was not feasible to hold evening sessions at the exhibits, but that restriction is not in force now and a chance is being given you to cast your vote for more time to study the latest developments in the motive power and car department fields. If you are in favor, come to the pier Monday evening and show your appreciation of the opportunity.

LOCOMOTIVE TESTING PLANTS.

BEYOND doubt the most valuable information contained in the proceedings of the Master Mechanics' Association is in connection with the work performed on the locomotive testing plants of the Pennsylvania Railroad and Purdue University. In several instances the conclusions reached from tests made on these testing plants have determined the policy of locomotive designers throughout the country. The tests on superheaters and front ends, in particular, have been of inestimable value. The appendix to the report of the committee on superheater locomotives, to be presented on Friday, will undoubtedly be a striking illustration of the value of these plants to the association. It is, therefore, with especial satisfaction that the members listened to Prof. Schmidt's description of the locomotive testing plant recently put in operation at the University of Illinois. This plant is considerably larger than its predecessors and will accommodate the largest size of mallets. It gives the first opportunity for accurately investigating some of the problems peculiar to this type. Furthermore, the plant, being located at a university, will be largely used in investigation of problems that are general in their nature, while the Altoona plant must of necessity be devoted for the greater part of the time to problems peculiar to the locomotives of the Pennsylvania Railroad. The Purdue plant is by its size prevented from undertaking tests on the most modern locomotives.

The Illinois testing plant differs essentially from the others, in addition to its size and capacity, only in the arrangements provided for collecting the sparks. For this purpose a somewhat elaborate equipment has been designed and installed. The loss of heat through the medium of the sparks discharged from a locomotive working at a high rate of combustion is very large, and heretofore considerable difficulty has been found in accurately determining the loss from this source. The information which will later be forthcoming will probably prove of decided value, especially in regard to fuel economy with stokers.

While tests in connection with many features of locomotive operation and design are not to be compared with the results of regular service operation, the character of most of the investigations made on a locomotive testing plant is such that they cannot be made in any other way. The findings in every case should be checked by road work under regular service conditions, but no amount of study of services can develop the basic principles and positive conclusions that can be readily obtained from test plant records. It is quite true, as President Crawford stated, that a few test runs of a stoker locomotive over a particular division and then a few with a hand fired engine over the same district are not to be compared with the comparative record of a year's service of a hundred locomotives of each kind to determine the relative coal consumption. Still a test of both kinds of firing on a locomotive testing plant will develop faults in the design and construction of the machine, quality and preparation of the fuel, and the best method of operating the locomotive that could never be discovered by road work.

The value of the new test plant to the railroads of this country will eventually be beyond calculation and the University and state of Illinois are to be commended for their enterprise and progress and the Master Mechanics' Association is to be congratulated on the fact that it will obtain the benefit of much of the work done on it.

LOCOMOTIVE PROGRESS.

SINCE the last Master Mechanics' convention the progress in locomotive design has been marked by no new, "largest locomotive in the world," but it has by no means been stagnant on that account. In fact, it may finally be found that the progress has been of more far-reaching importance than during any previous equal period. Probably the most valuable work of the year is the awakening to a better appreciation of the possibilities of improved combustion and the ways of taking advantage of it. The publication of the results of the tests on fireboxes at Coatesville forcibly drew attention to the value of that end of the boiler and the opportunities it offered for increasing the capacity of the engine. This was already well understood by some designers, but a general understanding of the possible improvements at this point is but now beginning to develop.

The most striking feature of the year has been the rapid application of superheaters to all classes of locomotives. During the past year there have been over 4,400 superheaters applied in this country. This is practically as many as had been applied altogether up to May 1, 1912. The use of superheaters on switching locomotives is now becoming general, while a year ago it was distinctly experimental. Superheaters have been applied to practically all classes of road engines built during the year and to many of the older engines as they passed through the shop. Considerable progress has been made in overcoming troubles with lubrication, and in a few cases slide valves are being successfully operated with superheated steam. It appears, however, that there is yet something to be learned in connection with the operation of superheater locomotives. There is a strong tendency for some engineers to carry the water too high and thus, either carelessly or thoughtlessly, defeat the economics and reduce the capacity of the locomotive. The water level should be as low, if not lower, on superheater locomotives as on saturated steam ones, and all traveling engineers should thoroughly understand this.

The progress of the mechanical stoker during the year has been continuous, although confined to comparatively few railroads, and, so far as practical, application is concerned, to but two types. Other designs are in the experimental stage, with fair prospects of future success. The possibilities of using cheap fuel with the stoker are opening most attractive prospects in some districts.

There have been no new locomotive types developed in this country during the year, but the status of some of the older types is undergoing a change. The Pacific type is becoming quite popular for high speed freight traffic, and Mallets are being built for switching and hump-yard work in some of the larger classification yards.

There has been a noticeable refinement and improvement of many of the detail parts. New valve gears and better designed parts of the older types are being generally used on new power. The design of driving boxes has been greatly improved in some cases. Power and screw reverse gears are preferred on the larger locomotives. In one case, at least, a power reverse gear has been applied to six-wheel switch engines. New throttle lever arrangements, protected water glasses, safer squirt hose construction and attachment coal pushers in the tender, heat-treated alloy steels for parts subject to excessive strain and improved pipe brackets and similar parts are among the smaller improved features. Feed water heating seems to have made but little progress.

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TO-DAY'S PROGRAM.

M. M. ASSOCIATION.

The following subjects which were on the program for Thursday could not be considered and were carried over until to-day:

Discussion of reports on:
Superheater Locomotives.
Specifications for Materials Used in Locomotive Construction.

Individual papers on:
Three-Cylinder Locomotives, by Mr. J. Snowden Bell.

The following is the scheduled program for to-day:

Discussion of Reports on:
Use of Special Alloys and Heat-treated Steel in Locomotive Construction ..... 9.30 A. M. to 10.30 A. M.
Smoke Prevention ..... 10.30 A. M. to 11.00 A. M.
Engine Tender Wheels ..... 11.00 A. M. to 11.30 A. M.
Individual Paper on:
Tests of Superheater Locomotives, by Dean C. H. Benjamin..... 11.30 A. M. to 12.00 M.
Resolutions, Correspondence, etc.... 12.00 M. to 12.15 P. M.
Unfinished Business ..... 12.15 P. M. to 12.30 P. M.
Election of Officers, Closing Exercises 12.30 P. M. to 1.30 P. M.
Adjournment.

ENTERTAINMENT.

Orchestra Concert 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Musicale, 9.00 P. M.—Entrance Hall, Million Dollar Pier.

EXHIBITORS ASKED NOT TO EMPLOY PRIVATE WATCHMEN.

The executive committee of the Railway Supply Manufacturers' Association has passed a resolution asking exhibitors not to employ private watchmen for their booths. The exhibits are given ample protection in accordance with the rules of the association, under the contracts for exhibit space.

INSPECTION LOCOMOTIVE FOR THE P. & R.

S. G. Thomson, superintendent of motive power and rolling stock of the Philadelphia & Reading, advises that a new Atlantic type officers' inspection locomotive has just been completed at the Reading shops and will be on exhibition at the track exhibit, Atlantic City, for the next few days. The locomotive is said to have several unusual features of construction which will be of interest to convention attendants.

RETURN TRANSPORTATION.

Any of the members desiring transportation over the Central Railroad of New Jersey should make application to C. E. Chambers, superintendent of motive power, and the transportation will be arranged for.

LOCOMOTIVE INJECTOR IMPROVEMENTS.

The last annual report of the Department of Locomotive Boiler Inspection of the Interstate Commerce Commission indicated that certain features of the injector and its fastenings were giving difficulty and needed attention. Representatives of the locomotive builders, the manufacturers of injectors and the Locomotive Boiler Inspection Department have held two conferences, one of them taking place in Atlantic City on Wednesday afternoon. The outcome has been the appointment of a committee to investigate the proper material, form, size, etc., of the coupling of the copper pipe to the injector. The most important question to be considered will be whether the method of brazing can be improved to make it satisfactory, or whether it will have to be superseded by some form of flange connection.

FOUND.

A memorandum book and a pair of eye glasses have been found and may be claimed at Secretary Conway's office.

INFORMAL DANCE AT THE PIER.

An informal reception and dance was held last evening at the entrance hall of the Million Dollar pier. The dance attracted a large crowd of the visitors at the convention and was just informal enough to be very popular.

CHROME VANADIUM TENDER WHEELS FOR THE GRAND TRUNK.

The Grand Trunk has specified chrome vanadium steel for 400 tender wheels which it has ordered from the Standard Steel Works and the Carnegie Steel Company, the order being divided evenly between the two companies.

MOVING PICTURES OF FIREBOX TESTS.

Visitors in the main hall on the pier enjoyed a rather interesting diversion while the moving pictures were being shown Thursday morning. Pictures were thrown on the screen showing the explosion tests of the Jacobs-Shupert and radial stay boilers at Coatesville, Pa., last spring. Convention attendants may be interested in knowing that the two fireboxes which were tested are being shown in the track exhibit this year. The moving pictures of the tests will be shown several times a day during the conventions.

COMMITTEES ON OBITUARIES.

President Crawford of the Master Mechanics' Association yesterday named the following committees on obituaries:

Geo. Richards	G. W. Wildin
Amos Pilsbury	P. H. Hammett
Henry Schlacks	Angus Sinclair
Reuben Wells	J. H. Setchel
Oscar Antz	O. M. Foster
F. M. Gilbert	F. M. Whyte
William Gill	G. W. Seidel
H. B. Howe	J. W. Taylor
C. E. Gossett	G. H. Emerson
W. A. Mallay	W. H. Bennett
J. H. Murphy	J. P. McCuen
J. J. Ryan	G. McCormick
A. Forsyth	C. B. Young

MASTER MECHANICS HONOR MEMORY OF HENRY SCHLACKS.

The Master Mechanics' Association, at the meeting yesterday morning, on motion of Angus Sinclair, adopted a memorial resolution on the death of Henry Schlacks, formerly superintendent of machinery of the Denver & Rio Grande, who died in Chicago on May 16, age 73 years, the resolution is as follows:

"Resolved, that this convention expresses warmest sympathy for the widow and family of Henry Schlacks, in the irreparable loss they have sustained in the death of an ideal husband and an affectionate father, which sad event occurred on May 16 last: Also, that in the death of Henry Schlacks, this association has lost a conscientious, hard-working mem-

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ber, who performed valuable services to the railroad world in promoting sound railroad engineering."

Mr. Schlacks, who retired from service in 1902, was one of the oldest members of the association. He was the father of Charles H., vice-president of the Western Pacific; Henry J., an architect in Chicago; Joseph T., vice-president of the McCord Manufacturing Company, Detroit, Mich.; William J., with McCord & Company, Chicago; Edward L., in the coal business in Nebraska, and Robert J., manufacturers' agent in Denver, Colo.

THE UNANSWERABLE QUESTION.

How many boards in the Boardwalk?
How many fish in the sea?
How many grains of sand on the beach?
Can you tell that all to me?

The information bureau man
Has an answer for them all,
His head is full of facts like that
Though his figures may be tall.

But there's one thing that stumps him,
Though he does the best he can;
That's where to go on Sunday,
For the very thirsty man.

MUSICAL EVENING.

An instrumental and vocal concert to be held at the entrance hall of the Million Dollar Pier has been arranged by the entertainment committee for this evening. F. Pincus presents Eugene Engel's orchestra in the following program:

1. Orchestra. "Rakaszy" Hungarian March.....*Liszt*
2. La Favorita Quartette.
   (a) Puck's Song from "Fairyland"
   (b) Come Away Elves " " *Morgan*
   Katherine Rosenkranz
   Julia Z. Robinson
   Henry Hotz
   Anthony D. McNichol
3. Orchestra. Overture Raymond .....*Thomas*
4. Trombone Solo.
   Cujus Animam, from "Stabat Mater" .....*Rossini*
   David Claffy
5. Soprano Solo.
   "One Fine Day," from "Madame Butterfly".....*Puccini*
   Elsa Meiskey
6. Orchestra. Spanish Serenade "La Paloma".....*Yeadier*
7. La Favorita Quartette. "Rigoletto" .....*Verdi*
   Katherine Rosenkranz
   Julia Z. Robinson
   Henry Hotz
   Anthony D. McNichol
8. Orchestra. Selections from Opera Traviata .....*Verdi*
9. Harp Solo. (a) Mazurka in B-f minor.....*Shuecker*
   (b) Serenade .....*Moszkowski*
   (c) Raindrops .....*Alvars*
   Helen Reed Alexander
10. Orchestra. Overture "Light Cavalry" .....*Suppe*
11. Soprano Solo. "Coquette" .....*Leo Stern*
    Elsa Meiskey
12. Orchestra. Medley of familiar Home Songs
    "Rocked in the Cradle of the Deep"
    "Massa's in the Cold, Cold Ground"
    "The Old Oaken Bucket"
    "Blue Bells of Scotland"
    "My Old Kentucky Home"
    "I Cannot Sing the Old Songs"
    "Swanee River"
    "Auld Lang Syne"

BOOSTING FOR SAN FRANCISCO.

Under the leadership of A. M. Mortensen, traffic manager of the Panama-Pacific International Exposition, a bunch of Western railroad men is boosting energetically for San Francisco as the meeting place of the conventions in 1915. Among the boosters are J. F. Dunn, assistant general manager of the Oregon Short Line, Salt Lake City; F. E. Davisson, superintendent of machinery of the San Pedro, Los Angeles & Salt Lake, Los Angeles; H. J. Small, general superintendent of motive power of the Southern Pacific, San Francisco; D. P. Kellogg, superintendent of shops of the Southern Pacific, Los Angeles; I. L. Yates, of the Pacific Fruit Express, and S. L. Bean, mechanical superintendent of the Atchison, Topeka & Santa Fe Coast Lines, Los Angeles. J. F. Graham, assistant general manager of the Oregon-Washington Railroad & Navigation Company, Portland, is also expected to join the brigade of Exposition pushers when he gets on the job.

To those who are familiar with the attitude usually assumed toward one another by the cities on the Pacific Coast, the way the railway men from the rival communities are pulling together is beautiful to behold.

Pictures illustrating the attractions of the Panama Canal trip, of the exposition and of San Francisco and the Pacific Coast generally will be thrown on the screen on the pier Monday, Tuesday and Wednesday of next week, and boosting literature will be distributed.

The Exposition offers to guarantee the expense of providing a place for the Railway Supply Manufacturers' exhibit, if the conventions go to San Francisco; and the railway will make a one-way freight rate on exhibits.

RAILWAY CONSTRUCTION IN FORMOSA.—The Daito line, Formosa, was projected for the purpose of developing the eastern side of the island and is to connect Karenko and Bokusekikaku, a distance of 53 miles. The work was started in 1909 and was to be spread over 6 years. The amount appropriated for this construction was $2,128,000. That portion of the line connecting Karenko and Hozan has been completed and opened to traffic, while the remainder is still under construction.

SZECHUAN-HANKOW LINE, CHINA.—In Chengtu a public meeting has been held by the shareholders of the Szechuan-Hankow railway. The shareholders decided to utilize their funds for the construction of lines in connection with the main line. By the order of the Ministry of Communications Mr. Chang Li-ken has been despatched to institute a survey and an estimate of the railway between Shasi and Ichang; Tuan Mu and others are to construct the branch lines from Pinghsiang to Changshu-tung.

CANTON-HANKOW LINE, CHINA.—Another section of the Canton-Hankow line has been opened and it is possible to get as far as Yingtak. There was some delay and difficulty in laying this line along the pass known as the Blind Boy's Pass, because the right of way was very rocky, and there was some tunnelling to be done. But whilst work went on slowly here, farther on the line was pushed forward, so that when this difficult section was conquered, little delay was expected, and so it has turned out. Unfortunately the station at Yingtak is some distance away from the city. It appears that the west river—that is a branch of the North river, not the West river—is the cause of this. In other words, the line had to cross this river, and near the mouth, which is just opposite the city, the river was too wide to be bridged. At any rate it was found to be much easier to run the bridge across farther up the stream, and so the line was carried along some distance from the city. Reports affirm that already the line is popular. The report of the opening of this section of the line goes on to say that before the year has run its course the line will be opened all the way to the district city of Shiu Chow. Much of the track is already laid, and it remains only to link up these several sections, whereupon there will be a direct track from Canton to that district city.

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MASTER MECHANICS' ASSOCIATION PROCEEDINGS.

Reports on Cast Steel Frames, Rods, Boilers, Tires, Headlights, Care of Electrical Equipment, Engine Testing Plants.

President Crawford called the meeting to order at 9.40 a. m. Thursday.

SPECIFICATIONS FOR CAST STEEL LOCOMOTIVE FRAMES.

In 1904 there was submitted to the association the following specification for cast-steel locomotive frames, as suggested by the committee of steel-casting manufacturers.

MATERIAL.

Carbon	.28 per cent.
Phosphorus	.05 per cent.
Sulphur	.03 per cent.
Manganese	.60 per cent.

Frames will be rejected that show:
- Less than .20 per cent. or over .35 per cent. carbon.
- Over .06 per cent. phosphorus.
- Over .06 per cent. sulphur.
- Over .70 per cent. manganese.

Tensile strength per square inch, not less than 55,000 lbs.
Elongation in 2-in., not less than 15 per cent.
All frames to be annealed.

The committee has found in its investigation that there is still considerable difference in opinion among railroad officers, steel manufacturers and locomotive builders in regard to the chemical and physical requirements for cast-steel locomotive frames.

CARBON.

The experience of many of our members and some of the manufacturers indicates that better results are obtained if frames are made from a .37 to .40 carbon steel instead of .25 to .28. This gives an increased stiffness and higher elastic limit. Of course, the ductility is reduced, but if the frames are properly annealed a high carbon content should give much better results on the heavy power used to-day. The tests of low carbon steel frames of recent manufacture show carbon content ranging between .24 and .30, with an average of .273. The tests of high carbon steel show carbon between .39 and .42, with an average of .405.

PHOSPHORUS AND SULPHUR

The general consensus of opinion among all manufacturers and users is that the rejection limit of the phosphorus and sulphur content should be changed from .06 to .05. From the large amount of data available to the committee, the phosphorus content of frames of recent manufacture ranges between .037 to .048, with an average of .0443, and the sulphur content ranges between .022 and .043, with an average of .0305.

MANGANESE AND SILICON.

The manganese content in the old specification was .60 with a rejection limit of .70. It is the usual practice to-day to accept material having .70 of manganese and .20 of the silicon, but it is not the usual practice to specify limits for either of these elements in recent specifications for steel. Manganese usually ranges between .50 and .70. Silicon usually ranges between .24 and .28.

TENSILE STRENGTH.

The specification of 1904 recommends not less than 55,000 lbs. tensile strength. All specifications which have been examined call for not less than 60,000 lbs. tensile strength, many call for 65,000 lbs. while some call for 70,000 lbs. to 80,000 lbs. Many tests in the hands of the committee show tensile strength from 75,000 to 80,000 lbs., and quite a number of them run as high as 85,000 lbs.

ELONGATION.

The 1904 specifications require an elongation of not less than 15 per cent. in 2 inches. The usual practice at the present time is an elongation of 20 per cent. in 2 in. As the carbon content of steel is increased the tensile strength is increased, but the ductility is decreased, and perhaps a better rule to follow is "the per cent. of elongation in 2 in. shall not be less than 1,200,000 divided by the tensile strength." For steel of 60,000 lbs. tensile strength, this gives an elongation of 20 per cent. For steel of 75,000 lbs. tensile strength, the elongation would be 16 per cent.

ANNEALING.

The usual practice in annealing frames is to apply heat slowly, so that all castings in all parts of the furnace are heated to a uniform temperature of 1,500 degrees, after which the furnace doors may be opened and the furnace and contents allowed to cool.

VANADIUM.

The committee has not deemed it advisable to submit a standard specification for vanadium steel frames at this time.

The following specification for cast-steel frames is recommended:

Castings must be true to pattern and free from flaws, shrinkage cracks, excessive scale or porosity. When patterns are furnished by a railroad company the manufacturer must make sure that the allowances for shrinkage in the patterns agree with his own practice, and castings will be rejected, even when made from railroad company's patterns, which do not conform closely to required dimensions. Frames must be made perfectly straight and in true alignment, both vertically and horizontally. Frames will not be accepted which weigh less than 97 per cent. of the weight specified, and material in excess of 6 per cent. above the specified weight will not be paid for. The specified weight must allow a proper amount for finish, as may be agreed on.

All castings must be thoroughly and properly annealed, and test pieces must be annealed with the castings before they are detached.

Test pieces shall be one inch square, and, when possible, 10 in. long, and must be left attached to each frame. At least two test pieces, one near each end of the frame, shall be provided. The test pieces shall be partly sawed off from the body of the casting so that they can be easily broken off, but shall not be entirely detached by the manufacturers. Both the main casting and test pieces shall be stamped with heat numbers. The finished test pieces for tensile strength test shall be ½ inch in diameter and 2 in. between shoulder fillets.

The material desired has a tensile strength of at least 70,000 lbs. per square inch; elongation, 20 per cent. in 2 in., and an elastic limit of 50 per cent. of the tensile strength.

Cast-steel frames will be rejected which show less than the following requirements:

Tensile strength, minumum	65,000 lbs. per sq. in.
Elastic limit, minimum	30,000 lbs. per sq. in.

Elongation in 2 in. shall not be less than a percentage represented by 1,200,000 divided by the tensile strength.

Reduction of area, minimum	.30 per cent.
Phosphorus, maximum	.05 per cent.
Sulphur, maximum	.05 per cent.

When high carbon steel frames are specified, the carbon content must be not less than .37 per cent. and the reduction of area not less than 25 per cent.; other requirements as above.

The report is signed by:—C. B. Young (C. B. & Q.), chairman; E. W. Pratt (C. & N. W.); R. K. Reading (Penna.); O. C. Cromwell (B. & O.); C. E. Fuller (U. P.), and L. R. Pomeroy.

DISCUSSION.

G. W. Wildin, (N. Y. N. H. & H.): I move the report be referred to the association by letter ballot.

F. F. Gaines, (C. of Ga.). I second the motion. I presume Mr. Wildin means for "Recommended practice." I would suggest that before the committee send in these Specifications for Locomotive Frames for letter ballot, that they carry out their suggestions in the last paragraph about high carbon content, and include that, as well as the suggestion about the elastic limit and tensile strength, and that they be placed in parallel columns in the final specifications.

(The motion was carried.)

INDIVIDUAL PAPER ON MAINTENANCE OF ELECTRIC EQUIPMENT.

By C. H. Quereau.

We all recognize the fact that several important steam railroads, have, to a limited extent, replaced steam locomotives with electric locomotives and multiple-unit cars; and that their successful operation for five or six years and the experience gained during this time makes the subject of the maintenance of electric equipment a live one. The fact that at least six American steam railroads are now using electricity for motive power purposes and the recent announcements of plans for extensive electrification of main lines on western steam railroads suggest the thought that almost any steam motive power organization may be called upon at an early date to maintain electric

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motive power and should make this subject of interest to all steam motive power men.

The word electricity naturally raises in the mind of a steam motive power man a suggestion of mystery, something he knows little or nothing about, and, what is worse, he is very apt to conclude he is "too old to learn." It is the object of this paper to try to show there is no more mystery about electricity than about water, steam, coal or other gifts of nature about which motive power men have enough knowledge and familiarity to successfully manage their work; if possible, to remove the natural, but useless, fear of the subject which most of us have.

To those acquainted with the men who are responsible for the maintenance of electric equipment—whether on trolley, interurban or steam railroad lines—it is a matter of common knowledge that those Master Mechanics, General Foremen and Mechanics who have been trained in the Motive Power Departments of steam railroads have somewhat the advantage of those who have not. I have in mind a western mechanic and general foreman whose experience with electric equipment was limited to six months as electric inspectors' helpers, who are eminently successful in maintaining electric equipment. In the case of steam railroads which are electrified, there are decided advantages in using men already in the organization whose characteristics are known, who are familiar with steam railroad policy, methods and requirements and such a plan removes all ground for the possible feeling that electrification will crowd out of their positions men who have served the railroads faithfully and satisfactorily for years. Some knowledge of electricity for such men is certainly necessary, but it is very elementary and simple, preferably practical rather than theoretical, and can be acquired in

C. H. QUEREAU,
Paper on Maintenance of Electric Equipment.

such a short time that the advantages of using men for the maintenance of electric equipment who are already in the steam motive power department very decidedly outweigh the disadvantages due to lack of an extended knowledge of electrical apparatus. This conclusion has been reached after six years' experience in an electric equipment maintenance department on a steam railroad.

I am inclined to believe the greatest bugaboo for the steam motive power man, when considering electrical matters, is the fact that he is not familiar with electrical terms and therefore imagines the whole subject is difficult. When the uninitiated hears or reads of volts, amperes, watts and kilowatts, circuit breakers, contactors and other electrical terms, he finds these words as meaningless as so much Choctaw. As a consequence, he gets no real information or adequate conception of the subject discussed and, perhaps naturally, concludes it must be beyond his powers and altogether mysterious. A little reflection will show him that at one time he was equally ignorant about such commonplace matters as hydrostatic pressure, steam consumption, horsepower, airbrakes and superheaters, and that in all probability it would puzzle him, after years of practical use, to accurately define these terms, or even explain to a visitor from Mars what a foot really is, though for all practical purposes he knows each of them thoroughly and never imagines his inability to define technically the words he uses almost hourly is any handicap in successfully holding his job.

I have previously stated that "Some knowledge of electricity . . . is certainly necessary, but is very elementary and simple, preferably practical rather than theoretical." In this connection it should not be forgotten that this paper relates to the maintenance and is not concerned with the design of electric equipment. Experience has shown that the graduate in an electrical course who is employed in maintaining electric apparatus is apt to require wiring diagrams and blue-prints showing the circuits and relations of the apparatus, while the inspector whose training has been wholly practical soon learns by precept and practice that a given symptom is caused by a given defect and does not find it necessary to trace the intermediate steps, but goes at once to the seat of the trouble and removes the cause. For instance, when an electric locomotive loses power when the motors are operated in series parallel, after having operated satisfactorily in series, the embryo electrical engineer is prone to waste time in hunting up wiring diagrams and tracing circuits, while the inspector whose knowledge has been acquired by practical experience knows that either a certain fuse has blown because of an overload, or a certain contactor has failed to operate properly and at once applies the necessary remedy.

It would be unwise to assume from the foregoing that an elementary knowledge of electricity and the ability to read wiring diagram blue-prints are undesirable or unnecessary to anyone employed in the maintenance of electric equipment. Such knowledge is both desirable and necessary, just as much as for steam equipment, but no more. The point is that the average mechanic, without previous electrical experience, does not require any great amount of electrical knowledge in order to successfully compete with an electrician in maintaining electric motive power.

The most helpful illustration to an understanding of electric circuits and diagrams is to think of them as showing a water system. In place of the electric motor put a water motor, and consider the wiring plans as showing the distribution and connection of water pipes. The analogy can be carried farther; the water pressure stands for the voltage and the pounds or gallons of water flowing or available, the amperage of electric current; the horse-power hours of a water turbine are the equivalent of the kilowatt-hours or horse-power hours of an electric motor or generator.

If simple and inexpensive precautions are taken, there is no greater danger in working about electric than steam equipment. No one with ordinary sense and experience would think of putting his bare hand on the unprotected steam pipe of an injector, even though he cannot see the steam flowing through it. There is no greater danger in connection with electric circuits if the same common sense is used. This refers to 600-volt direct current and would possibly have to be modified for materially higher voltages, not to high-tension lines, where the hazard is undoubtedly greater.

The statement is occasionally made that an electric is a simpler machine than a steam locomotive. If this refers to ease of handling and operating or matters requiring the attention of the engine crew, such as injectors, steam pressure and water level, there is no possible doubt the statement is correct, but if it refers to the mechanical simplicity or number of adjustable or moving parts that must be inspected and kept in proper relation, the steam locomotive is very much the simpler. There is, however, this fundamental difference favoring the electric machine: that the moving parts of the control are of very light weight, easily accessible for inspection and repairs and not subjected to nearly as great wear as are the corresponding parts of a steam locomotive.

It will no doubt interest motive power men to know that the shop arrangement and tools for maintaining electric equipment are not essentially different from those they are accustomed to in repairing steam locomotives, except, of course, that the electric locomotive has no boiler or tender and it is necessary to provide facilities for rewinding armatures and field coils.

The steam motive power man will no doubt be much surprised when told the electric locomotive requires no shopping for a general overhauling, except for a few general parts. This is made possible by having a stock of spare parts, permitting the removal of a defective part from a locomotive, the substitution of a repaired part and releasing the engine, the defective apparatus being repaired at leisure. For instance, a set of driving wheels needing tire turning are replaced by an extra set in good condition, this operation requiring not more than five hours with adequate drop pit facilities. Air compressors, controllers and contactors can be handled in the same way.

The steam locomotive can not be maintained on this plan, as the boring of cylinders and resetting flues make it necessary to shop the engine, withdrawing it from service for a considerable length of time.

It is quite possible the foregoing statements of personal experience and opinions will not prove as convincing as the records made by an electric equipment maintenance department organized by and largely consisting of men whose earlier experience and training were obtained in the motive power department of steam railroads. It seems reasonable common sense will conclude there can be no particular mystery or unusual danger in maintaining electric locomotives when the records for the year 1912, after five years' service, show a cost of less

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than 4 cents per mile and an average of 48,271 miles per train detention due to electrical apparatus, with a banner record of 249,423 miles (equivalent to ten times around the world), without a train detention due to the electrical equipment.

DISCUSSION.

C. P. Keiser (Penna. Terminal): On the Pennsylvania, we have two electrified divisions, the West Jersey and Seashore and the Manhattan division, both divisions being operated by steam men. The entire organization, including those in charge of the power houses, substations, transmission lines, and the maintenance of the electrical equipment is under the direction of a master mechanic; that is also true of the third rail. Some may think this is primarily a maintenance of equipment matter, yet we find that the substation and transmission lines and the third rail are so closely allied that they can be handled by one foreman. In fact, in our organization on the Manhattan division, the only additional foreman of department we have, other than what is required on other divisions of the Pennsylvania, is the man who is responsible for the electrical side, that is, the substations and

PENNSYLVANIA RAILROAD COMPANY, MANHATTAN DIVISION.
Electric Locomotive Detentions in Minutes During 1912.

Month	ELECTRICAL						MECHANICAL		Miles	Miles per Minute Detention
	Fuses	Master Control	Motor Control	Misc. Electrical	Misc. Mechanical	Brakes	Total, All Causes	Mileage		
January	..	2	..	..	..	..	2	84,422	42,211	
February	..	5	6	5	..	..	16	76,100	4,881	
March	..	3	..	..	..	..	3	82,573	27,524	
April	..	2	..	..	..	..	2	78,886	39,443	
May	..	..	..	..	..	..	..	80,880	40,440	
June	..	5	..	..	2	..	7	80,013	11,430	
July	..	..	..	..	..	..	..	84,283	..	
August	..	..	2	..	4	..	6	85,486	14,248	
September	..	..	5	..	2	11	83,950	7,632		
October	..	..	..	..	4	7	11	85,305	7,755	
November	..	..	6	..	..	..	6	84,473	14,079	
December	..	..	..	..	..	..	..	86,221	..	
Total	..	19	19	5	12	11	66	994,592	15,070	

EXPLANATION OF DELAYS.

Master Control:
2 minutes. "J" switch not operating owing to oil on armature
2 minutes. Grease on master controller drum.
2 minutes. Broken control battery plate.
3 minutes. Loose master controller finger.
2 minutes. "J" switch sticking; motors not operating in parallel.
1 minute. Bent finger on No. 2 controller plug.
4 minutes. Master controller finger loose.
3 minutes. Bridge relay finger not making contact; small piece of waste found under same.

Motor Control:
6 minutes. Circuit-breaker not resetting owing to glycerine in dash pot gumming, account cold weather.
6 minutes. Due to motorman not using power in proper manner and blowing breaker by notching up too rapidly
2 minutes. Broken strap connection.
5 minutes. R-5 resistance strap breaking No. 2 motor.

Miscellaneous Electrical:
5 minutes. Shoe cable burning off.

Miscellaneous Mechanical:
8 minutes. Latch on engine coupler opening when starting
4 minutes. Motor crank disk striking cover (stopped to examine same.).

Brakes:
2 minutes. Brakes failed to release promptly.
4 minutes. Defective air hose.
5 minutes. Loose finger on pilot governor of air compressor.

transmission lines, as well as the third rail, outside of which we have a foreman of our power house, and also a foreman in the shops. The foreman who has charge of the locomotives, and has the maintenance of the multiple unit cars, is a steam man with twenty years' experience in roundhouses and in general locomotive shop practice.

Mr. Quereau has mentioned the article published in the *Electric Railway Journal* on May 15. The total number of detentions due to locomotives in 1912 was 66 minutes, and the mileage was 994,000. Thirty-eight of these minutes were due to electrical causes, and a portion of the detentions on the electrical side were due to improper handling of the locomotives. The delay due to the master control was 19 minutes; motor control, 19 minutes; miscellaneous electrical, 5 minutes; miscellaneous mechanical, 12 minutes; brakes, 11 minutes; so that the detentions are very low. In fact, the electrical side to the repairs to the locomotive is practically nothing. After two and a half years, we have our first armature to rewind or coil to replace. The parts are easily removed and it takes a mechanic but a short time to get the slight experience necessary to make these changes and to know the functions of the various contacts, etc. In fact, our engine men who operate the electric locomotives, after six months, are very familiar with the equipment, and in many cases make repairs out on the road on a failure from loose connections of some sort. On many projects for the electrification of steam railroads, I think it does not require any special organization for taking care of them, that is, of the equipment, the power house or substations.

S. A. Bickford, (N. Y. C.): My experience corroborates Mr. Quereau's statements. He addresses himself to men who have the shaping of the policy of an organization. It might be well to dwell briefly on the organization of the maintenance force. It is true you will need some few men who have had some knowledge of electrical equipment, just as you do in repair shops on steam locomotives where you must have men who have had special training for some particular line of work. After the organization is once started, it can be readily taken care of, just as you take care of your working force in the average engine house. The personnel of the men in the average repair shops for electrical equipment does not differ from that in the repair shop for steam locomotives.

In our entire organization, we do not have what might be known as a technical man, except in the case of those who are there in the capacity of students; they come for the experience they get. Our force is entirely made up from practical men. My personal opinion is that the electrical engineer has up to the present time confined his efforts entirely to the electrification of roads and the design of electrical equipment, and is not so much concerned at the present time about the maintenance. You will need, in addition to these men, a few men who can exercise supervision over the operation and handling of the machine, who are thoroughly familiar with that particular type of equipment. At the present time, the electric locomotive has not reached the high state of reliability and development that car equipments have. This is due largely, I think, to the much increased loads placed upon the electric locomotive over the average car equipment. Each particular type of electric locomotive has its own peculiar weaknesses just as would develop in any machine, and in a high speed express train service, like that which we have on the New York Central, it is important that you have men who are thoroughly familiar with the particular type or the grouping of the apparatus on your locomotive. Aside from that, I do not know that it needs any special training to fit in to successfully meet the problems that are present in handling the electric locomotive, and meet these emergencies as they arise in actual operation.

G. W. Wildin, (N. Y., N. H. & H.): For years the New Haven has had a couple of branches electrified; one is the Nantasket Beach line which operates about three months in the year, and is handled by the master mechanic, along with the steam line, and I never hear from him. We have another line running from Providence to Fall River and Bristol, operating 106 trains a day, direct current, and that is handled by the master mechanic along with his steam operation, both power house and equipment, and there are no complaints about that line.

We have, as some of you know, a very peculiar situation in our electrified zone; we have a very complicated arrangement. Until the first of this month, I did not have full control of the operation of that line, but it was under the control of what we term an electrical superintendent, who kept all the mysteries under his hat, who would tell you nothing, and would do nothing, and consequently we were in a pretty bad fix. We have reorganized the division, placed a master mechanic on it, a man with steam railroad knowledge, and have made him a superintendent of shops to report directly to the mechanical superintendent, and the chief engineer of the power house reports to the mechanical superintendent. The master mechanic handles the outlying shops which you would term round-houses in steam service, and has nothing to do with the main shop or main repairs which are made, but he does make all the running repairs. I have an assistant mechanical superintendent who gives his full time to this end of the work, and who has grown up on the steam lines, and I got him because he knew because he knew nothing about electricity. What he does learn now will be a real knowledge of electricity. I thoroughly concur in the statement of Mr. Quereau, but I want to go a little further, and say that 99 per cent. of the knowledge required in the operation of electrical service is mechanical knowledge, and one per cent. electrical knowledge. You should not put your electrical equipment in the hands of electricians; if you do, you will be in trouble. It is a notorious fact that they know nothing about mechanical parts, and as long as they keep the copper portions in running order, and a few other electrical parts in proper condition, they think that they are keeping the locomotive up to a standard condition. What you need is good sound sense behind the whole situation, and not very much theory.

President Crawford: Is there any further discussion on

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this paper? If not, we will proceed to the consideration of an individual paper entitled "A new Locomotive Testing Plant at the University of Illinois," by E. C. Schmidt, professor of railway engineering, University of Illinois.

LOCOMOTIVE TESTING PLANT.

Professor E. C. Schmidt, of the University of Illinois, presented an extensive individual paper describing the new locomotive testing plant which was recently installed at the University of Illinois. The paper was quite similar to one which was presented at the March meeting of the Western Railway Club, and which was abstracted in the *Railway Age Gazette* of March 28, 1913, page 732.

DISCUSSION.

D. R. MacBain, (L. S. & M. S.): I think the paper just read by Professor Schmidt is one worthy of a great deal of study on the part of the membership, and I believe it is going to be a very valuable document as I feel that the railroads will more that ever in the future avail themselves of the opportunities of testing on such plants; and I move that the Association extend a vote of thanks to Professor Schmidt.

(Motion seconded, stated and carried).

A. W. Gibbs (Pennsylvania): Will it trouble Mr. Schmidt too much to tell us how successful the method of separating the sparks has proven to be? It is not a difficult problem, and as the plant has been running since April, perhaps he could give some information as to how completely that practice serves its purpose, separating the solid matter from the gases.

Professor Schmidt: As far as our experience goes thus far it is successful, as we are trapping either in the duct or in the collector, all the solid matter. We have not, however, run this locomotive up to its capacity. The plant has been in operation only a month and is new, and what with interruptions, we have not had more than 10 days' continuous running, so that we are not in position to draw very satisfactory conclusions from the operations, as yet.

A. W. Gibbs: Does any of the dust from the coal sift down onto the roof?

Professor Schmidt: Not so far as we are able to discern. It is discharged 80 feet above the ground, and there might be something get away which we would find. We have means of exploring the stack; there is a manhole in the stack above the separator, which will enable us to explore the gas stream and determine if there is any considerable amount of solid matter which gets away. Thus far we have not done that. The separator to which I refer is of almost identical design and of the same proportions as one used by the Lackawanna, as called to my attention by one of their men located at Scranton. They have had a good deal of experience with that device at that point. For some reason or other they found it necessary to separate the sparks in the gas discharge of the stationary power plant.

President Crawford: We will now proceed to the report of the committee on Main and Side Rods, of which committee Mr. W. F. Kiesel, Jr., is chairman.

MAIN AND SIDE RODS.

The report on the above subject was submitted two years ago, was discussed at the last meeting, and was held over for a year for consideration, to be brought up again at this meeting for possible adoption as a standard. During the past year we have received a number of letters, some containing suggestions, as follows:

As it will be but a short time before heat-treated and alloy steels are introduced, maximum allowable stresses for such materials should be recommended.

That allowable pressure per square inch for pin bearings be specified, and a ratio of length to diameter of pins be established, especially for high-speed engines.

Offset rods for locomotives with three pairs of drivers sometimes have all of the offset in rod between two drivers, and none between the third and middle driver. It is then not positively necessary that the total offset be taken as leverage for bending.

These suggestions have been considered, but were not deemed of a nature to require changing or adding to the previous report. Taking them in their order, the committee reports as follows:

We are not yet justified in giving a limit of stress for heat-treated or alloy steels, as too little is known concerning such material in actual locomotive service.

The design of pins is necessarily handicapped by the available space, therefore the designer is restricted, and must obtain best results regardless of preferred bearing area and desired ratio of length to diameter of pin. Furthermore, the design of pins is not a part of the problem submitted to us.

A general rule for type of offset rods described can not be formulated without danger of having it misapplied. The rule as given may err slightly on the safe side, but can not be misapplied. It is therefore preferable to make no change.

W. F. KIESEL, JR.
Chairman, Committee on Main and Side Rods.

Attention is called to a correction that should be made in the original report:

In Volume XLIV, 1911, page 137, at bottom, a change should be made, as follows:

The minimum area at points indicated by letter "b."

For main rods and main pin bearing of side rods.

$$\text{A equals } \frac{\text{Px}}{30000\text{b}}$$

For side rods, except main pin bearing. A equals $\frac{\text{Px}}{60000\text{b}}$

The report, including the correction just noted, was submitted for adoption as standard practice.

The report is signed by:—W. F. Kiesel Jr. (Penn.), chairman; H. Bartlett (B. & M.); G. Lamm; H. B. Hunt (Am. Loco. Co.), and W. E. Dunham (C. & N. W.).

DISCUSSION.

J. A. Pilcher, (N. & W.): This report has been before the association for two years, if I am correct, and under the resolution passed yesterday, it could now be adopted as a standard.

President Crawford: It could be adopted as "Recommended Practice."

J. A. Pilcher: Isn't it permissible to adopt it after it has been before the association for one year?

President Crawford: The idea is that anything adopted would remain a recommended practice for at least one year. While it is true it has been before the association for two years, it can be adopted today for recommended practice if the association so desires and remain as recommended practice for at least one year.

J. A. Pilcher: I move that this be adopted as recommended practice before the association, and that the committee be discharged. (The motion was carried.)

F. F. Gaines: Last year there was some discussion on this paper relative to the question of why in American practice, the rods are so much heavier than in European practice. I did not believe at the time, and I do not now, that that is the case. I noticed in a recent issue of the *American Engineer*, a gentleman of the Baldwin Locomotive Works has an article on the subject, and he shows that American practice as compared with European practice is quite similar when you consider related parts, the size of the cylinders and the other parts involved.

Henry Fowler, (Midland Railway, Derby, England): I have not it checked, but I should decidedly say yours are heavier when you take that into account. When we purchase rods, they are subjected to very careful heat treatment.

President Crawford: If there is no further discussion on this report, we will take up the next report, which is on Safety Appliances. I am the Chairman of that committee, and the report of the committee is that nothing transpired during the

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year which has lapsed since the last convention, for this committee to give consideration.

H. T. Bentley (C. & N. W.): I move that the report be accepted.

(Motion seconded and carried).

President Crawford: The next report is that of the committee, on "Design, Construction and Inspection of Locomotive Boilers" of which Mr. D. R. MacBain, superintendent of motive power of the Lake Shore and Michigan Southern is chairman.

D. R. MacBain: I have asked Mr. Gaines to kindly read the report, as my voice is not in good shape.

MAINTENANCE OF LOCOMOTIVE BOILERS.

The committee reported relative to the maintenance of locomotive boilers, the report on design and construction being presented to the members at the last convention.

ELECTRIC AND OXY-ACETYLENE WELDING.

The committee has investigated the results obtained by electric welding, especially for fire-box work, and has included in the report results obtained by oxy-acetylene process, which is used extensively. Some roads install electric welders in such a location that they can be used in the shop as well as the engine house. The oxy-acetylene can be arranged in the same manner by running pipes from the central plant to any part of the engine house or shop.

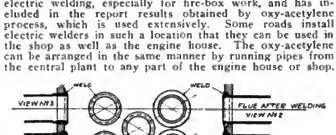


Fig. 1—Methods of Welding Flues.

A complete portable oxy-acetylene cutting and welding outfit is also used in both shop and engine house.

One road, using the electric process, welded beads of small and large superheater tubes, after they had been set in regular manner but they gave trouble on account of leakage. It proved successful where the material of the flue was in good condition. An experiment was made by the same road on three engines omitting copper ferrules and it did not prove successful on account of not countersinking the sheet to allow for welding the bead on the flue.

A road using the oxy-acetylene process has welded in a number of small tubes and omitted copper ferrules; they could not make satisfactory welds with the ferrules. The tube sheet was prepared as shown in Fig. 1, View 1 shows the tubes set ready for welding; the tubes were not expanded in any manner. View 2 shows the tubes after being welded. The tubes are allowed to project far enough beyond the sheet so that when finished the beads are the same size as when beaded in the regular manner. They experimented with flues welded as shown on view 3. Tubes were allowed to extend through the sheet 5/16 in. and were prossered and then welded after which a beading tool was used to smooth up the bead. This set of flues has been in service only a short time, and so far has been satisfactory.

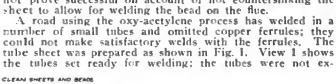
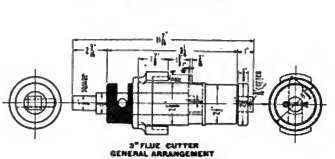


Fig. 2—Welding Flues, Electric Process.

A road using oxy-acetylene process for welding in flues believes that the copper ferrules are not necessary. The flue sheet is prepared as follows: The old flue having been removed, the first operation is to draw the centers of the back and front flue sheets toward each other. The center of the back sheet is drawn forward about 1¾ in., and the front sheet is drawn backward about 1½ in. This is accomplished by applying eleven stay rods distributed in a circle about 2½ ft. in diameter, one of the rods being located in the center. While these rods are under tension the back flue sheet is annealed around the edges by an oil torch. Rods are then removed and there is a permanent dish in the back sheet of about 1¼ in., and in the front sheet 1⅛ in. The holes are then countersunk on the fire side to a depth of ⅜ in. with a countersinking tool, the cutting faces of which are at an angle of 90 degs. Flues are then set in place, projecting ⅛ in. beyond the flue sheet, then rolled and ready to be welded. They have not undertaken to weld any large superheater flues.

One road had considerable difficulty with the large superheater tubes in the back flue sheet, and one engine which had a flue mileage of 75,000 miles was brought to the shop and large flues welded with electricity. Nothing was done to flues or beads except to clean them before welding. Metal was built around the bead as shown in Fig. 2, and the weld was made from the edge of the bead to the sheet. The ferrules and flues were prossered and rolled, and have proved so successful that this method was continued. The engine was placed in service and has made 14,000 miles without giving any flue trouble. On one division they have 96 superheater engines having a total of 3,024 large superheater tubes, all welded, and 24,655 small tubes, of which 3,557 are welded. The total flue mileage of these 96 engines is 1,117,437 miles, and up to date there has not been one case of welded flues leaking. This practice has been extended over the entire road. It is unnecessary to adopt a special method of welding tubes other than what was followed previously for prossering tubes.



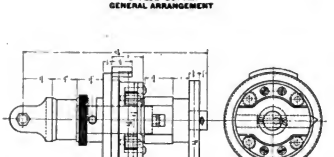


Fig. 3—Flue Cutting Tools.

Two roads using the oxy-acetylene process chip off the high spots and use an ordinary beading tool: others do not go over flues in any manner. Roads using electricity find it unnecessary to smooth off the welds. The majority of roads which weld in flues use steel safe-ends and no difficulty is experienced. It has been found that it takes about three hours longer to cut out a set of flues which have been welded. In removing these flues no special difficulty has been encountered. Fig. 3 shows tools used in removing flues that have proved very successful.

When flues are welded-in, the maintenance is less than

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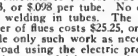
when tubes are prossered. It is unnecessary to give any special attention to welded tubes when boilers are washed. Reports received from different roads indicate that considerable difficulty was experienced in welding flues with the oxy-acetylene process, while the roads using the electric process report very satisfactory results, especially one of the roads that tried out both methods and adopted the electric process. Therefore, the committee recommends electric process for welding flues, and also recommends that flues be set with coppers, prossered and beaded in regular manner before welding, until it is clearly demonstrated that other methods are equally as good or better.

One road using oxy-acetylene for welding the flues reports that it costs, including gas and all work preparing flue sheets and safe-ending flues, an average of 71 cents per flue, and the regular method, which consists of safe-ending and applying coppers and other work for the same number of flues, is 22 cents per flue.

A road using oxy-acetylene for setting the flues, as shown in Fig. 1, reports that a set of welded flues, containing 335 flues, amounts to $18 for labor, $15 for gas, making a total of $33, or $.098 per tube. No coppers are used by this road when welding in tubes. The regular method for the same number of flues costs $25.25, or $.075 per flue. These figures include only such work as necessary to set flues.

A road using the electric process of welding flues reports that the cost of labor complete to weld beads is $.037 per flue. The cost to weld in new flues is $.03 per flue.

A road using the electric process for welding the flues as shown in Fig. 2 reports the cost of welding 34 4½-in.



ELECTRIC WELDED

Fig. 4—Method of Welding Door Sheets to Mud Ring.

tubes and 32 2-in. tubes—labor, $4.12; current, $2; material, $1.25. Total, $7.37. One 4½-in. tube is equivalent to two 2-in. tubes; therefore, this amounts to 100 2-in. tubes costing $.073 per flue. The standard method of setting the flues by the same road, which consists of safe-ending, applying coppers and prossering, is $.089 per flue, and adding the cost of welding ($.073) makes a total of $.162, which is the cost of welding one 2-in. tube, as shown by Fig. 2.

Below is the cost of setting flues by different roads. This cost applies to the old method:

A. $.06 a flue ready for testing, new flues.
B. $.06 a flue ready for testing, new flues.
B. $.14 removing, cleaning, safe-ending and resetting.
C. $.13 removing, cleaning, safe-ending and resetting.
D. $.067 installing copper ferrules, setting flues, rolling front ends, setting and beading firebox end of tube.
E. $.044 per flue for setting tubes only, includes copper ferrules.
F. $.04 per flue for setting tubes only, includes copper ferrules.
G. $.036 per flue for setting tubes only, includes copper ferrules.

From these figures, it appears that the cost of welding flues in accordance with electric process is cheaper than the oxy-acetylene process, and also gives better service. None of the roads are welding-in tubes in the front tube sheet, as it does not seem to be desirable to change the method now used.

Vertical cracks in the side sheets are welded with both oxy-acetylene and electric process. Seven roads get good results with electric process when cracks do not exceed 12 in. in length. Two roads advised very poor success with welding vertical cracks with the oxy-acetylene process. The method used by all railroads is to V out the sheet ⅜ in. to ½ in. at the top and ⅛ in. to ⅜ in. at the bottom.

Cracks in the top of the back flue sheet as long as 38 in. have been welded successfully with both types of welder. The sheet is cut out a few inches beyond the end of the crack to avoid a new crack from starting, and is dressed out V shape the same as the cracks in the firebox. Some roads preheat the sheets before welding.

Cracks are successfully welded in the crown sheet with both processes. One road, using oxy-acetylene process for welding cracks at the flue sheet, cut off the forward part of the crown sheet and welded a strip the full width of the crown sheet, about 6 or 8 in. deep. This was done to avoid any new cracks developing at this location. It was found that this gives more serviceable results.

Cracks in the door sheet have been successfully welded with both types, but the oxy-acetylene is preferred, as it gives more satisfactory results. One road preheated sheets before welding.

In preparing firebox sheets for electric welding, the crack is V'd out to an angle of about 65 deg. and the metal is filed bright. For oxy-acetylene it is V'd out to an angle of about 90 degs. and no filing is required; the metal is built up from the fire side of the sheet.

Considerable difficulty has been experienced by roads using both oxy-acetylene and electric welding on account of welded cracks opening up after service from three to eight months. The percentage in some cases, which are few, runs as high as 15 per cent. About 5 per cent. is the average.

It is considered that very good service is obtained in welding cracks and sheets in fireboxes by both processes. Most of the difficulty was experienced in the earlier days when this method was new. The same can be said of new cracks developing adjacent to welded cracks. This trouble is very rare and it is not serious.

Some roads using oxy-acetylene use water on each side of the weld, and others preheat the sheets to take care of the expansion and contraction. Roads using electric welders do not have any special method of taking care of the expansion and contraction.

When welding cracks in the firebox sheets which embrace three or four staybolts, the best practice is to remove the staybolts, whether broken or not, and weld the sheets solid and drill new holes.

When renewing broken staybolts in the vicinity of cracks in the firebox sheet, which have been welded, occasionally a weld will open up due to vibration of hammers used in chipping, calking, or driving up staybolts. These cases are rare, however, and the second weld made usually holds good. To prevent this, some roads endeavor to keep the sheets hot while driving bolts.

Bridges have been welded in both front and back tube sheets with both processes and give fairly good results, although some roads have had difficulties with oxy-acetylene. Sheets in some cases must be preheated before and at the time of welding to take care of expansion and contraction, also to prevent cracking of adjacent bridges. Flue holes are rolled while the sheet is hot.

Full firebox sheets are welded successfully with both types of welders, and in some cases experiments have been made with welding the flange of the flue sheet and the door sheet to the side sheet, omitting the rivets.

One road had a switch engine built at a locomotive works, and all the firebox seams were welded with the oxy-acetylene process. There are no rivets in this firebox except the ones that fasten the box to the mud ring. Engine went into service August, 1912, and has given no trouble with the seams leaking, or otherwise. Three-quarter door sheets have been welded in by one road and the rivets have been omitted where the sheet is welded to the side sheet. Another road

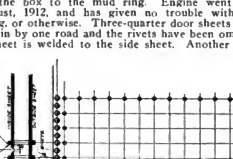


Fig. 5—Method of Applying New Strips Around Bottom of Side Sheets, Throat Sheets and Back Head by Oxy-Acetylene Welding.

reports having welded door sheets from the firebox door down to the mud ring. The rivets were cut out and plugs screwed into rivet holes which were cut off flush with the sheet and welded over as shown in Fig. 4. Fig. 5 shows method of applying new strips around bottom of the side sheet, throat sheet and back head.

One road welded a patch in the side sheet by oxy-acetylene, July, 1909, which was removed March 1, 1913, having made a mileage of 136,980 miles.

Another road, using the electric process, reports that some patches in firebox side sheet fail in from one to three months. Patches in the crown sheet give no trouble. Door-hole collar gives good service, and any patches in the firebox, applied round or oval, will give better service than square ones which are welded on three or four sides.

Another road, to overcome the difficulty they were having with the vertical welding, applied patches, cut diagonally.

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Since adopting this practice they have been very successful with the oxy-acetylene. Plugs and sunflowers have been successfully welded with both processes. The plugs were applied in the usual manner and then welded around the edge, the same as welding flues.

There have been cases where staybolt holes and washout-plug holes have become enlarged, and holes, in some cases, especially the staybolt holes, have been welded up entirely, redrilled and retapped for new bolts with satisfactory results. On washout-plug holes patches have been applied 4 or 5 in. in diameter and welded and new holes drilled for the plugs; washout-plug holes have been reinforced around the hole for a distance of 6 in. or more. This work has proved very successful with both types of welders.

Welding of cracks in mud rings have been successfully done with both types of welder. Mud rings have been welded on the firebox sheets at the corners in addition to riveting, to eliminate mud-ring leakage and have proved very successful. Building-up of metal at the mud rings is done by roads with both types of welder and has proved every successful.

The committee feels that there is a field in which each of the two welders, that is, electric and oxy-acetylene, excels the other. For welding seams, cutting out and removing old sheets, the oxy-acetylene excels. For welding flues, short cracks and welding metal where expansion must be taken care of, the electric welder excels. At engine houses the committee would recommend that electric welders be installed, and at shops, both electric welder and oxy-acetylene process be used, as oxy-acetylene process can be kept busy cutting out and applying new sheets.

BOILER WASHING.

It is the consensus of opinion of the roads reporting that boilers should be washed with hot water. This method avoids sudden change in temperature and by this process the staybolts firebox sheets and boiler being washed clean in a shorter time. Most railroads now install hot water plants when building new roundhouses.

One road reports having a special boiler-washing plant which consists of two washout pits about 150 ft. long. The engines are placed on the pits and connected up to the blow-off cock with a high-pressure flexible hose. This is connected to a pipe line which conveys the steam and water into a filtering plant, which consists of three large tanks with a total capacity of about 30,000 gallons. It is equipped with two motor-driven Buffalo turbine pumps, which pump the water out through another line for washing and filling of locomotive boilers. All water used in washing, runs back into the tanks by gravity system and pass through the filtering pits of hard coke, etc., on its way to the tanks. They advise that this plant is very satisfactory, as there is no loss of steam or water from boilers or tenders.

Another road has installed its own system which provides for the blowing off of all water and steam from the boilers to the tank. The foul water from this tank flows off to the sewer. The steam separates and passes to a concrete cistern which is filled with fresh water admitted by a thermostatic control. The steam enters this cistern through two pipes at the top, the pipes extend down close to the bottom of the cistern. At the end of the pipes are 4-in. noiseless heaters. The steam heats the water in the cistern to 140 degs., and when the temperature rises above 140 degs., more water is admitted automatically, the supply shutting off when the temperature reaches 140 degs. The water is then pumped from this cistern to the roundhouse and is used in washing and filling boilers. The exhaust steam from the pumps is piped to the cistern for heating purposes. There are a number of patented systems now on the market.

One road advises that it takes two hours and thirty minutes to wash a boiler with hot water, from the time the locomotive is brought in and placed on the pit, completely washed, replace the plugs and get the engine under steam ready for service.

Some roads have gone so far as to install the hot-water system in old engine houses, where a large number of engines are handled.

When washing with cold water, care should be taken that the boiler is properly cooled before cold water is turned into it. The general practice is to remove two washout plugs in the backhead above crownsheet, connect the cold-water hose to the feed pipe, which allows the cold water to pass through the injectors and boiler check and mix with the hot water in the boiler, thereby allowing the water to escape through the washout holes. By this method the boilers may be fairly well cooled down, and after this has been accomplished all washout plugs are removed, which will allow the boiler to drain itself. With this method it consumes more time than washing out the boilers with hot water. It requires from forty to sixty minutes to cool the boiler down. One road using cold water reports that it takes six hours and twenty minutes to cool a boiler down, wash it, fill it, and fire it up again ready for service.

The washing of a boiler is a local proposition and depends on the water conditions which have to be met; therefore, no hard fast rules can be recommended by this committee to govern the washing of boilers.

After the boiler is washed, the flues are examined carefully and any flues not welded, which show signs of leaking, are gone over with a prosser. Fig. 6 shows a straight prosser used for small and large tubes. These tools are used for re-working tubes.

Some roads prosser full sets of flues every thirty days, using a long-stroke air hammer. If leaking between this time they are expanded by a sectional prosser expander, driven to place by a hand hammer or beaded with the air hammer and beading tool. The form of the beading tool must be kept to original dimensions by frequent gauging.

One road takes into consideration the mileage, combined with time element; for example, re-set every four weeks on freight engines that have made 8,000 miles or over, and every six weeks on passenger engines making 6,000 or 8,000 miles.

The flue mileage varies from 40,000 to 60,000 and one road

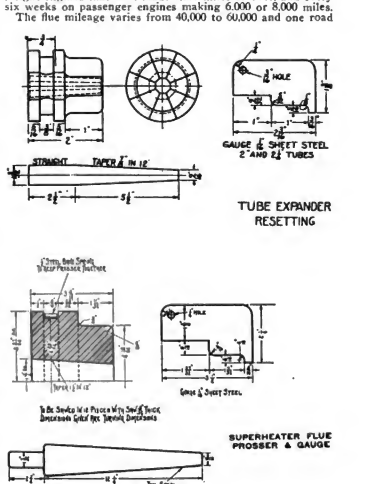

Fig. 6—Straight Prosser for Re-working Tube.

reports having obtained 75,000 miles. No rules can be recommended for fixed flue mileage. This must be governed by local conditions. If flues are welded in, the present indications are that they can be run for three years, which is the limit prescribed by the Federal Rules.

WATER CONDITIONS.

A few roads have what would be called good-water conditions. Practically all roads are using treated water in some form. A few roads are using a boiler compound which is made in stick form about 18 in. long and is applied after the boilers have been washed, through the washout holes and laid on the crown sheet and a few sticks are laid on top of the flues at the rear end. This compound has increased the mileage between washouts over 150 per cent, on a road which has very bad water conditions, and it has been in use almost a year. In addition to increasing the mileage between washouts, it has increased the life of boiler flues.

It is important to keep the arch tubes free from scale, and when washing boilers it is the general practice to use

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a Cyclone cleaner through each tube until all scale is removed. The Lagonda arch-flue cleaner is used by a good many roads. The cleaner is started into arch tubes at the boiler head. It is driven by air and a small stream of water is entered through a separate pipe for the purpose of washing down the scale. The cleaner is run through gradually, making sure to remove all of the scale from the arch tubes.

In order to get the most efficiency out of a boiler, it is necessary to keep the flues from stopping up. Some roads blow out flues at the end of each trip, especially on important power. Others blow them out at each washout. The blowing is done with air pressure from 100 to 120 pounds, using a ¼-in. pipe for blowing out the superheater flues, and ⅜ to ½-in. for other flues.

All roads, except one, who have a large number of superheaters in service, report no difficulty with the small superheater tubes clogging up on the inside. They found some of the units almost closed up at the return bends, which was caused by the use of too much soda ash and by foaming.

FLEXIBLE STAYBOLTS.

Your committee reported at the convention last year that one of the members applied a full installation of flexible staybolts to a locomotive in February, 1904, when, with the exception of four bolts under the auxiliary dome, four under the steam turret and eight bolts which go on top of same at back head, February, 1908, engine received general repairs and firebox was in good condition. All caps were removed from flexible staybolts and they were found to be in good condition. April, 1909, it was found necessary to patch the top of the back tube sheet on account of sheet cracking from the hole next to the flange; this was done in the engine-house. October, 1909, engine was given general repairs, and by this time the top of back tube sheet had given out in two more places, but as the sheet was in good condition otherwise, it was patched. Three mud-ring corners also required small patches applied. After ratting scale from firebox sheets with large hammer, it was found that forty of the flexible sleeves had cracked outside of the sheet, and on being taken out they were found to be crystallized, but no broken bolts were found. In 1911, engine was again in the shop for general repairs and had all caps removed from flexible staybolts and bolts found to be in good condition. A patch was applied to top half of one flue sheet, half side-sheet seam in firebox was in good condition. In July, 1912, the engine was given general repairs, and at this time it was necessary to apply new back tube sheet; caps were removed from all flexible staybolts and none found broken. Side-sheet seam has never given any trouble and engine has lost no time in roundhouse due to broken staybolts since the box was applied. Mileage up to May 6, 1913, is 398,997 miles.

The application of staybolts with some form of slack, is believed to be desirable as it relieves the firebox of excessive internal stresses which would be brought into play if the bolts are turned up tight.

BRICK ARCHES.

To get the most efficiency out of a brick arch it must be maintained properly and not often disturbed. The general practice seems to be to remove the center row of bricks when it is found necessary to bore or work on flues. Only enough brick should be taken out to enable the operator to get at the tubes. They must be removed as carefully as possible to avoid breakage. Some roads have a special brick-arch man, day and night, at the large terminals to make repairs to arches and see that they are kept in good condition. Brick arch should be blown off with air by a pipe put in through the firebox door with a tee on the end which will blow the dirt, or a portion of it, to the corners where there is an opening which allows it to fall out on the grates.

The report is signed by:—D. R. MacBain (L. S. & M. S.), chairman; C. E. Chambers (C. of N. J.), T. W. Demarest (Penna.), R. E. Smith (A. C. L.), F. H. Clark (B. & O.), J. Snowden Bell, and E. W. Pratt (C. & N. W.).

DISCUSSION.

H. T. Bentley: I was interested in the different methods of welding in flues and have just experimenting a little bit, and my impression is that the method shown at sketch *A* is not nearly so desirable as that shown on sketch *B*, for the reason that when you want to remove the flues with the former method, you must have a special tool to get the flue out, whereas by the method shown in sketch *B* you have only to have an air-chisel and cut the old portion off flush with the sheet. While I have heard a good many things said in reference to welding the flues in favor of the sketch *A* method, it seems to me to be the longer process, and not as satisfactory as the one shown in sketch *B*. I notice a reference to vertical cracks in side sheet. Everybody seems to think that the welding of a horizontal crack is a better form and will last better than the vertical crack. The committee made the statement that the cracks in crown sheets are successfully welded with both processes. Some time ago we had an electric welding outfit, and the first thing we asked them to do was to weld a crack overhead, and after they worked on it and apparently succeeded (it was in the case of an old fire-box) we got a piece of the sheet and put it on the testing machine and there was no strength in it at all. We got a second electric welder from another form and made a similar experiment with practically the same results, and we finally got a third electric welder and welded a crack in the crown sheet, and this was done very successfully, the strength of the welded part running up to 75 or 80 per cent. of the original strength of the sheet. I am glad to note the committee thinks it a difficult to weld cracks in crown sheets, because I considered it was one of the most difficult places to weld, especially with electricity.

We welded a large number of sheets in with the oxy-acetylene process, before we went into the electrical process, and I want to agree with the committee in their statement that both the electric and oxy-acetylene processes have their uses. I do not think there is any question that the oxy-acelene is very much better for certain work than the electric welding process, and that the best thing to do is to have both of the methods available in your shop, and to use the one which will give you the best results in any particular case.

I would like to ask the members if they are having any more trouble with pitted flues than they used to have. At one time, in one of our districts where we used rather bad water, we occasionally found a few flues pitted, but lately we are having a tremendous amount of trouble in this direction, and we are trying to overcome it. Where the flue is not badly pitted, but has a few deep holes, we weld it up with electricity and oxy-acetylene, and apparently these flues are giving good service. I think it might be of interest to find out whether the pitting of flues is more general now than it has been, and if so, how can it be done away with, and what is the method by which to overcome it?

C. L. McIlvaine (Pa.): On the Pennsylvania we experimented on welding the flues with the oxy-acetylene process three years ago. The two holes in the flue sheet were countersunk and there was a number of flues first welded in at various locations, both at the front and back end, the idea being to save the sheets, after which the remaining flues were welded with the oxy-acetylene process, the operation requiring about two weeks' time. It was very slow, because only one man could work in the firebox, owing to the excessive heat, it being necessary to blow air into the firebox to enable him to work continuously. That experiment proved a complete failure, as did all the experiments with the oxy-acetylene process.

About a year ago, we began using the electric process and had uniformly good results. We made a great many micro-photographs of sample welds of both processes. I have inspected a number of samples of welded flues, etched with micro-photographs, and they show a uniformly better weld is made by the electric process. The oxy-acetylene process usually shows a large amount of oxide and slag included, and these are absent in the electric process. However, unless the electric weld has been properly made, it will be porous, and that emphasizes the necessity of hammering and cleaning the work as we go along. The first locomotive with the welds in has been running for about 15 months, and made about eighty or ninety thousand miles; it is a Pacific type. There has been no leakage except with one tube where it was sweating a little. Five more engines running about eight or nine months averaged about forty thousand to fifty thousand miles each, and they have had no leaks with the exception of one engine which had one tube leaking slightly, due to a pin-hole caused by the fact that the operator did not clean the job while he was doing it. That was corroded slightly, and it was fixed and has not leaked since. We have now running about forty engines with welded flues, of which eleven are saturated and about thirty-three are superheater engines. We find we get as good results with the welding of large flues as we did with small ones. The prospect looks very promising, and with this class of engine, with these long flues which are giving so much trouble, we feel assured that if we have almost one hundred per cent. performance with that class we will have no trouble with any other class.

F. F. Gaines: I would like to ask Mr. Bentley what kind of material he has in his tubes.

H. T. Bentley: Steel.

F. F. Gaines: I think that is the answer. We were using steel flues and having the same trouble. We had pitting, and we stopped steel tubes, and that fixed it up. I experimented a long while with acetylene and we could not do much with it, but we have recently put in an electrical outfit

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and have welded some of our large tubes which were giving trouble after one year's service, and now they give no trouble; we are hoping to run them for some time yet. We will take the majority of the engines in for tire repairs and setting, but we will miss the tubes, I think, this time. There is one thing advisable which is not mentioned in the paper, and that is, the use of the sand blast preparatory to welding. Unless you get your sheet clean, you will not get a good weld, and the only way to clean it is to do it with a sand blast.

H. T. Bentley: We are using steel flues, but we have been using iron flues also for many years, and I think the iron flues are giving us as much trouble with pitting as the steel flues.

B. P. Flory (N. Y., O. & W.): We have been using the electrical welding process for over a year and a half; we do not use the oxy-acetylene process much now. I have been looking over the paper and I was surprised to learn that some roads have had so much trouble in opening up electrically welded sheets. We have had very little trouble. I remember one of our first jobs had an sixty-one cracks in the firebox. We welded it up and it has been in service now over a year and a half and I do not think any of the cracks have opened up. We had the engine in the shop recently and welded up a few more cracks; we have welded the flues in, and so far, have had very good results. We figure that the electric welding process is cheaper than the oxy-acetylene, and also gives better results.

D. R. MacBain: As chairman of the committee, I deserve very little credit for this paper; the work in compiling the data gathered is entirely due to Mr. Demarest. I want all to understand that, so there will be no wrong opinion.

Now, as to the usefulness of the electric apparatus and the gas apparatus for welding joints, our men on the Lake Shore are well satisfied that each system has its own particular advantage. We were one of the pioneers in gas welding and we have had a great deal of experience, and our men are well satisfied that the electric has its field as well as the gas. We have one of our master mechanics Mr. Foster, here whom I would like to call on to make a few remarks on this subject. He is a pioneer in flue welding on the Lake Shore. He had some engines which were causing trouble in the tools, and he and welded the old flues in, and had no trouble after that with them for the entire winter.

O. M. Foster (L. S. & M. S.): I suppose the welding of flues is naturally the most attractive use for welding; leaky flues constitute one of the things that has caused considerable trouble. Since we have had the superheaters, while the little flues were always troublesome, the large flues were three or four times as troublesome. We did so much work on the large flues that they deteriorated very rapidly. We started in with a large flue, as they were the things we wanted to get fixed in a hurry. We devoted our attention to welding in old flues, as they were the ones we were making us trouble. We welded the first ones in last September, and today there are 260 superheater engines on the Lake Shore with flues welded in, and few of those engines have full sets welded in. In one case, after welding, we found the engine had to go into the shop in a couple of months and we had enough confidence in the welding to let the engine go through the shop and come out again without touching those flues; and we have not been sorry for it as yet. Of course, the easy thing was to weld the flues as we find them, and our success in doing this suggested naturally some thoughts as to the new installation of the flues. As far as leaking is concerned, it might happen that in one case out of forty there would be a flue or flues that would be spongy, as some say. That is due to the carelessness of the operator. Sometimes it is necessary to clean sheets stopped up by little pin-holes, sometimes they will take those up themselves, and you do not need to do anything. We use a small hammer and peener, a small one with a round end on it—that is, it is shaped like the contour of the flue. We use that to shape the flue, knocking off the dirt and scale, and then we take a wire brush and clean it as thoroughly as possible in that manner. I do not think the use of the sand-blast would be advisable as in the hands of a careless operator, it can do a great deal of damage. The results we have in the welding system seem to prove our method as satisfactory, and we get the sheet clean enough for good welding.

In the application of new flues, of which we have done very little, there has been an inclination to counter-bore the hole in the sheet. I think our way is better, because while these are prossered before welding, still it stands to reason that you lose a little. Flexibility there relieves the weldine of something it might get if you counter-bore the hole and weld it down; that would make an absolutely rigid condition. Furthermore, it would take more trouble to get that out of the sheet. I am inclined to think that anybody undertaking to weld in flues had better start as we did, to weld in the old beads, and convince themselves as to how they had better go ahead with any new application. We leave the copper in because it was there, and if we make any new installations, we put it in also, because if the weld failed, we would still have the original condition. This has not proved necessary, but I do not know whether or not it will always be necessary to use copper; probably not. We thought, when we welded the flues in the back sheet they would perhaps leak in the front sheet; there has not been anything in that. We have been rather surprised to find the absence of any such difficulty. I believe as a matter of fact, the flues leak less in the front sheets since they have been welded than they did before.

C. E. Chambers (C. of N. J.): We are all pioneers in electric welding. We have had an electric welder in our shop for about a year and four months. Like a washtub, we would not try to keep house without it. We had not welded any flues until this year. We had a superheater engine in service between New York and Philadelphia, and the superheater flues rolled out and gave us trouble. We took the engine into the shop, and welded the flues in with an electric welder, and since that time the engine has been running daily, no attention has been given to the flues and there is no indication of any leakage. At the same time we passed another engine through the shop, a saturated steam engine, and we welded in all of the flues by the electric welder, having gone through the proper process of placing the ferrules and beating, etc., and no work has been done on that engine since that time. We have never experienced any more trouble in welding vertical cracks than in welding horizontal cracks. We have a large number of patches, large and small, and we weld a great number of vertical cracks. We weld a number of crown sheets, making patches of various sizes, and in all instances, this work has proved satisfactory.

E. W. Pratt (C. & N. W.): I want to make a suggestion in regard to flexible staybolts. The report mentions a complete installation of flexible staybolts, in which connection it seems to me that provision should be made for taking up the slack of the flue front crown bolts, due to the upward movement of the crown sheet. I know of at least one railroad that has a flexible staybolt that permits the cap being removed and this slack taken up, but it seems to me that some bolt of that character should be used more generally. If we are to have any strain on the front one or two or three rows of crown bolts. In connection with the welding of the larger superheater tubes it occurs to me that inasmuch as any work that we do on these large tubes is of a more serious character than that on the small ones, we ought to be able to get a longer service than three years out of these large tubes, especially if they are welded in, and notwithstanding the reading of the law, which indicates that all flues must be removed, there is no question in my mind but that the intent of the law is for the internal inspection of the boiler, and in that connection I may say that we have recently had several inspectors from different sections making a thorough inspection of Pacific type locomotives without removing the large superheater tubes. They reported unanimously that non-removal of the large superheater tubes does not interfere with the thorough and complete internal inspection of the boiler, hence, I believe if this matter were taken up in a proper way, and it seemed to be an advantage to the railroads to continue these large tubes in service more than three years, that that might be arranged for.

H. T. Bentley (C. & N. W.): As a matter of information to Mr. Pratt, I will say that we have some engines equipped with flexible staybolts in the crown sheet next to the flue sheet. We took the matter up with the people who furnished the staybolts, which I understood him to stay were originally at the top, and they said that if they furnished that type of staybolt, it was a mistake, because they have a flexible bolt with a screw arrangement on the top which takes up the slack referred to.

D. J. Redding (P. & L. E.): There are two distinct types of welder as I understand it, one being a welder with which you can work only one man, and the other, a multiple unit welding equipment, in which you can work simultaneously four or five or six men, as you may require. I understand that some of the members of the Association have multiple unit equipments. I think it would be interesting to know whether or not they experience any particular difficulty when they come to putting the second, third or fourth man on the welder, and whether they have any trouble in maintaining a uniform voltage for the work. I am also inclined to think that Mr. Pratt's difficulty in regard to the upward growth of the flue sheet and the upward motion of the crown sheet will be largely overcome if he welds in all of his tubes, as that growth is largely due to the repeated working of the tubes.

D. R. MacBain: In reply to Dr. Redding's remarks, I have been informed on very reliable authority that there is only

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one concern now, practically speaking, which furnishes welding apparatus and they will give you whatever you want, anything from one to six points. We are installing on the Lake Shore a welding outfit that has four points. The difficulty that existed in the past, which was litigation between a couple of the concerns which make welding apparatus, I believe has been practically settled, so that you will be able to get about whatever you want. The Lake Shore has installed a single point machine in a roundhouse, and about the only repairs, as I understand it, that are necessary on a set of welded flues is that occasionally one comes in with a pin-blow out of it, and the man touches it with a needle and closes it, and that does the job. Our experience has been very satisfactory, and I hope that the information gathered by the committee and put in this form will be of some use to the association.

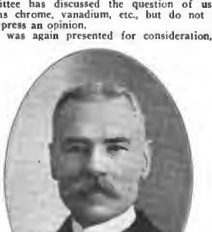
President Crawford: If there is no further discussion on this paper, we will proceed to the next subject which is the report of the committee on Steel Tires, of which L. R. Johnson, of the Canadian Pacific is chairman. In the absence of the chairman, the report will be presented by the secretary.

STEEL TIRES.

The committee reported no change in the specification presented last year, except to add a new sub-clause: (d) The elasticity shall be at least 50 per cent. of the tensile strength.

The committee has discussed the question of using alloy steels, such as chrome, vanadium, etc., but do not feel in a position to express an opinion.

The report was again presented for consideration, and the



L. R. JOHNSON,
Chairman, Committee on Steel Tires.

committee suggested to the association the advisability of appointing a standing committee on "Steel Tires."

The report is signed by:—L. R. Johnson (C. P.), chairman; J. R. Onderdonk (H. & O.); R. B. Kendig (N. Y. C.); R. L. Ettenger (So. Ry.), and L. H. Turner (P. & L. E.).

The report was received and the recommendations made by the committee were referred to letter ballot for adoption as recommended practice, and the question of making the committee a standing committee was referred to the executive committee. There was no discussion.

President Crawford: The next report is that of the committee on "Minimum Requirements for Headlights," of which I am Chairman. The report will be presented by C. H. Rae, of the Louisville & Nashville.

MINIMUM REQUIREMENTS FOR LOCOMOTIVE HEADLIGHTS.

The committee appointed to report on the minimum requirements for locomotive headlights has kept in touch with the various tests which have been run on headlights in the past year, but do not feel that they are in position to make other than a progress report at this time.

In 1911 the committee sent out circular of inquiry No. 6, which, among other things, requested an opinion as to the functions of locomotive headlights, in which the committee agrees, are as follows:

To warn employees and the public of the approach of a train.

Marker to designate the head end of a train.

To permit the enginemen to observe wayside objects, such as whistle posts, landmarks, etc.

The above requirements can be met by the oil headlight or a light of the same energy as the present oil lamp.

Analysis of the oil headlight and of various tests run in the past year develops the fact that the distribution of the light with the various detail arrangements vary to such an extent that it is impossible to make a simple definition of minimum requirements, i. e., it is impossible to designate the minimum size of reflector and candle-power of the source of light without going into the distribution of the light with the headlight as a whole.

As to high powered lights, as for example, the electric headlights. Tests which have been made in the past year, confirm the conclusion that they are a decided source of danger when used on roads with multiple track and automatic signals; this confirms the resolution adopted by the Association at the 1912 Convention.

The report is signed by:—D. F. Crawford (Penna.), chairman; C. H. Rae (L. & N.); A. R. Ayers (N. Y. C.); F. A. Torrey (C. B. & Q.), and R. Quayle (C. & N. W.).

The report was received and thoroughly discussed, but no definite action was taken, pending the final report of the committee, which will be made by January 1, 1914, and printed and distributed to the members.

President Crawford: We will now have the report of the committee on Subjects, of which George W. Wildin, of the N. Y., N. H. & H., is chairman. The other reports and papers are referred over until tomorrow.

SUBJECTS.

The committee prepared a circular setting forth the subjects which are now before this convention, as well as those which had appeared before the various conventions during the ten years previous—this in order that the members might see exactly what the Association had done and whether or not it was desirable to reconsider any of the subjects.

After receiving various and numerous suggestions and communications, the committee prepared the following program for consideration:

STANDING COMMITTEES.

1. Revision of Standards.
2. Mechanical stokers.

SPECIAL COMMITTEES.

3. Autogeneous welding:
   Covering the investigation of electric, gas in its various forms, Thermit, oil and other special methods of welding, with their limitations.
4. Autogeneous welding.
4. Recommended method of calculating stresses in locomotive boilers.
5. Locomotive, counterbalancing of; does the Rule 1896 meet modern conditions.
6. Maintenance of electric equipment, locomotives and motor cars.
7. Locomotive types.
   Have we reached the limit of Atlantic, ten-wheel and Consolidation types before beginning the development of other and more complicated wheel arrangements.
8. Cylinder lubrication in connection with superheat:
9. Motors for railway shops.
   Various types of both A. C. and D. C., and drives, group or individual—their uses and limitations.
10. Superheater locomotives, with special reference to design of front-end appliances.
11. Proper location and clearances of side bearings on locomotive-tender trucks, both forward and rear.
12. Tonnage rating of locomotives—the most practical method.

INDIVIDUAL PAPERS.

13. Has the increased weight of modern locomotives brought a correspondingly increased efficiency.
14. Piston valves, best types and proportions with superheat.
15. The possible reduction of reciprocating parts on a locomotive, with attending results.

TOPICAL DISCUSSION.

16. Packing rings for pistons and valves in connection with superheat.
17. Locomotive frames, material for.
18. Cylinder lubrication, graphite.
19. Tools and machinery, the safe-guarding of.

SUBJECTS SUGGESTED WOULD BE SUITABLE AND DESIRABLE FOR REPORTS OF COMMITTEES.

Air-brake and signal equipment.
Ash pans, design of.
Boilers, design and inspection of.
Boilers, washing and filling.
Cast iron, substitution of for brass on locomotives.
Cylinders, use of cast iron in.
Educating firemen and engineers, recent method.
Electrification.
Exhaust nozzles.
Fire-box arrangement, the best for oil-burning locomotives.
Forgings for driving and engine-truck axles.
Flues, standard spacing of.
Fuel economics.
Grates for locomotives.
Headlights.
Locomotives, electric.
Locomotives, design of trailing trucks.

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Locomotives, internal-combustion.
Locomotives, Mallet.
Locomotive performance.
Locomotives, rating of.
Locomotive tend rs, standard center plates.
Locomotives, steam versus electric.
Locomotives, three-cylinder.
Locomotives, uniform specification for material.
Lubrication, flange.
Lumber, specifications.
Metal, excess amount purchased account of patterns too large or wrong.
Motor cars, comparison McKeen and General Electric.
Motors, variable-speed.
Painting locomotives.
Power versus weight.
Repairs, cost of locomotives.
Rods, main and side.
Safety appliances.
Safety on railroads.
Shops, electric drive in.
Shops, locomotive-repair, cost of.
Smoke prevention.
Stay bolts, flexible.
Steel, alloy and heat-treated.
Tender derailment.
Tender, largest capacity to be carried on two four-wheel trucks.
Tinware, design.
Tires—shrinkage, contour, specifications.
Ton-mile statistics.
Tool steel.
Tubes, leak in.
Tubes length.
Valve gear.
Wheel loads.
Boilers, washing and filling.
Drawbars and buffers.
Examinations, progressive.
Gas producer in railroad shops.
Locomotives, clearing of, safety first.
Locomotive coaling stations and ash pits.
Locomotive fuel, anthracite as a.
Oil burning, effects of with and without arch, tubes or superheater.
Safety valves.
Tubes, leaks in.

The report is signed by:—G. W. Wilden (N. Y., N. H. & H.), chairman; A. W. Gibbs (Penna.), and C. E. Chambers (C. of N. J.).

President Crawford: If there is no objection the report will be received and referred to the incoming executive committee. We will now stand adjourned until 9.30 tomorrow morning. The reports on Superheater Locomotives and Specifications for Materials Used in Locomotive Construction, and the paper on Three Cylinder Locomotives are carried over.

PEKING TRAMWAYS.—It is said that the Peking Tramway Company has raised a loan of two million francs from a French bank.

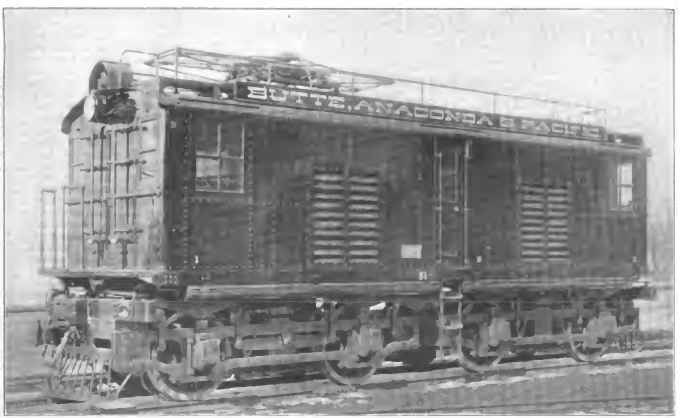
2400-VOLT DIRECT CURRENT LOCOMOTIVE.

Among the most interesting of the track exhibits is an electric locomotive, which is one of an order recently completed by the General Electric Company for the Butte, Anaconda & Pacific. These are the first direct current electric locomotives in this country to use 2400 volts. The traffic on this line consists principally of long trains of copper ore, which are hauled over heavy mountain grades. This service has heretofore been performed by large and powerful steam locomotives. A careful study of all conditions indicated that electric traction could be used to advantage, and the work of conversion has been under way for some time. The plans called for the starting of the electric operation on June 1 of this year.

The section that has now been electrified lies between Butte, Mont., and Anaconda, comprising 30 miles of main line single track, which with numerous sidings, yards and smelter tracks gives a total of about 90 miles, on a single track basis, that have been electrified. The adoption of the 2400-volt direct current system was determined after a thorough study of all local conditions, and it appeared that it gave an opportunity to realize unusual economy, both in initial expenditures and in the cost of operation.

The traffic over this section of the line amounts to practically 5,000,000 tons of freight per year. The trains are nominally made up of 50 loaded steel ore cars, giving a weight of 3400 tons behind the locomotive. These trains will be hauled against a ruling grade of 0.3 per cent. by a locomotive consisting of two units. Single units will be used for making up trains in the yard and for spotting cars.

The initial equipment consists of 17 locomotive units, of which 15 are for freight and 2 for passenger service. Each unit weighs approximately 80 tons and two units, forming a freight locomotive, will be coupled together and operated in the multiple unit system. This combination freight locomotive will haul the full tonnage train at a maximum speed of 15 miles an hour against the ruling grade and at 21 miles



First Direct Current Electric Locomotive in this Country to Operate at 2400 Volts.

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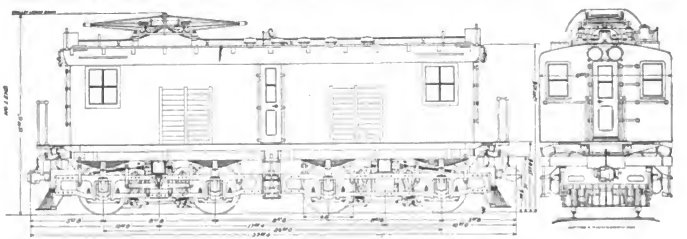
an hour on a level tangent track. The passenger locomotives are the same design as the freight except that they are geared for a maximum speed of 45 miles an hour on a level track. A schedule of eight passenger trains, four each way, is maintained and the average train will be composed of a single locomotive unit and three standard steam railroad passenger coaches.

The locomotives are of the articulated, double truck type with all the weight on the drivers. The draft gear is mounted on the outer end of the truck frame, and thus transmits all the pulling and buffing strains directly to the truck frame. The truck frames are formed of heavy steel castings, the side frames being of the truss pattern and connected by heavy end frames and a cast steel center transom. The entire weight is carried on semi-elliptic springs suitably equalized. The two 12 in. steel channels forming the center sills of the center frame have a top and bottom cover plate, thus forming a duct for distributing the air used for forced ventilation of the motors. The air is conducted from the center sill duct through the hollow center pins to the hollow truck transom and thence to the motors.

There is a motor mounted directly over each axle and connected to it by twin gears. The motors are of the commutating pole type wound for 1200 volts and insulated for 2400 volts. A steel pinion is mounted on each end of the armature shaft and meshes with gear mounted on each



Elevation of One Unit; Butte, Anaconda & Pacific Electric Freight Locomotive.

wheel hub. The gear reduction is 4.84 on the freight locomotives and 3.2 on the passenger locomotives.

The continuous capacity of each motor is 190 amperes on 1,200 volts under forced ventilation, and 225 amperes on 1,200 volts for the one hour rating. For the double unit locomotive this is equivalent to a continuously sustained output of 21,000 horse power. Air is circulated over the armature and field coils, over and through the commutator, through longitudinal holes in the armature core, and thence exhausted through openings in the bearing head. This method of ventilation circulates a large volume of cool air effectively throughout the motor and keeps all parts at a uniform temperature.

The control equipment is the Sprague-General Electric Type M multiple unit control, and is designed to operate the four motors in series and series parallel. The pairs of motors with their respective resistances are all connected in series on the first point of the controller. The resistance is varied through nine points and finally short-circuited on the tenth or running point. The pairs of motors are then operated similarly in series-parallel and all resistance is cut out on the nineteenth point, which is the full speed running point. This provides a control with ten steps in series and nine steps in series-parallel.

The transition between series and series-parallel is effected without opening the motor circuit, and there is no appreciable reduction in tractive effort during the change. A switch is provided having manually-operated handles for cutting out either pair of motors, so that the locomotive can then be operated with one pair of motors in the usual way. The contactors are actuated by the 600-volt circuit obtained from dynamotor.

Current is collected by overhead trolleys of the pantograph type. They are pneumatically operated and can be put into service from either engineer's compartment by a hand-operated valve. Each passenger locomotive is equipped with two collectors, and each freight unit with one. A 2,400-volt insulated bus line connected direct to the pantograph is run along the center on the roof of the cab. The bus lines are connected by couplers between the two units of the freight locomotive, so that current is obtained from both collectors, or from a single collector. The collectors and bus lines are adequately guarded by railings. A 600-volt bus line is provided on the passenger locomotives for lighting and a 2,400-volt bus line for heating the passenger coaches.

The air brakes are the combined straight and automatic type. The air compressor is two-stage, motor driven, and has a piston displacement of 100 cu. ft. of air per minute when pumping against a tank pressure of 135 lbs. per square inch. Air is taken from the interior of the central compartment. The compressed air in passing from the low pressure to the high pressure cylinder is conducted through radiating pipes on the roof of the cab. This reduces the temperature and allows condensation of moisture before entering the high pressure cylinder. From the high pressure cylinder it is delivered into four air reservoirs, each 12 in. by 164 in. They are located under the floor of the cab and connected in series, which affords a further opportunity for radiation and condensation.

The general dimensions, weights, etc., are as follows:

Length inside of knuckles	37 ft. 4 in.
Height over cab	14 ft. 10 in.
Height with trolley down	15 ft. 6 in.
Width over all	10 ft.
Total wheel base	26 ft.
Rigid wheel base	8 ft. 8 in.
Total weight	160,000 lbs.
Wheels, steel tired	46 in.
Journals	6 in. by 13 in.
Tractive effort at 30 per cent. coefficient	48,000 lbs.
Tractive effort at one hour rating	30,000 lbs.
Tractive effort at continuous rating	25,000 lbs.

NEW BRAKE BEAM ARRANGEMENT.—The Committee on Brake Shoes and Brake Beams is exhibiting in the Buckeye Steel Castings company's booth (603-605) a complete full size truck showing the new arrangement of brake beams. Members should examine this truck before the report of the committee comes up for discussion on Monday.

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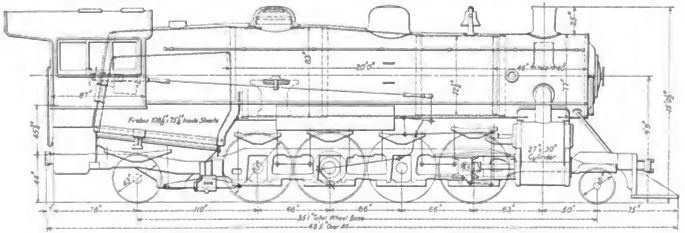
GRAND TRUNK MIKADOS.

Twenty-five locomotives of the Mikado (2-8-2) type have recently been delivered to the Grand Trunk by the American Locomotive Company and an order has been placed with that company for fifty more of the same design.

The freight traffic on the Grand Trunk has until recently been hauled mainly by Richmond compound consolidation (2-8-0) type locomotives, which have a total weight, including the tender, of 349,100 lbs. and a tractive effort of 34,000 lbs. The Mikados have a total weight, including the tender, of 455,100 lbs. and a tractive effort of 51,700 lbs., an increase in weight of 30 per cent., and an increase in tractive effort of 52 per cent. The Mikado locomotives are at present doing their best work on the Western division which has a number of grades which do not exceed 0.6 per cent. except in one case, where a five mile 0.95 per cent. grade requires helper service. The tonnage rating is shown in the accompanying table. These runs are being made at an average speed for the consolidations of 20 miles per hour, and for the Mikados of 22 miles per hour.

	Miles	Helper Service	Consolidation	Mikado	Increase, Per Cent.
Port Huron					
Port Huron to Nichols	156.5	None	2000 Tons	2800 Tons	40
Nichols to Eldon	168.5	None	1700 Tons	2500 Tons	47
Eldon to Nichols	168.5	For 5 Miles	2000 Tons	2800 Tons	40
Nichols to Port Huron	156.5	None	2000 Tons	2800 Tons	40

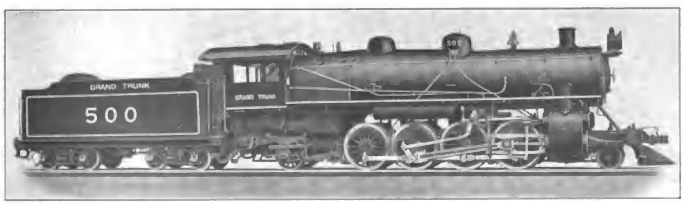
The consolidations use saturated steam and have a total heating surface of 2,952 sq. ft.; the Mikados have an equivalent heating surface (evaporative heating surface plus 1½ times the superheating surface) of 4,776 sq. ft., an increase of 62 per cent. over the consolidations with an increase in the grate area of only 11-½ per cent. The design in general follows the standards of the builders. The boiler is of the extended wagon top type, is 74 in. in diameter at the first ring and 83 in. in diameter outside at the largest course. There are 240 2 in. tubes, 20 ft. long, and a thirty-two unit, Schmidt type, top header superheater. The firebox is 108⅛ in. by 75¼ in. and is fitted with a brick arch, a pneumatically operated fire door and a power operated grate shaker. An interesting feature is the arrangement of the throttle lever support, which combines the lever fulcrum and quadrant support in an integral casting. This makes a saving in the number of parts and also a reduction in the number of holes in the back head of the boiler. The support fits around the stuffing box as a sleeve, and can be turned to any desired angle to bring the lever to a convenient position. The locomotives are also equipped with outside steam pipes, screw reverse gear and self-centering valve stem guides.



Side Elevation Showing Principal Dimensions of Grand Trunk Mikados.

The following table gives a comparison of the principal data with that of the consolidations:

	2-8-2	2-8-0
Tractive effort	51,700 lbs.	33,970 lbs.
Weight in working order	283,000 lbs.	299,400 lbs.
Weight on drivers	213,500 lbs.	183,700 lbs.
Wheel base, driving	16 ft. 6 in.	17 ft. 0 in.
Wheel base, total	35 ft. 1 in.	25 ft. 9 in.
CYLINDERS.		
Diameter and stroke	27 in. x 30 in.	22.5 in. and 35 in. x 32 in.
WHEELS.		
Driving, diameter over tires	63 in.	63 in.
Driving journals, main	11 in. x 20 in.	9½ in. x 12 in.
Driving journals, others	10 in. x 12 in.	9 in. x 12 in.
BOILER.		
Style	Ext. Wagon Top	Ext. Wagon Top
Working pressure	175 lbs.	210 lbs.
Outside diameter of first ring	74 in.	68⅝ in.
Tubes, number and outside diameter	240 2 in.	353-2 in.
Flues, number and outside diameter	32 5¾ in.	
Tubes, length	20 ft.	15 ft.
Heating surface, tubes	3398 sq. ft.	2757 sq. ft.
Heating surface, firebox	215 sq. ft.	168 sq. ft.
Heating surface, total	3640 sq. ft.	2952 sq. ft.
Superheater heating surface	757 sq. ft.	
Grate area	56.5 sq. ft.	50.6 sq. ft.



Mikado Locomotive for the Grand Trunk.

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Conventionalities.

Who will wear the Superheater white pants tomorrow?

The good old summer time seems finally to have caught up with the good old winter time.

Mr. and Mrs. George C. Bardon, Philadelphia, who have not missed the conventions in many years, are at the Shelburne.

Mr. and Mrs. Clarence Mark, Evanston, Ill., reached Atlantic City Tuesday morning and registered at the Traymore. This is their first convention.

Phil Arnold, who is attending the conventions, has just been made manager of the newly created railroad department of the Garlock Packing Company.

A Progressive Euchre party was given on Wednesday evening by Mr. and Mrs. W. C. DeArmond at their summer home, 17 S. Providence Avenue, to their friends who are attending these meetings.

H. M. Edgerton, who has recently accepted the position of engineer of the Standard Car Truck Company, is attending the conventions. He is accompanying James T. Milner, vice president.

L. A. Richardson, mechanical superintendent of the Rock Island Lines, Third District, with office at El Reno, Okla., arrived with his wife Wednesday afternoon. They are located at the Dennis.

M. K. Barnum arrived Thursday afternoon. He had expected to attend the opening session but was delayed because of Mrs. Barnum's illness. She is now recovering rapidly from a case of grippe.

G. P. Robinson, assistant chief inspector of the department of locomotive boiler inspection of the Interstate Commerce Commission, is accompanied by Mrs. Robinson this year and expects to remain for several days.

Burton W. Mudge and wife, Chicago, arrived Wednesday afternoon, and are stopping at the Marlborough-Blenheim. This

From left to right, H. Dixon, Supt. of Shops, C. P. R., W. Toronto; J. H. Mills, M. M., C. P. R., Toronto.

year they are not accompanied by Burton W. Mudge, Jr., or "Junior," as he is usually called.

E. H. Janes, vice-president of the Standard Steel Castings Company, and a member of the Entertainment Committee, has been called to California on business and will not return in time to attend the conventions this year.

William Lodge, president of the Lodge & Shipley Machine Tool Company, sailed Wednesday on the Victoria Louise for Hamburg to join the American forces attending the International Convention of Mechanical Engineers.

C. J. Mellin, consulting engineer of the American Locomotive Company, who was not able to attend the convention last year because of very serious illness, is on hand this time and reports that he has completely recovered his health.

J. C. Kuhns, Purchasing Agent, Illinois Central, is Among Our Guests.

Secretary and director of exhibits H. G. McConnaughy, of the American Electric Railway Supply Association, reports an unusually large demand for exhibit space for the convention of the A. E. R. A. to be held at Atlantic City in October.

J. J. Reid, master mechanic of the Delaware & Hudson at Carbondale, Pa., arrived Thursday. The heavy Mallet locomotives on his division are reported to be doing exceptionally good work and he is quite enthusiastic over them.

Greater ingenuity and skill could not have been shown in arranging the steps and floor at the entrance to the pier so as to cause the maximum number of legs and necks to be broken. Have you been tripped up this morning? Everybody else has.

One of the keenest pangs of regret experienced by the convention visitors is due to the fact that no opportunity will be given George Wilden this year to try his luck at knocking a hole in the Bull Durham sign or running bases a la Mallet.

G. S. Allen, one of the oldest members of the M. M. Association, is attending the meetings with his son C. W. Allen. Mr. Allen, Sr., who is now retired was for 54 years in the employ of the P. & R. and was master mechanic at Tamaqua, Pa.

Axel Levedahl, chief engineer of the Independent Pneumatic Tool Company, Aurora, Ill., sailed from New York for a European trip on the "Lusitania" on May 21. While abroad Mr. Levedahl will visit the prominent ship yards and manufactories.

With a patent first issued by the department at Washington for a new wheel press recording gage, J. W. Motherwell, vice president of the Ashton Valve Company, arrived Monday and registered at the Marlborough-Blenheim. He was accompanied by Mrs. Motherwell.

D. J. Redding, assistant superintendent of motive power of the Pittsburgh & Lake Erie, is accompanied this year by Mrs. Redding and their eldest daughter, Agnes. This is the first convention which Miss Agnes has attended and she seems to be enjoying it immensely.

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The troubled look in the eyes of O. S. Beyer, Jr., of the Rock Island Lines, is explained by the fact that he is trying hard to get a paper on Scientific Train Loading and Tonnage Rating ready in time for the annual meeting of the Traveling Engineers' Association in August.

Charles Harter, mechanical engineer of the Missouri Pacific, received a telegram on his way to Atlantic City advising him that his daughter had been made valedictorian of

John Weigle, Retired Motive Power Department Foreman, Pennsylvania Railroad.

her class. She is thirteen, and just about to graduate from the grammar school to high school.

F. T. Slayton, superintendent of motive power of the Virginian, is in attendance at the convention and has some interesting information concerning the performance of the large Mallets which are giving such an excellent account of themselves in handling heavy trains on his road.

W. H. Fettner, master mechanic of the Central of Georgia at Macon, Ga., is enthusiastic over the results which are being obtained from two small switching locomotives which were specially designed for working over sharp curves and are equipped with the Gaines combustion chamber.

A. M. White, superintendent of the Manchester works of the American Locomotive Company, is attending the conventions this year with Mrs. White. He has not been able to attend very regularly during the past few years, and his many friends will be delighted to see him again.

Postlethwaite was a little late in arriving, but his excuse was most commendable. To begin with, he has a daughter at Swarthmore. Then this year Mrs. Postlethwaite's class at Swarthmore held its twenty-fifth annual reunion. What more natural than that papa should go along to show off?

G. S. Goodwin, mechanical engineer of the Rock Island Lines, is being congratulated because of his headquarters being removed from Silvis, Ill., to the general offices at Chicago. He will have charge of problems of locomotive design, while E. G. Chenoweth, with the same title, will be in charge of car design.

The Atlantic City weather man was slow in finding the ball, but when he connected with it he hit the Bull Durham sign. The first three days of this week were overcoat weather, but nothing could have been finer than yesterday. (P. S. This is written at 11.20 A. M. Thursday, and is subject to change without further notice.)

W. P. Richardson, mechanical engineer of the Pittsburgh & Lake Erie, will be missed from the conventions this year. Among the problems which are keeping him at home is one of trying to adjust the counterbalance of some of the new consolidation locomotives by the use of heavy eccentric weights on the axle.

George H. Chadwell, the Woolworth tower of the Safety Car Heating & Lighting Company, registered at the Shelburne in his latest wardrobe creation of black and white checque. George denies that he is soon to start training for the heavy-weight class, as he cannot possibly reduce without serious inconvenience to himself and his many friends.

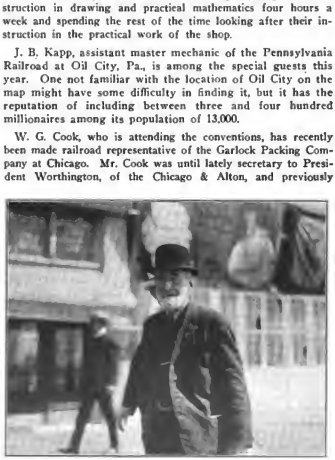
Paul T. Warner of the Baldwin Locomotive Works made a hurried visit to the convention yesterday, returning to Philadelphia at night. The company's plants are working at present at almost full capacity. He looked very distinguished in the broad brimmed Panama which he purchased at Kingston while on a recent visit to the Panama Canal.

F. J. Harrison, superintendent of motive power of the B. R. & P., has been detained because of illness in his family, and is not expected to arrive before next Monday. The mechanical department of the B. R. & P. is very proud of the fact that all of its passenger trains are now fitted throughout with all-steel equipment.

H. E. Blackburn, apprentice instructor of the Erie Railroad at Dunmore, Pa., is enjoying a few days at the conventions. He has about 57 apprentices under his charge, giving them instruction in drawing and practical mathematics four hours a week and spending the rest of the time looking after their instruction in the practical work of the shop.

J. B. Kapp, assistant master mechanic of the Pennsylvania Railroad at Oil City, Pa., is among the special guests this year. One not familiar with the location of Oil City on the map might have some difficulty in finding it, but it has the reputation of including between three and four hundred millionaires among its population of 13,000.

W. G. Cook, who is attending the conventions, has recently been made railroad representative of the Garlock Packing Company at Chicago. Mr. Cook was until lately secretary to President Worthington, of the Chicago & Alton, and previously



Chas. H. Cory, Honorary Member Ex-Superintendent of Motive Power, Cincinnati, Hamilton & Dayton.

acted for six years in the same capacity for different general managers of that road. He is staying at the Shelburne.

A. B. Appler, mechanical engineer of the Delaware & Hudson, is getting a great deal of satisfaction out of the fact that his office is now located in close proximity to the new general shops at Watervliet, N. Y. It gives him a good

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opportunity of following the work in the mechanical engineer's office into practical service and in studying the results.

The technical term for mistakes in the printing art is the word "bugs." Chairman Yardley, of the Enrollment Committee, found a number of "bugs" in the official enrollment list No. 1, Thursday morning. Mr. Yardley promises a better list in No. 2, and at the same time earnestly requests all members and guests to notify the Enrollment Committee of all errors.

The elimination of the ball game feature from this year's convention program is deeply mourned by D. Schepmoes, the publicity man of the Safety Car Heating & Lighting Company. "Skep," not having been informed about the decision to eliminate this feature, had prepared some printed matter of special interest to the numerous rooters hereabout. We advised him to feed it to some of the suckers in the aquarium.

A. R. Ayers, general mechanical engineer of the New York Central Lines west of Buffalo, attended the scientific management meetings of the Western Economic Society in Chicago a couple of months ago. When asked yesterday as to the practical results which followed he remarked that the road was now putting ball bearings on everything in sight.

Henry Gardner, supervisor of apprentices of the New York Central & Hudson River, reports continued good success with the shop schedule at the West Albany shops and the possibility of extending it to other shops on the system. Mr. Gardner is to present a paper on the subject before the annual convention of the International Railway General Firemen's Association which meets at Chicago next month.

The most frequent visitor at the booth of the *Railway Age Gazette* this year is Bob Alter, of the American Tool Works

Two Master Mechanics of the N. Y. C. & H. R. R.

Company. Every time a high speed tool is smashed on one of his machines it is brought to us for inspection, and judging from the number that we have looked over so far the manufacturers of special tool steels will have to wire back to headquarters for more supplies before the end of the week.

Prof. E. C. Schmidt, of the University of Illinois, is feeling very proud about the Transportation Building and Locomotive Laboratory at the University which recently were dedicated with appropriate ceremony. The University of Illinois is rapidly becoming one of the best equipped in the country for training men for railway work. Dr. W. F. M. Goss, who is so well known to those attending the conventions, was unable to come this year.

The students of the Casino Technical Night School at the works of the Westinghouse Company, Wilmerding, Pa., honored George M. Basford on Tuesday evening, June 3, by presenting him with a diploma which they made themselves and which, as a token of appreciation, proclaimed Mr. Basford a friend of the class. Mr. Basford had previously made the commencement address for the graduating class to an audience of over 1,000 people.

Hiram Hammett is having more than the ordinary number of visitors at his booth this year. The enlarged photograph of the convention attendants at the 1888 meeting of the M. M. and M. C. B. Associations at Alexandria Bay is of special interest because so many of the older members who are still attending the conventions are shown in it. The facial adornments, the hats and general make-up offer a great contrast to those now in vogue.

It is quite safe to say that the man attending the convention who has the longest title is G. P. Robinson, assistant

Left to Right—J. B. Randall, M. M., L. H. & St. L., Mrs. Randall, and Chas. H. Bieder, Nat. Mall. Castings Co.

chief inspector, Department of Locomotive Boiler Inspection, Interstate Commerce Commission. His brother is a close second with the title of supervisor of locomotive fuel operation on the Baltimore & Ohio. In size the brothers are rated in the inverse ratio of the length of their titles, G. P. being the smaller one of the two.

Robert F. Carr, president of the Dearborn Chemical Company, is registered at the Marlborough-Blenheim. On the way to the conventions Mr. Carr, in company with J. D. Purcell, stopped off at New York and witnessed the international polo contest; and it is stated, parenthetically, that although Mr. Carr warmly applauded the well earned victory of the American team his pocketbook was noticed with a crimp in it at the conclusion of the contest.

It is only fair to record that the Information Bureau, a photograph of which was shown in yesterday morning's *Daily*, is in the hands of some lightning change artists, and yesterday presented the appearance of a perfectly good place for obtaining answers to questions. It is provided with time tables, programs, a diagram of the exhibits, etc., and is in charge of a man who is fully competent to furnish information on any subject connected with Atlantic City or the convention.

The genial president of the Railway Supply Manufacturers' Association, Sam Allen, practices what he preaches, but he will not preach—in public. He was invited to speak in behalf of the supply men, at the afternoon services at the Atlantic City Y. M. C. A. next Sunday, but after mature deliberation declined the honor. It is a serious question as to why the honor was declined. Was it Mr. Allen's well-

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known modesty or was he afraid of the subject assigned him?

W. H. Cook enjoys the distinction of being the only foreign exhibitor at the conventions, assuming, of course, that our Canadian friends on this side of the water are not classed as foreigners. From such records of the association as it has been possible for us to examine, it appears that he is the first representative from across the water, although we have, of course, had many visitors from foreign lands at all of the conventions. He is representing the Fastnut, Limited, of London, England.
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J. S. Sheafe, engineer of tests of the Illinois Central, has Mrs. Sheafe with him again this year and is stopping at the Dennis. He is rather hoarse because of his strenuous exertions in May. Early in the month he addressed the Storekeepers' Association on the Effect of Specifications and the Testing of Materials on the Storekeeper's Stock, and later in the month, as chairman of a committee of the Locomotive Fuel Association, he presented a report on the Scaling of Locomotive Boilers.

J. F. Dunn, assistant general manager (mechanical) of the Oregon Short Line, Salt Lake City, is accompanied only by Mrs. Dunn, their daughters having decided not to attend the conventions this year. Mr. and Mrs. Dunn are at the Marlborough-Blenheim. He gives glowing reports of the business conditions and prospects in the territory of the Short Line. This year's crops are extraordinarily promising, and the population of the country is increasing and its development going forward at a rapid rate.

J. F. DeVoy, Assistant Superintendent Motive Power, C. M. & St. P., with E. D. Garfield, of Manning, Maxwell & Moore, at His Right, and an Interesting Background.

The presence of George R. Carr, Chicago, will be missed at the conventions this year by his many friends, who, however, will be pleased to know that on July 15 he will be united in marriage to Miss Katherine Mortensen, Oak Park, Ill. The wedding will take place at the Fairmont Hotel, San Francisco, and extensive preparations are now being made for the happy event in the Mortensen winter home in Pasadena, Cal. On July 16 the newly wedded couple will leave for Honolulu on their honeymoon trip.

G. S. Edmunds, shop superintendent of the Delaware & Hudson at Watervliet, N. Y., reports that the new shops are getting into good working shape and that they are turning out considerably better than one engine per month per pit. Probably the most interesting feature of the new plant is the foundry for steel castings. Many of the friends of Mr. Manning, superintendent of motive power, were skeptical when he decided to build such a foundry, and it is a source of gratification to all the mechanical officers that it is giving such good results.

H. J. Small, general superintendent of motive power of the Southern Pacific, is naturally one of the most enthusiastic advocates of the conventions being held at his home city, San Francisco, in 1915, in connection with the Panama-Pacific Exposition. A Californian now of twenty-five years' standing Mr. Small descants with as much eloquence as a native son on the beauty, the climate and the resources of the Pacific Coast, and is anxious to give all his fellow-mechanical officers and also the supply men an opportunity to know and appreciate them. Mr. Small is staying at the Marlborough-Blenheim.

George B. McGinty, secretary of the Interstate Commerce Commission, and eleven of the boiler inspection force of the

A GROUP OF FEDERAL OFFICERS.

Left to Right—Locomotive Boiler Inspectors J. McManamy, E. N. Weist, and J. M. Hall; Assistant Chief Inspector, G. P. Robinson; Secretary of Interstate Commerce Commission, G. B. McGinty; Chief Inspector, J. F. Ensign; and Assistant Chief Inspector, F. McManamy.

commission, arrived on Tuesday afternoon and are attending the meetings of the Master Mechanics' Association and the exhibit this week. They are staying at Haddon Hall. Secretary McGinty is greatly interested in the exhibit and has a very high opinion of its instructive value. He hopes to remain through part of next week, when he will be joined by a number of the safety appliance inspectors, who are interested in the work of the Master Car Builders' Association. In the party of federal inspectors this week are Chief Inspector J. F. Ensign, Assistant Chief Inspectors G. P. Robinson, F. McManamy, and District Inspectors J. McManamy, E. N. Wiest, J. M. Hall, Scudder, Pfahler, Winterstein and Nicholas. Mr. McGinty has been secretary of the Interstate Commerce Commission since March 5, when he was appointed to succeed John H. Marble, who was made member of the Commission at that time. He was previously for some time assistant secretary of the commission. He is staying at Haddon Hall. The first secretary of the commission, E. A. Mosely, was for years a regular attendant at the conventions. Mr. Marble, it is believed, never was here while secretary, his service in that office being short. Railway men will doubtless join with the *Railway Age Gazette* in hoping that Mr. McGinty will come often and stay long, for nothing can better promote harmonious relations between the railways and the commission than a better acquaintance between those connected with them.

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MASTER MECHANICS' REGISTRATION.

Allen, C. W., Shelburne.
Barnum, M. K., Gen. Supt. Motive Power, Illinois Central, Dennis.
Beyer, F. A., General Foreman, Frisco Lines, Haddon Hall.
Bishop, G. C., Supt. Motive Power, Long Island, Haddon Hall.
Brangs, P. H., Traymore.
Brewer, J. W., M. M., Baltimore & Ohio R. R., Dennis.
Bridges, E. A., M. M., Durham & Southern, Silverdale.
Brown, H. M., Shop Supt., Ches. & Ohio.
Butler, W. S., M. M., Ches. & Ohio.
Byron, A. W., M. M., Penna., Chalfonte.
Carey, J. J., M. M., Baltimore & Ohio, Marlborough-Blenheim.
Clark, F. H., Gen. Sup. M. P., B. & O., Marlborough-Blenheim.
Durham, George, M. M., D., L. & W., Traymore.
Elmer, Wm., S. M. P., Penna. (B. & A. V. Div.), Chalfonte.
Endsley, Prof. L. E., Chalfonte.
Ewing, J. J., M. Engineer, Ches. & Ohio, Seaside.
Finegan, L., D. M. M., B. & C. S. R., Monticello.
Fulmore, J. H., M. M., Penna., Pennhurst.
Gill, John, Traymore.
Givin, E. F., M. E., P. S. & N., Monticello.
Greenwood, B. E., Supt. of Shops, Seaboard Air Line.
Hamilton, Tabor, M. M., Cumberland Valley, Chalfonte.
Irvin, I. B., Gen. Foreman, Pitts. Shaw. & Nor., Monticello.
Kadie, C. H., Lexington.
Keenan, C. E., M. M., N. Y. C., Traymore.
Kirkpatrick, James, M. M., Baltimore & Ohio R. R., Shiltz.
Lide, C. D., M. M., Carolina & N. W. Ry., Lexington.
Lovell, A., Traymore.
Miller, E. A., Supt. Motive Power, N. Y., C. & St. L., Traymore.
Miller, S. W., Haddon Hall.
Moll, Geo., M. M., Phila. & Reading, Jackson.
Montgomery, Wm., M. M., Central R. R. of N. J.
Murphy, F. K., M. M., C. C. C. & St. L., Pennhurst.
Murrian, W. S., Supt. M. P., Southern Ry., Shelburne.
Reagan, F. H., Shop Supt., D., L. & W., Marlborough-Blenheim.
Robertson, D. D., M. M., L. V., Traymore.
Rumney, T., Marlborough-Blenheim.
Ryan, P., M. M., L. & N., Sterling.
Searles, E. J., Supt. Motive Power, B. & O., Marlborough-Blenheim.
Slayton, F. T., Supt. M. P., Virginia Ry., Arlington.
Smith, J. L., M. M., Pitts. Shaw. & Nor. R. R., Monticello.
Smith, W. T., Supt. M. P., Chesapeake & Ohio, Dennis.
Sprowl, N. F., S. M. P., Atlantic Coast Line, Chalfonte.
Thomas, I. B., Supt. Motive Power, Penna., Chalfonte.
Thomson, S. G., Supt. Motive Power, Phila. & Reading, Lennox Apartment.
Turner, J. S., Marlborough-Blenheim.
Turth, John A., M. M., Union Pacific, Chalfonte.
Werst, C. W., Works Supt., Sterling.

MASTER CAR BUILDERS' REGISTRATION.

Barnum, M. K., General Supt. Motive Power, Ill. Cent., Dennis.
Beyer, F. A., Gen. Foreman, Frisco Lines, Haddon Hall.
Boutet, H., Chief Joint Inspector, Cincinnati (all lines), Chalfonte.
Bridges, E. A., M. M., Durham & Southern, Silverdale.
Byron, A. W., M. M., Penna., Chalfonte.
Clark, F. H., Gen. Sunt. M. P., B. & O., Marlborough-Blenheim.
Clark, J. J., M. M., Tenn. Cent., Dunlop.
Durham, Geo., M. M., D. L. & W.
Elmer, Wm., Supt. Motive Power, Penna., Chalfonte.
Endsley, Prof. L. E., Chalfonte.
Finegan, L. E., D. M. M., B. & O.
Gaskill, C. S., Asst. Engr. Motive Power, P., B. & W., Marlborough-Blenheim.
Hamilton, Tabor, M. M., Cumberland Valley, Chalfonte.
Hogsett, I. W., Chief Joint Car Insp., Ft. W. & D., Rudolph.
Kendig, R. B., Chief Mech. Engineer, N. Y. C., Marlborough-Blenheim.
Lide, Chas. D., M. M., Carolina & N. W., Lexington.
Lovell, Alfred, Traymore.
Miller, E. A., Supt. Motive Power, N. Y. C. & St. L., Traymore.
Onderdonk, J. R., Engr. Tests, B. & O., Marlborough-Blenheim.
Parks, O. J., General Car Inspector, Penna., Traymore.
Searles, E. J., Supt. Motive Power, B. & O., Marlborough-Blenheim.
Slayton, C. E., Asst. Supt., St. J. & G. I., Arlington.
Slayton, F. T., Supt. M. P., Virginia, Arlington.
Smith, W. T., Supt. Motive Power, Ches. & Ohio, Dennis.
Streeter, L. P., A. B. Engineer, Ill. Cent., Dennis.
Thomas, I. B., Supt. Motive Power, Penna., Chalfonte.
Thomson, S. G., Supt. M. P., P. & R., Lennox Apt.
Turney, E. E., Dist. Car Foreman, M. & St. L. Shops, Schlits.
Twedell, J. W., Car For., St. J. & G. I., Arlington.
Young, J. P., General Foreman Car Dept., N. P. Ry., Dunlop.

M. M. GUESTS.

Adams, C. S., General Foreman, N. Y. C. R. R., Pennhurst.
Bachman, J. H., Motive Power Inspector, Penna.
Bankard, E. H., Purchasing Agent, B. & O. R. R., Brighton.
Baumgardner, F. M., M. M., Ill. Cent., Sterling.
Bradshaw, J. H., Traymore.
Brand, F. L., Chief Eng., Penna.
Bright, Geo. P., Gang Foreman, Penna., Elberon.
Brown, F. S., Mech. Eng., Erie.
Calnan, C. E., Engineer, B. & O.
Case, T. G., Asst. Genl. Foreman, N. Y. C. R. R., Pennhurst.
Chaffee, W. D., M. M., N. Y. C. & H. R., Cheltenham.
Clark, J. J., M. M., Tennessee Central, Dunlop.
Coates, H. T., Jr., Asst. Eng. M. P., Penna., Dennis.
Cooke, D. E., Genl. Foreman, N. Y., N. H. & H. R., Arlington.
Crawford, M. R., Foreman, C. R. R. of N. J., Louvan.
De Salis, J. H., Chief R. For. Eng., N. Y. C., Pennhurst.
Dillon, H. W., Dftr., Penna.
Driscoll, F. E., Chief Clerk Purch. Dept., Erie R. R., Dennis.
Eppley, G. Alfin, Islesworth.
Ford, E. J., Supt. Terminal, C. & O., Seaside.
Gardner, J. W., B. & A., Marlborough-Blenheim.
Gority, H. E., Insp. Test Dept., Penna., Dunlop.
Gormley, Jos., Train Master, Penna., Jackson.
Hartman, W. J., Gen. Air Brake Instr., Rock Island.
Hattory, M. M., M. C. R., South Manchuria Ry., Traymore.
Hein, J. F., Engineman, Penna., Ellwood.
Huber, H. G., Asst. M. M., Penna., Chalfonte.
Hurley, W. J., Supv. Mech. Exam., N. Y. C., Rudolph.
Ishiki, M. T., Imperial Govt. Rys., Traymore.
Jones, H. W., Shop Inspector, Penna., Elberon.
Keller, F. J., Engineer, Penna.
Kelley, O. J., M. M., B. & O. R. R., Haddon Hall.
Kilcoin, Thomas, Foreman Boiler Maker, A. C. & L., Traymore.
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Takaki, M. R., Imperial Govt. Rys. of Japan, Traymore.
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Treger, G., Asst. Road Foreman, Lehigh Valley, Jackson.
Tukushima, M. W., Asst. Mechanical Engineer, Imperial Government Ry., Traymore.
Vaughan, H. H., Asst. to V. P., Canadian Pacific Ry., Marlborough-Blenheim.
Webb, T. H., Foreman Tool Room, S. A. L.
Weidhesier, R. W., Engineer, Union Pacific, Commercial.
Wood, Arthur J., Asst. Prof. R. R. Mech. Eng., Arlington.
Yenami, M. T., Asst. Mechanical Engineer, Govt. Rys. of Japan, Traymore.

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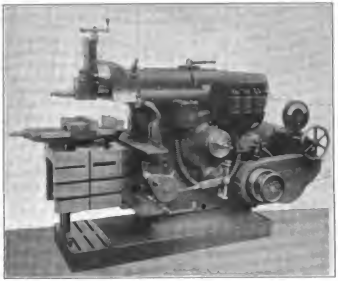
SHAPER FOR HEAVY SERVICE.

A shaper, specially designed for heavy railroad work, is being exhibited by Gould & Eberhardt, Newark, N. J. It is substantially designed and the frame is so constructed that the ways on each side of the ram are solid, insuring rigidity under heavy cuts. The gearing is more powerful



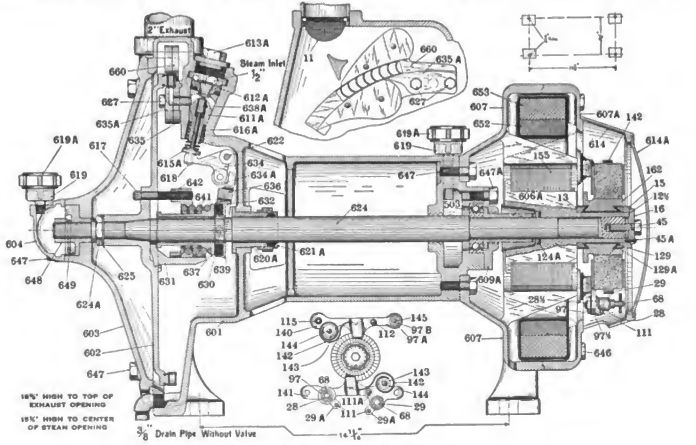
Heavy Duty Shaper.

than that provided in previous machines turned out by these makers and by means of a double train gear drive the machine may be run as fast as 115 strokes per minute.

The shaper is driven by an adjustable speed motor and is equipped with the Electrical Controller & Supply Company's automatic starter and dynamic brake, which enables the operator to start or stop the machine without any friction clutch or brake. The motor arrangement of this equipment is compact and the drive is made through gears from the motor to the machine. A back gear feature, controlled by a lever, is provided and enables the operator to quickly change the speed of the machine to suit his work; there are eight changes of speed for each change of stroke. The cross feed is simple and the amount of feed can be varied while the machine is in motion. The hole under the ram for key-seating shafts has been placed at one side, thus greatly improving and strengthening the machine by making the lever solid and raising the bull gear nearer the ram without changing the lower fulcrum; this adds to the power for heavy cuts at high speed. An oil pocket is provided in the base to catch all drippings and prevent them getting on the floor. The weight of the shaper is 5500 lbs.

PYLE NATIONAL ELECTRIC HEADLIGHT.

The Pyle National Electric Headlight Company, Chicago, is exhibiting its latest improved type E electric headlight. The steam consumption per electric horsepower has been greatly reduced, and the only care required is in the oiling of the turbine end at each strip and the replacing of the carbons. It is only necessary to lubricate the armature bearing once a week. There is no lubrication required on the inside of the machine. The lubrication between the governor sleeve and the governor ring, on which it bears, is accomplished by a composition graphite disc inserted in the ring. The apparatus is so designed that the entire machine may be completely dismantled in eight minutes and re-assembled in the same time. The company has made a special effort to make the machine as simple as possible. The barrel, or main casting, and the turbine yoke are cast in one piece. The generator yoke, or rear field frame, is



Pyle-National Electric Headlight, Type E.

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bolted to the barrel, as shown in the accompanying illustration. By removing the front field frame the field coils, armature and all the electrical end of the machine are readily accessible.

The shaft is ground to a fit for the various sleeves placed on it. It runs in a ball-bearing on the armature end and in a brass sleeve-bearing on the turbine end. The turbine end is provided with an oil ring, as shown in the illustration, which keeps the bearing oiled at the various heights of oil in the oil reservoir. The armature bearing is so arranged that any excess oil passing through the bearing will be drained from the casing so that it will not get into the field coils or the armature. The buckets in the turbine wheel are dovetailed into the ring and calked with a copper calking strip, after which they are welded across the top by the oxy-acetylene process. The steam is fed to the valve through a ½-inch pipe and passes through the vanes three times. The machine is regulated to operate at 2,800 r. p. m. by a tension spring governor, which consists of only three parts. This type of governor is used in contrast to the compression type, as it has been found that the turbine shaft will remain in a more perfect balance. The governor is carefully set before the machine leaves the works of the company, and any adjustments that are necessary, due to the wear of the valve, are made in the valve itself. The valve has a lift of only 1-16 in.

The field coils are compound wound, the series and shunt coils being bound together in a compact unit. The brush-holders and springs are so fixed in the casing that they require no attention, except when the carbon brushes have worn away. The generator will take a momentary overload of 100 per cent. From repeated tests it has been found that this headlight will use about 200 lbs. of steam per hour for the full equipment, which is the equivalent of 140 lbs. per h. p. hour. Each machine is given a running test of two hours before it leaves the factory.

REED GEARED-HEAD LATHE.

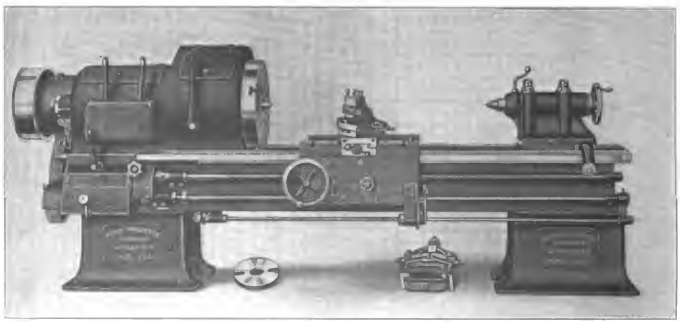
The lathe shown in the illustration is manufactured by the Reed-Prentice Company, Worcester, Mass., and is a 20 in. machine of the geared-head type. There are 13 gears with which 18 spindle speeds may be obtained. Any of these speeds may be instantly obtained and as the gears are always in mesh, it is almost impossible to damage them, the shock when changing speed being taken care of by a friction clutch. Tbis clutch makes it possible to change speed quickly and safely while the lathe is working. A single pulley drive is used, the pulley running on ball-bearings.

The lathe is equipped with a spindle reversing mechanism in the head-stock by which the spindle can be started, stopped or reversed through a handle located at the right-hand end of the carriage. This brings all the necessary changes within control of the operator without his having to move about. The machine is equipped with the Reed quick change gear box which gives 60 changes to both the lead screw and feed rod; all the gears in the front box are made of steel. The reverse lever at the front of the apron moves a double bevel pinion and can be set for feeding in either direction, or in a neutral position which will stop all gearing in the apron. An automatic lock-out connected with the reverse lever makes it impossible to engage the lead screw and the feed rod at the same time; the bearings are all large and well provided with oiling facilities. The lathe can be arranged for motor drive if desired, the motor being mounted on a bracket attached to the rear of the head-stock leg.

HEAT TREATED STEEL AXLES.

The effect of correct heat treatment on carbon steel axles is well demonstrated by the exhibit of the Pollak Steel Company, Cincinnati, Ohio. Two axles of ordinary open hearth steel of 45-point carbon content which have gone through a special process of heat treatment are shown. One is bent cold through 180 degrees by a 250-ton press, while another is bent cold flat on itself under a 20-ton steam hammer, in both cases without evidence of distress or rupture of material.

Another unique feature of this exhibit is a half forged car axle, showing half of the axle forged and the other half in the billet state. This gives an excellent idea of how much reduction in forging from the square billet to the finished axle should be given to secure material that has been properly forged.



Reed 20-inch Geared Head Lathe.

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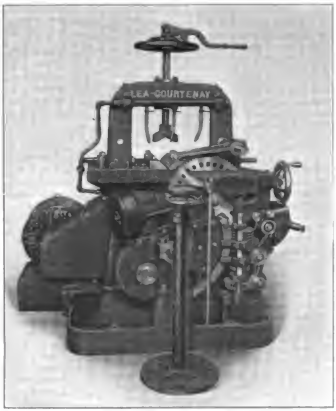
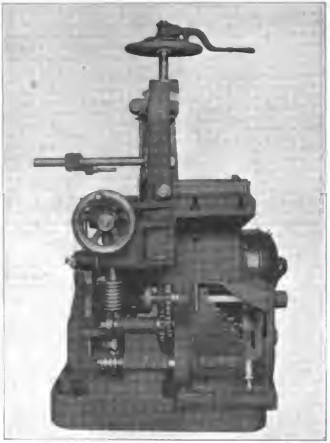
COLD METAL SAW.

The Lea-Courtney Company, Inc., New York, are exhibiting two of their sprocket driven cold metal saws, one of which is fitted with an inserted tooth blade. These machines are driven by variable speed motors and the general design is the same in all of the sizes, except the larger ones, where there are some slight differences in the details of the swing arm. The frame is made in two pieces, the upper part being joined to the base at a point slightly above the level of the liquid in the lubricating tank, so as to guard against all leakage, and the two sections are securety bolted together to secure rigidity and correct alinement. The swing arm or saw carriage turns on heavy trunnions, one of which is mounted on the center of the frame and the other is supported on the outside by an outboard bearing over a heavy pedestal. The trunnion next to the frame is fitted with an oilless bearing because its location makes it probable that an operator would neglect to oil it. The saw is fed into the work by means of a heavy quadrant working against a large worm on the vertical shaft. The power is transmitted from the main drive shaft to the sprocket shaft by means of heavy gears. The spur gears are of cast steel and the two bevel gears are planed from a high grade of tool steel. The feed mechanism is the result of much experimenting to eliminate the weaknesses of previous construction. On the No. 21 machine any one of nine different rates of feed can be obtained almost instantly by moving a lever. The feed box is driven by means of a roller chain, taking its power from the main drive shaft of the machine. The capacity of these saws ranges from 3½ in. to 8½ in. on round bars and on square bars from 3½ in. to 8¼ in., depending on the size of the machine.



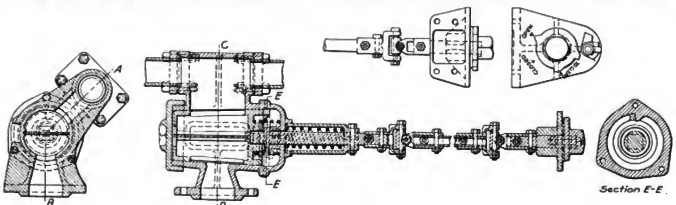
Cold Metal Saw.



Rear View of Lea-Courtenay Cold Metal Saw.

TANK AND STRAINER VALVE.

The device shown in the illustrations is intended to perform the functions of both the tank valve and the injector strainer valve ordinarily used on locomotives. It is operated by a



Franklin Tank and Strainer Valve.

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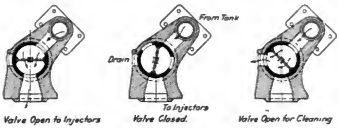
key and is held in an open position by means of a spring; to close the valve the key is turned to the right, this operation closing both ports. In order to clean the strainer the movement of the key is continued to the right until the port from the tank is open and the drain on the opposite side of the screen is also open. In bringing the valve to this position, the screen is reversed so that the flow of water through it is opposite to its normal flow when the valve is in the open position, resulting in a thorough cleansing action on the screen. An indicator is provided from which



Sections Through Franklin Tank and Strainer Valve, Showing Valve Positions.

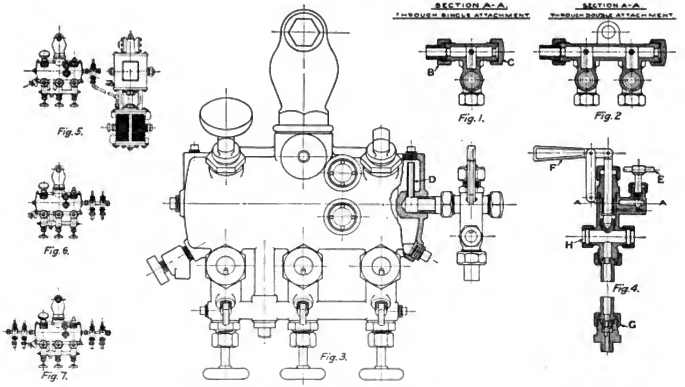
the operating rods extend to the valve, and a dog is placed on this indicator for holding the valve in either the closed or cleaning position. The valve is connected so that it is operated from the outside, making it unnecessary for the operator to go under the tender. It is manufactured by the Franklin Railway Supply Company, New York, and can be used either with the ordinary hose connection, or with the Franklin water joint.

OILING THE AIR CYLINDERS OF AIR PUMPS.

The proper lubrication of the air cylinders of locomotive air pumps is a troublesome problem; very little oil is required, and a surplus causes the cylinder to gum up. Automatic oilers have been tried, and also oiling devices attached directly to the lubricator, but the automatic oilers, as a rule, are very difficult to regulate, and the oilers attached to the lubricators are liable to be left open by the operators and the air cylinder then becomes flooded with oil.

The Nathan Manufacturing Company, New York, has developed a device which, it is claimed, solves this problem in a satisfactory manner. It consists of a chamber connected to the lubricator by means of the union connection *B*, and is so constructed that it may be attached to either side of the lubricator by simply exchanging this connection with the cap *C*. The oil is supplied to the lubricator from the pipe *D*, and the rate of flow is regulated by means of the screw valve *E*. The small passage beneath the valve *E* is filled with oil, and when lubrication of the air cylinder is desired, the operator pulls down the lever *F* for an instant and then lets it go. The valve attached to the lever *F* then closes automatically and it is, therefore, impossible for the operator to leave the valve open and flood the air cylinder with oil. At the point where the usual oiler screws into the top of the air cylinder, a check valve *G* is attached. The arrangement is made either single as shown in Figs. 1 and 4, or double, as shown in Fig. 2. The sight-feed *H* enables the operator to observe the flow of oil. The general arrangement of the attachment is shown in Fig. 5, while Fig. 6 shows a double attachment connected to the right side of the lubricator, and Fig. 7 a double device attached to both sides of the lubricator. It will thus be seen that all possible requirements may be complied with by either a single, one double or two double attachments.

IMPROVED CAST STEEL SIDE FRAME.—The Buckeye Steel Castings Company, Columbus, Ohio, has on exhibition a type of cast steel side frame which does away with half the usual number of journal box bolts, and still allows the use of the standard M. C. B. journal box. The two journal box bolts that are used with each truck frame, instead of four, are relieved of much of their work without introducing a special design of journal box or bolt.



Arrangement of Device for Lubricating the Air Cylinders of Air Pumps.

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Railway Age Gazette

DAILY EDITION

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Vol. 54. NEW YORK—JUNE 14, 1913—ATLANTIC CITY No. 24b.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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United States and Mexico	$8.00
Canada	8.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily Issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE that of this issue more than 9,300 copies were printed; that of these more than 9,200 copies, 7,048 were mailed to regular paid subscribers, 200 were provided for counter and news companies' sales; and 1,700 were printed for distribution at Atlantic City and for use as sample copies.

JOWDEN BELL'S paper on three-cylinder locomotives is an historical review of some of the more noteworthy engines of that class. The discussion was brief, presumably because of the lack of experience of the members with that class of motive power. But from what was said, in discussion as well as from the contex and of the paper itself, it appears that the design has much to recommend it, both on the basis of uniformity of turning movement and increased tractive effort without encroaching on the clearance space, as would be done by an increase of cylinder diameter with a two-cylinder machine. The fact that the Philadelphia & Reading has a number of engines of Mr. Taylor's design in satisfactory operation, and that the Midland of England has over a hundred of the Smith locomotives in service and finds that they effect a coal saving as compared with the ordinary locomotive, indicates that there is a basis for the claims of those who are advocates of this design.

IT has been suggested before in these columns that it would be to the advantage of all concerned if the American Society for Testing Materials would keep in a somewhat closer touch with the members of the mechanical associations, before adopting specifications which the latter are to use. This is exemplified, in a small way, by the report on specifications for materials used in locomotive construction, which is merely a report on boiler tube specifications. The specifications of the Society for Testing Materials are not acceptable, as they stand, to the Master Mechanics' Association. Hence, they have been revised, and now it will be necessary for the Society for Testing Materials to either blindly adopt the specifications that were sent to letter ballot yesterday or issue those to which no one will pay attention or use. It emphasizes the necessity of co-ordinating the work of the two associations in the same way that has been done by the Master Car Builders' and the Master Mechanics' Associations, if satisfactory and acceptable specifications are to be obtained.

IT is rather staggering, this talk of a cast iron wheel for tenders of 140,000 lbs. capacity, when we remember how few years ago it was that the car of 60,000 lbs. capacity was thought to be the last word in big cars. The problems involved in the use of such a wheel load, using, as it does, 23,000 lbs. or so per wheel, are by no means easy of solution. Dr. Dudley's suggestion that the coning of the standard wheel is too sharp and throws an excessive load on the inside of the rail head is but one of the points involved. And though the relation of the wheel and rail has been the subject of constant attention ever since the publication of M. N. Forney's historic paper on the subject before the Master Car Builders' Association in the eighties, the question has not yet been settled. And now, with these heavier loads, the cast iron wheel makers are asking for another eighth of an inch of guard rail spacing in order to permit of strengthening the flange. This request has the support of many car builders and, if it is granted, will give a new lease of life to the cast iron wheel. On the score of safety it seems quite feasible to adopt this wider spacing, and it remains to be seen whether or not the American Railway Association will grant the request should the Master Car Builders' Association decide to formally prefer it.

THE American Railway Engineering Association, which meets at Chicago each year during March, conducts its meetings in a way which might be studied with profit by members of the Master Mechanics' and Master Car Builders' Associations. In the first place, the reports are published in the association bulletins which are issued during the year, thus giving the members ample opportunity to thoroughly check over and digest them before the annual meeting. When a report is called for at the convention all the members of the committee, and there are usually eight or ten of them, go to the platform and seat themselves behind a long table which extends practically the full width of the platform. As the convention attendants are all supposed to be familiar with the report the Chairman does not attempt to present it in detail, but places it before the convention with a few brief introductory remarks, unless he has additional information to present which was not incorporated in the printed report. It is then open for discussion, and as various questions or criticisms are brought up, they are referred to the member of the committee who is best able to answer or reply to them. The sight of the committee seated in a long row on the platform is impressive, and one cannot but be struck by the businesslike and earnest way in which the meetings are conducted.

IN view of the general character of the replies to the series of questions sent to the railroads by the committee on the Use of Special Alloys and Heat-Treated Steel in Locomotive Construction it would seem that the convention acted wisely in continuing the committee. The subject is a broad one and while it seems to be the concensus of opinion that the association should have such specifications, the actual preparation of these can well be continued for another year at least in order that the results of further experiments and service may be utilized. Although the discussion of the report was quite limited, it brought out the fact that the use of heat-treated carbon steel in axles has not always produced desirable service results. The Chicago, Milwaukee & St. Paul reported very unsatisfactory service from such axles used under 200 locomotives; on planing down the axles that had failed it was found that cracks began to develop about four inches from the surface and that beyond that the metal could be fractured with great ease. On the Central of Georgia a number of axles failed after from four to six weeks service. In view of these facts it would seem desirable that some steps be taken to determine the cause and remedy

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for the trouble and it is probable that the committee has this in mind. The report also brought out the fact that vanadium is being extensively used in locomotive frames.

AFTER all that has been said and written on the subject of smoke abatement and the numerous devices that have been applied to locomotives to prevent the making of black smoke, it is gratifying to learn from the report of the committee on Smoke Prevention that such a simple procedure as the injection of air into the firebox by means of steam jets solves the problem. It was brought out in the discussion of the report that the idea is not a new one, but it is nevertheless so effective that a large number of locomotives operating in the city of Chicago are now equipped with the necessary apparatus and the chairman of the committee, E. W. Pratt of the Chicago & North Western, stated that no one need have the least apprehension about the failure of the jet system to abate the smoke on any locomotive to which it is applied. While the fact of smoke abatement in itself demonstrates that there is more complete combustion, it is particularly interesting to learn that apparently the steam-jet tubes reduce the weight of sparks discharged from the stack and that there is an increase in the equivalent evaporation and a corresponding increase in economy. It was also brought out that the use of the brick arch gave an increase in evaporation of about 8.6 per cent., but the steam jets increase the equivalent evaporation whether a brick arch is used or not.

TESTS WITH SUPERHEATED STEAM.

IN some respects, the appendix to the report of the committee on superheater locomotives, which gives the results of an elaborate series of comparative tests made with otherwise exactly duplicate locomotives, one having a Schmidt superheater and the other without a superheater, on the locomotive testing plant at Altoona, is the most valuable contribution to the proceedings of the Association that has been offered for many years. It forms a book of 192 pages and includes over 100 charts and 30 tables. Conclusive results are given on several features of locomotive design over which there has been considerable difference of opinion. The saving of coal and water by the use of superheated steam is about what has been shown by other tests and by regular service. The increase in the capacity of the locomotive by the application of a superheater has also been generally understood, but it is doubtful if its amount has been fully appreciated. On the other hand, the temperature at various points in the tubes, the most desirable ratio of tube length to its diameter, the pressure and temperature at various points in the path of the steam throughout its course from the throttle to the cylinders, the most desirable point of cut-off, the proper relation of the diameter of the cylinders, the effect of throttling and a number of other similar questions are here, for the first time, answered with confidence.

One of the most interesting results of these tests is the amount of power it is possible to obtain from an Atlantic type locomotive using superheated steam. To be sure this is an exceptionally heavy locomotive, much heavier than could be used on most roads, but it comes as a surprise to find that over 2,200 indicated horsepower can be obtained with a locomotive of this type. Furthermore, the water rate, or pounds of steam used per indicated horsepower hour, at the higher powers is a record for locomotive practice. At 84.4 miles an hour, when the locomotive had an indicated horsepower of nearly 2,000, the water rate was 15.81 lbs. At 1,360 horsepower the minimum coal consumption of 2.29 lbs. per indicated horsepower hour was obtained.

For the conditions on the Pennsylvania a ratio of 100 between the diameter and length of the tubes is recommended, although it is pointed out that the most desirable length of tube depends on how much the designer is willing to sacrifice in boiler efficiency to obtain rapid evaporation. The temperature investigations throughout the length of the tubes showed that there is a rapid drop for a distance of three or four feet from the firebox end, after which the drop is much more gradual until the curve becomes flat toward the smokebox end. There is also a large drop between the temperature of the firebox and just inside the end of the tubes. Firebox temperatures from 2,000 to 2,400 degrees were obtained, while the maximum temperatures in the tubes was from 1,370 to 1,620 degrees. The location of the tube in the boiler has little influence on the temperature. Those at the bottom are as hot as those at the top. The superheater flues were uniformly from 100 to 200 degrees hotter than the tubes, due to the larger volumes of gases passing through them.

The drop in pressure between the boiler and the branch pipe increases regularly with the increase in power and did not exceed 14 lbs. at the maximum. This difference, however, is largely offset by the accompanying increase in steam volume resulting from the increase in superheat and the corresponding decrease in the heat supplied to the cylinders per stroke. At the front return bend of the superheater under conditions of maximum steam flow there is a drop of 4.2 lbs.

An increase in the output of the boiler is accompanied by a direct increase in the amount of superheat in the branch pipe. At horsepowers above 700 there was found an increase of approximately one degree for each increase of 15.3 indicated horsepower. In connection with the finding, however, the report draws attention to other factors which might alter it when applied to other locomotives. It is also shown that the amount of superheat cannot be increased at a given cut-off without an increase in speed. An investigation of the back pressure develops that, for the same work done, superheated steam exhausts with less than half the least back pressure with saturated steam.

Attention was drawn by Mr. Vaughan to two most interesting sets of curves given in the report. These show the coal and steam consumption at various horsepowers for both locomotives and indicate the economy and increased capacity in a striking manner. The fuel consumption at power below 500 horsepower shows little difference in the two locomotives, but from that point the consumption on the saturated locomotive rises very rapidly until it reaches over 5 lbs. at 1,300 horsepower, which is the limit of capacity of this locomotive. The consumption in the superheater locomotive, on the contrary, is well below 3 lbs., up to 1400 horsepower, and does not reach 4 lbs. at 1800 horsepower. As regards steam consumption it is shown that one of the causes for the limitations of the saturated locomotive is the increase in the water rate at the higher powers. The contrary is true with superheated steam and it continued to decrease up to the limit of capacity of the locomotive.

From this data conclusions are drawn that the application of the superheater increased the economy of this locomotive from a minimum of 12 per cent. to a maximum of 40 per cent., and that, in addition, a capacity of 30 per cent. greater can be obtained beyond the capacity when using saturated steam. The increase in capacity is about the same as the theoretical increase in the volume of the steam in the two cases. It is the 30 per cent. less weight of steam used which in a large measure is believed to account for the economy, as it results in a smaller amount of heat being discharged through the exhaust. A smaller total quantity of heat is supplied and a larger percentage utilized.

The report states that it would seem logical from these economies in water and fuel, that any locomotive which is being converted from a saturated to a superheated steam locomotive should have enlarged cylinders so long as the proper coefficient of adhesions is not exceeded. Such a locomotive will maintain its steam pressure through a wider range of power and there will be less chance of insufficient steam supply at the highest speeds.

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TO-DAY'S AND SUNDAY'S PROGRAMS.

SATURDAY, JUNE 14.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

SUNDAY, JUNE 15.

Concert, 11.00 A. M.—Marlborough-Blenheim Hotel Orchestra Jacques Kinsbergen, musical director: Prelude and Intermezzo from Cavalleria Rusticana (*Mascagni*); (A) Ave Maria (*Gounod*); (B) Mighty Lake Rose (*Nevin*); Andante Religiosa (*Thome*); 'Cello Solo; Norwegian Folk Song (*Ole Bull*); Mr. Carl Johner; Serenade, Le Millions D'Arlequin (*Drigo*); Dreams (*Wagner*); (A) There is a Green Hill Far Away (*Gounod*); (B) Pastoral Dance (*German*); Fantaisie Lohengrin (Wagner).

Concert, 8.45 P. M.—Overture Mignon (*Thome*); Piano Solo, A Flat Major Polonaise (*Chopin*); Mr. Joseph Lanin, Fantaisie, La Boheme (*Puccini*); Violin Solo, Gypsy Airs (*Sarasate*), Mr. Jacques Kingsbergen; Cansette (*Schindler*); 'Cello Solo, Antante Cantabile (*Cui*); Fantaisie Faust (*Gounod*).

CONVENTION OF RAILWAY ELECTRICAL ENGINEERS.

The semi-annual meeting of the Association of Railway Electrical Engineers will be held in Atlantic City, June 16, at the Dennis Hotel.

ANNUAL MEETING R. S. M. A.

The annual meeting of the Railway Supply Manufacturers' Association will be held in Convention Hall this morning at 10:30 to elect officers and transact any other business that may come before the meeting.

MUSICALE.

An instrumental and vocal concert was given at the entrance hall of the Million Dollar Pier last evening, by Eugene Engel's orchestra. The committee in charge was composed of Messrs. Sherman (chairman), Toothe, Crowe, Nealley, Sheridan, Chaffee, Fettinger and Landreth.

PURDUE DINNER.

The annual dinner of Purdue men at the convention will be held at the Shelburne Hotel this evening at 6.30. Dean Benjamin and Prof. Endsley will be present and a large number of Purdue men have already signified their intention of attending. All Purdue men are requested to register at the booth of the *Railway and Engineering Review*.

B. & O. CLUB.

The annual meeting of the B. & O. Club will be held in the Park Place hall of the Marlborough-Blenheim hotel at 3.30 p. m. next Monday afternoon, June 16. The hall is on the Blenheim side of the hotel, one can be reached by entering that side, and turning to the right.

The first meeting of the club, called for the purpose of organizing it, was held during the conventions last year. All present or former employes of the Baltimore & Ohio attending the conventions, whether the mechanical department or not, are eligible to membership.

C. F. Giles, superintendent of machinery of the Louisville & Nashville, was elected president and C. L. Sullivan, sales manager of the Cowles-McDowell Engineering Company, secretary last year. A committee composed of S. M. Dolin, American Car & Foundry Company, A. Gordon Jones, General Railway Supplies, and J. Snowden Bell, was appointed to draft a constitution and by-laws. This committee will present its report for action Monday; and officers for the next year will be elected The transaction of business will be followed by a social time.

SUPPLY ASSOCIATION DISTRICT ELECTIONS.

Results of the district elections held Friday for members of the executive committee of the Railway Supply Manufacturers' Association were as follows:

Second district (New York and New Jersey)—C. B. Yardley, Jr., Jenkins Bros. and J. C. Currie, Nathan Manufacturing Company.

Fourth district (Ohio, Indiana and Michigan)—C. F. Elliott, Acme White Lead & Color Works.

Fifth district (Illinois, Wisconsin, Iowa and Minnesota)—Joseph H. Kuhns, Republic Rubber Company.

SOCIETY OF RAILWAY CLUB SECRETARIES.

This paragraph is a reminder to officers of railroad clubs and others that the Society of Railway Club Secretaries has an informal luncheon today at 12.30 P. M. at the Hotel Strand. No invitations have been issued, and the secretaries will be glad to welcome around the board all of their friends who have the time and inclination to participate. The luncheon takes the place of the annual dinner of former years to accommodate those whose time is much taken up in the evening with engagements.

Preceding the luncheon the secretaries will have their annual business meeting in Apartment 5 of the Marlborough-Blenheim.

M. K. BARNUM GOES TO THE BALTIMORE & OHIO.

M. K. Barnum, general superintendent of motive power of the Illinois Central, will go to the Baltimore & Ohio on July 1, to take the office of general mechanical inspector of that road. Thus Mr. Barnum once more becomes associated with Daniel Willard, president of the B. & O., and F. H. Clark, its general superintendent of motive power. When Mr. Willard was vice-president of the Burlington and Mr. Clark superintendent of motive power, Mr. Barnum was general inspector of machinery and equipment of that road, reporting direct to the vice-president.

Mr. Barnum is so well known to those attending the conventions as to make superfluous mention of his many admirable qualities personally and as a railway officer. He first entered railway service on the Erie, and was successively machinist, mechanical inspector and general foreman of that road. He was later assistant master mechanic of the Santa Fe at Argentine, Kan.; superintendent of the Union Pacific shops at Cheyenne, Wyo., and district foreman and division master mechanic of the same road. He has served since then as assistant mechanical superintendent of the Southern, as superintendent of motive power of the Rock Island, in the capacity already mentioned on the Burlington, and as general superintendent of motive power of the Illinois Central.

Mr. Barnum returned to Atlantic City yesterday from New York, where he conferred with President Willard.

LACK OF RAILWAYS IN CHINA.—Neither the province of Kwangsi nor that of Kweichow nor the section of Yunnan supplied by Wuchow has any railways. The existence of a Kwangsi provincial railway company is made known whenever any suggestion is made that foreign capital be employed to build railways in the province; further than that, however, it has accomplished nothing to date. Three lines of railway for Kwangsi have been projected by the Ministry of Posts and Communications, but no one of them has as yet progressed beyond the projected stage.

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MASTER MECHANICS' ASSOCIATION PROCEEDINGS.

Reports on Superheaters, Heat-Treated Steel, Smoke Prevention, Three-Cylinder Locomotives, Tender Wheels.

President Crawford called the third session to order at 9.30 a. m. Friday morning.

SPECIFICATIONS FOR MATERIALS USED IN LOCOMOTIVE CONSTRUCTION.

After conferring with subcommittee X of the American Society for Testing Materials, the specifications which follow have been prepared covering lap-welded and steel boiler tubes. These specifications do not differ greatly from those of the American Society for Testing Materials. They have, however, been amplified by including arch tubes and the large superheater tubes, instead of being confined to tubes of 2½ in. in diameter and less. The paragraph describing the method of making the flange test has been introduced, and some other changes of a minor nature made.

The report is signed by:—W. C. A. Henry (Penna.), chairman; H. T. Bentley (C. & N. W.); H. E. Smith (L. S. & M. S.); Frank Zeleny (C. B. & Q.), and A. G. Trumbull (Erie).

SPECIFICATIONS FOR LAP-WELDED AND SEAMLESS STEEL BOILER TUBES, SAFE ENDS, AND ARCH TUBES.

MANUFACTURE.

1. The steel shall be made by the open-hearth process.

CHEMICAL PROPERTIES AND TESTS.

2. The steel shall conform to the following requirements as to chemical composition.

Carbon	0.08—0.18 per cent.
Manganese	0.30—0.50 per cent.
Phosphorus	not over 0.04 per cent.
Sulphur	not over 0.045 per cent.

3. (a) Analyses of two tubes in each lot of 250 or less may

W. C. A. HENRY,

Chairman, Committee on Specifications for Materials Used in Locomotive Construction.

be made by the purchaser, which shall conform to the requirements specified in Section 2. Drillings for analyses shall be taken from several points around each tube.

(b) If the analysis of only one tube does not conform to the requirements specified, analyses of two additional tubes from the same lot shall be made, each of which shall conform to the requirements specified.

PHYSICAL PROPERTIES AND TESTS.

4. (a) A test specimen not less than 4 in. in length shall have a flange turned over at right angles to the body of the tubes without showing cracks or flaws. This flange as measured from the outside of the tube shall be ¾ in. wide for tubes 2½ in. or less outside diameter, and ½ in. wide for tubes larger than 2½ in. outside diameter.

(b) In making the flange test, it is recommended that the flaring tool and die block as shown he used.

5. A test specimen 4 in. in length shall stand hammering flat until the inside walls are in contact, without cracking at the edges or elsewhere. For lap-welded tubes, care shall be taken that the weld is not located at the point of maximum bending.

6. A test specimen 2½ in. in length shall stand crushing longitudinally until the outside folds of metal are in contact, without showing cracks or flaws.

7. Tubes under 5 in. in diameter shall stand an internal hydraulic pressure of 1,000 lbs. per sq. in. and tubes 5 in. in diameter or over, an internal hydraulic pressure of 800 lbs. per sq. in.

8. (a) Test specimens shall consist of sections cut from tubes selected by the inspector representing the purchaser from the lot offered for shipment. They shall be smooth on the ends and free from burrs.

(b) All specimens shall be tested cold.

9. One flange, one flattening and one crush test shall be made from each of two tubes in each lot of 250 or less. Each tube shall be subjected to the hydraulic test.

10. If the results of the physical tests of only one tube from any lot do not conform to the requirements specified in Sections 4, 5 or 6, retests of two additional tubes from the same lot shall be made, each of which shall conform to the requirements specified.

STANDARD WEIGHTS.

11. The standard weights for tubes of various outside diameters and thicknesses are as follows:

Outside Diameter.	Thickness (Inches). .095	.110	0.125	0.135	0.150	0.165	0.180
Inches.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
1.75	1.68	1.93	2.17	2.33	2.56	....	....
2.00	1.93	2.22	2.50	2.69	2.96	....	....
2.25	2.18	2.51	2.83	3.05	3.36	....	....
2.50	2.44	2.81	3.17	3.41	3.77	4.09	4.41
3.00	....	3.40	3.84	4.13	4.57	4.93	5.30
3.50	....	....	4.51	4.85	5.37	5.81	6.31
4.00	....	....	....	5.57	6.17	6.76	7.26
4.50	....	....	....	....	6.97	7.64	8.30
5.00	....	....	....	....	7.77	8.52	9.27
5.25	....	....	....	....	8.17	8.96	9.75
5.375	....	....	....	....	8.37	9.18	9.99
5.50	....	....	....	....	8.57	9.40	10.23
6.00	....	....	....	....	9.37	10.28	11.19

12. The weight of the tubes shall not vary more than 5 per cent. from that specified in Section 11.

WORKMANSHIP AND FINISH

13. (a) The finished tubes shall be circular within 0.02 in. and the mean outside diameter shall not vary more than 0.015 in. from the size ordered. The thickness at any point shall not vary more than 10 per cent. from that specified. The length shall not be less, but may be 0.125 in. more than that ordered.

14 The finished tubes shall be free from injurious defects and shall have a workmanlike finish. They shall be free from kinks, bends and buckles.

MARKING.

15. The name or brand of the manufacturer and "Tested at 1,000 lbs." for tubes from 0.125 to 0.180 in., thickness of material, or "Tested at 900 lbs.," for tubes less than 0.125 in. thickness of material, shall be legibly stenciled in white on each tube.

INSPECTION AND REJECTION.

16. The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the tubes ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the tubes are being furnished in accordance with these specifications. All tests except check analyses and inspection shall be made at the place of manufacture prior to shipment unless otherwise specified, and are to be so conducted as not to interfere unnecessarily with the operation of the works.

(a) Tubes when inserted in the boiler shall stand expanding and beading without showing cracks or flaws, or opening at the weld. Tubes which fail in this manner will be rejected and the manufacturer shall be notified.

17. (b) Unless otherwise specified, any rejection based on tests made in accordance with Section 3 shall be reported within five working days from the receipt of samples.

18. Samples tested in accordance with Section 3, which represents rejected tubes, shall be preserved for two weeks from

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the date of the test report. In case of dissatisfaction with the results of the test the manufacturer may make claim for a retesting within that time.

The report was received and referred to letter ballot for adoption as recommended practice.

SUPERHEATER LOCOMOTIVES.

Since the last report there has been an increase in the number of locomotives in the United States and Canada using superheated steam to 8,822, or more than 100 per cent. Reports from the users indicate that they have been uniformly satisfactory. The troubles that were feared with packing and valves, due to the high temperature of superheated steam, have not developed to any great degree, and where there has been any trouble it has been overcome largely, if not entirely, by the use of good material for the parts in question. It is conceded generally that it is necessary to have cylinders, cylinder bushings, valves and valve bushings made of close-grained iron rather harder than is absolutely necessary when using saturated steam, and that iron low in phosphorus and silicon is desirable.

The committee has not been able to determine any definite figure on the comparative cost of maintaining superheated and saturated steam locomotives, but the general concensus of opinion seems to be that the increase, if any, in the cost of maintenance is not going to be of sufficient moment to influence the question one way or the other.

During the year the Pennsylvania Railroad started a series of tests contemplating the comparison of two Atlantic type locomotives, two Pacific and two consolidation locomotives, of modern size, one of each type equipped with Schmidt superheater, and the other using saturated steam. The tests of the Atlantic and Pacific type locomotives have been completed, and copy of report upon the Atlantic type locomotive is given in complete detail as an appendix to this report. The work on the Pacific and consolidation type locomotives is not yet in such shape as to warrant figures being given out, but at least a résume of the results will be given in next year's report.

The members of the committee concur in the conclusions appended to this test.

The report is signed by:—J. T. Wallis, (P. R. R.), chairman; C. H. Hogan, (N. Y. C. & H. R.); R. W. Bell, (I. C.); Thomas Roope, (C., B. & Q.); W. J. Tollerton, (C. R. I. & P.); H. H. Vaughan, (C. P.), and J. R. Gould, (C. & O.).

[The report of the tests on the Altoona locomotive testing plant on superheater and saturated steam locomotives, which forms an appendix to this report, is too voluminous to be covered here. It will be reproduced in full in this regular weekly and mechanical editions of the *Railway Age Gazette*. The conclusions of the tests are given below.—EDITOR.]

BOILER.

Previous tests have indicated, and the results obtained with this locomotive confirm the conclusion, that the locomotive boiler surfaces absorb a fixed amount of heat from each cubic foot or from each pound of the gases of combustion flowing past them, and the increase in evaporation is due to the increase in weight or quantity of the gases of combustion, and to no other cause. This being true, the capacity of the boiler is fixed by limitations of combustion upon the grate, and not by a failure of the boiler surfaces to absorb heat.

The limit of boiler capacity with this locomotive was reached at a rate of coal burning of approximately 7000 lbs. per hour, and, therefore, whether or not a stoker is required to efficiently handle this locomotive will depend upon the length of grades to be ascended and the requirements of continual heavy loading.

These tests furnish us with additional information on flue lengths which is of value. The short tubes show an advantage in activity of combustion and also in rapidity of evaporation, with an attending lower efficiency of the boiler, and we conclude that:

(*a*) The most desirable length of tube depends upon how much the designer is willing to sacrifice in boiler efficiency to obtain rapid evaporation with some loss of heat.

(*b*) There is a rapid decrease of temperature in the tubes for a distance of three or four feet from the firebox end, after which the temperature drop is more gradual until, with this short tube, the curve of tube temperature becomes flat toward the smokebox end, and therefore the heat transfer at the firebox end of this tube is much higher than at the smokebox end.

(*c*) The temperature of the superheater flue is in all cases from 100 to 200 degrees higher than the temperature in the boiler tube. This is probably due to the larger volume of gases passing a hot tube surface, namely, the superheater units.

(*d*) Observations made on other locomotives indicate that there is little if any difference in temperature of flues as far as their location in the sheet is concerned.

(*e*) From the boiler efficiency obtained with this locomotive, the form of the curve of temperature drop in the tubes, and the high smokebox temperature, slightly longer tubes seem desirable.

ENGINES.

For a given cut-off, the water rate decreases with an increase in superheat, the rate of decrease apparently being faster at the shorter cut-offs. For a given water rate the superheat increases with an increase in cut-off, the increase in cut-off causing a higher draft on the fire and an attending increase in power output.

Remembering that 30 per cent. less weight of steam is used when superheating, it is this fact which in a large measure results in a lower amount of heat discharged through the exhaust. A smaller total quantity of heat is supplied and a larger percentage utilized, and therefore an economy is brought about by the reduction of waste heat through the exhaust.

In exhausting steam from a locomotive cylinder it has been found that, for the same work done, less than one-half the least back pressure is required as compared with these cylinders operating with saturated steam.

LOCOMOTIVE.

In Bulletin 19, when discussing the K29 locomotive, conclusion 9 on page 144 was drawn that an economy in water approximately 30 per cent. and in coal of between 20 and 30 per cent. might be expected when using highly superheated steam with a boiler pressure of 200 pounds per square inch. This conclusion is confirmed by these E6s tests, and the additional conclusion seems to be warranted that, when approaching the limit of the saturated steam locomotive, a saving as high as 50 per cent. may be expected, and that the application of the superheater justifies itself by an increased maximum capacity over the saturated steam locomotive of not less than 30 per cent.

If we assume a limit of 1400 dynamometer horse-power for the E6s locomotive, the E6s may be expected to produce 1850 dynamometer horse-power, or an increase of 32 per cent.; this marks the increased power which may be expected by superheating.

The application of the superheater to this locomotive increases its economy from a minimum of 23 per cent. to a maximum of 46 per cent., the economy increasing with the increased power required of the locomotive.

It was found that 30 per cent. higher capacity was derived from the E6s locomotive when using superheated steam than with the same size and type of locomotive using saturated steam.

When conditions are such that the starting of trains, and low speeds up to approximately 30 miles per hour, are not factors in tonnage rating, the application of the superheater to a passenger locomotive permits an increase of rating of approximately 30 per cent. If the starting of heavy trains and low speeds of operation are factors in establishing the tonnage rating, there is nothing in these tests to indicate that the superheater locomotive should have a lower rating than the saturated steam locomotive.

From the results obtained in the tests we believe that any locomotive in being converted from saturated to superheated steam should, with the application of the superheater, have enlarged cylinders, the results indicating that for the purpose of obtaining maximum economy the extent of the cylinder enlargement should be such that the maximum indicated horse-power may be developed at a cut-off not exceeding 30 per cent.

DISCUSSION.

H. T. Bentley, (C. & N. W.): I move that the thanks of the Association be tendered to Messrs. Wallis and Young and the Pennsylvania Railroad for their assistance in giving us this splendid paper. (The motion was carried).

H. H. Vaughn, (San Pac.): I think the diagrams showing the coal per dynamometer horse-power hour, and the steam per dynamometer horse-power, calculated with reference to the horse-power, are about the most remarkable illustrations that we have ever had of the gain that is obtained by the attachment of superheater to a locomotive. One of the most remarkable features is the way in which the capacity of the superheater locomotive goes up and the amount of power it can develop, while the saturated steam locomotive comes to an absolute stop at about 1,300 h. p. The curve shows at that point that the engine is simply done, there is no more to it, whereas a superheater steam locomotive of the same size

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is still going on and giving increased horse-power as required.

Henry Fowler (Midland Railway, England): Of course, on our side we shall welcome very heartily the free way in which these exhaustive experiments have been presented. It is something that I am afraid we do not develop in the same way on our side of the water, but nevertheless, we shall use them to the same advantage, and we also feel a great indebtedness to the Pennsylvania Railroad, to Mr. Young and also the Master Mechanics' Association. There is one point I would question, and that is whether they open the fire-hole door, it appears that the steam pressure went up. I do not know if Mr. Young has any figures to show how the efficiency goes, but it has always been our aim on our side to get the firemen to keep the doors closed, which we believe under ordinary circumstances, is the best condition.

C. D. Young: This is the second application we have made of this principle, and we have noticed the same characteristic when the grate surface is being forced to a burning rate of 135 or 150 lbs. of coal per sq. ft. of grate. With probably 15 in. of draught in the front end, there is an insufficient air-supply through the grate, and therefore it is necessary to supply that air for proper combustion. If the fire door is closed under these high-burning rates with the tremendous draughts, it immediately results in a fall of the steam pressure, due to the failure of the coal to burn. By opening the door wide and permitting the air to pass into the firebox from the door, the pressure is quickly regained. These tests are made for one hour duration, and you can readily understand that under a test of this kind your attention and that of your people is taken up with noting a number of details, and it is impossible to make a close study of the efficiency of the increased quantity of air that comes in at that time. But I am convinced we could demonstrate that our monoxide was running very high until we opened the door, when it would change to dioxide. But these things all happen within five minutes, because if the boiler falls, in steam at 16 lbs. evaporating head, it only takes a very brief time to lose a lb.; and besides, you have little time for your observation.

It is difficult to make an examination of the firebox under conditions of this kind. The box is incandescent, due to the depth and the brilliancy of the fire; and the introduction of the air gives a black cone from the point of entry, indicating quite clearly what it is. There is so much air in the inside of the box that I question very much whether under these forced firing rates, there is any drop in the temperature due to the admission of the cold air. It should be remembered, too, that under these conditions, the evaporation is high—above 14 and 15 lbs. of water to the square ft. of heating surface. The thickness of fire was about 18 in. at the door, to 10 in. at the flue sheet, sloping.

THREE-CYLINDER LOCOMOTIVES.

By J. Snowden Bell.

The three-cylinder locomotive, although originated as early as 1846, and applied in railroad service in 1847, has been confined to a smaller range of actual practice than any other design which differs from the standard two-cylinder construction, and the record of its performance may, perhaps, be considered too limited to determine, with reasonable probability of correctness, whether its advantages are sufficient to recommend its general adoption. It does not, however, involve any error in mechanical principle, nor appear to have indicated objections in practice, and seems to the writer to be of sufficient interest and probable value to warrant a more careful and thorough consideration by locomotive designers and users than it has heretofore received.

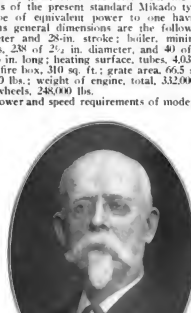
[A historical sketch of the origin and development of three-cylinder locomotives, starting with that developed by Robert Stephenson and William Howe in 1846 down to and including those built from the designs of Howard D. Taylor for the Philadelphia and Reading in 1909, was then presented by the author, many illustrations being included. An abstract of the remainder of the paper follows.—Editor.]

A design for the application of three cylinders in a locomotive of the Mikado type, proposed by H. S. Vincent of the American Locomotive Company, is illustrated in Fig. 1. The central cylinder is set in advance of the two outside cylinders, on an incline of 8 degs., and its piston is coupled to the pin of a crank on the second driving axle. In order to minimize the inclination of this cylinder, the middle portion of the front driving axle is bent slightly into crank form. The pistons of the outside cylinders are coupled to crank pins on the wheels of the third driving axle. The crank pins are set 120 degs. apart. All cylinders are of the same diameter (23 in.) and the main rods are all of equal length (10 ft. 6 in.). The valve chest of the central cylinder is located on its right-hand side, and is readily accessible, as are also the cross head and guides.

The characteristic feature of novelty of this design consists in a construction of valve gear devised by Mr. Vincent, which operates on a principle which appears to be new, viz.: The actuation of the distribution valves of the central cylinder by what is termed a selector lever, the ends of which are connected to and derive motion from the gears which actuate the valves of the outside cylinders. The resultant motion imparted to the middle of this lever is transmitted to the distribution valve of the central cylinder through rocker arms proportioned to give this valve the same steam distribution action as those of the valves of the outside cylinders. This arrangement will be understood by reference to Fig 2, and its simplicity is obvious, no independent link, eccentric, or other analogous valve actuating element being required, as the central valve is moved, controlled, and reversed by the same mechanism as the valves of the outside cylinders, through its connection therewith by the selector lever.

Except as to the application of three cylinders and the means for actuating the valve of the central cylinder without an independent valve gear, as above described, the locomotive of this design is of the present standard Mikado type, and is calculated to be of equivalent power to one having two 28-in. cylinders. Its general dimensions are the following: cylinders, 23-in. diameter and 28-in. stroke; boiler, minimum diameter, 84 in.; tubes, 238 of 2¼ in. diameter, and 40 of 5½ in. diameter, 20 ft. 6 in. long; heating surface, tubes, 4,038 sq. ft.; heating surface, fire box, 310 sq. ft.; grate area, 66.5 sq. ft.; tractive power, 60,600 lbs.; weight of engine, total, 332,000 lbs.; weight on driving wheels, 248,000 lbs.

The high power and speed requirements of modern service have



J. SNOWDEN BELL.
Paper on Three Cylinder Locomotives.

developed the Mallet and Mountain type locomotives, weighing up to 540,000 and 331,500 lbs., respectively, the weights per axle being so great that, in many cases, rails and bridges are strained nearly to the limit of their capacity, and cylinder dimensions being also increased up to the limit of the clearance of some railroads and beyond that afforded on others. As stated to the writer by a locomotive designer of acknowledged high standing and ability, "we have about reached, especially in some of the large Mountain designs, the possibilities of a two-cylinder engine." The destructive effect upon the rails, which increases with the speeed resultant upon the unbalanced vertical force in two-cylinder engines, has long been recognized, and there being apparently no effective means available for neutralizing this effect, there has resulted the arbitrary limitation of static weight per axle to that which, when augmented by the dynamic effect of the excess balance, will not be above that which can be safely carried by the rails and bridges. This limit varies on different railroads, as affected by the solidity of the roadbed and by local traffic conditions.

The most important advantage claimed for the three-cylinder locomotive is the attainment of substantially uniform turning moment, from which there results more rapid acceleration in starting and greatly increased smoothness and steadiness in running; reduced destructive action on rails and bridges; and the exertion of greater tractive power and utilization of a lower factor of adhesion than a two-cylinder engine. The system further affords facilities for providing increased cylinder power, equally divided in a balanced application, at a minimum cost of construction and maintenance, and is adapted for opera-

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tion upon the simple, compound, or triple-expansion principle. The necessity of using a crank axle and connections, for the attainment of these results, of course, involves the objection of increased complication and cost, but with the materials and methods now available in the manufactuve of crank axles, the objections to this form of driving axle, as compared with a straight axle, are reduced to a minimum, and, as compared with four-cylinder locomotives, a considerable number of which have been constructed, both in Europe and in the United States, the advantage, in point of simplicity and economy, is obviously materially in favor of the three-cylinder locomotive. This is also the case as to structural considerations, there being sufficient space between the frames to provide crank cheeks of ample width, and by reason of its comparatively simple form, the axle can be readily forged in an ordinary railroad shop.

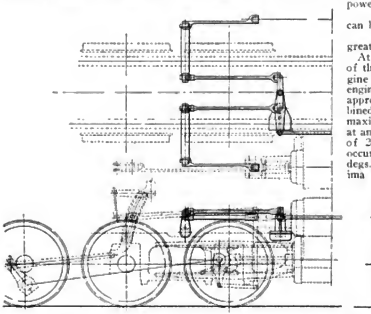
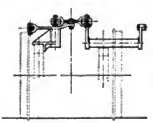


Fig. 2—Valve Gear of Proposed Three Cylinder Locomotive.

When comparing the difference in dynamic effect on the rail of a modern two-cylinder Mikado type locomotive and an equivalent three-cylinder engine of the same power and type, at a speed of 40 m.p.h., it will be found that at this speed the vertical effect of the unbalanced force for the two-cylinder engine is 8,380 lbs. per wheel, or 67,000 lbs. for the engine, thereby causing a difference in rail pressure of 134,000 lbs. in each evolution of the driving wheels, and while the normal static weight of this engine on driving wheels is 243,000 lbs., at a speed of 40 m.p.h., the effect on the rail becomes equal to a static weight of 310,000 lbs.

With the three-cylinder engine, in which the tractive power and nominal driving wheel weights are identical with the two-cylinder engine, there being no unbalanced weight and consequently no vertical dynamic effect, it would seem entirely possible to operate this engine on a much lighter rail than the two-cylinder engine; or, if the latter requires a rail weighing $\frac{243000 \times 100}{310000}$ lbs. per yard, the former can be carried safely on $\frac{310000}{243000}$ = 80-lb. rail. If the same weight of rail be maintained, the power and weight on driving wheels of the three-cylinder engine can be increased $\frac{310000 - 243000}{243000}$ = 27.6 per cent., without any greater destructive effect on the rail.

At a speed of 45 m.p.h., a comparison of the turning moments of three-cylinder and two-cylinder engines, the two-cylinder engine having cylinders 28 by 28 inches, and the three-cylinder engine having cylinders 23 by 28 inches, both engines having approximately the same power, show that the curve of combined turning moment for the two-cylinder engine reaches its maximum at a crank angle of about 37 degs., and its minimum at an angle of about 80 degs., with a variation in turning moment of 26,000 lbs. With the three-cylinder engine the maximum occurs at 60 degs., 180 degs., and 300 degs., the minimum at 90 degs., 210 degs., and 330 degs., the difference between the maxima and minima being about 9,000 lbs. This increased uniformity of turning action is clearly beneficial in lessening the racking effect due to sudden and violent reversals of strain in the machinery of the locomotive.



At the instant of starting, or for the first few revolutions when the maximum tractive power is being exerted, the maximum combined turning moment of the two-cylinder engine occurs at a crank angle of 45 degs., while at 85 degs. it has nearly reached its minimum, the total variation in one revolution being about 56,000 lbs., and a variation of 54,000 lbs., occurring while the cranks are turning through an angle of 40 degs. In the three-cylinder engine of equal power the curve of total turning moment exhibits the same characteristics as before; that is, the maxima and minima occur at three points in the crank circle, the amount of variation being 25,000 lbs. It should be borne in mind that these rotative curves represent the steam force only. When moving at high speeds, they would be modified somewhat by the inertia of the reciprocating weights.

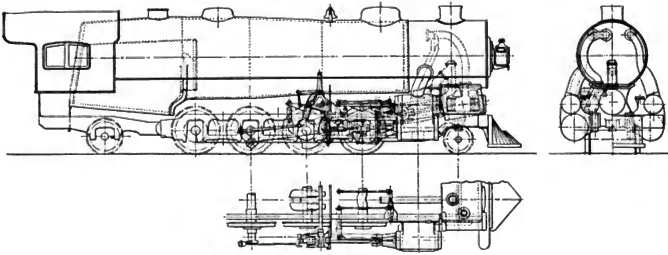


Fig. 1—Proposed Three Cylinder Locomotive.

In the first case the maximum combined turning moment equals 150,400 lbs., and in the second, 131,700 lbs. Slipping will, of course, occur at that point in the stroke where the turning moment is a maximum. Therefore, for the two-cylinder engine, the instantaneous tractive power at the point of maximum turning moment = $\frac{150400 \times 28}{56}$ = 75200 lbs. And the

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factor of adhesion $= \frac{243000}{75200} = 3.23$. For the three-cylinder engine the maximum tractive power $= \frac{131700 \times 28}{56} = 65850$ lbs. and the factor of adhesion $= \frac{243000}{65850} = 3.68$. It is therefore entirely feasible in a three-cylinder engine of the proportions mentioned, to increase the tractive power $\frac{3.68 - 3.23}{3.23} = 14$ per cent., with no greater liability to slip the wheels than in the less powerful two-cylinder engine having the same weight on driving wheels. This capability permits the designer to take advantage of the increased boiler capacity obtainable on account of the higher rail loads permissible with this type of locomotive.

DISCUSSION.

Henry Fowler (Midland Railway, England): We have 45 three-cylinder compound engines, working perfectly satisfactorily, at 220 lb. pressure, and as compared with our simple engines on similar work, I fancy the gain we have had in coal consumption has been 7 per cent. I would like to say that the Great Central Railway of England has built one of these engines which operates as a switching engine, which works on a hump, and the Northeasternu Railroad Company has in service a considerable number of 3-cylinder superheater engines. The difficulty, of course, with us, is that we have not the room to put the big cylinder on the side, and have to put it in between. I take it that you also will have to come to something of that kind.

A vote of thanks was given Mr. Bell for his paper.

SPECIAL ALLOYS AND HEAT-TREATED STEEL IN LOCOMOTIVE CONSTRUCTION.

The committee sent out a circular of inquiry outlining a series of seventeen questions. Replies were received from twenty-six railroads, which cover an ownership of approximately 25,266 locomotives. From the information received and that which has been in the possession of the committee, it was decided to only make a progress report.

A few roads are using and others are making experimental investigation of heat-treated carbon steel in locomotive frames, main and parallel rods and miscellaneous parts. Five roads are

C. D. YOUNG,

Chairman, Committee on Use of Special Alloy Steels and Heat-Treated Steel in Locomotive Construction.

using heat-treated carbon steel springs, wheels and tires. Carbon heat-treated steel for piston rods, axles and crank pins is the more generally used of the treated steels, and ten roads in all are doing more or less work with this class of material.

The replies as to the use of alloy steels in locomotive construction are so varied that it can only be stated that alloy steels are being used to some extent, and the greatest quantity seems to be confined to locomotive frames, main and parallel rods, piston rods, axles and crank pins, although some roads are using alloy steels for springs. Vanadium is quite extensively used in frame material, eight roads making use of this element. For main rods, piston rods, axles and crank pins there seems to be about an equal number requiring heat treatment, as compared with those which do not require heat treatment of the material. For tires and springs the majority of the roads do not require special treatment, and for boiler steel, cast iron and miscellaneous parts no treatment is required by any one.

The following chemical requirements for various materials used with heat-treated carbon and alloy steels, seems to indicate tentatively the average existing practice:

PISTON RODS, AXLES AND CRANK PINS.

	Heat Treated Carbon Steel. Per cent.	Alloy Steel. Per cent.
Carbon	.45 to .60	.30 to .40
Manganese	.45 to .70	.40 to .65
Phosphorus, not over	.05	.05
Sulphur, not over	.05	.05
Silicon	.....	.15 to .30
Vanadium, not less than	.....	.16
Chrom	.....	.90 to 1.10

For the physical requirements the practice from the replies seems to indicate the following:

PISTON RODS, AXLES AND CRANK PINS.

	Elastic Limit Lbs. per Sq. In.	Ultimate Lbs. per Sq. In.	Elong. Per cent. in 2 In.	Per cent. Reduc. of Area.
Heat Treated Carbon	50,000 Min.	85,000 Min.	22.0	45.0
Alloy	80,000 Min.	100,000 Min.	20.0	50.0

The Pennsylvania Railroad practice for heat-treated carbon steel for piston rods, axles and crank pins is approximate, depending upon the normal carbon of their specifications, namely, heating between 1,500 degs. and 1,600 degs. F. and quenching in water and drawing to a temperature of between 1,050 degs. and 1,150 degs. F., the material not being permitted to get entirely cold between quench and temper.

In a general way the use of heat-treated carbon and alloy steels has resulted in satisfactory service, increased mileage having been obtained from the materials with apparently fewer failures, although in the majority of the cases the material has not been in service long enough to make a fair reply.

Seven roads do not require any heat-treated carbon or alloy steel axles and crank pins to be drilled, whereas four roads are at this time requiring drilling of this proper treatment. Present tendency seems to be toward requiring the drilling of shafts of large diameters.

Most of the members have not found it desirable to use alloy steels and heat-treated carbon steels in designs where excessive vibration or shock is not expected, five roads stating that this is their present practice. One member is using this material for springs, one for side rods and one for all machinery parts for high-speed passenger locomotives.

Heat-treated carbon steel can be obtained at a slight advance in price, whereas alloy steels may be purchased at an increased cost, approximately double that of the plain carbon steel, heat-treated.

The report is signed by:—C. D. Young (Penn.), Chairman; Henry Bartlett (B. & M.); S. M. Vauclain (Bald. Loco. Wks.); H. B. Hunt (Am. Loco. Co.), and J. C. Little (C. & N. W.).

C. D. Young presented the paper closing with the following remarks:

I would like to say with reference to the exhibits, that some of the manufacturers of alloyed steel have called our attention to apparent discrepancies in the replies which the Committee has received, in that all the information they have does not agree with the shipments made to various roads. The question of prices does not seem to be on the same basis, and I would suggest that in the publication of the Committee's report, we omit the appendices, and submit merely the report of progress, so there will be no confusion of facts from the data we received in reply to our circular. I suggest this after taking it up with the members of the committee.

DISCUSSION.

F. F. Gaines, (C. of Ga.): We have had two cases of heat treated axles in less than four to six weeks' service, where the axles broke off in a very peculiar manner, and it seems to me it must be due absolutely to the method of heat treatment, so much so that I would like to know if anyone else has had a similar experience. I have got to the point where I am rather afraid of them.

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C. D. Young: I believe if heat treated material is purchased without careful inspection and test, that you are very apt to get even poorer material in the heat treated carbon steel than perhaps in annealed carbon steel, as the punching of a large mass of steel is very severe on the steel structure. If it is not properly and intelligently done, it may make the material poorer than it would be without that treatment, and it would be my suggestion to the members to buy this material on close testing and close observation of the treatment which is being given.

The Pennsylvania Railroad this year is installing a heat-trating plant, and it is our intention to not only subject the punching charges to a specimen test, but also to a drop test on each individual piece, in order to assure ourselves that we have given the proper treatment to the material. We expect to discontinue the drop test if we do not find any disastrous results. There has been quite a good deal of trouble, I understand, from improper heat treatment. Heat treatment will not make poor steel any better, it will make poor steel still worse, but it certainly will improve good steel.

J. F. DeVoy (C. M. & St. P.): The Milwaukee Road has tried to use these axles under about 200 locomotives. I am perfectly free in stating that under no circumstances whatever would I put a so-called heat-treated axle under a locomotive, with the methods as I know them. We have not tried a heat-treated axle, for there is no question in my mind whatever but that the heat treatment known now, will make a good steel about as bad as it can be. We planed the axles that failed down to the centre, and at about 4 in. from the surface on a 12-in. axle, cracks began to develop, and pieces broke off of their own weight. I do not just exactly understand what Mr. Young meant by making a proper inspection. A proper inspection of a heat-treated axle cannot be made for the reason that there is no way of testing them until you have reached a point at least 3 in. in from the outside of the axle.

SMOKE PREVENTION.

Several members of this committee were on a special committee appointed by the General Manager's Association of Chicago to determine the advantages of steam jets in locomotive fireboxes as an aid to smoke prevention, and it was on their recommendation that their report be transmitted to the committee for the use of this convention.

The chairman acknowledges his indebtedness particularly to the President of this Association for his careful test and its valuable deductions, and begs leave to submit it in full.

The report is signed by:—E. W. Pratt (C. & N. W.), chairman; J. F. DeVoy (C. M. & St. P.); W. C. Hayes (Erie); T. R. Cook (Penna.), and M. K. Barnum.

SMOKE PREVENTION BY USE OF STEAM JETS.

These smoke-abatement tests were made at the Altoona testing plant of the Pennsylvania to determine the merits and proper application of steam jet combustion tubes in a locomotive firebox for abating smoke, both with and without a brick arch, the special purpose being the development of a specification applicable to locomotives operating in the city of Chicago.

In brief, the results show that if from 4 to 6 lbs. of air per pound of coal fired is delivered over the fire by steam jet tubes, the emission of smoke will be reduced to a very low amount, and that while the brick arch is a benefit, particularly while the locomotive is running, the steam jet combustion tube is of value either with or without a brick arch.

E. W. PRATT,
Chairman, Committee on Smoke Prevention.

Locomotive No. 7042 (0-6-0) was selected for the tests as being representative of a large class of shifting engines in service in Chicago. The locomotive was equipped with a Security brick arch consisting of six rows of bricks supported on two 3-in. tubes with a 3-in. gap between the flue sheet and the front of the arch, as illustrated in Fig. 1.

The steam jet combustion tubes were applied in accordance with Fig. 1. There were eight tubes along each side of the firebox, six above the fire door on the back head, and four below the fire door. The tubes consisted of pieces of 2-in. boiler tubing, approximately 6 in. long, inserted in place of staybolts, and each tube was provided with a $\frac{3}{16}$-in. steam nozzle connected to a $\frac{1}{2}$-in. steam line. Arrangement was also made to use air in the nozzles in place of steam. The blower was of the double tip nozzle type and is shown in Fig. 2. Steam admission to the blower line was controlled by a quick-opening

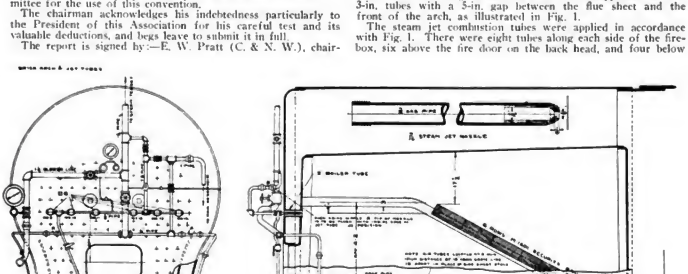

Fig. 1—Arrangement of Steam Jets in Firebox.

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flat disk valve, which gave any desired pressure up to a maximum of 130 lbs.

The fire door was equipped with an adjustable damper and deflector. The damper was set with an effective opening of 10 sq. in., and the deflector at an angle of 30 degs. with the door, throughout the tests. The smoke box was of the self-cleaning type, with adjustable lift and deflector.

METHOD OF MAKING THE TESTS.

In order to obtain conditions similar to exacting yard service, the locomotive was run for seven minutes at a drawbar pull of about 15,000 lbs. at 12 m. p. h., and then shut off and allowed to stand for three minutes with the blower on full. The rated tractive effort of this locomotive is 26,517, so that 56 per cent. of the rated tractive effort was delivered, which made the locomotive work very hard. The minimum boiler pressure allowed was 170 lbs., or a variation of ten pounds from the rated pressure of 180 lbs.

While running, careful and uniform firing was insisted upon with a light, sloping fire, but as soon as the throttle was closed the fireman promptly threw a stated amount of coal under the front of the arch, to make plenty of smoke. One, four, none

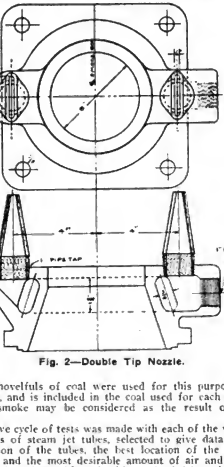

Fig. 2—Double Tip Nozzle.

and six shovelfuls of coal were used for this purpose on the four stops, and is included in the coal used for each test. The standing smoke may be considered as the result of careless firing.

The above cycle of tests was made with each of the various arrangements of steam jet tubes, selected to give data as to the best location of the tubes, the best location of the nozzles in the tubes, and the most desirable amount of air and steam injected by the tubes, with and without the brick arch.

The amount of air entering the firebox through the ash pan, fire door and steam-jet tubes was determined by the use of anemometers.

The sparks discharged from the stack were caught in a spark catcher erected on the roof on the testing plant.

After each set of tests the sparks collected were sweut up and weighed. Analyses of eleven representative samples of these sparks were made. Analyses of the flue gas were made from samples representing the average of the running and standing tests for every cycle.

The brick arch was in place on 35 tests and removed for 40 tests. On 7 tests the gap between the arch and flue sheet was closed.

The coal used throughout the tests (except in nine efficiency tests) was furnished by the Superior Coal Company from the Benld Mine in Macoupin County, Illinois, and is representative of the coal used in the Chicago District. The following table gives the two analyses and the corresponding test numbers:

Number of tests	Fixed Carbon	Volatile Matter	Moisture	Ash	Sulphur Determined Separately
25	37.73	37.14	8.00	16.14	6.16
51	37.47	38.41	9.89	12.23	5.57

The noticeable features of this coal are the high ash, sulphur and moisture, which make it a very dirty, clinkering coal, of comparatively low heating value. The calorific values of the two carloads were 11,671 and 12,884 B. t. u. per pound dry coal, respectively.

After the best arrangement of steam-jet tubes, with and without the arch, had been determined, a series of efficiency tests was run at the same speed and cut-off, both with and without the arch, to determine the efficiency of the boiler and locomotive with the steam-jet tubes as compared with the same locomotive without tubes. These tests were run for one hour each.

To determine the merits of the steam-jet tube in abating smoke while a fire is being built in a locomotive, or while building up a fire after the firebox temperature has become very low, a series of firing-up tests was made, using the best arrangement of steam-jet tubes with the arch in place. Starting with a cold boiler, the fire was lighted and built up as rapidly as possible. Continuous smoke readings were made until boiler pressure was obtained.

RESULTS OF TESTS.

There is a great variation in the amount of smoke for a given quantity of air and steam and for a given condition, which no amount of care seems to overcome, and eliminating variable after variable does not appear to change this condition. The general law, however, is clearly defined, the smoke being reduced almost directly in proportion as the total quantity of air and steam above fire is increased until a practical limit of about 190 lbs. per minute is reached, above which it was impossible to go under the test conditions, on account of the locomotive failing to steam. At this point the curves indicate that little further reduction in smoke could be made with increased air and steam above the fire. They indicate that the locomotive would have made from 25 to 30 per cent. smoke under the test conditions with no air or steam admitted through the jets, although 4 tests gave only 13.5 per cent. with this condition, probably because the engine steamed freely enough for the fireman to keep the door open a good deal. The minimum smoke with normal brick arch was 6.5 per cent., or a reduction of about 75 per cent.

The ratio of air to steam seems to be immaterial, although some of the variations can be accounted for by the total pounds of air per pound of coal fired (including ash pan) being greater or less as the case may be, indicating that the quantity of air is the important factor. The jets in the back head above the fire door are apparently superior to the side jets.

In each case a further reduction of smoke was made by filling the gap between the arch and flue sheet.

In the standing tests it was possible to use the maximum amount of air and steam obtainable with the equipment, and accordingly the smoke was still further reduced, with the indication that a further increase of air and steam, above fire, would not be of great benefit. The curves indicate that with no air and steam admitted, the locomotive would have made from 25 to 30 per cent. smoke. The minimum smoke with normal brick arch was about 3.5 per cent., or a reduction of about 87 per cent.

The ratio of air to steam appears important in this case. The tests with no steam, or a ratio of air to steam greater than four to one, fall upon the same curve, but the tests where the ratio of air to steam is less than four to one resulted in a higher smoke reading for the same total weight of air and steam as indicated by the upper curve. This points to the fact that the air injected over the fire is the greatest factor in smoke reduction.

The amount of air injected, per pound of steam, should be increased as closely as possible to a maximum of 25 lbs., to give the best results and at the same time make an economical use of the steam. This means that the quantity of air injected by the steam jets is the valuable factor in smoke reduction, but it is clear that the presence of a small amount of moisture is essential, and therefore the air should be injected by steam jets.

The average smoke results when running, and with and without the brick arch, were plotted against total cubic feet of air per minute above the fire. These curves show substantially the same characteristics as the total air and steam curves, except a sharper break at from 2,000 to 2,400 cubic feet of air per minute, which seems to be the critical point either with or without brick arch. It also appears to be possible to reduce the smoke when standing without the arch to as low a figure as with the arch, when using the jets in the back head above the fire door, although the side jets lose considerable ground without the arch.

The intensity of draft in the front end being the same on all tests except for the variation in steam pressure, the amount of air drawn through the grates is reduced by the amount injected over the fire by the steam jets, the total being constant. This means that the steam jets reduce the firebox vacuum and explains the greatly reduced coal consumption on tests where a large amount of air was injected.

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Curves indicate that the greater the total amount of air per pound of coal the less smoke, and that the back head jets are superior to the side jets, although both are capable of reducing smoke to about 0.5 per cent., under the test conditions, when the total air per pound of coal is greater than 13 lbs. and 35 per cent. of it is injected above the fire.

Assuming the locomotive would have averaged 20 per cent. smoke when running without the jet tubes, curves show that when about 4 lbs. of air per pound of coal fired is injected over the fire, this smoke may be reduced to 7.5 per cent., or a reduction of about 62 per cent.

The average smoke when standing may be reduced from, say, 30 per cent. to 4 per cent., or a reduction of about 87 per cent., when 4.5 pounds of air per pound of coal is injected by the back head jets or 5.5 pounds of air by the side jets.

The back head jets reduced the smoke when standing even lower without the arch than with it, although they were not able to do so while running. The side jets show a loss of efficiency both when running and standing.

The brick arch greatly improves the performance of the side jets, which might be expected, since the arch helps the admixture of air and combustible and creates a longer flame-way, thus making the longest possible passage for the air injected at the sides. The jet tubes on opposite sides were directly opposite each other, so that the columns of air and steam met in the center of the firebox. The back head jets, however, seem to be as good without the arch as with it, and therefore considerably superior to the side jets without the arch.

In general, when the average smoke is reduced, the maximum smoke is also reduced, and that when the average smoke is reduced to 7 per cent. the maximum density of the smoke emitted at any time will not be higher than No. 1 on the Ringelmann scale.

In order to determine if possible whether it was the distance from the flue sheet or the height above the fire that was important, tests were run with the five side jets on either side farthest from the flue sheet in use. The resulting smoke was very high in all cases, indicated that the height above the fire bed is the most important feature with the upper back head jets. Referring to Fig. 1, showing the relative position of the jet tubes and brick arch, it is seen that the upper back head jet tubes are practically on a line with the back edge of the arch, and it is highly probable that a large part of the air injected by these jets was drawn over the top of the arch directly into the flues by the draft of the locomotive and never reached the fire at all. This would also account for the fact that these jets with the brick arch gave no better smoke results than without the arch, if as good.

EFFICIENCY TESTS.

Penn Gas coal was used for the efficiency tests, with the exception of 2 tests in order to make the locomotive steam. While Penn Gas coal is a high volatile, smoky coal, the analysis shows practically the same volatile matter as the Illinois coal used in the other tests, with a considerably higher heating value, and it was possible to reduce the smoke to quite as low a figure, so that the results are fairly comparable. One point of interest is that with no jets in use, the same smoke was obtained with and without the brick arch. This was probably due to the fact that on one test without the arch, the fireman was able to keep the door open a good deal after putting in a fire, and again it may be due to the unaccountable variations in smoke.

The curves drawn from the results indicate that, while running, the brick arch is capable of making a 50 per cent. reduction in smoke, irrespective of the steam jets. The upper back head jet tubes are capable of reducing the smoke approximately 60 per cent. without the arch and 70 per cent. with the arch, with approximately 5.5 lbs. of air per pound of dry coal. The two tests made with the side jets did not show that they had very much merit.

ECONOMY OF THE STEAM-JET TUBES.

The results of the efficiency tests show that a reduction of smoke results in an increase in equivalent evaporation and a corresponding increase in efficiency and economy with or without the brick arch, showing that the steam-jet tubes make for improved combustion and economy, rather than simply "whitewash" the smoke. The brick arch itself shows an average increase in evaporation of about 8.6 per cent.

As the smoke is reduced the rate of combustion is reduced either with or without the arch. Since the drawbar horse-power of the locomotive was practically the same in all tests, this seems to be direct economy. But the firebox vacuum is reduced by the air thrown over the fire to reduce smoke and therefore it was impossible to burn as much coal. To be sure, the locomotive steamed and the drawbar horse-power was maintained, but on many of the tests it was necessary to fill the boiler before starting and keep the injector off until the stop, in order to maintain steam pressure within the limit of 170 lbs. This could not, of course, be done with a road locomotive, but it is entirely possible with the majority of shifting locomotives, and although the economy shown is not direct, a proportion of it is, because on the efficiency tests the water level in the boiler was maintained at all times, and there was a resulting economy from the use of the steam-jet tubes. In yard service it is probably that a much larger economy could be effected by using the jet tubes to check combustion.

Taking account of the variations in drawbar horse-power, it was also shown that below about 10 per cent. smoke the increase in economy is not so great.

SPARKS.

The average analysis of the sparks discharged on 44 tests (11 cycles), with and without arch, is as follows:

Volatile Matter	Fixed Carbon	Ash	Sulphur Determined Separately	British Terminal Units
12.36 per cent	46.76 per cent	40.88 per cent	2.98 per cent	7810

The average heating value of the Illinois Coal was 12,227 B. t. u. per pound dry coal, hence the sparks had 63.7 per cent. of the heating value of the coal. This may explain the increased economy when using the steam jets, coupled as it is with the reduction of smoke. Allowing for the reduction in smoke by the brick arch, it is seen that the arch does not reduce the amount of sparks discharged, and the indications are that more sparks are discharged with the arch than without it.

FIREBOX TEMPERATURE.

The firebox temperature was uniformly high, no definite relations between it and the amount of air above the fire being apparent, although it is fair to presume that a large amount of air above the fire would reduce the firebox temperature enough to offset the increase due to better combustion. The average temperature of the firebox without the arch was 1,697 degs. F., and with the arch 1,911 degs. F., or an increase of 12.6 per cent.

On the efficiency tests with Penn Gas coal, the average firebox temperature was 1,888 degs. F. without the arch and 2,166 degs. with the arch, or an increase of 15.8 per cent.

BLOWERS.

The operating pressure of the blower was maintained as nearly uniform as possible to make the draft the same for all tests. The maximum pressure obtainable on the blower with full boiler pressure was 130 lbs., and this gave a front-end vacuum nearly equal to that of the 5-in. nozzle under running conditions.

To determine the value and economy of the blower used (see Fig. 2), it was compared with a double-tip stack blower as it was temporarily applied for this test. The tips were arranged so that the tube jets would meet about half way up the center of the stack, and they had precisely the same area of opening as the double-tip blower used in the smoke test. A multiple-tip blower was also compared. All three blowers had the same blower valve and line from the steam turret.

Comparing the blowers according to vacuum and steam consumption, the multiple blower is the most efficient of the three, with the double-tip blower, applied at the nozzle, the next. The objection to the multiple-tip blower is the liability of the tips to become clogged up or broken off.

FIRING-UP TESTS.

Three firing-up tests were made with a cold boiler to determine the efficiency of the steam jets with a low firebox temperature. The following table gives results.

Test No.	Jet Tubes in Use	Time to Obtain Full Blower Pressure	Cubic Feet of Air per Minute From Jets.	Maximum Smoke No.	Average Smoke in Per Cent.	Corresponding Smoke in Per Cent.
1		68		4	28	25
2	Upper back head	68	1,670	2	10	8
3*	Upper back head	74	1,525	2	16	10

*Double Tip Stack Blower.

The double-tip nozzle blower was used on the first two tests, and the blower was the same on all three. The results show that the steam jets are capable of reducing smoke even when the

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firebox temperature is low, but they are not as efficient as when it is high, as might be expected. Hence they would be of service at all times in shifting service, but in greater degree when the firebox temperature is high.

SIZE AND POSITION OF STEAM-JET NOZZLES.

From the results outlined in the previous paragraphs, two things are apparent: First, that a large quantity of air must be injected over the fire by the steam-jet tubes to reduce smoke properly, and, second, that this air should be injected with the least amount of steam practicable. To determine the proper arrangement of the steam-jet tubes to fulfill these requirements, complete air and steam calibrations were made upon $\frac{1}{2}$-in., $\frac{3}{16}$-in. and $\frac{1}{4}$-in. nominal diameter steam nozzles in the 2-in. outside diameter jet tube.

It was found possible to move the nozzle from the inner end of the tube to a position $8\frac{1}{2}$ in. from the inside edge, or approximately $2\frac{1}{2}$ in. beyond the outer end of the tube, and in case of the $\frac{1}{4}$-in. nozzle $3\frac{1}{2}$ in. beyond the outer end, with a continually increasing quantity of air injected into the firebox. Beyond that position the quantity of air falls off, probably due to the greater friction of the steam in the tube and the striking of the outer edge of the jet of steam on the firebox sides. The indications are that the most efficient position is where the jet of steam expands and completely fills the tube just before reaching the inner end of the tube.

The $\frac{1}{4}$-in. nozzle is the most efficient of the three, with the $\frac{3}{16}$-in. slightly less efficient and the $\frac{1}{4}$-in. very much less efficient. All three are more efficient as the operating pressure decreases. While the $\frac{1}{4}$-in. nozzle is most efficient, the $\frac{3}{16}$-in. nozzle is capable of injecting 50 per cent. more air with only slightly less efficiency, and, in general, would probably be the desirable nozzle to use.

CONCLUSIONS.

The steam-jet combustion tube has a decided value in reducing smoke under the widely varied conditions of these tests. The air injected by the tube was found to be the greatest factor in reducing smoke, although a small amount of steam seems essential in smoke reduction. When using steam-jets, injecting air into the firebox, it was apparent that a greater reduction in smoke was accomplished by their use with improper firing as compared with careful firing. The firebox temperature was found to be higher when the arch was in service as compared with the plain firebox, although the data do not consistently show that a reduction in smoke follows increased firebox temperature.

The steam-jet tubes seem to give the best results in preventing smoke when located so that the injected air and steam meet the flame as high as possible above the fuel bed. If the arch is used the best results seem to be obtained when the air passes underneath the arch as high as possible above the fuel bed. The arch gives better results in smoke prevention if it fits tight against the fire sheet. A tight arch, however, has the practical disadvantage of collecting deposits of sparks and eventually closing the lower flues.

An efficient design of smoke-box blower is an important factor in smoke abatement. Air openings in the fire door are of slight assistance in smoke abatement, as they are capable of supplying only about 10 per cent. of the air necessary above the fire and a very small percentage of the total air for complete combustion.

Best results were obtained when from 4 to 6 lbs. of air per pound of coal fired was injected by the steam tubes from a location in the back head above the fire door. It was found on these tests that the total amount of air, including that which was introduced above the fire, should not be less than 13 lbs. per pound of coal for good smoke prevention.

The data seem to indicate that the best results can be obtained when the least amount of steam is injected with the greatest amount of air.

The use of the steam-jet tubes results in considerable economy, and in the efficiency tests an increase in evaporation was obtained.

The steam-jet tubes apparently reduce the weight of sparks discharged from the stack, but the data were not of a character to firmly establish this point.

There is a necessity for a quick-acting, easily operated valve capable of giving reasonable graduations in pressure.

It was found during the tests that the steam nozzles were being worn by the steam and this accounts for the inability of the steam lines to supply as great a pressure to the jets as desired in some of the later tests. The nozzles were made of brass. The indentations are that they should be made of steel and, if necessary, hardened. The $\frac{3}{16}$-in. diameter steam nozzle seems to be the desirable one to use in a 2-in tube.

There is noise incident to the use of the steam-jet tubes in the most efficient arrangement, and if the steam-jet tubes are located in the cab they should be covered with a $\frac{1}{16}$-in. cast-iron box provided with cast-iron air intake from a point outside the cab, the air intake being provided with a muffler.

DISCUSSION.

W. H. Fetner (Cent. of Ga.): I notice in the conclusion that the committee states that the best results were obtained when the arch hit against the fire sheet. I have had the same experience, and like your committee have had the experience of being unable to keep the lower flues clean on account of accumulation of sparks. The road with which I am connected, however, has a plan which gives us the benefit of this tight arch without the difficulty of keeping the flues clean, and taking care of the sparks. It is done by the application of a spark-hopper, which enables us to take care of the sparks and get results which we had get from the tight arch. The hopper is located on a casting that is used to support the arch. The arch is similar to the arch used in stationary practice very much now.

T. H. Curtis (communication read by Mr. Taylor): While the human factor, the fireman, is the greatest regulator of smoke-emission, the fact must not be lost sight of that this fireman will produce the best results on locomotives equipped with adequate and efficient appliances.

I suggest that paragraph 65, page 38 (first paragraph under "Sparks" in Abstract) be revised, as its present content is liable to give an erroneous impression. From this paragraph I quote:

"Allowing for the reduction in smoke by the brick arch, it is seen that the arch does not reduce the amount of sparks discharged, and the indications are that more sparks are discharged with the arch than without it."

The following burning rates are cited, as the production of sparks is dependent, to an appreciable degree, upon the burning rate per square foot of grate surface per hour and the kind of coal burned. In the thirty-two tests made with the brick arch the maximum rate of coal burned per square foot of grate surface per hour was 87.3 lbs.; minimum 60.1 lbs., average 72.4 lbs. With no arch, for nine tests, the maximum was 75.7 pounds; minimum 63.5 pounds; average 70.1 pounds.

We are fortunate to have data, other than that given in this report, that is of great importance in considering the efficiency of the brick arch relative to the abatement of sparks. The tests of Macoupin County, Ill., coal conducted for the General Managers' Association of Chicago showed more sparks produced with the arch than without it, the burning rate for these tests ranging from a minimum of 60.1 to a maximum of 87.3 lbs. of coal per square foot of grate surface per hour. The Chicago Association of Commerce Committee of Investigation on Smoke Abatement and Electrification of Railway Terminals had tests conducted at Altoona, Pa., with ten representative bituminous coals from Illinois, and Indiana. Four of these coals were tested with and without the arch, at a rate of burning of from 30 to 100 lbs. per sq. ft. of grate surface per hour. (Two of these coals were from different counties in Indiana, and the four from different counties in Illinois—Macoupin County being one of them). The averages for these four coals were: At the minimum burning rate of 30 lbs. of coal per sq. ft. of grate surface per hour, the tests showed 63.7 per cent. less sparks with the arch than without it; at the burning rate of 40 lbs. of coal, the tests showed only 7.4 per cent. more sparks with the arch than without it; at the burning rate of 50 lbs. of coal, the tests showed 10 per cent. less sparks with the arch than without it; at the burning rate of 60 lbs. of coal, the tests showed 15.7 per cent. less sparks with the arch than without it. The benefit of the arch in the abatement of sparks commences with the burning rate of about 45 lbs. of coal per sq. ft. of grate surface per hour, and increases with the burning rate as shown by the average results from the four coals tested with and without the brick arch.

The finding as to the comparative percentages of sparks emitted with and without the brick arch, in the tests of the four coals discloses that the results from the brick arch are the opposite of that reported in this report to the American Railway Master Mechanics' Association for burning rates of about 45 lbs. and over.

From the previously mentioned paragraph I further quote:

"The average heating value of the Macoupin coal was 12,277 B. t. u. per lb. of dry coal, hence the sparks had 63.7 per cent. of the heating value of the coal."

I beg to suggest that changes and additions be made to this paragraph so as to read: "65. The average analysis of the sparks discharged on 44 tests (11 cycles), with and without arch, is as follows:

Volatile Matter	Fixed Carbon	Ash	Sulphur Determined Separately	British Thermal Units
12.36 per cent.	46.76 per cent.	40.88 per cent.	2.98 per cent.	7,810

"The average heating value of the Macoupin coal was 12,277 B. t. u. per lb. of dry coal, and the average heating value of the sparks emitted when burning this coal was 7,810 B. t. u. per lb. of dry sparks, and therefore, for equal weights of dry coal and dry sparks, the sparks had 63.7 per cent. of the heating value of

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the coal. With the weight of sparks ranging from 2 per cent. to 8 per cent. of the weight of the coal, and the B. t. u. of the sparks averaging 63.7 per cent. of the B. t. u. of the coal, the spark loss would range from 1.3 per cent. to 5 per cent. of the heat in the coal. This may explain the increased economy when using the steam-jets, coupled as it is with the reduction of smoke. Allowing for the reduction in smoke by the brick arch it will be seen that the arch does not reduce the amount of sparks discharge, and the indications are that more sparks are discharged with the arch than without it, when burning Macoupin County coal. (The tests with four coals from Indiana and Illinois which were made at Altoona, showed results as to the production of sparks which were in accord with this report, for burning rates under 45 lbs. of coal, and opposite for burning rates of 45 lbs. of coal and over.) From the results of the tests with and without the brick arch in the firebox, it is apparent that the kind of bituminous coal and the rate of burning are important factors in determining the merits or demerits of the brick arch as an appliance for the abatement of sparks."

I would suggest that in the entire report the words "spark" and "sparks" be changed to "cinder" and "cinders" respectively, as the American Railway Master Mechanics' Association's locomotive dictionary gives preference to the word "cinder;" further, Webster defines "spark" as a small particle of fire or ignited substance emitted by a body in combustion, and I do not think the impression should be given that the particles emitted from the stack are ignited.

E. W. Pratt: Several Chicago Railroads have equipped a large number of locomotives in accordance with the recommendation of this report, and found in practice that the suggestions are eminently practical. I would like to call to your attention the following paragraph under recommendations:—"Jet Tubes of a minimum outside diameter of 2 in. should be used and located on the back head or side sheets of the firebox, dependent upon the most efficient location for the specific dimensions and type of firebox under consideration." I read to you recommending them on the back head. The side sheet is recommended by several roads and the results obtained were satisfactory.

In regard to the comments of Mr. Curtis, I want to say that in conducting these tests, it was only natural that all data obtained, whether directly referring to the smoke-tests or not, should be jotted down. That is to say, a particular type of locomotive, particular style of grate area, working at certain intervals and standing at certain intervals. In paragraph 64, on page 38, it says "The percentage of total coal fired which was discharged as sparks is plotted against total pounds of air and steam per minute above the fire and smoke in per cent. when running in Figs. 24 and 25. The curves show that the steam-jet tubes have the same effect on the quantity of sparks discharged as they do upon smoke, and therefore the two are proportional to each other." That was true in this particular test and Mr. Curtis was fearful that some member might read that alone, and read the conclusion in paragraph 103, which calls particular attention to the fact that while the steam-jet tubes apparently reduce the weight of the sparks, the data was not of a character to establish this point.

In paragraph 65, page 38 (second paragraph under sparks in above abstract) speaking of the analysis of the sparks, it states: "The average heating value of the Macoupin coal was 12,277 B. T. U. per pound dry coal; hence the sparks had 63.7 per cent. of the heating value of the coal." That, of course meant pound for pound—a pound of sparks contained two-thirds of the total heat of a pound of coal.

ENGINE AND TENDER WHEELS.

The committee has made a careful study of the design of solid carbon wheels for engine truck and tender service, as made by the various steel wheel manufacturers, and used by the members of this association.

In reference to the question of working up specifications and designs for chilled cast-iron wheels for 140,000-pound capacity tenders, no action has been taken, as the question of increased thickness of flange and its relation to frog and gutard-rail clearance has not been determined upon, and until such time the committee does not feel warranted in recommending a design for this capacity chilled cast-iron wheels.

RECOMMENDATION NO. 1.

Specification for solid wrought carbon steel wheels for locomotive and tender service:

I.—MANUFACTURE.

Process.—The steel shall be made by the open-hearth process.

Discard.—A sufficient discard shall be made from the top of each ingot from which the blanks are made to insure freedom from injurious piping and undue segregation.

II.—CHEMICAL PROPERTIES AND TESTS.

Chemical Composition.—The steel shall conform to the following requirements as to chemical composition:

	Acid.	Basic.
Carbon	0.60-0.80	0.65-.85 per cent.
Manganese	0.55-0.80	0.55-0.80 per cent.
Silicon	0.15-0.35	0.10-0.30 per cent.
Phosphorus	Not over 0.05	Not over 0.05 per cent.
Sulphur	Not over 0.05	Not over 0.05 per cent.

Ladle Analyses.—To determine whether the material conforms to the requirements specified in Section II, an analysis shall be made by the manufacturer from a test ingot taken during the pouring of each melt. A copy of this analysis shall be given to the purchaser or his representative.

Check Analyses.—A check analysis may be made by the purchaser from any one or more wheels representing each melt and this analysis shall conform to the requirements specified. A sample may be taken from any one point in the plate or

W. GARSTANG,
Chairman, Committee on Engine Tender Wheels.

two samples may be taken, in which case they shall be on radii at right angles to each other. Samples shall not be taken in such a way as to impair the usefulness of the wheel. Drillings for analysis shall be taken by boring entirely through the sample parallel to the axis of the wheel; they shall be clean from scale, oil and other foreign substances. All drillings from any one wheel shall be thoroughly mixed together.

Limits of Segregation.—The segregation of either element of carbon, manganese and phosphorus must not exceed 6 per

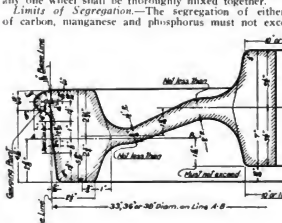

Exhibit A—33 in., 36 in. or 38 in. Solid Steel Tender Wheels for 4 1-4 in. x 8 in., 5 in. x 9 in. and 5 1-2 in. x 10 in. Axles.

cent. of the ladle test of the same melt or any part forming the thickness of the plate and tread and rim of the wheel.

III.—TOLERANCES.

Wheels should be furnished rough bored and with faced hubs and have a contour of tread and flange as rolled or machined according to M. M. Recommended Practice, Sheet 1, Fig. 1. They shall conform to dimensions specified on

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drawings shown on Exhibits A, B and C herewith, within the following tolerances:

Height of Flange.—The height of flanges should not be more than 1/8 in. over and must not be under that specified, or 1 in.

Thickness of Flange.—The thickness of flange shall not vary more than 1/16 in. over or under that specified.

Throat Radius.—The radius of the throat shall not vary more than 1/16 in. over or under that specified.

Thickness of Rim.—The thickness of rim to be measured between the limit-of-wear groove and the top of the tread at the point where it joins the fillet at throat of flange. The average thickness of service metal of all wheels in any ship-

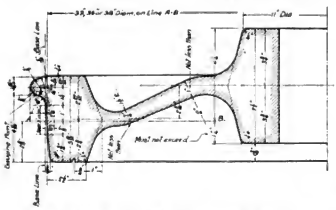

Exhibit B—33 in., 36 in. or 38 in. Solid Steel Wheels for 6 in. x 11 in. Axles.

ment must not be less than 1¼ in., measured from the limit-of-wear-groove to top of tread. The thickness of rim should in no case be less than 3/16 in. under that specified.

Width of Rim.—The width of rim shall not be more than 1/8 in. less, nor more than 1/8 in. over that specified.

Thickness of Plate.—The thickness of the plate of the wheel shall not be less than ¾ in. at the point where the plate joins the fillet at the rim and not less than 1 in. at the point where the plate joins the fillet at the hub. Intermediate minimum thickness to be proportional.

Limit-of-wear Groove.—The limit-of-wear groove to be locat-

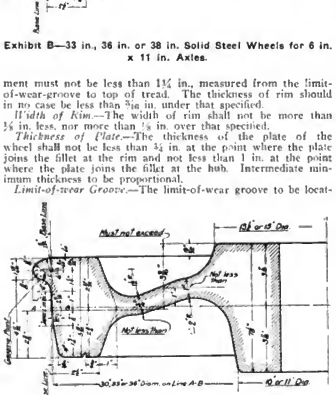

Exhibit C—30 in., 33 in. and 36 in. Steel Engine Truck Wheels.

ed as shown on wheel drawings, M. M. Recommended Practice.

Diameter of Bore.—The diameter of rough bore shall not vary more than 5/16 in. above or below that specified. When not specified, the rough bore shall be ¼ in. less in diameter than the finished bore, subject to the above limitations.

Hub Diameter.—The hub may be either 10 in. or 11 in. in diameter, as specified for tender wheels and outside hub of engine wheels, and 13½ in. and 15 in. in diameter for inside hubs on engine truck wheels. Maximum variation of 1/8 in. below. The thickness of the wall of the finished bored hub

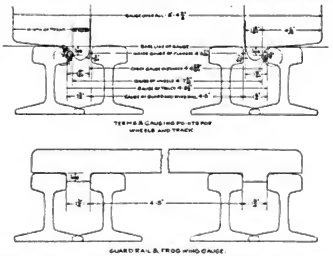

Exhibit Z—Terms and Gaging Points for Wheels and Track.

shall not vary more than 3/32 in. at any two points on the same wheel.

Hub Length.—The length of the hub shall not vary more than ¼ in. over or under that specified.

Depression of Hub.—The depression of the hub must be made so that the distance from the outside face of the hub to the line "AB" shall not exceed 11/16 in. for tender wheels on 5½ in. axles and under, and 1 5/16 in. for tender wheels on 6 by 11 in. axles. For engine truck wheels the distance from the

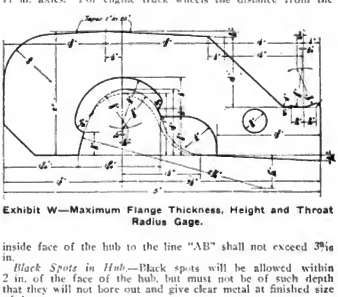

Exhibit W—Maximum Flange Thickness, Height and Throat Radius Gage.

inside face of the hub to the line "AB" shall not exceed 3 5/16 in.

Black Spots in Hub.—Black spots will be allowed within 2 in. of the face of the hub, but must not be of such depth that they will not bore out and give clear metal at finished size of bore.

Eccentricity of Bore.—The eccentricity between the tread at its center line and the rough bore shall not exceed 3/64 in.

Block Marks on Tread.—The maximum height of block marks must not be greater than 1/64 in.

Rotundity.—All wheels shall be gaged with a ring gage and the opening between the gage and tread at any one point shall not exceed 1/16 in.

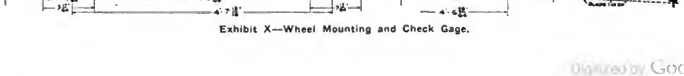

Exhibit X—Wheel Mounting and Check Gage.

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Plane.—Wheel shall be gaged with a ring gage placed concentric and perpendicular to the axis of the wheel. All points on the back of the rim equidistant from the center shall be within a variation of $\frac{1}{32}$ in. from the plane of the gage when so placed.

Tape Sizes.—Wheels shall not vary more than five tapes under nor nine tapes over the size called for.

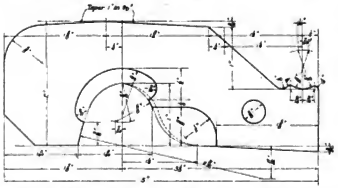

Exhibit V—Minimum Flange Thickness, Height and Throat Radius Gage.

Mating.—The tape size shall be marked in plain figures on each wheel. Wheels must be mated to tape sizes and shipped in pairs.

Gage.—Gages and tape used shall be M. M. Recommended Practice.

IV.—BRANDING.

The name or brand of the manufacturer, date and serial number shall be legibly stamped on each wheel in such a way that the wheel may be readily identified. The tape size shall be legibly marked on each wheel.

V.—FINISH.

The wheel shall be free from injurious defects, and shall have a workmanlike finish.

Wheels shall not be offered for inspection if covered with paint, rust, or any other substance to such an extent as to hide defects.

that the wheels are being furnished in accordance with these specifications. Tests and inspection at the place of manufacture shall be made prior to shipment, and free of cost to the purchaser.

The purchaser may make the tests to govern the acceptance or rejection of material in his own laboratory or elsewhere as may be decided by the purchaser. Such tests, however, shall be made at the expense of the purchaser.

All tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Wheels that show injurious defects while being finished by the purchaser shall be rejected, and manufacturer properly notified.

Samples of rejected material must be preserved at the laboratory of the purchaser for one month from date of test report.

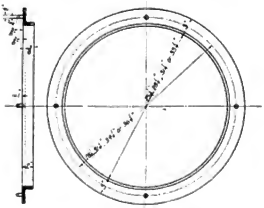

Exhibit R—Plane Gage.

In case of dissatisfaction with the results of the test, manufacturer may make claim for a re-hearing in that time.

It is recommended that the following gages and cuts be adopted as standard and shown in the Proceedings of the association, as follows:

RECOMMENDATION No. 2.

Standard design for solid steel wheels for engine and tender

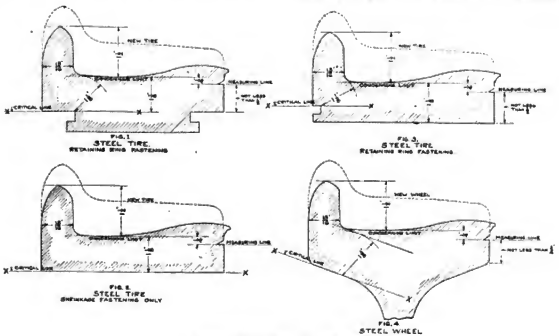

Exhibit S—Limits of Wear.

VI.—INSPECTION.

Inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

The manufacturer shall afford the inspector, free of cost, all reasonable facilities and necessary gages to satisfy him

truck service to be as shown on the following drawings:

33-in., 36-in. and 38-in. solid steel wheel for tenders, 5½ in. axle or under. Exhibit A.

33-in., 36-in. and 38-in. solid steel wheel for tenders, 6 by 11 in. axle, Exhibit B.

30-in., 33-in. and 36-in. solid steel wheel for engine trucks, Exhibit C.

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RECOMMENDATION NO. 3.

Terms and gaging points for wheels and track as shown on drawing, Exhibit Z.

RECOMMENDATION NO. 4.

Guard-rail and frog-wing gage shown on drawing, Exhibit Z.

RECOMMENDATION NO. 5.

Wheel-mounting and check gage as shown on drawing, Exhibit X.

RECOMMENDATION NO. 6.

Maximum flange-thickness, height and throat-radius gage for

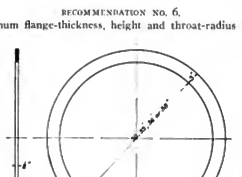

Exhibit Q—Rotundity Gage.

solid steel, steel-tired and chilled cast-iron wheels, as shown on drawing, Exhibit W, to be substituted for maximum flange-thickness gage shown on M. M. Sheet No. 14.

RECOMMENDATION NO. 7.

Minimum flange-thickness, height and throat-radius gage for solid steel, steel-tired and chilled cast-iron wheels shown on drawing, Exhibit V, to be substituted for minimum flange-thickness gage shown on M. M. Sheet No. 14.

RECOMMENDATION NO. 8.

Standard wheel-circumference measure for cast-iron wheels

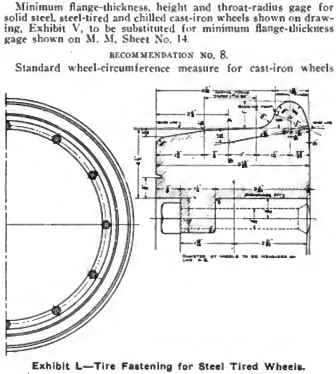

Exhibit L—Tire Fastening for Steel Tired Wheels.

as shown on M. M. Sheet No. 14, to be changed as shown on drawing, Exhibit U. [Not reproduced.—Editor.]

RECOMMENDATION NO. 9.

Standard wheel-circumference measure for steel and steel-tired wheels as shown on drawing, Exhibit T. [Not reproduced. —Editor.]

RECOMMENDATION NO. 10.

Cuts giving minimum thickness or limit of wear for steel tires with retaining-ring fastenings, shrinkage fastening only, retaining-ring fastening, solid steel wheels, to be shown as per drawing, Exhibit S.

RECOMMENDATION NO. 11.

Plane gage for 30-in., 33-in., 36-in. and 38-in. solid steel engine and tender truck wheels as shown on drawing, Exhibit R.

RECOMMENDATION NO. 12.

Rotundity gage for 30-in., 33-in., 36-in. and 38-in. solid steel engine and tender truck wheels as shown on drawing, Exhibit Q.

RECOMMENDATION NO. 13.

Gage for measuring steel wheels to restore contour as shown on drawing, Exhibit P. [Not reproduced.—Editor.]

RECOMMENDATION NO. 14.

Limit gage for remounting cast-iron, wheels and method of using same as M. C. B. Standard Practice, Sheet 16-A.

RECOMMENDATION NO. 15.

According to specifications for solid steel wheels, Recommendation No. 1, the method of branding solid steel wheels and size of letters for branding to be as shown on drawing, Exhibits N and N-1. [Not reproduced.—Editor.]

RECOMMENDATION NO. 16.

It is recommended that the M. C. B. revised and rearranged specification for chilled cast-iron wheels be substituted for the specifications of chilled cast-iron wheels for tender service, shown in last Proceedings of the M. M. Association.

RECOMMENDATION NO. 17.

Substitute present cuts of 60,000-lb., 80,000-lb. and 100-000-lb. capacity chilled cast-iron wheels with cuts as shown on attached drawing, Exhibits M-1, M-2 and M-3. [Not reproduced.—Editor.]

RECOMMENDATION NO. 18.

Adopt standard tire fastening for steel-tired engine and tender truck wheels, same as shown on drawing, Exhibit L.

The report is signed by:—W. Garstang (C. C. C. & St. L.), chairman; W. C. A. Henry (P. R. R.); A. E. Manchester (C. M. & St. P.); R. L. Ettenger (Southern); J. A. Pilcher (N. & W.) and O. C. Cromwell (B. & O.).

DISCUSSION.

William Garstang (C. C. C. & St. L.): There is a question in regard to the special contour of the wheel. Dr. Dudley, in his research for defects in rails and their causes, is of the opinion that with our one in 20 contour, that the greatest part of the load is carried on the inside of the rail, and due to this it is creating fractures in the ball of the rail which is largely due to the present contour. He suggested that the matter be brought before the convention for the purpose of giving it due and full consideration, and also if it would not be better to go back to our old contour of 1 in 38. I present this matter at this time so that it may be considered with the balance of the paper.

In the second paragraph you will notice that reference is made to cast-iron wheels for 140,000 lbs. capacity. We have on exhibition at this convention, some of the wheels referred to, and I think that it is pretty generally known that there is quite a large number of these wheels now in service. While the wheel is new, and there is no perceptible wear in the tread, the thick flange that appears on these wheels will pass through all frogs and crossings and clearances without interference. But as the tread becomes worn, 1/8 in. or more, there will be an interference. Insofar as I have been able to learn, there have been no bad or serious results which have occurred from that interference. The question is now being considered by manufacturers of chilled wheels and also by the M. C. B. Association, with a view of taking the matter up with the American Railway Association for the purpose of having the clearances, frogs, switches and crossings changed from 1 3/4 in. as a standard, to 1 5/8 in. as may be required. I personally feel that if you can get the American Railway Association to do that, that the cast-iron wheel can be made so as to carry the heaviest load contemplated at the present time with perfect safety.

The report of the committee was referred to letter ballot for adoption of the various recommendations made by the committee as recommended practice.

TESTS OF SUPERHEATER LOCOMOTIVES.

By C. H. Benjamin, and L. E. Endsley.

INTRODUCTION.

The work reported to the association in 1911, showed a comparison of locomotive performance under different degrees of superheated steam. The Schmidt superheater was the last one which was installed. The work this year is a continuation of that accomplished upon the Schmidt superheater and shows the

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increased power of the superheater locomotive over the ordinary locomotive when both are using the same amount of coal. Last year a brief statement of the progress of the work was made, but no definite results were given. It was stated at that time that plans were under way to get a larger set of cylinders for the Purdue locomotive. This, however, was not done, and so the report this year only gives the increased power produced by superheating with the same sized cylinder. The work as outlined for the use of larger cylinders remains yet to be carried out at a future time.

Equipment.—The locomotive known as Schenectady No. 2, for the saturated tests, and No. 3, for the superheated tests, was used in all the work. When used with saturated steam the locomotive was in normal condition. When the Schmidt superheater was installed the number of 2-inch tubes was reduced from 200 to 107, and 21 5-inch flues were installed. The original

C. H. BENJAMIN,

Paper on Tests of Superheater Locomotives.

water-heating surface in Schenectady No. 2 was 1,322 square feet. The change in the tubes made necessary by the installation of the Schmidt superheater reduced the water-heating surface to 1,080 square feet. The heating surface of the Schmidt superheater is 324 square feet, making a total water and superheating surface of 1,404 square feet for Schenectady No. 3 after it was equipped with the Schmidt superheater. The nominal dimensions of Schenectady No. 3 as used in the tests with the Schmidt superheater installed are as follows:

Type	4-4-0
Total weight (pounds), about	109,000
Weight on four drivers (pounds), about	61,000
Driving-axle journals:	
Diameter (inches)	7½
Length (inches)	8½
Drivers, diameter (inches)	68.99
Valves (type, Richardson balanced):	
Maximum travel (inches)	6
Outside lap (inches)	1⅛
Inside lap (inches)	0
Ports:	
Length (inches)	12
Width of steam port (inches)	1.5
Width of exhaust port (inches)	3
Total wheel base (feet)	23
Rigid wheel base (feet)	8.5
Cylinders:	
Diameter (inches)	16
Stroke (inches)	24
Boiler (style, extended wagon top):	
Diameter of front end (inches)	52
Number of 2-inch tubes	107
Number of 5-inch flues	21
Length of tubes (feet)	11.5
Heating surface in tubes (square feet)	956.5
Heating surface in fire box (square feet)	123.5
Total water-heating surface (square feet)	1080.0
Length of firebox (inches)	72.06
Width of firebox (inches)	34.25
Depth of firebox (inches)	79
Grate area (square feet)	17
Thickness of crown sheet (inches)	7/16
Thickness of tube sheet (inches)	9/16
Thickness of side and back sheet (inches)	½
Diameter of stay bolts (inches)	1
Diameter of radial stays (inches)	1⅛

The Schmidt superheater, as used in these experiments, has the following dimensions:

Outside diameter of superheater pipe (inches)	1¾
Number of double return loops	21
Average length of the pipes in the double return loops (feet)	42.88
Total superheating surface, based on the outside surface of the pipes in square feet	324

The fuel used in all the tests, both superheated and saturated, was Youghiogheny lump. Repeated analyses of this coal show it to have a very uniform heat value.

TESTS USING SATURATED STEAM.

The Tests Involving Saturated Steam, which were used in this report, were taken directly from Tables IV and V in the report of Dean W. F. M. Goss to the association in 1909. All the tests were run at a speed of 30 miles per hour, and steam pressures of 200, 160 and 120 pounds. The conditions of pressure and cut-off under which the tests were run are shown diagrammatically in Fig. 1. The cut-off is determined by the position of

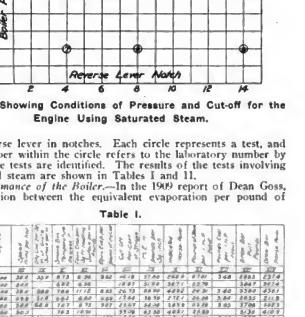

Fig. 1—Showing Conditions of Pressure and Cut-off for the Engine Using Saturated Steam.

the reverse lever in notches. Each circle represents a test, and the number within the circle refers to the laboratory number by which the tests are identified. The results of the tests involving saturated steam are shown in Tables I and II.

Performance of the Boiler.—In the 1909 report of Dean Goss, the relation between the equivalent evaporation per pound of

Table I.

Number	Laboratory Symbol	Steam Pressure by Gauge	Degree of Superheat	Dry Coal per Hour	Water per Hour	Temperature of Feed Water	Factor of Evaporation	Equivalent Evaporation from and at 212° F.	Cut-off	Equivalent Evaporation per Square Foot of Heating Surface	Dry Coal per Square Foot of Heating Surface per Hour	Horse Power	Dry Coal per Horse Power per Hour	Water per Horse Power per Hour	Boiler Horse Power
1	30—2-200	38.5	35.9	9.73	8.36	9.62	.9618	37.66	24.8 %	8.749	1.468	1.468	6.63	5.69	257.8
2	30—2-160	34.5		8.93	8.36		.9618	31.82	20.7	7.391	1.239		5.60	4.81	217.8
3	30—2-120	30.5	39.0	7.69	7.12	9.83	9.73	24.90	16.8	5.784	1.285	1.46	5.266	4.861	
4	30—2-200	38.5	31.0	9.01	8.60	9.62	.9618	37.62	24.8	8.739	1.359	1.360	6.632	6.319	
5	30—2-160	34.5	34.9	9.71	8.73	9.67	.9567	33.97	24.0	7.893	1.509	1.509	5.706	5.783	
6	30—2-120	30.5		10.3	10.0		.9578	32.32	20.1	7.509	1.719		5.26	4.69	
7	30—2-160	34.5	35.6	9.08	8.70	10.30	9.72	34.25	21.5	7.958	1.411	1.411	5.877	5.881	
8	30—2-160	34.5	37.1	8.89	8.76	10.30	9.72	34.25	21.5	7.958	1.381	1.381	5.765	5.963	
9	30—2-160	33.3	120.7	6.33	5.99	9.38	9.63	32.36	20.8	7.521	1.098	1.098	5.756	5.265	

dry coal and the equivalent evaporation per square foot of heating surface per hour for the locomotive using saturated steam is shown by the equation $E = 11.305 - .22\ I$, in which E is the equivalent evaporation per pound of dry coal and H is the equivalent evaporation per square foot of heating surface per hour. This equation is assumed to represent the evaporative

Table II.

Number	Laboratory Symbol	Steam Pressure by Gauge	Degree of Superheat	Dry Coal per Hour	Water per Hour	Temperature of Feed Water	Factor of Evaporation	Equivalent Evaporation from and at 212° F.	Cut-off	Equivalent Evaporation per Square Foot of Heating Surface	Dry Coal per Square Foot of Heating Surface per Hour	Horse Power	Dry Coal per Horse Power per Hour	Water per Horse Power per Hour	Boiler Horse Power
1	30—2-200	38.5	35.9	9.73	8.36	9.62	.9618	37.66	24.8 %	8.749	1.468	1.468	6.63	5.69	257.8
2	30—2-160	34.5		8.93	8.36		.9618	31.82	20.7	7.391	1.239		5.60	4.81	217.8
3	30—2-120	30.5	39.0	7.69	7.12	9.83	9.73	24.90	16.8	5.784	1.285	1.46	5.266	4.861	
4	30—2-200	38.5	31.0	9.01	8.60	9.62	.9618	37.62	24.8	8.739	1.359	1.360	6.632	6.319	
5	30—2-160	34.5	34.9	9.71	8.73	9.67	.9567	33.97	24.0	7.893	1.509	1.509	5.706	5.783	
6	30—2-120	30.5		10.3	10.0		.9578	32.32	20.1	7.509	1.719		5.26	4.69	
7	30—2-160	34.5	35.6	9.08	8.70	10.30	9.72	34.25	21.5	7.958	1.411	1.411	5.877	5.881	
8	30—2-160	34.5	37.1	8.89	8.76	10.30	9.72	34.25	21.5	7.958	1.381	1.381	5.765	5.963	
9	30—2-160	33.3	120.7	6.33	5.99	9.38	9.63	32.36	20.8	7.521	1.098	1.098	5.756	5.265	

efficiency of the boiler when operated under saturated steam. In order to obtain the relation between the equivalent evaporation per pound of dry coal and the rate of firing, an equation was obtained in the following manner: Letting G equal the dry

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coal per square foot of grate surface per hour, 1.322 is the number of square feet of water-heating surface, 17 the number of square feet of grate surface, and H and E the same as above mentioned. Now, from the above values, the following equation is true: $1.322\ H = 17\ E\ G$, or $H = \frac{17\ E\ G}{1.322}$

Substituting this value of H in the equation $E = 11.305 - .221\ H$, we obtain the equation $E = \frac{G + 351.9}{3978}$

This equation gives the relation between equivalent evaporation per pound of dry coal and the dry coal per square foot of grate surface per hour when using saturated steam. The graphical representation of this equation is shown in Fig. 2.

Performance of Original Locomotive Assuming Irregularities to Have Been Eliminated.—Table II shows the performance of the locomotive, assuming irregularities due to boiler performance to have been eliminated. The results in this table were obtained as follows:

Column XV, which gives equivalent steam supplied to locomotive per hour with feed-water at 60° F., equals pounds of

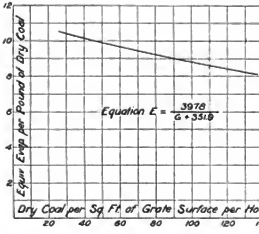

Fig. 2—Showing Relation between Equivalent Evaporation per Pound of Dry Coal and Dry Coal per Sq. Ft. of Grate Surface per Hour for the Engine Using Saturated Steam.

steam supplied to locomotive per hour from original log multiplied by (B. t. u. taken up by each pound of steam minus [60 minus feed-water temperature]) divided by 970.4 (latent heat of evaporation).

Column XVI, which gives the equivalent evaporation per pound of dry coal corrected by equation, was obtained by substituting the values in column VII, Table I, for H in the equation $E = 11.305 - .221\ H$.

Column XVII, which gives dry coal fired per hour corrected by equation, equals column XV divided by column XVI.

Column XVIII, which gives dry coal per square foot of grate surface per hour, equals column XVII divided by 17 (the number of square feet of grate surface).

Column XIX, which gives dry coal per indicated horse-power per hour, equals column XVII divided by column X in Table I.

Column XX, which gives the equivalent steam per indicated horse-power per hour, equals column XV divided by column X in Table I.

Column XXI, which gives the machine friction in terms of mean effective pressure, was taken from Fig. 13, page 158, of the 1909 report of Dean Goss.

Column XXII, which gives the machine friction in horse-power, is obtained by using the values of M. E. P. of column XXI and the speed in revolutions per minute of the individual test, together with the indicated horse-power constant of the locomotive.

Column XXIII, which gives the machine friction in per cent. of indicated horse-power, equals column XXII divided by column X in Table I and multiplied by 100.

Column XXIV, which gives dynamometer horse-power, equals column X in Table I minus column XXII in Table II.

Column XXV, which gives the drawbar pull, equals column XXIV divided by (.000547 multiplied by the revolutions per minute), in which .000547 is the tractive horse-power constant of the locomotive.

Column XXVI, which gives the coal per dynamometer horse-power per hour, equals column XVII divided by column XXIV.

Column XXVII, which gives the equivalent steam per dynamometer horse-power per hour, equals column XV divided by column XXIV.

TESTS USING SUPERHEATED STEAM.

The tests involving superheated steam, as run on Schenectady No. 3, were at a speed of 30 miles an hour, at the same pressures as were used on the original locomotive—that is, 200, 160 and 120 pounds. The conditions of pressure and cut-off under which the tests were run are shown diagrammatically in Fig. 3, in which the cut-off is determined by the position of the reverse lever notch. Each circle represents a test, and the

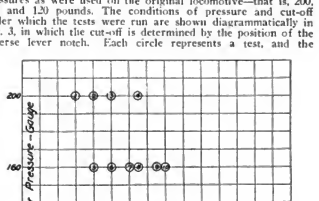

Fig. 3—Showing Conditions of Pressure and Cut-off for the Engine Using Superheated Steam.

number written in the circle represents the laboratory number by which the tests are identified. The results of tests under superheated steam are shown in Tables III and IV. It will be seen that the reverse lever was carried to a higher notch than with the saturated steam.

Performance of the Boiler.—The equivalent evaporation per

Table III.

Number	Laboratory Symbol	Speed (Driving Wheels) Revolutions per Minute	Throttle Pressure Pounds per Square Inch	Temperature Degrees F.	Superheating Degrees F.	Cut-off Percentage of Stroke	Dry Coal per Hour	Dry Coal per Sq. Ft. of Grate per Hour	Water per Pound of Dry Coal	Equivalent Evaporation per Pound of Dry Coal	Dry Coal per Indicated H.P. per Hour	Water per Indicated H.P. per Hour	Equivalent Evaporation per Indicated H.P. per Hour	Dry Coal per Dynamometer H.P. per Hour	Water per Dynamometer H.P. per Hour	Equivalent Evaporation per Dynamometer H.P. per Hour
1	84-8-200	303	188.5	358	169.5	8.00	10.40	0.61	10.43	10.83	0.862	8.99	9.30	0.962	9.96	10.30
2	84-8-200	301	187	358	168.5	7.75	10.38	0.610	10.43	10.84	0.858	8.95	9.30	0.959	9.96	10.30
3	84-8-200	289	187	357	170	9.00	11.63	0.684	10.82	11.24	0.949	8.87	9.22	1.022	9.55	9.93
4	84-8-200	298	187	358	171	9.00	11.80	0.694	10.82	11.24	0.963	8.88	9.22	1.03	9.50	9.86
5	84-8-160	302	155	358	170	8.00	10.70	0.629	10.80	11.22	0.932	8.86	9.20	1.008	9.58	9.95
6	84-8-160	300	155	358	170	8.00	10.70	0.629	10.80	11.22	0.932	8.86	9.20	1.008	9.58	9.95
7	84-8-160	298	154	357	170	8.00	10.66	0.627	10.80	11.22	0.929	8.86	9.20	1.005	9.58	9.95
8	84-8-160	298	154	358	170	8.00	10.66	0.627	10.80	11.22	0.929	8.86	9.20	1.005	9.58	9.95
9	84-8-120	298	122	358	170	8.00	10.66	0.627	10.80	11.22	0.929	8.86	9.20	1.005	9.58	9.95
10	84-8-120	298	122	358	170	8.00	10.66	0.627	10.80	11.22	0.929	8.86	9.20	1.005	9.58	9.95
11	84-8-120	298	122	358	170	8.00	10.66	0.627	10.80	11.22	0.929	8.86	9.20	1.005	9.58	9.95
12	84-8-120	298	122	358	170	8.00	10.66	0.627	10.80	11.22	0.929	8.86	9.20	1.005	9.58	9.95
13	84-8-120	298	122	358	170	8.00	10.66	0.627	10.80	11.22	0.929	8.86	9.20	1.005	9.58	9.95
14	84-8-120	298	122	358	170	8.00	10.66	0.627	10.80	11.22	0.929	8.86	9.20	1.005	9.58	9.95

square foot of water and superheating surface per hour and the equivalent evaporation per pound of dry coal. Columns VI and VII in Table III, were plotted as shown in Fig. 4. There were sixteen different tests run under superheated steam, and, as

Table IV.

Number	Laboratory Symbol	Speed (Driving Wheels) Revolutions per Minute	Throttle Pressure Pounds per Square Inch	Temperature Degrees F.	Superheating Degrees F.	Cut-off Percentage of Stroke	Dry Coal per Hour	Dry Coal per Sq. Ft. of Grate per Hour	Water per Pound of Dry Coal	Equivalent Evaporation per Pound of Dry Coal	Dry Coal per Indicated H.P. per Hour	Water per Indicated H.P. per Hour	Equivalent Evaporation per Indicated H.P. per Hour	Machine Friction: Mean Effective Pressure	Machine Friction: Horse Power	Dry Coal per Dynamometer H.P. per Hour	Water per Dynamometer H.P. per Hour	Equivalent Evaporation per Dynamometer H.P. per Hour	Drawbar Pull	Dry Coal per Drawbar H.P. per Hour	Water per Drawbar H.P. per Hour	Equivalent Evaporation per Drawbar H.P. per Hour
1	84-8-200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	84-8-200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	84-8-200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	84-8-200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	84-8-160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	84-8-160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	84-8-160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	84-8-160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	84-8-120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	84-8-120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	84-8-120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	84-8-120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	84-8-120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	84-8-120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

shown, each point represents one test. The equation for the line as shown, which most nearly approximates all the points, is $E = 12.443 - .319\ H$, where E is the equivalent evaporation

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per pound of dry coal and H is the equivalent evaporation per square foot of water and superheating surface per hour. The area of the heating surface is based upon the interior surface of the firebox and the exterior surface of the boiler and superheating tubes. This equation was derived from all tests at all pressures and therefore fairly represents the average performance of the boiler at any pressure when operated under superheated steam. It is a noteworthy fact that this equation is practically the same as that obtained from the lower rates of firing reported to the association in 1911. The equation for the nine points as obtained that year was $E = 12.450 - .318$ H. In the same manner as used in the original locomotive, G equals the dry coal per square foot of grate surface per hour, 1.404 the number of square feet of water and superheating surface, 17 the number of square feet of grate surface and H and E the same as before mentioned, the following formula is true: $1.404\ H = 17\ E\ G$, or $H = \frac{17\ E\ G}{1.404}$

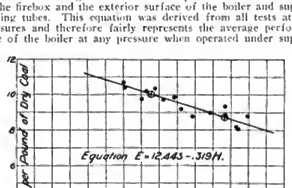

Fig. 4—Showing Relation between Equivalent Evaporation per Pound of Dry Coal and Equivalent Evaporation per Sq. Ft. of Heating Surface per Hour for the Engine Using Superheated Steam.

Substituting this value of H in the equation $E = 12.443 - .319$ H, we obtain the equation $E = \frac{3,221}{G + 258.9}$, which shows the relation between the equivalent evaporation per pound of dry coal and the dry coal per square foot of grate surface per hour when using superheated steam. The graphical representation of this equation is shown in Fig. 5.

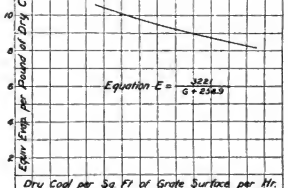

Fig. 5—Showing Relation between Equivalent Evaporation per Pound of Dry Coal and Dry Coal per Sq. Ft. of Grate Surface per Hour for the Engine Using Superheated Steam.

Performance of the Superheated Locomotive, Assuming Irregularities to Have Been Eliminated.—Table IV shows the performance of the locomotive when using superheated steam, assuming irregularities to have been eliminated. The results in this table were obtained in exactly the same manner as those from the locomotive when using saturated steam as shown in Table II, and may be compared with them.

THE INCREASE OF POWER OF THE SUPERHEATER LOCOMOTIVE OVER THE ORIGINAL LOCOMOTIVE WHEN USING THE SAME AMOUNT OF COAL.

Having now obtained the values as shown in Tables II and IV for the two types of locomotives, the curves as shown in Figs. 6 to 9 were plotted. By the use of the equations of the curves in Figs. 2 and 5, the equivalent pounds of steam per pound of coal can be determined for any rate of firing of either locomotive. Also, from Figs. 6 and 7, the equivalent pounds of steam per L. H. P. per hour can be determined for any cut-off, and from the lines shown in Figs. 8 and 9 the mean effective pressure for any cut-off can be ascertained. Now, assuming that the curves as shown in these figures fairly represent the performance of each locomotive at the same rate of firing—that is, burning the same number of pounds of coal per square foot of grate area per hour. Table V shows this comparison of the two locomotives while burning 110, 120 and 130 pounds of coal per square foot of grate.

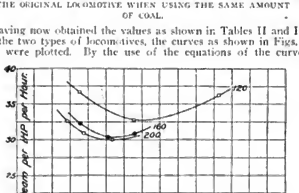

Fig. 6—Showing Relation between Equivalent Pounds of Steam per I.H.P. per Hour and Cut-off for the Engine Using Saturated Steam.

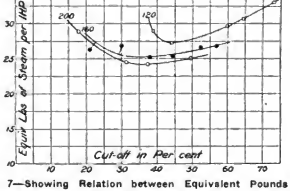

Fig. 7—Showing Relation between Equivalent Pounds of Steam per I.H.P. per Hour and Cut-off for the Engine Using Superheated Steam.

Column I of this table shows the rate of firing per square foot of grate per hour.

Column II gives the steam pressure, the comparisons being made at three pressures, namely, 200, 160 and 120.

Column III gives the equivalent evaporation per pound of dry coal for the original locomotive, and was obtained by substituting the values in column I for G in the equation $E = \frac{3,978}{G + 351.9}$

Column IV gives the equivalent evaporation per pound of dry coal for the superheater locomotive, and was obtained by sub-

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stituting the values in column I for G in the equation

$$E = \frac{3.221}{G + 258.9}$$

Column V gives the equivalent pounds of steam per hour for the ordinary locomotive, and was obtained by multiplying the

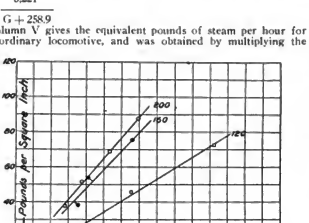

Fig. 8—Showing Relation between M. E. P. and Cut-off for the Engine Using Saturated Steam.

values in column I by those in column III and then by 17.

Column VI gives the equivalent pounds of steam per hour for the superheater locomotive, and was obtained by multiplying the values in column I by those in column IV and then by the grate area, which is 17 square feet.

Columns VII to XIV were obtained in a "cut and try" method,

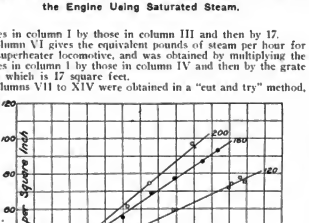

Fig. 9—Showing Relation between M. E. P. and Cut-off for the Engine Using Superheated Steam.

which is shown by the following example: When using 110 pounds of coal per square foot of grate area under a steam pressure of 200 pounds, we get at a 48 per cent. cut-off;

From the curve in Fig. 7, 24.9 pounds of steam per I. H. P. per hour;

Table V.

Pounds of Coal per Sq. Ft. of Grate per Hour	Steam Pressure	Equiv. Evap. per Pound of Dry Coal	Equiv. Pounds of Steam per Hour	Cut-Off in Per Cent	Equiv. Pounds of Steam per I.H.P. per hr.	M.E.P. Lbs. per Sq. In.	Indicated Horse Power	Percent Increase in I.H.P.
A		Sat.	Sup.	Sat.	Sup.	Sat.	Sup.	Sup.
110	200	8.01	9.73	48.0	24.9	69.5	1564	22.6
110	160	8.01	9.73	48.0	24.9	69.5	1564	22.6
110	120	8.01	9.73	48.0	24.9	69.5	1564	22.6
120	200	8.01	9.73	42.0	24.9	69.5	1705	22.6
120	160	8.01	9.73	42.0	24.9	69.5	1705	22.6
120	120	8.01	9.73	42.0	24.9	69.5	1705	22.6
130	200	8.01	9.73	36.5	24.9	69.5	1846	22.6
130	160	8.01	9.73	36.5	24.9	69.5	1846	22.6
130	120	8.01	9.73	36.5	24.9	69.5	1846	22.6

From the line in Fig. 9, 92.2 pounds mean effective pressure.

Thus, I. H. P. $= \frac{16325.1}{24.9} = 655.6$.

Also, I. H. P. $= 4\ (92.2)\ (.012144)\ (146.2) = 654.6$.

At 48.2 per cent. cut-off we obtain from the curves in Fig. 7 24.9 pounds of steam per I. H. P. per hour, which gives I. H. P. = 655.6, and from the curves in Fig. 9 92.7 mean effective pressure, which gives I. H. P. = 658.2.

By looking at the above sets of values, it can be seen that at 48 per cent. cut-off the I. H. P. figured from the basis of pounds of steam per I. H. P. is greater than that figured from the basis of the M. E. P., and at 48.2 per cent. cut-off just the reverse is true. Therefore, the proper values must lie somewhere between 48 and 48.2 per cent. cut-off.

The proper value of 48.1 per cent. cut-off was found to give the same I. H. P. figured from the pounds of steam per I. H. P. per hour as figured from M. E. P.; that is, with 48.1 per cent. cut-off, the steam per I. H. P. per hour is 24.9 as obtained from the curve and gives an I. H. P. of 655.6. The M. E. P. at this cut-off is 92.4, and gives an I. H. P. of 656.0. These are so near the same that the 655.8 value was taken as the I. H. P. developed while burning 110 pounds of coal per square foot of grate. The four values mentioned above were used in the tables. The same process was used in determining the values for each line of Table V.

Column XV of Table V, which gives the per cent. increase in indicated horse-power of the superheater locomotive over the other locomotive, when using the same amount of coal, equals column XIV minus column XIII divided by column XIII and multiplied by 100.

DISCUSSION OF RESULTS.

Increased Power Due to Superheating.—It can be seen from Column XV, Table V, that the increase in power due to superheating, when burning from 110 to 130 pounds of coal per square foot of grate surface per hour, varies from 22.6 to 13.0 per cent. Also from the values in this column it can be seen that for any steam pressure the per cent. increase of power decreases as the coal consumption increases, and that for any coal consumption, the increase of power increases as the steam pressure increases.

The Effect of Increasing Size of Cylinder for Maximum Power.—By comparing the values of equivalent pounds of steam per I. H. P. per hour it will be seen that they are considerably

Table VI—Superheater Engine 120 Pounds Dry Coal per Sq. Ft. of Grate per Hour.

Steam Pressure	Cut-Off in Percent of Steam	Equiv. Lbs. of Steam per I.H.P. per hr.	M.E.P. Pounds per Sq. Inch	Cut-Off at Maximum Efficiency	Equiv. Lbs. of Steam per I.H.P. at Maximum Efficiency	M.E.P. at Maximum Efficiency	Percent Increase in I.H.P.	Diam. of Cyl. in inches to give Maximum Efficiency
I.	II.	III	IV.	V.	VI.	VII	VIII.	IX.
200	30.9	25.2	86.9	33.0	24.2	70.0	3.97	18.62
160	33.5	26.7	91.3	37.0	24.2	66.7	6.44	18.73
120	65.93	31.7	78.5	44.0	27.3	58.0	12.28	18.62

Ft. of Grate Surface per Hour.

larger than the best performance of the locomotive as obtained at a lower cut-off; that is, the cut-off of maximum efficiency for 160 pounds steam pressure is approximately 37 per cent., while the cut-off as obtained under 120 pounds of coal per hour is 55.5 per cent. The relative steam consumption for these two values of cut-off is 25.2 and 26.7 pounds per I. H. P. per hour, respectively. It will be seen that the increase in power to be accomplished by having the cut-off at the proper point to give maximum efficiency is about 5.6 per cent., as is shown in column VIII. That is, $\frac{26.7 - 25.2}{26.7} \times 100 = 5.6$ per cent. In order to show this more clearly, the values in Table VI have been worked out.

Columns I, II, III and IV were taken from columns II, VIII, X and XII, respectively, in Table V, at 120 pounds of dry coal

Table VII.

Steam Pressure	I H P		Per Cent Increase in I. H. P
	Sat	Sup	
200	567.8	217.0	26.3
160	553.1	689.0	24.5
120	487.2	636.0	30.0

per square foot of grate surface per hour. The values in column V, which give the cut-off at maximum efficiency, were taken at the lowest points of the curves in Fig. 7. The values in column VI, which give the equivalent pounds of steam per I. H. P. per hour at maximum efficiency, were taken from the curves in Fig. 7 at the points of cut-off shown in column V. The values in column VII, which give the M. E. P. at maximum efficiency, were taken from the curves in Fig. 9 at the points of cut-off shown in column V. The values of column VIII, which give the per cent. increase in indicated horse-power, equals column III minus column VI divided by column III and multiplied by

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100. The values in column IX, which give the diameter of cylinders necessary to obtain maximum efficiency, equal sixteen times the square root of values given in column IV divided by the square root of values given in column VII. The following sample calculation will show this more clearly. The diameter of the cylinders at present is 16 inches. The ratio of this to the new diameter required to give the same indicated horsepower must be inversely proportional to the square roots of the mean effective pressures. For 200 pounds pressure

$$\frac{X}{16} = \frac{\sqrt{96.0}}{\sqrt{70.0}} = 9.86$$

$$X = 18.82 \quad 8.38$$

where X is the new diameter of cylinder.

The average of the three values in column IX is about 18½ inches. Now, if the locomotive were equipped with 18½-inch cylinders, when using 120 pounds of coal per square foot of grate, the cut-off could be at the most efficient point to obtain maximum power.

Under these conditions there would be an increase in power as shown in Table VII, or, in other words, the increase in power of the superheater locomotive over the other for the 160 and 200 pounds pressure would be about 25 per cent, if the size of the cylinders were increased to 18½ inches, whereas at present the increase is about 20 per cent.

Table VII, showing the increase of power of the superheater locomotive over the other when using 120 pounds of coal per square foot of grate per hour if the cylinders were increased to 18½ inches, is given below.

DISCUSSION.

C. D. Young (Penna.): As Professor Benjamin has said, we have both arrived at about the same destination by different means. The facts could not be otherwise, owing to the physical laws with which we were both working. There are two or three points in the paper to which I would like to call the attention of the membership, that in degree only differ from the results which we have obtained. In referring to diagram 5, front which it has been determined what would be the proper size of cylinders, the coal burning rate per square foot of grate when plotted against the equivalent evaporation per lb. of dry coal is slightly higher for the superheated than for the saturated. For example, for 80 lb. rate, the diagram shows it would be in the neighborhood of 9½ for the superheated locomotive, and about 9.3 for the saturated locomotive. All of our experience has indicated that the application of the superheater at a good burning rate, will reduce the equivalent evaporation per lb. of dry coal. In other words, we can expect less efficiency by the boiler alone, whereas the data shows that the superheated steam boiler has higher efficiency than the saturated steam boiler. The diagrams in the Committee's report are 24, where at 80 lbs, the E-6 locomotive gave when superheated, 9.4, and when saturated, 10 lbs equivalent of water per lb. of dry coal. That has been all the difference we found due to the application of the superheater to the boiler.

All of Prof. Benjamin's tests were run at 30 m. p. h., and I do not think it is fair to make determinations on the results of one speed in the volume of cylinder. A saturated steam engine will give a given water rate at 30 m. p. h. which will probably be comparable with its cylinder volume, whereas at speeds of 60 to 75 m. p. h., you get the best rates from a passenger locomotive; freight at 30 miles. you are only getting the average superheat as compared with about as good as you can get from the saturated steam locomotive; therefore it would be well to consider a range of speed in making your water rates; for if you disregard these, you make the increase too small in the cylinder volume to get the maximum value.

J. E. DeVoy (C. M. & St. P.): We have under consideration the equipping of saturated engines with superheaters, and the opinion we have formed since coming here makes it that it would be better to throw away the present cylinders and increase the diameter of the cylinders, rather than try to say, bore them out one inch.

L. H. Fry: One point Mr. Young made in regard to the efficiency of the saturated boiler as compared with the superheated boiler can be applied to the locomotive. I believe this can be explained by the fact that the superheater boiler takes more air than the saturated boiler. I have followed the Purdue University test and it seems that in this particular engine the application of the superheater reduced the resistance of the boiler to the passage of the air. The Purdue Superheater engine takes more air than the saturated, while in the Pennsylvania test the reverse is the case.

W. C. A. Henry (Penna.): We have a saturated engine with 20 in. cylinders, and when we apply superheater, I hope to get more fuel economy out of the change. These locomotives are now double-headed to a considerable extent owing to the increase in the weight of trains and fast schedules; so in working up plans, we made new drawings calling for a cylinder of 2 in. greater diameter than the ones that we used before. We hope to realize this increase in starting and in horse-power by so doing.

E. W. Pratt (C. & N. W.): On the North Western we had a number of the Pacific type engines, some of which were saturated and some superheated, and at the present time all the saturated engines have been changed, without enlarging the cylinders. We have not made any careful tests, but the results in operation appear to be a considerable saving of fuel and a livelier engine, by putting on the same cylinder and fixing the boiler pressure to 185 lbs. In heavy trains, the 2 in. larger cylinder, superheated engine, with less pressure does the business more economically. That is the practical standpoint, covering our experience with over 100 locomotives.

F. F. Gaines: From a preliminary study of the two reports, it is indicated that larger cylinders point to larger economy, and going into that we will find at maximum cut-off we will have an engine with low adhesive factors.

C. D. Young: I think we will establish a diameter; but probably you may, with short-stroke engines, be able to increase the volume by increasing the cut-off. That will have to be carefully considered in freight engines where the turning torque enters into consideration. As far as the Pennsylvania is concerned, we are increasing the size of cylinders of our freight engines. The first engine was a Consolidation, which had a tractive power of 42,000 saturated and we have increased the cylinder size to where we obtain about 51,000 lbs. from the same identical boiler. This has been done entirely by an increase in the diameter of the cylinder. Even on exhaust cylinders this can be done, because our original pins and rods were figured with a sufficient factor to take care of the strength at the starting.

Such an engine has been on our test plant and for a freight engine, has given remarkable water rates. We have run the steam as low as 8 m. p. h. in full gear, on the locomotive test plant, something that we were never able to do before, owing to braking troubles, and at 8 m. p. h., we have developed more tractive power than we calculated for at the start, which is a somewhat remarkable figure, and we have had sufficient capacity in the boiler to operate it full gear up to something like 13 m. p. h. without affecting the steam pressure whatsoever. At these long cut-offs, the water rate is fairly comparable with the old saturated steam water rates at more economical cut-off, and when operating at 25 per cent. cut-off we have got as low as 17.8 lb of water per indicated horse power at slow speed which shows that the compound superheater is somewhat in the distance.

J. E. DeVoy (C. M. & St. P.): I wish to say a word or two about the factor of adhesion. I believe, and have always thought, that we should take the greatest unit of power out of the locomotives that is possible. We have 80 consolidation engines with a factor of adhesion of 3.91, so that it does not appear to me that we are going to take a very big chance. With an engine built for long grades and sustained effort, we can afford to reduce the factor of adhesion. I am more alarmed about the stress on pins and rods and other things than I am about the factor of adhesion. I am fully convinced that in order to take all the power out of the locomotive that we should take, that we had better consider increasing the size of the cylinders in order to get the best results, so far as efficiency is concerned, and take a chance with the factor of adhesion.

F. F. Gaines: My experience has been that a slippery engine is a costly engine. We have some engines with a factor of adhesion of 3.9, which is around the neighborhood of what Mr. DeVoy speaks of, and we have another class of engines with the same tractive power, but have a higher factor of adhesion, and there is a difference in the maintenance cost of the two types of locomotives; the one with the lower factor of adhesion does slip and wears out the tires and rods and other parts of the locomotive much faster than the heavier engines do, and as a suggestion, possibly, to getting a larger cylinder, I think what might be done would be to block off the reversing lever, so that you could not get the engine down in a corner.

J. F. DeVoy: I wish it to be understood that my opinion is due to the country in which I am engaged in railroad operation.

G. W. Wildin (N. Y., N. H. & H.): There is one point which is brought out, and that is in applying the superheater to your locomotive, you add to the weight of your drivers from 3,000 to 5,000 lbs., which enables you to get a more effective engine by having a larger cylinder. We have some Pacific type engines, with 22 in. x 28 in. cylinders and 200 lb. pressure, which we changed over to superheaters. We retained the pressure and increased the cylinder to 23 in. x 28 in. and we have a 10 per cent. larger engine on the starting capacity and 25 per cent. larger engine on the hauling capacity.

Prof. L. E. Endsley: The design which was brought out

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in the last application of the superheater through the Purdue Locomotive, was very carefully worked out so that the reduction in the heating surface made necessary was small in comparison to the size of the firebox. We all know that the firebox does a great deal more work per sq. ft. of heating surface, so that we did not reduce the water-heating surface so very much when we put in the last superheater. By adding the larger superheater with 324 sq. ft. of heating surface, we got a boiler that gave a very high efficiency, possibly higher than you would get today should you redesign any of your present saturated steam boilers. You would not have as much heating surface in your firebox of the boiler today as compared with the Purdue Locomotive. In fact, the last installation as put in with the superheater gave a much higher efficiency of the boiler than on any other superheaters which we have used, and we did not have nearly the total heating surface that we have now.

I do not think you would expect to get any such increased efficiency by the installation in a modern locomotive as Mr. Young described, but it so happened that at Purdue, this engine was built in 1897 for saturated steam and did not have as large a heating surface for the size of the locomotive as you would get today, and that accounts for the increase in the boiler efficiency as compared with the engine of today.

One thing which Mr. Pratt brought out was in relation to the reduction of pressure. I think it is pretty well shown by our tests that the difference in efficiency of the locomotive as a whole between 160 lb. and 200 lb. is small, and that if you do not want to increase the tractive power by increasing the size of the cylinder, you can reduce your pressure and not lose very much in the efficiency of your engine.

Insofar as steam is concerned, these tests were run at 30 m. p. h., that being a speed which gave the minimum steam consumption to the saturated locomotive. In the superheater locomotive, I think you will find, possibly, that it will be about the same.

The boiler efficiency is not affected by steam, it is merely the rate at which you put the coal in the locomotive. If you put it in at a high rate of firing, the efficiency will increase, and if you should attempt to maintain the same cut-off at higher rates, you will increase your coal consumption, and therefore decrease the efficiency of your boiler.

As to the question of added air, I was not able to follow just how we could get more air in. We have practically the same vacuum at the front end, the same area in the flues, practically the same grate areas, and I do not see how we can get any more air through to increase the efficiency. I think whatever increase in efficiency we get in the boiler is due to the firebox, in most of the cases, in both cases, and having enough flue area so that we have a sufficient heating surface. You will not get that in all locomotives, because we are taking advantage of every foot of flue area to get as many flues as we can, today. That was not taken advantage of in the design of the locomotive tested at Purdue under saturated steam.

A vote of thanks was extended to Dean Benjamin and Prof. Endsley for the very competent and able paper which they presented.

CONCLUDING EXERCISES.

The usual resolutions were offered thanking the Railway press in general and the *Railway Age Gazette* in particular for the daily reports of the convention's proceedings.

The following officers were elected for the ensuing year: President, D. R. MacBain, (L. S. & M. S.); first vice-president, F. F. Gaines, (Cent. of Ga.); second vice-president, E. W. Pratt, (C. & N. W.); third vice-president, Wm. Schlafge, (Erie), and treasurer, Angus Sinclair. Executive Members for two years: W. J. Tollerton (Rock Island Lines); J. F. DeVoy (C. M. & St. P.), and J. T. Wallis (Penna.). F. H. Clark (B. & O.) was elected for one year.

Scott H. Blewett presented Ex-President Crawford with the ex-president badge.

4-6-2 TYPE FREIGHT LOCOMOTIVE.

With a view of bettering operating conditions and reducing operating costs the Delaware, Lackawanna & Western has introduced several powerful new locomotives in both passenger and freight service. In June, 1912, the American Locomotive Company delivered to this company fifteen Mikado type freight locomotives, having a total weight of 312,000 lbs., and a tractive effort of 57,100 lbs., and seven Pacific type passenger locomotives having a total weight of 284,000 lbs. and a tractive effort of 40,800 lbs. These engines have so thoroughly demonstrated the fact that the most powerful locomotives of approved design are also the most economical, that not only have the Mikado and Pacific type engines been duplicated, but seven of the most powerful Pacific type locomotives have recently been built for use in fast freight service. These new locomotives have a total weight of 286,000 lbs., a tractive effort of 43,100 lbs., and a large and well proportioned boiler.

Previous to their introduction, the fast freight traffic was handled by locomotives of the mogul type. The demands of this traffic are constantly increasing, and fast outgrowing the boiler capacity of this type of locomotive. Hauling capacity depends on sustained tractive effort, which in turn depends on boiler capacity. To this end most careful attention was given to the boiler design in the new power.

Powerful Fast Freight Locomotive; Delaware Lackawanna & Western.

The mogul engines have a total weight, engine and tender, of 303,700 lbs., a tractive effort of 29,480 lbs., and a total heating surface of 2,185. The new Pacific type engines have a total weight, engine and tender, of 455,600 lbs., a tractive effort of 43,100 lbs., and a total equivalent heating surface (evaporating heating surface plus 1½ times the superheating surface) of 5, 292. As compared with the mogul type, this is an increase of 50 per cent. in weight, of 47.8 per cent. in power, and 142 per cent. in equivalent heating surface.

The following table shows the results of a test run between Scranton, Pa., and Hoboken, N. J., a distance of 133 miles. Although the men were not familiar with the new engines,

			Percentages In favor of	
	2-6-0	4-6-2	2-6-0	4-6-2
lbs. of coal per engine mile.....	108.0	104.02	100	96.3
lbs. of coal per 1,000 ton miles.....	102.8	75.14	100	73.1
lbs. of coal per 1,000 ton miles hours	15.13	9.81	100	64.7
lbs. of coal per 1,000 car miles....	3598.9	2509.0	100	69.7
lbs. of coal per 1,000 car miles hours	534.5	327.9	100	61.3
lbs. of water per engine mile.....	837	852.9	100	102.0
lbs. of water per 1,000 ton miles....	796.8	616.2	100	77.3
lbs. of water per 1,000 ton mile hours	121.3	80.4	100	68.3
lbs. of water per 1,000 car miles....27891.5		2057.8	100	73.7
lbs. of water per 1,000 car miles hours	4142.1	2688.8	100	64.9

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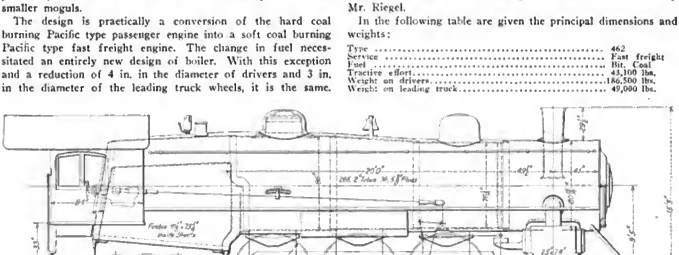
a very decided improvement in coal and water consumption per ton and car mile was obtained. On a train mile basis these new big engines handle their increased train loads on practically the same coal and water consumption as the smaller moguls.

The design is practically a conversion of the hard coal burning Pacific type passenger engine into a soft coal burning Pacific type fast freight engine. The change in fuel necessitated an entirely new design of boiler. With this exception and a reduction of 4 in. in the diameter of drivers and 3 in. in the diameter of the leading truck wheels, it is the same.



Pacific Type Fast Freight Locomotive; Delaware, Lackawanna & Western.

This means a duplication of almost all the parts that require the most frequent renewals or need to be kept in stock.

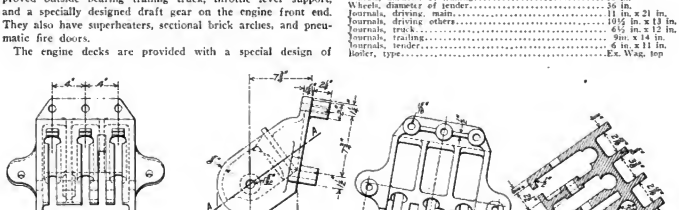
The design includes practically all of the improved features perfected by the builders. Among these are: The screw reverse gear, extended piston rods, self-centering valve stem guide, long main driving box, Woodard engine truck, improved outside bearing trailing truck, throttle lever support, and a specially designed draft gear on the engine front end. They also have superheaters, sectional brick arches, and pneumatic fire doors.

The engine decks are provided with a special design of

free from stuffing boxes or operating levers. This valve is designed so that during periods of standing it can be closed and the water in the hose blown back into the tank, thus leaving the hose free from freezing. This was also devised by Mr. Riegel.

In the following table are given the principal dimensions and weights:

Type	462
Service	Fast freight
Fuel	Bit. Coal
Tractive effort	43,100 lbs.
Weight on drivers	186,500 lbs.
Weight on leading truck	49,000 lbs.
Weight on trailing truck	50,500 lbs.
Total weight of engine	286,000 lbs.
Total weight of tender	169,600 lbs.
Wheel base, driving	13 ft. 0 in.
Wheel base, total engine	33 ft. 10 in.
Wheel base, total engine and tender	66 ft. 4 in.
Cylinders, diameter and stroke	25 in. x 28 in.
Valve gear	Walschaert
Wheels, diameter of driving	69 in.
Wheels, diameter of truck	30 in.
Wheels, diameter of trailing	50 in.
Wheels, diameter of tender	36 in.
Journals, driving, main	11 in. x 21 in.
Journals, driving, others	10½ in. x 13 in.
Journals, truck	6½ in. x 12 in.
Journals, trailing	9in. x 14 in.
Journals, tender	6 in. x 11 in.
Boiler, type	Ex. Wag. top



Riegel Grate Shaker Brackets; Delaware, Lackawanna & Western.

grate shaker brackets shown in the illustration. These are completely enclosed against the dropping of coal and permit the use of the standard tender apron without the necessity of covering the usual openings for the grate shaker brackets. They were designed by S. S. Riegel, mechanical engineer of the railroad.

The tenders are equipped with a low type, quick opening tank well, operating from the ground, and located outside the side sills of the underframe. This keeps the top of the tender

Steam pressure	200 lbs.
Boiler, outside diameter front end	78 in.
Boiler, outside diameter back end	86 in.
Firebox length	111-⅝ in.
Firebox width	75⅝ in.
Tubes, number and diameter	265-2 in.
Flues, number and diameter	36-5½ in.
Tubes, length	20 ft.
Heating surface, tubes	2769 sq. ft.
Heating surface, firebox	221 sq. ft.
Heating surface, total	3990 sq. ft.
Superheating surface	1000 sq. ft.
Grate area	58.0 sq. ft.
Water, capacity of tender	9000 galls.
Coal, capacity of tender	10 tons.

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POWERFUL PACIFICS FOR THE ERIE.

The Lima Locomotive Corporation, Lima, Ohio, has recently completed an order of five Pacific type locomotives for use on the New York division of the Erie. These were ordered after considerable experience with experimental engine No. 50,000, built by the American Locomotive Company and purchased by the Erie. The size of the cylinders, length of stroke and diameter of drivers of the new engines are the same as those on No. 50,000, giving them the same tractive effort, viz.: 40,630 lbs., but a number of alterations have been made in the boiler. The new design has a firebox 84 in. wide, giving a grate area of 66.6 sq. ft. in place of 59.75 sq. ft. on No. 50,000. The number of tubes has been reduced from 207 to 199 and a straight top instead of a conical type boiler has been specified. The diameter at the front end has been increased from 76¾ in. to 78 in. but the diameter at the dome is 81¼ in. instead of 87 in. The number of superheater elements is also less, there being 32 in this case as compared to 36 in the experimental engine. In spite of the wider grate the firebox heating surface is less and the total heating surface is 3,813 sq. ft. No. 50,000 has 4,048 sq. ft. evaporating surface.

These changes have affected the weights somewhat, but, contrary to what might be expected, it has increased them. No. 50,000 has a total weight of 269,000 lbs. while the new engines weigh 286,825 lbs. in working order. The weight on drivers is 175,725 lbs., an increase of 3,225 lbs. The ratios have also been materially altered as will be seen by comparing the list below and the list published on page 12 of the January, 1912, issue of the *American Engineer*.

The location of the bell ahead of the smoke stack is an innovation that has not been tried before on this railroad. The reason for the change is the belief that a warning can be heard more distinctly when the bell is located in this manner than when it is in the usual position.

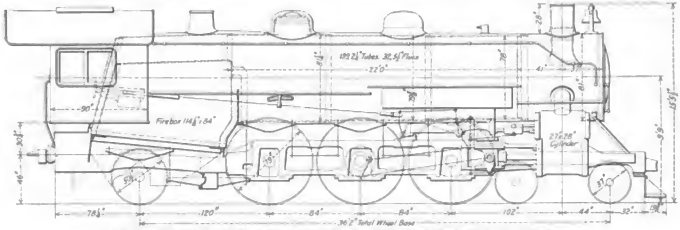
The main driving boxes are of the extended design giving a hearing area of 11 in. x 21½ in. The screw reverse gear is used and the locomotives have Baker valve gear. Among the other specialties applied are: Franklin fire door; Chicago flange lubricator; Security brick arch; Ryan and Johnson coal pusher; radial buffers; Leach sanders, Dressel oil headlight; Simplicity bell ringer; Tallmage ash pan; full installation of Tate flexible staybolts; Klinger water gage and U. S. King type piston and valve rod packing. Vanadium steel is used for the frames and rods, and Hunt-Speller iron is employed for piston and valve bushings and rings.

The general dimensions, weights and ratios are given below:

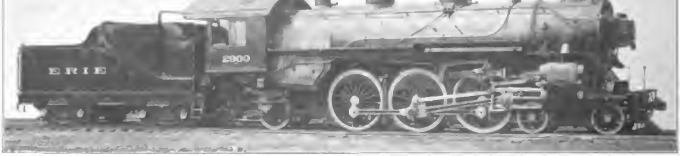
General Data:	
Type	4-6-2
Gage	4 ft. 8½ in.
Service	Passenger
Fuel	Bit. coal
Tractive effort	40,630 lbs.
Weight in working order	286,825 lbs.
Weight on drivers	175,725 lbs.
Weight of engine and tender (loaded)	469,585 lbs.
Wheel-base (driving)	14 ft.
Wheel-base, engine and tender	68 ft. 4¾ in.
Wheel-base, total	36 ft. 2 in.

Ratios:	
Weight on drivers ÷ tractive effort	4.32
Total weight ÷ tractive effort	7.06
Tractive effort × diameter drivers ÷ heating surface	604
Total heating surface ÷ grate area	57.2
Firebox heating surface ÷ total heating surface, per cent.	5.45
Weight on drivers ÷ heating surface*	33.05
Total weight ÷ heating surface*	53.95
Volume both cylinders, cu. ft.	19.54
Heating surface* ÷ vol. cylinders	286.73
Grate area ÷ vol. cylinders	3.59

Valves:	
Kind	Piston
Greatest travel	6 in.
Outside lap	1¼ in.
Inside clearance	3/16 in.
Lead	¼ in.



New Pacifics for the Erie; Designed on the Basis of Experience with No. 50,000.



Pacific Type Locomotive for the Erie, Built by the Lima Locomotive Corporation.

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Cylinders:	
Kind	Simple
Diameter and stroke	27 in. x 28 in.
Wheels:	
Driving, diameter over tires	79 in.
Driving, thickness of tires	4½ in.
Driving journals, main	11 in. x 21-½ in.
Driving journals, others	11 in. x 13 in.
Engine truck wheels, diameter	36 in.
Engine truck journals	6½ in. x 12 in.
Trailing Truck wheels, diameter	50-½ in.
Trailing Truck journals	9 in. x 14 in.
Boiler:	
Style	Straight
Working pressure	185 lbs.
Outside diameter of first ring	78 in.
Firebox, length and width	114⅛ in. x 84 in.
Firebox plates, thickness	⅜ in.
Firebox, water space sides and back	4½ in.
front	5 in.
Tubes, number and outside diameter	199-2¼ in.
Flues, number and outside diameter	32-5½ in.
Tubes, thickness	.125 in.
Flues, thickness	.150 in.
Tubes, length	22 ft.
Heating surface, tubes and flues	3575 sq. ft.
Heating surface, firebox	208 sq. ft.
Heating surface, arch tubes	30 sq. ft.
Total heating surface	3813 sq. ft.
Superheating surface	1002 sq. ft.
Equivalent heating surface*	5316 sq. ft.
Grate area	66.6 sq. ft.
Smokestack, diameter	18.5 in.
Smokestack, height above rail	15 ft. 5½ in.
Tender:	
Wheels, diameter	33 in.
Journals, diameter and length	6 in. x 11 in.
Tank	Water bottom
Water capacity	8500 gals.
Coal capacity	14 tons

*Equivalent heating surface equals total heating surface plus 1.5 times superheating surface.

IMPROVED CAST STEEL TRUCK SIDE FRAMES.—Many mechanical men have long felt that the cast steel truck side frames, designed with the "I" sections now generally used, do not have sufficient strength transversely. A truck frame with channel sections throughout would be best for taking care of the transverse strains, but the foundry difficulties involved in making side frames of this type have so far precluded their use. However, The Buckeye Steel Castings company, Columbus, Ohio, has developed a side frame with the channel sections throughout so that for the same amount of metal the transverse strength is almost three times that of the "I" section of equal area, and at the same time the vertical strength is not decreased. Samples of these designs are on exhibition in Booths 603-605.

YEUNGKONG-KONGMOON LINE, CHINA.—The progress of this line is being retarded by a quarrel about a bridge over the river between Sanui and Kongmoon. There has been a good deal of delay over the building of this structure, and the train does not run any farther than Kongmoon city, which is some four or five miles away from the terminus; that is, the station at Kongmoon. The river runs through this section. An influential body of men signed a petition, and sent it in to headquarters, Canton, asking that the bridge be not allowed, but the reply was that the company was to set to it that the work of constructing the bridge was put through at once, for it was too late to let the prejudices of the few in the vicinity hinder this important work.

MOTOR CAR SERVICE PROPOSED IN CHINA.—It is proposed to institute motor-car service between Lungchow, China, and Nam Kwan, the present northern terminus of the railway from Hanoi. The commencement of this service would be contingent upon the successful operation of a line of launches between Lungchow and Nanning, and would, it is claimed, constitute, next to the extension of the railway to Lungchow, the best solution of the difficulties that hamper and restrict the trade of the port. The proposed service would handle passengers, light freight and parcels, while the heavier and more bulky cargo would continue to come and go by water. The present existing roads would require only moderate improvement to make them serviceable for motor cars. It is doubtful, however, whether this suggestion will receive any consideration from the people of Lungchow.

Conventionalities.

The fact that there is no ball game today will "bear" the amica market tomorrow.

Ask Burt White of the National Boiler Washer Co. the sequel to the yarn of the Superheater pants?

Lost—Diamond bar pin on the pier during the M. M. dance Thursday evening. Please return to enrollment committee booth.

Mrs. Bateman, wife of "Doc" Bateman, and the two young Docs, Huston and Stanley, are scheduled to arrive on the scene to-day.

E. A. Laughlin, vice-president of the Joliet Ry. Supply Co., Chicago, arrived Monday evening and is stopping at the Traymore.

The Davis twins, Nathan H. and Thomas C.—they of steel back fame—spent Friday on the Pier. They are due to return on Monday.

The Superheater white pants had a "day off" yesterday to keep an appointment with the valet. There is some speculation out in the Annex where they will appear next.

On Friday, June 13, 1913, at 9.13 A. M., Chairman Yardley,

Left to right—J. F. Hill, Master Mechanic, Wheeling & Lake Erie, and F. P. Pfahler, Inspector, Interstate Commerce Commission.

of the Enrollment Committee, issued M. M. badge No. 313. The next badge issued was a special guests' badge, No. 1313.

One of the first timers is K. C. Gardner, chief clerk in New York of the Pressed Steel Car Company. Not only is this Mr. Gardner's first convention, but it is his initial visit to this seaside resort.

Mr. and Mrs. W. E. Fowler, Chicago, will be missed at the conventions this year. Mr. Fowler was formerly master car builder of the Canadian Pacific, he is now president of the Fowler Car Company.

P. H. Wilhelm, of the Standard Leather Packing Company, accompanied by Mrs. Wilhelm, reached Atlantic City Thursday. This is Mr. Wilhelm's twenty-third M. M. and M. C. B. Convention, without a miss.

George A. Post, president, and E. H. Walker, vice-president of the Standard Coupler Company, arrived yesterday, and are at the Marlborough-Blenheim. Col. Post, who is president also of the Railway Business Association, speaks optimistically as to public opinion regarding railway matters. He believes there has

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been a marked improvement in recent years, and that this is going to continue.

Owing to illness in his family it is greatly regretted that J. F. Graham, assistant general manager of the Oregon-Washington Railroad and Navigation Company, could not this year make the trip to Atlantic City.

The friends of S. K. Dickerson, who for so many years was connected with the Lake Shore and was recently made superintendent of motive power of the Big Four, are extending congratulations on the new job.

Among the convention visitors are Mr. and Mrs. D. J. Gilliland. Mrs. Gilliland was formerly known to those attending the conventions as Mrs. W. P. Appleyard. She and Mr. Gilliland were married on June 2.

Mrs. E. M. Grove and Miss Grove arrived Thursday and, with Mr. Grove, are staying at Chalfonte. The family left Pittsburgh together; but Mrs. Grove and Miss Helen stopped off at Philadelphia to visit Mrs. Grove's mother.

S. F. Bowser, president of S. F. Bowser & Co., is attending the conventions for the first time. This is also true of S. B. Bechtel, assistant general manager, and D. A. Correy, manager of engineering sales of that company.

Ex-superintendent of motive power Peter Maher, of the Chicago & Alton, Bloomington, Ill., who has retired from the active field of railroading, will be unable to attend the conventions this year on account of Mrs. Maher's recent severe illness.

Mrs. Robert Radford, wife of the secretary of the Standard Steel Works Company, is spending a few days here. She and Mr. Radford came over from their summer home at Ocean City on Wednesday. Mrs. Radford expects to return to-day.

E. S. Wortham, manager of purchases and supplies of the Chicago & Alton, fully expected to be in Atlantic City at this time and Mrs. Wortham was to accompany him. At the last moment Mr. Wortham was detained by important business.

M. D. Franey, who was recently promoted to the position of master mechanic on the Lake Shore, with headquarters at Elkhart, Ind., is wearing an unusually broad smile, and has made a thorough job of looking over the exhibits on the pier. He left last night.

Alfred I. du Pont, vice president, and Frank L. Connable, general manager, of the du Pont Powder Company, are visiting the exhibits at the invitation of their friend, J. A. Carey, vice president and general manager of the Standard Stoker Company.

John F. Newhouse, Master Mechanic, Kentucky & Indiana Terminal, Louisville, Ky.

W. E. Dunham, Supervisor Motive Power and Machinery, Chicago & North Western.

J. W. Gardner, general manager, Allis-Chalmers Company, is attending the convention this year as a guest of R. D. Smith, superintendent of motive power, Boston and Albany. This is Mr. Gardner's first convention since 1903, when the Association met at Manhattan Beach.

W. J. Frauendiener, superintendent of shops on the Lake Shore at Elkhart, Ind., has his wife with him this year. He is very much interested in the welding of tubes by electricity, which is being very successfully done on the Lake Shore; he was closely connected with the development of this work at the Elkhart shops.

J. M. Hopkins, president of the Camel Company, who is at the Marlborough-Blenheim, is attending the conventions alone this year. Mrs. Hopkins and J. M., Jr., have been traveling for some time, and are still there. They were accompanied on part of their trip by Mrs. Hopkin's father, A. J. Farley, who is well-known to convention visitors.

Mr. and Mrs. Theodore H. Curtis, Chicago, were unable to attend the conventions this year. Mrs. Curtis has been ill, but is rapidly regaining her health. Mr. Curtis was formerly superintendent of machinery of the Louisville & Nashville. He is now mechanical engineer of the Chicago Association of Commerce board of engineers on smoke prevention and electrification.

Allen Sheldon, manager of the Permanent Exhibition of Railway Supplies in the Karper Building, Chicago, is spending most of his time on the pier seeking whom he may devour. Not having decided until the eleventh hour to come to Atlantic City, he suffered the fate of the rest of the delinquents and had to be content with bunking at one of the smaller hotels—The Lexington.

F. H. Reagan, superintendent of the Delaware, Lackawanna & Western shops at Scranton, Pa., spent Thursday and part of Friday at Atlantic City, returning to Scranton by way of Philadelphia, where he expected to make a short stop. The new shops at Scranton are now about two and a half years old and are operating with exceptionally good results.

George W. Lyndon, Chicago, acting secretary of the association of manufacturers of chilled car wheels, accompanied by E. C. Edwards, secretary of the Association, arrived Thursday and registered at Haddon Hall. Mr. Lyndon has spent most of his active life with the chilled iron wheel. His contributions to the technical press on the subject are sought by the editors. His knowledge of the properly made iron wheel is most thorough and his published efficiency data on the subject is spark-

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D. Petrescu, Inspecting Engineer, Roumanian Government Railway.

ling. It is even said by his friends that he put the "pep" in "pepper."

The photograph in Friday morning's *Daily* labeled "Two Master Mechanics of the New York Central & Hudson River" was not intended as a puzzle picture. In some way the second and third lines of the caption were lost. The two master mechanics were M. H. Strauss, of New Durham, N. J., and W. G. Babcock, of High Bridge, N. Y. Mr. Strauss is the one in the Panama hat.

Gaetano Lanza, professor emeritus, Massachusetts Institute of Technology, attended the convention Thursday morning. Professor Lanza is at present conducting special investigations on crank axle design for the Baldwin Locomotive Works at Philadelphia. He is a member of the committee on Main and Side Rods, and has been an associate member of the Association for a number of years.

A. M. White, superintendent of the Manchester Works of the American Locomotive Company, objects, and very properly, to the statement in Thursday's *Daily* that he has not been able to attend the conventions regaularly in recent years. "As a matter of fact," Mr. White writes to the *Daily*, "I have been in attendance for the past twenty-seven years. My first meeting was in 1872, but being general foreman of a railroad shop who at that time was not eligible as a member, I could attend only as a guest."

President Crawford had a rather disturbing incident happen at his home in Pittsburgh day before yesterday. Mr. and Mrs. Crawford spent the summer months at the Country Club, and received advice by wire that it had been burned to the ground. The garage was also destroyed, but Mr. Crawford's machine was removed without suffering damage. He and Mrs. Crawford went West last night to get things straightened up, but expect to return to Atlantic City on Sunday morning.

Mrs. George M. Basford returned home yesterday to officiate at the laying of the corner stone of the Westchester Woman's Club at Mt. Vernon. This club has a membership of over 450, and has a number of sections which are doing active and progressive work along the lines of domestic economy, child training and other subjects of special interest to women. Mrs. Basford is president of the club and has had an exceptionally good administration during the first year of her term, which has still another year to run. The program of the laying of the corner stone includes the name of only one man, and that is the Mayor of Mt. Vernon. The various addresses, the prayer, etc., will all be made by women. Mrs. Basford—according to G. M.—wishes to have it distinctly understood that she is not a suffragette.

P. P. Mirtz is attending his first convention as mechanical engineer of the Lake Shore. He has had all his railroad experience with that road, and during the past year has given a great amount of attention to the problem of locomotive boiler maintenance. Mr. MacBain, the superintendent of motive power, acknowledged his services in connection with the boiler maintenance report at the Thursday morning meeting, but the stenographer did not get the spelling of the name quite right, and it was credited to Mr. Demarest in the *Daily* of June 13, page 1355.

George P. Fox, general foreman car department of the New York Central & Hudson River, at West Albany, reports that the new passenger car shop which was placed in operation during the past year is in good working condition. Six new steel baggage cars have been built during the year, and work is now being started on three new all-steel dining cars. The car shops at West Albany are now handling all of the passenger car work on the New York Central & Hudson River and are splendidly equipped for that purpose.

Although Will Johnson remembers his recent trip abroad with a great deal of pleasure (and incidentally Will says he got some orders over there) he declares that his headlight was not to blame for the accident which occurred on the Shanghai-Nanking railway, in China, in which one death resulted. Will says the following official report was made by the station master to his superior officers: (1) The death named—was smashed by the engine on 3-10-13. (2) Has two sons—and—(3) The death without ticket. (4) The death's fault. (5) The death no relative see. (6) The death is deaf and blind. No cannot say what was.

A. M. Waitt, formerly superintendent motive power of the New York Central, was referred to in one of the issues of the *Daily* as a past vice-president of the M. M. Association. He should have been mentioned as a past president, he having held that office in 1901-1902. Mr. Waitt has missed the last four conventions, being abroad a good deal of the time, but he is here this year, and is at the Marlborough-Blenheim. Few men who have been connected with the railways of the United States have had as good opportunities as he to compare their practice with that of the railways of Europe, and he talks very interestingly of the latter. He expects to make another trip to Europe in a short time. Mr. Waitt is one of the comparatively few American business men who have early made a resolution to retire at a predetermined age and have carried it out, and his

J. L. Meehan, Master Mechanic, Ashland Coal & Iron Company, Ashland, Kentucky.

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friends are glad to see him at the conventions in which for many years he was an active participant.

John Philpot, foreman of the machine shop of the car department of the New York Central & Hudson River at West Albany, is attending the convention, and expects to return home the latter part of the week. The large amount of all-steel equipment which is being handled at the West Albany shops

C. B. Young, Mechanical Engineer of the Burlington.

has necessitated the addition of a considerable amount of new equipment to the machine shop during the past year. This includes a 10-in. gate shear, plate straightening roll, 5-ft. radial drill, two 21-in. upright drills, one 1½-in. Rich high speed drill, 15-in. throat horizontal punch, 48-in. heavy punch and shear, 24-in. and 36-in. combination punches and shears, and a 3-in. forging machine. Mr. Philpot has been with the New York Central for over 15 years.

E. B. Leigh, president of the Chicago Railway Equipment Company, arrived Friday and is at the Traymore. Arthur

Henry Gardner, Supervisor of Apprentices, N. Y. C. Lines East.

Wyman, assistant to the president of the same company, is expected to arrive this week. Mr. Leigh returned only recently from his vacation. He went from New York by steamer to Texas, and thence to his ranch which is about 60 miles from San Antonio. Unfortunately, he was able to stay there only two weeks, being called back by a fire in the Franklin plant of the company. He came to Atlantic City by way of New York, where on Tuesday he attended a meeting of the executive committee of the Railway Business Association, of which he is a member. Mr. Wyman was accompanied as far as New York by Mrs. Wyman, and expects after the conventions to return there and go on his vacation.

Professor A. J. Wood, of the Pennsylvania State College, is very enthusiastic over the progress which has been made in railway mechanical work at that institution during the past year. He is accompanied by several of the engineering students who are interested in the railroad course. The college has doubled its attendance in five years, there being now over 2,500 students, a third of whom are in engineering courses. There are about 30 taking the new course in railroad mechanical engineering, the equipment for which is being added to each year. All engineering students of this institution are now required to spend 18 weeks in summer employment by the industries. One railroad has taken on four students for this summer, beginning their special apprenticeship course in this way instead of waiting until after graduation. Professor Wood states that this plan of summer practice is working to the satisfaction of both the college and to the outside interests. The greatest advantage comes

T. E. Hessenbruch, General Inspector, Philadelphia & Reading.

from the discipline received at a period when it counts for the most.

Thomas Aldcorn, general eastern sales agent of the Chicago Pneumatic Tool Company, and Mrs. Aldcorn, celebrated their twenty-fifth wedding anniversary with a dinner at the Marlborough-Blenheim Thursday evening. The affair was a complete surprise to Mr. Aldcorn. Mrs. Aldcorn came down from New York especially for the occasion. The guests present were all connected with the company and included W. O. Duntley, president; Mrs. J. F. Duntley, Miss Blanche Duntley, Fred. D. Johnson, managing director of the company in London; W. P. Pressinger, general manager compressor department; Charles E. Walker, general manager railroad department; C. E. Coates, manager electric tool department; and Mr. and Mrs. J. C. Campbell, Burton H. Tripp, Mrs. L. Summers, Mr. and Mrs. J. W. McCabe, Miss J. McCabe and "Doc" W. H. S. Bateman, C. E. Walker, in behalf of the guests, presented Mrs. Aldcorn with a silver chatelaine bag, and to Mr. and Mrs. Aldcorn a silver service. After Mr. and Mrs. Aldcorn had made appropriate speeches of acceptance, "kiss the bride" was in order. Mrs. Aldcorn faced the ordeal with becoming charmingness.

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MASTER MECHANICS' REGISTRATION.

Alling, E. W., M. M., N. Y., N. H. & H., Strand.
Edwards, J. B., Master Mechanic, Col. Newberry & Laurens R. R., Sterling.
Hatch, M. C. M., Supt. Freight Service, D., L. & W. Ry.
Hawkins, B. H., Traymore.
Hedley, F., General Manager, Interborough R. T. Ry., Shelburne.
Hoke, H. A., Asst. Engr. Mech. Engr. Dept., Penna., Chelsea.
Luscombe, J. T., M. M., Big "4."
Machesney, A. G., Lexington.
McGoff, J. H., Mechanical Supt., A. T. & S. F.
Parks, G. E., Asst. Engr., N. Y. C. Lines, Marlborough-Blenheim.
Prendergast, A. P., Supt. M. P., C., H. & D., Shelburne.
Prendergast, Jas. F., M. M., East Broad Top Ry., Haddon Hall.
Sample, N. W.
Smith, C. B., Mechanical Engineer, B. & M., Dennis.
Symons, W. E., Chalfonte.
Tritsch, Chas. M., Supt. Motive Power, W. M., Brighton.
Turner, Amos, M. M., Lehigh Valley, Lexington.
Warnock, H. R., Loco. Dept., Monongahela, Grand Atlantic.

MASTER CAR BUILDERS' REGISTRATION.

Benjamin, C. H., Dean Eng. School, Pierrepont.
Calkins, A. E., Asst. to Supt. Rolling Stock, N. Y. C. & H. R., Traymore.
Cleaver, F. C., Supt. Motive Power, Rutland, Marlborough-Blenheim.
Hoke, H. A., Asst. Engineer Mech. Engr. Dept., Penna.
Luscombe, J. T., M. M., C. C. C. & St. L.
Prendergast, A. P., Supt. Motive Power, C., H. & D., Shelburne.
Rohleder, W. J., M. C. B., Cent. of Georgia, Chelsea.
Schroyer, C. A., Supt. Car Dept., C. & N. W., Traymore.
Staley, H. F., M. M., Caro., Chinchfield & O., Traymore.
Symons, W. E., Chalfonte.
Thomas, F. H., Vice-Pres. & General Manager, Bellefonte Central, Craig Hall.
Tritsch, C. M., Supt. M. P., Western Maryland, Brighton.
Turner, Amos, M. M., Lehigh Valley, Lexington.

M. M. GUESTS.

Anderson, G. S., For. Fleet., Penna.
Anderson, J. B., Chief Clerk S. M. P., Penna., Runnymede.
Baird, L. H., C. Clk., Penna., Chalfonte.
Barnes, P. H., G. F. M., B. & O.
Barton, E. O., Gen. For., Penna., Chalfonte.
Barwis, C. W., Asst. Supervisor, Penna., Princess.
Beall, Ecard, Channell.
Beall, J. W., Inspr. Shops M. P. Dept., B. & O., Channell.
Bower, W. C., N. Y. C. & H. R. R., Shelburne.
Boyer, C. W., Asst. For. Erecting Shops, Pa., 122 Seaside Ave.
Buchsbaum, F. J., Enginehouse For., Penna.
Burke, H. C., Gang For., B. & O., Wittle.
Carrall, J. T., Asst. Gen. S. M. P., B. & O., Marlborough-Blenheim.
Clare, Jas. E., Asst. Foreman, Penna.
Collins, C. R., Chief C. T. Time Clerk, Pittsburgh Div. Penna., Shelburne.
Corkill, L., Foreman, C. R. R. of N. J., Lyric.
Cotton, W. A., Chief Clerk to Gen. Mech. Supt., Erie, Marlborough-Blenheim.
Cromwell, H. C., Draughtsman, B. & O., Kenderton.
Cross, D. W., M. M., T., St. L. & W.
Curran, D. D., Pres., N. O. & N. E., Marlborough-Blenheim.
Demarest, G. L., Chief Clerk, C. R. R. of N. J., Islesworth.
Dildine, J. A., Chief Clerk M. P. Dept., Penna. Lines, West, Traymore.
Disharoon, L. T., Fireman Blacksmith Shop, N. Y., P. & N., Haddon Hall.
Dixon, B. R., Air Brake Instructor, Penna., Haddon Hall.
Down, William E., Gang Foreman, Camden Terminal Division, Penna. R. R., Bonber.
Dupell, R. E., Rd. For. of Engines, W. J. & S.
Eliot, H. H., Jr., Motive Power Insp., Penna.
Engard, A. C., U. S. Navy, Bothwell.
Erb, Chas. W., S. Keeper, Penna.
Filskov, T., Raritan River, Worthington.
Forrester, Geo. W., Traffic Manager, Piedmont Northern, Chalfonte.
Fulmor, J. H., M. M., W. J. & S., Pennhurst.
Gainey, J. J., M. C. B., C. N. O. F. P., Chalfonte.
Gearhart, John, For. P. A., Penna., Dunlop.
Gibson, Edward, Foreman, P., B & W.
Gority, John, Foreman Machine Shop, Penna., Seaside.
Grant, H., For., Penna., Iroquois.
Griest, E. E., Asst. M. M., Penna. Lines.
Heimmelberger, C. M., Supt., Raritan River, Worthington.
Henlig, E. L., For., So., Lexington.
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Hill, Clarence, Chief Clerk Accts., Penna., Shelburne.
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Hutson, H. M., M. M., P. & O., Lexington.
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Kauffman, G. B., Passenger Agent, Atlantic City.
Kelly, G. W., Foreman, C. R. R. of N. J., Worthington.
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Kilborn, James E., Purch. Agt., Rutland Transit Co., Shelburne.
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Kresder, Charles N., General Boiler Inspector, P. & R.
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Little, David, Foreman Painter, Penna., Rndolf.
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Montgomery, Wm. H., Traveling Freight Solicitor, Penna.
Mordland, W. H., Penna., Seaside.
Morley, E. S., Asst. Chief Clerk, Penna., Shelburne.
Morningstar, W. E., Draughtsman, B. & O., 163 Ocean View Ave.
Morton, R. C., Draughtsman, B. & O., Kinderton.
Mueller, J. R., P. A., Hocking Valley, Marlborough-Blenheim.
Munro, R. C., Pur. Dept., So. Pacific, Louvan.
Olhausen, J. T., Supt. Phila. Div., B. & O.
Olhauser, Joseph, B. & O.
O'Neal, E., Car Foreman, D. & H., Chalfonte.
Oren, J. W., Foreman Engine House, N. Y., P. & N., Haddon Hall.
Pearce, C. B., For., Penna.
Pease, L. D. A., Test Dept., Penna., Shelburne.
Porter, S. C., Traffic Mgr., Old Dominion Steamship Co., Chalfonte.
Potts, S. C., Test Dept., Penna., Shelburne.
Portner, W. H., Supt. Car Shops, O. R. R., New American.
Pratt, P., Asst. Eng. House For., W. J. & S.
Purt. Arthur F., Penna. R. R., Devonshire.
Read, W. P., W. J. & S.
Reinhart, E., Time Keeper, Cornwall, De Lacey.
Riley, S. B., Dist. For., Kansas City So., Monticello.
Rittenhouse, J. R., Supt. Pullman Co., Brighton.
Roche, John J., Foreman Blacksmith.
Rommel, Charles, Eng. House Foreman, P. & R.
Rommel, C. T., Spec. Insp. M. P. Dept., B. & O., Craig Hall.
Roop, S. H., W. J. & S.
Sandhas, H. L., Air Brake Inst. & Insp., C. R. R. of N. J., Lexington.
Scanland, N. B., M. M., Maryland & Pa., Dunlop.
Scott, Harry C., Gen. Mach. Foreman, Penna., Fredonia.
Scott, G. E., Asst. Purch. Agt., M. K. & T., Shelburne.
Severn, A. B., Draughtsman, B. & O., Kenderton.
Shafter, M. L., For., Penna., Dunlop.
Sheldon, R. D., Engine House Foreman, P., B. & W., Chalfonte.
Smith, F. W., For., Penna., Princess.
Snyder, J. C., Asst P. A., N. Y., C. & H. R., Marlborough-Blenheim.
Sproul, S. V., Road For. of Engines, Penna. Lines.
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Thomson, McLeod, 43 Aberdeen Pl.
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Van Buskirk, E. C., Gen. For., Wash. Terminal.
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Watkins, G. H., Asst. M. M., Penna., Haddon Hall.
White, Geo. D., S. Keeper, Penna.
Wilbur, Rollin H., Vice-Pres. & Gen. Manager, Lehigh & New England, Shelburne.
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Wilson, Amos, Special Instructor, D. L. & W.
Wilson, S. E., Traveling Fireman, D., L. & W.
Witherspoon, W. H., Foreman, C. R. R. of N. J., Edison.
Wine, W. E., Ch. Drftsman, Atlantic Coast Line.
Wynn, F. P., Piecework Foreman, P. & R. Loco. Shop.
Young, J. B., Chemist, P. & R.

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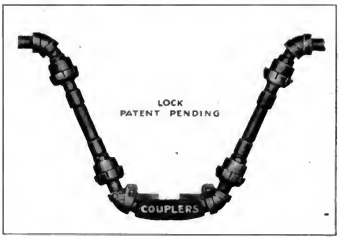
BUDA-ROSS ELECTRIC HEADLIGHT.

The Buda Company, Chicago, has recently formed a headlight department for the manufacture and sale of the **Buda-Ross** electric headlight. Mark A. Ross, who has been identified with the electric headlight industry for the past 16 years, is in charge of the department and is assisted by Harry P. Bayley and John Eberhart. One of the new headlights is being exhibited at the Buda Company's booth.

LOCK FOR STEAM HOSE COUPLINGS.

With the high pressures frequently required on the steam heat train line there is an increasing tendency for the couplers to rise from their normal position and leak. The Greenlaw Manufacturing Company, Boston, Mass., is exhibiting a locking device to prevent this trouble. It is shown as applied to the design of flexible metallic hose manufactured by this company and consists of a lever attached to the hose elbow which, when in position, bears firmly on the top of the opposite coupler head. The lever is held in place by a key fitting through a slot above it. When it is desired to disconnect the hose, the key can be quickly released, the lever raised and the coupler head is freed for uncoupling. While this lock is shown in the illustration as in use with two metallic hose, its operation is equally efficient if one is a rubber hose. It is arranged to operate with any type of coupler head.

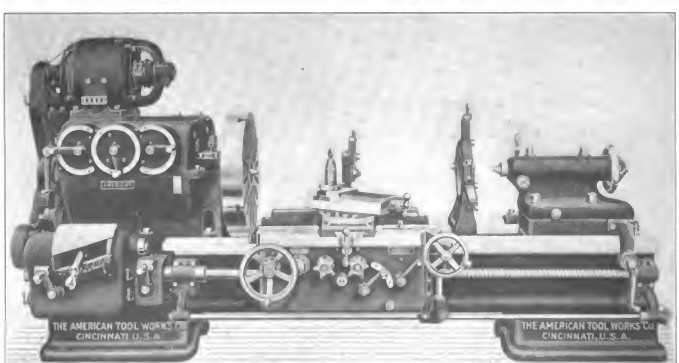
Locking Device for Steam Hose Couplings.



Steam Heat Line Couplings Locked in Place.

TWELVE-SPEED, GEARED HEAD FOR LATHES.

The American Tool Works Company, Cincinnati, Ohio, is exhibiting a new 12-speed, geared head for application to its 30 in. and 36 in. lathes. This head is of the compound, back-geared type and is furnished for either belt or motor drive. Twelve spindle speeds are obtainable, ranging from 6 to 250 r. p. m., by the operation of levers on the front of the head; an index plate located on the head indicates how to obtain the various speeds. The maximum gear ratio is unusually high, being 43.3 to 1. The head is heavily con-



Heavy Duty 36-in. Lathe Driven Through a Twelve-Speed Geared Head.

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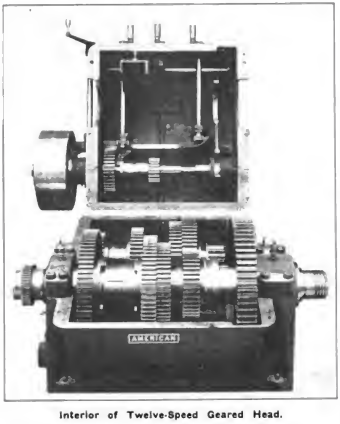
structed and an important feature is its simplicity, as only 12 gears are used to produce the 12 spindle speeds. The gears are cut from the solid with special cutters, are of wide face and coarse pitch and are tested for accuracy on special machines; the teeth of the slip gears are machine



Interior of Twelve-Speed Geared Head.

rounded to facilitate meshing. The driving pulley runs on a bronze bushed steel sleeve, thus relieving the driving shaft of all belt strain. The pulley has an improved automatic oiling system and a friction clutch controlled by a drop lever is provided, by means of which the gears in the head can be stopped or slightly moved without interfering with the driving belt, thus permitting speed changes to be easily made. The head-stock can be quickly converted into a motor drive at any time after installation by simply removing the pulley drive unit, placing a motor on top of the head-stock, and connecting it to the driving shaft through a spur gear.

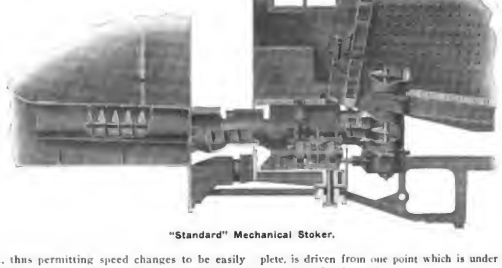
THE "STANDARD" MECHANICAL STOKER.

One of the exhibits that is attracting general attention is a new design of mechanical stoker being shown by the Standard Stoker Company, New York. It provides for conveying the fuel from the tender by means of a screw conveyor located in a trough under the floor of the coal space. This trough is covered by a grating with 6-in. openings and by sectional covers each about 15 in. in length. The conveyor carries the fuel under the deck of the cab and discharges to a similar vertical conveyor which rises through the grates and discharges the fuel at a point about 12 in. above the grate level at the center of the back of the firebox. The section of the stoker projecting above the grates and in the fire bed is protected by a ring of a special quality of iron which has great heat resisting properties. This ring is also further cooled by the admission of exhaust steam from the small engine driving the stoker which is discharged through passages on its interior, emerging at the top. Arrangement is made for the ready renewal of this ring, if it becomes burned, without inconvenience or delay.

Six steam jets from the ends of four small pipes projecting through an opening in the back water leg, distribute the coal from the top of this conveyor to the various parts of the fire bed. These jets are intermittent in their action, being controlled by a specially constructed valve which, by its reciprocation, allows a small amount of high pressure steam to escape through each of the four pipes successively. The pressure in each pipe can be controlled by means of a globe valve, permitting full control of the distribution. The reciprocating valve and its immediately associated parts are the only parts of the stoker that are located in the cab.

The machine is driven by a small reciprocating engine secured to the outside of the frame on the left side of the locomotive immediately under the cab. The main driving shaft from this engine drives a short intermediate shaft, through beveled gears, which is connected by reduction gearing to the conveyors, both horizontal and vertical. An eccentric operated from the main shaft provides a reciprocating motion for the distributing jet control.

An interesting feature of the design is the arrangement for providing a flexible motion in the conveyor trough between the locomotive and tender. This is done by means of a double ball and socket arrangement and the use of universal joints on the shaft of the screw. By this means the horizontal conveyor, complete, is driven from one point which is under the cab deck and convenient for inspection.



"Standard" Mechanical Stoker.

Any coal that will pass through a 6-in. opening, which will permit it to enter between the flights of the conveyor, can be handled by the stoker. Large pieces will, of course, become somewhat crushed when it is forced to the vertical screw, and

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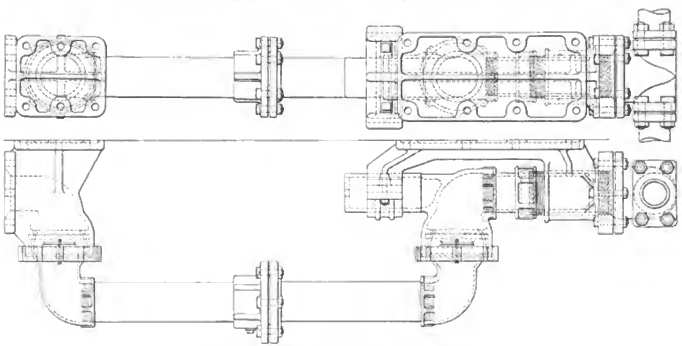
the fuel as discharged from the top will be comparatively small pieces which are easily handled by the steam jets. The intensity of the steam jets is under full control of the fireman.

A stoker of this design is now in experimental use on a large consolidation locomotive on the New York Central & Hudson River. Experience up to the present time has indicated its success.

FRANKLIN WATER JOINT.

The Franklin Railway Supply Company, New York, is exhibiting a flexible metal connection for the injector supply between the engine and tender. This device is shown in the illustration and consists of two ball joints connected by suitable lengths of pipe, one of the joints being rigidly mounted on either the engine or the tender while the other is so mounted as to take care of all movement. Only one of these connections is used on a locomotive, as it is made sufficiently large to supply enough water for both injectors. In order to reduce wear to a minimum, the connection is placed directly under the drawbar, this being the point where the least movement is required. A flanged joint is used to connect the two pieces of pipe through which the water passes between the ball joints. A device of this kind will readily commend itself to motive power officers, particularly on roads which operate in cold climates where much trouble is often experienced with hose connections in the winter months.



Franklin Water Connection for Injector Feed.

SPRAGUE ELECTRIC HOIST.

Some new features in hoist construction are incorporated in the one-ton hoist which is on exhibition in the booth of the Sprague Electric Works. It is equipped with a 1½ h. p. direct current motor and is suspended from a motor driven trolley carriage which runs on the lower flanges of an I-beam. The motor is controlled by means of a special foundry controller intended to give the very slow speeds which are necessary to satisfactory foundry operation; this speed control may also be used to advantage for any work which requires delicate manipulation such as setting driving wheels and heavy castings in lathes. One of the interesting features of the machine is that which provides for the entire mechanism being completely enclosed. There is nothing exposed outside the frame except the wheel which operates the controller shaft, the controller itself, the rheostat and all other parts being completely protected. An automatic safety device prevents the hook from over-running when it reaches the upper limit of its travel. The controller cylinder becomes disengaged from the operating wheel and returns to the "off" position, although the operating wheel may be held in the "on" position. This concentrates all the electrical contacts within the controller itself, eliminating the necessity for additional and external contacts to break the circuit when the limit operates.

OXYGEN GENERATORS.

The use of oxygen in this country for welding and cutting operations is growing at such a rapid rate that the several large companies engaged in making commercial oxygen are having difficulty to keep up with the demand. Compared with foreign countries, however, the consumption of oxygen by railways in this country is comparatively small. It is stated that one railway in France uses over 2,500,000 cu. ft. of oxygen a year and in England practically every railroad has oxy-acetylene or oxy-hydrogen installations in nearly every repair shop.

The future prospects in this direction makes the improved oxygen generating apparatus that is being exhibited by the International Oxygen Company, New York, of special interest at this time. This company has on exhibition its standard type of generator which will produce 3½ cu. ft. of oxygen and 7 cu. ft. of hydrogen a kilowatt hour. The oxygen exceeds 99 per cent. in purity while the hydrogen is practically perfect in regard to purity. The present apparatus shown is a very decided improvement over that exhibited last year and it has been possible to reduce the size of the generator by one-third.

This type of apparatus is entirely automatic in its operation and will operate for days and months without requiring repairs or change of parts, or even to be cleaned. The gases can be carried through a pipe to any part of the shop or yard and the oxygen can be compressed in cylinders for use at distant points, if desired.

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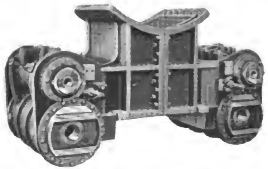
FINISHING TOOL FOR BALL ENDS OF SUPERHEATER UNITS.

After the ball ends of the inner units of superheaters become rusted they are liable to leak and they deteriorate rapidly under the cutting action of the superheated steam if they are neglected. To facilitate the repairs to the ball ends, the Draper Manufacturing Company, Port Huron, Mich., has developed a tool which is shown in the illustration and which it is exhibiting at the conventions. The tool consists of two parts, a cup tool and a ball reamer for the seat and as shown in the illustration, may be operated by a hand brace. It can also be used in a pneumatic drill and it is claimed that it cuts a perfect ball joint and that no special skill is required by the operator to do the work successfully.

Tool for Finishing the Ball Ends of Superheater Units.

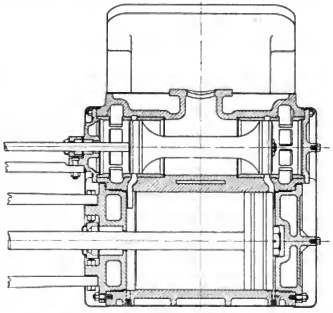
ALFREE CYLINDERS WITH PISTON VALVES.

The Hobart-Allfree Company, Chicago, is exhibiting a ¼ size model of a locomotive equipped with the Allfree cylinders arranged to work with piston valves. The valves on one side of the engine are operated by the Walschaert gear and on the other by the Baker gear to show the adaptability of either gear to the operation of the compression valve. As in previous designs of the Allfree cylinders the main valve controls the admission, cut-off and release in the same manner as in all cylinders, but with an increase in the exhaust lap which holds the steam in the cylinders longer so that more work may be obtained from greater expansion. The compression valve opens for release simultaneously with the main valve which not only permits of more expansion but gives greater freedom of exhaust.

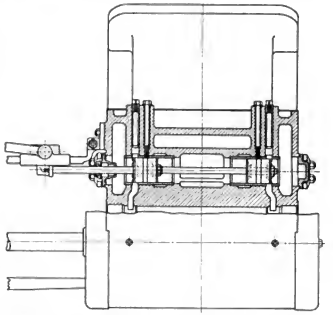


Allfree Cylinders with Piston Valves.

The most important work of the compression valve comes after the main valve has closed. This point is usually the beginning of compression, but the compression valve is timed to remain open after the main valve closes and may be set to give any desired amount of compression without disturbing the events of the main valve. Having compression under control, it is a matter of adjustment to reduce it to only that amount which is necessary as a cushion for the reciprocating parts, when the direction of their movement is reversed. This practically eliminates the effective resistance of compression and the equivalent in power becomes available for drawbar pull. This also permits of reducing the clearance space between the piston and the valves.



Section Through Main Valve, Alfree Cylinder.



Section Through Compression Valve, Alifree Cylinder.

The use of the compression valve will allow an increase in the ratio of expansion, as the reduced clearance space changes the proportion of the actual volume of steam admitted at any given cut-off. The illustrations show sections through the main valve and the compression valve.

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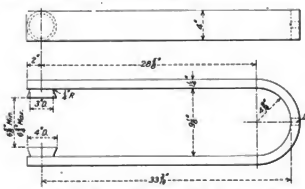
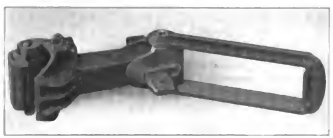
SWIVEL DRAWBAR YOKE.

A recent development in drawbar yokes is being exhibited by McCord & Company, Chicago. One of the illustrations shows a cast steel yoke and its accompanying sleeve keyed



Forged Yoke for McCord Keyed Flexible Drawbar Arrangement.

to a drawbar, while the drawing shows a later development of the yoke in wrought iron. The cast steel sleeve is held to the drawbar by a key and the yoke is so constructed that



Key Attached Swivel Drawbar Yoke.

it swivels on two discs. By this means rivet connections are eliminated and it is possible to remove the drawbar without taking down the draft gear.

AUTOMATIC TILTING LAMP.

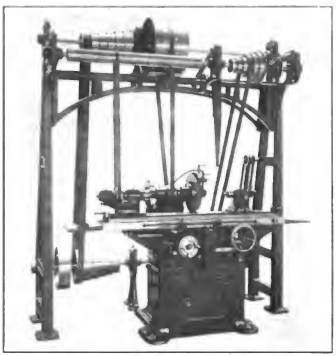
The automatic, self-tilting lamp, which is shown in the illustration, is manufactured by the Cooper Hewitt Electric Company, Hoboken, N. J., and is similar in most respects to

Cooper-Hewitt Automatic Tilting Lamp.

the other mercury vapor lamps manufactured by that company. It has, however, a small solenoid or magnet between the holder and the auxiliary and when the circuit is closed, the current flows through the solenoid which tilts the tube for lighting. This makes the automatic lamp particularly desirable for use in places where it would be difficult to reach the lamp to tilt it by hand. The automatic operation insures the relighting of the lamp should there be a momentary interruption of the current supply. In places where the bluish-green light given out by the mercury vapor lamp is not desired, this company is now prepared to fit their lamps with a device known as a light transforming reflector. This is a paraholic rhodomain reflector which takes the place of the standard white glazed reflector and is based on the phenomenon of florescence. This reflector transforms the light to a white with a slight rosy tint.

UNIVERSAL GRINDING MACHINE.

The Morse Twist Drill & Machine Company, New Bedford, Mass., is exhibiting a universal grinding machine with automatic feed and arranged for motor drive, as shown in the illustration. This machine will take wheels 12 in. in diameter and ⅜ to ¾ in. thick, and 7 in. in diameter and ⅜ in. thick. The wheel spindle is hardened and ground and runs in phosphor bronze boxes, which are arranged for adjustment for wear. The wheel slide is graduated in degrees and is adjusted by a hand wheel and dial, the latter having graduations to express thousandths of an inch on the diameter of the work. The travel of the table is automatic and the reversing is controlled by dogs; the table can be



Universal Grinder Equipped for Motor Drive.

stopped at any point by a lever on the front of the machine, leaving it free to be moved by a hand wheel. A feed box, arranged conveniently on the machine, provides a means, through a lever, of instantly changing the traverse feed from a roughing to a finishing feed. The usual pump and piping are provided for wet grinding; the pump tank is hung on pivots to provide a ready method of cleaning. The overhead apparatus is provided with two shipper arms, one of which controls the drive for the wheel and the feed, and the other the work and the pump. The wheel feeds range from 1,025 to 3,333 r. p. m. in six changes. The weight of the machine is 3,750 lbs., and the floor space occupied is 80 in. by 119 in.

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Railway Age Gazette

DAILY EDITION

Copyright, 1913, by the Simmons-Boardman Publishing Co.

Vol. 54. NEW YORK—JUNE 16, 1913—ATLANTIC CITY No. 24c.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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United States and Mexico $5.00
Canada 6.00
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Single Copies ..... 15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily Issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE that of this issue more than 9,300 copies were printed; that of these more than 9,200 copies, 7,048 were mailed to regular paid subscribers, 200 were provided for counter and news companies' sales; and 1,700 were printed for distribution at Atlantic City and for use as sample copies.

AT the recent convention of the Air Brake Association the operation of triple valves was thoroughly discussed. The undesired quick action of the brakes has been carefully investigated by the Duluth, Missabe & Northern and it was found that the triple valve was the chief cause of this difficulty. That road is now using a high grade of fine dry graphite for the triple valve slide valve, which has practically done away with the trouble. It was also found necessary to use a brake cylinder lubricant that would remain at the same consistency in hot and cold weather; some lubricants become lighter and more penetrating in warm weather, working back on the slide valve feed valve and destroying the beneficial effects of the dry graphite. That road now finds its greatest trouble with foreign cars whose triple valves are not so carefully maintained. If some standard practice was adopted in this matter and strictly adhered to, a very material reduction could be made in the number of break-in-twos, thus reducing the maintenance cost of cars.

IN looking over the machine tool exhibit in Machinery Hall, which is larger this year than most of the railway machine shops of this country, with its whirring wheels and big cuts with high speed tools, one's mind instinctively wanders back a few years to the time when machine tools were few and far between. When the conventions were held at Saratoga power was not available for operating machine tools, and it was only occasionally that such a tool was shown and then not in operation. The first time that the machine tools were a feature of any convention of railway officers was at the International Railway Congress meeting at Washington in 1905. At that time, owing to the efforts of J. Alexander Brown, the secretary and director of the exhibit, a considerable number of tools was shown in operation. The machine tool builders were so pleased with the result that a number of tools were shown at the next meeting of the M. M. and M. C. B. conventions which was held on the steel pier. Because of the weight carrying limitations of the steel pier the larger machine tools could not be accommodated, but in spite of this a considerable number of such tools was shown during the two years the conventions were held there. The Million Dollar Pier afforded such good facilities for this purpose that the exhibit has grown steadily ever since. This year practically all the space in Machinery Hall, 360 ft. long by 45 ft. wide, is given over to machine tools and one need only to stroll through it at any time during the day to be convinced of its popularity with the convention attendants.

THE young railway men and supply men attending these conventions can do themselves great and permanent good by looking about them, and taking careful note of certain very important developments that are occurring in the railway and supply business. The developments in question are all closely asociated with a very marked moral awakening that is taking place throughout the entire business world. It has not been many years since personal conduct and business methods prevailed generally, and were generally tolerated, which to-day are avoided, repudiated and condemned by every man who has any real self-respect or desire for the respect of others. There are a few here and there, some of them in very high places in the railway and supply business, who are so lacking in moral sense, or so incapable of observing the trend of the times, or have so much contempt for public opinion, that they do not, and perhaps cannot, come up to modern standards in their manners and conduct. Some of them have been able up to the present time, in spite of this, to maintain their positions in the railway and supply business. But hardly a day passes without some event occurring which shows there is no man in the railway or supply business who is too big to be reached and disgraced, if not actually ruined, if he persists in the use of methods that defy public opinion and fall below a high standard of decency and honor. The railway and supply history of this country in recent years is strewn with the wreckage of little men and big men who have had the notion, equally reprehensible and stupid, that they could persistently over-ride and defeat the opinions of their fellows, and the dictates of law and of morals. The young men attending these conventions will profit greatly if they will learn *now* that they are living in a new era; that the old ways are not the new ways; that certain methods that formerly were condoned and sometimes spelled success are now condemned and denounced and spell certain failure; and that not only the future, but the immediate present, belongs to the decent man, to the square man, to the man who helps to make the right kind of public opinion and who then respects and heeds the kind of public opinion that he knows to be right.

THE problem of increasing the efficiency of common labor in railroad shops and repair yards is a most difficult one and must be given more attention, as suggested by President Crawford in his address on Wednesday morning. The need of employing interpreters, or of having foremen who can understand foreign languages and thus direct the men to the best advantage, has not been as apparent in the motive power and car department as in maintenance of way work. Mr. Crawford's idea, however, is that as the demand for common labor increases, more and more of the foreign element will find employment in the mechanical department and that conditions will be much improved if the foremen, and particularly those in charge of unskilled and semi-skilled labor, become proficient in a foreign language, thus avoiding the necessity of using interpreters, which is usually a more or less unsatisfactory arrangement. Mr. Crawford's suggestion that more attention be given this phase of the problem is, therefore, an excellent one. There is another problem which involves the skilled, as well as the unskilled employes, and should be given immediate atten-

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tion. It is the more careful selection and assignment of workmen for the different classes of work. The necessity of this has been realized in the railway shops of several of the European countries, and more particularly in the Hungarian State Railways. The practice of that railway system in the shops at Buda Pesth was described in a series of articles on Impressions of Foreign Railway Practice by H. W. Jacobs, which appeared in the *Railway Age Gazette* during the past few months. The personality and characteristics of each man are carefully studied during his apprenticeship, and he is later assigned to the particular kind of work for which he is best fitted. In this country comparatively little attention has been given to this matter, except in a few isolated cases, none of which, as far as we can find, are on railroads. Of course, a good executive intuitively selects the men who are best qualified for work in his department, but in these days of large organizations, more scientific methods must be used in order that the efficiency of the organization as a whole shall not unnecessarily suffer. Possibly the most advanced exponent of this theory is Dr. Katherine Blackford. She has had unusual success and has discovered and outlined certain principles which should govern the selection of employes. These include not only a study of the physical characteristic and character of the workman and the class of work for which it is proposed to use him, but also the personality of the man he is to work for, or the boss, as she calls him. While her methods and views are so advanced as to be beyond the comprehension of many of those in charge of forces of workmen, there can be no question as to the value of a more scientific study of this problem, and the Master Mechanics' Association can well afford to give it more attention.

GEARING IN MACHINE TOOLS.

AMONG the most important features of the extensive improvements in machine tools in recent years is the full appreciation, by some of the builders, of the value of proper material, properly treated, for the gearing. In the earlier stages of machine tool building, cast iron was exclusively used for gears and pinions, and it has a number of advantages for this use. Because of the large percentage of uncombined carbon in it, it is practically self-lubricating and will run without serious wear with the minimum of oil, or even with no oil at all. Furthermore, its cheapness and ease of machining, and the convenience of obtaining the rough stock in case of an emergency, make it attractive. Its structural weakness and inability to withstand shocks, however, make it unsuitable for use on many of the modern, high power, machine tools, except for a few unimportant gears.

With the advent of steel gears came the necessity of more thorough lubrication, as this material is in no degree self-lubricating and wears rapidly when run dry. It has been found, however, that, even with what would ordinarily be considered good lubrication, the quality of material used makes a surprising difference in the wearing qualities and strength of the teeth. One of the large machine tool manufacturers has exhaustively investigated this subject during the past four or five years, and developed some valuable information. The first steel gears were made from ordinary spindle steel having a carbon content of about 40 points. A gear was made from this material without further treatment and was run under working conditions with a pinion of similar material case-hardened. Grease was used for lubrication. The gear wore rapidly, and it was clearly shown that this material was not suitable in that form. Trials with the same combination running in oil gave better results, but by no means satisfactory service. A pair of gears of the same steel, both case-hardened, was then tried running in oil. The wearing qualities were practically perfect, but it was found that the process of case-hardening had apparently affected seriously the interior structure of the teeth and they were not able to properly withstand a shock or even a heavy strain.

Trials were next made with two gears of a high carbon alloy steel, case-hardened. These showed practically the same structural weakness and were discarded. The experience thus far indicatd that case-hardening, while excellent to produce the desired wearing qualities, apparently weakened the best material to a serious extent. Oil tempered manganese steel with a low carbon content was then tried. This gave much better results, but still the wear was more than it was believed should take place. The strength was found to be satisfactory. An investigation of the practice of some of the leading automobile manufacturers was then made, and the next tests were with a material that had been found suitable for that purpose. This is a heat treated, oil hardened, nickel-chromium steel. These gears fulfilled all requirements both as to wear and strength when the treatment and composition were exactly right. A great variation was found in the result by an error even as low as 25 deg. in the temperature at which it is hardened. Furthermore, the exact proportions of the alloys are found to be of equal importance. Experiments with steel of this kind made from ores having the desired elements in natural combination were not successful, and all the later experiments point to the vital importance of exactness in the composition and treatment. In the case of this manufacturer, this feature is believed to be of so great importance that a complete chemical and physical laboratory for testing steels is being installed.

This is but one example of the way in which the problems of producing a high grade, modern machine tool are being solved. It is becoming better understood that the present demands for output from machine tools of all kinds require the employment of the highest grade of engineering skill and the use of materials which were practically unknown a few years ago. It is comparatively easy to build a lathe, shaper or drill press which will take a very heavy cut, but to produce such a machine which will continue to do it accurately and without failure of parts is a problem of considerable magnitude. That many are doing it speaks well for the continued progress of the industry.

A CRITICISM, AND AN ANSWER.

Atlantic City, June 13, 1913.

To the Editor of The Railway Age Gazette:

These conventions are really a post graduate course for railroad men, who come here to exchange ideas and match experience with the keenest intellects in their line of endeavor. Here they discuss problems, adjust differences, acquire knowledge and deal in facts, born of actual experience, all with a view to formulating rules for the safety, advancement and betterment of railroad operations.

Most professions offering a post graduate course to their members supplement the work of the lecture room and the convention hall with a *practical clinic*, and this world-wide, every-day working university of railroad mechanical construction and operation has a valuable clinic, supplied by men whose interests dove-tail very closely with that of their railroad customers.

This clinic each year increases its scope and aims to extend its usefulness, but each year there is a growing feeling on the part of those who provide this feature of the convention that the exhibits are not receiving their share of attention.

Is the clinical feature of this convention being neglected and are its possibilities as factors in the progress and development, so earnestly desired by all, being underestimated to an extent that will lead the manufacturers to conclude that their efforts to contribute their mite in the form of this educational work are not appreciated?

There is a serious thought back of this question, involving as it does the consideration of the futility of coöperation that is apparently one-sided. In the joy of fellowship the serious business feature of these occasions should not be neglected, and the fact that the exhibits offer educational advantages, second only to the benefits of the meetings themselves, cannot be overlooked without serious injustice to both interests involved.

Tom Lehon.

The *Railway Age Gazette* gladly publishes Mr. Lehon's letter. But, while it agrees fully with what he says as to the merits of the exhibitions, it does not believe that the railway men attending the conventions fail, as he seems to imply, to take full advantage of it. Doubtless many of them might give more attention to it; but most of them do give a great deal of attention to it. Furthermore, the amount of time railway men give to the exhibits has been increasing year by year. They are of great mutual benefit to the supply men and the railway men, and never in our opinion, has this been more true than it is this year.

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PROGRAM OF THE WEEK.

MASTER CAR BUILDERS' CONVENTION.

MONDAY, JUNE 16

9.30 A. M. to 1.30 P. M.

Address by the president	9.30 A. M. to 10.30 A. M.
Reading of the minutes of the last meeting	10.30 A. M. to 10.35 A. M.
Report of secretary and treasurer	10.35 A. M. to 10.50 A. M.
Assessment and announcement of annual dues; appointment of committees on correspondence, resolutions, obituaries, etc	10.50 A. M. to 11.00 A. M.
Election of auditing committee	11.00 A. M. to 11.05 A. M.
Unfinished business	11.05 A. M. to 11.10 A. M.
New business	11.10 A. M. to 11.20 A. M.
Discussion of reports on:	
Nominations	11.20 A. M. to 11.30 A. M.
Revision of standards and recommended practice	11.30 A. M. to 11.45 A. M.
Train brake and signal equipment	11.45 A. M. to 12.00 M.
Brake shoe and brake beam equipment	12.00 M. to 12.30 P. M.
Coupler and draft equipment	12.30 P. M. to 1.00 P. M.
Car wheels	1.00 P. M. to 1.30 P. M.

3.00 O'CLOCK P. M.

The executive committee decided that it would be best to have a session devoted exclusively to a discussion of the revision of the rules of interchange. Heretofore it has been the custom to hold an informal discussion on the report of the arbitration committee on the revision of these rules, and no record made of the meeting except that possibly the arbitration committe might make some changes in its recommendations. The record of this meeting will now be a part of the proceedings.

At this session the following reports of committees will be considered:

1. Arbitration committee.
2. Conference with Association of American Railway Accounting Officers.
3. Revision of Prices for Labor and Material.

TUESDAY, JUNE 17.

9.30 TO 1.30 P. M.

Discussion of Reports on:	
Safety Appliances	9.30 A. M. to 9.45 A. M.
Rules for Loading Materials	9.45 A. M. to 10.00 A. M.
Overhead Inspection	10.00 A. M. to 10.15 A. M.
Car Trucks	10.15 A. M. to 10.45 A. M.
Train Lighting and Equipment	10.45 A. M. to 11.30 A. M.
Train Pipe and Connection for Steam Heat	11.00 A. M. to 11.15 A. M.
Tank Cars	11.15 A. M to 11.45 A. M.
Specifications for Tests of Steel Truck Sides and Bolsters for Cars of 80,000, 100,000 and 150,000 Pounds Capacity	11.45 A. M. to 12.00 M.
Topical Discussion:	
Retirement from Interchange Service of Cars of 40,000 and 50,000 Pounds Capacity	12.00 M. to 12.30 P. M.
Discussion of Reports on:	
Capacity Marking of Cars	12.30 P. M. to 1.00 P. M.
Lettering Cars	1.00 P. M. to 1.30 P. M.

WEDNESDAY, JUNE 18.

9.30 A. M. TO 1.30 P. M.

Discussion of Reports on:	
Damage to Freight by Unloading Machines	9.30 A. M. to 10.00 A. M.
Air-brake Hose Specifications	10.00 A. M. to 10.30 A. M.
Revision of Present Specifications	10.30 A. M. to 11.30 A. M.
Car Construction	11.00 A. M. to 11.30 A. M.
Unfinished business; Reports of Committees on Correspondence, Resolutions, and such other committees as may be named during the convention	11.30 A. M. to 11.45 A. M.
Election of Officers	11.45 A. M. to 1.30 P. M.
Adjournment.	

ENTERTAINMENTS.

MONDAY, JUNE 16.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Social Gathering and Informal Dance, 9.00 P. M.—Blenheim Exchange, Marlborough-Blenheim Hotel.

TUESDAY, JUNE 17.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Informal Dance, 9.30 P. M.—Entrance Hall, Million Dollar Pier.

B. & O. CLUB.

The annual meeting of the B. & O. Club will be held in the Park Place Hall of the Marlborough-Blenheim hotel at 3.30 this afternoon.

LOST.

Supply men's badge No. 2563. Please return to the enrollment booth.

Badge No. 3448 was lost Friday evening, probably on the pier. Finder please return to Secretary Conway's office.

A card case containing personal cards and a railroad ticket to Washington, D. C. Finder please return to T. G. Smallwood, Room 555, Dennis Hotel.

SUPPLY MANUFACTURERS' ANNUAL MEETING.

The annual meeting of the Railway Supply Manufacturers' Association was held in Convention Hall Saturday morning. The attendance was large. President Allen's annual report consisted simply of brief remarks to the effect that the affairs of the association were in excellent shape.

Officers for the ensuing year were chosen as follows:

President, Benjamin A. Hegeman, Jr.

Vice-president, J. Will Johnson.

Members of the executive committee, C. B. Yardley, Jr., J. C. Currie, C. F. Elliott and Joseph H. Kuhns.

In retiring from the chair in favor of the new president Mr. Allen received a rousing vote of thanks.

VISIT THE COUPLER EXHIBIT.

The coupler committee's report will be received and discussed at about noon to-day and if possible every member should visit the committee's exhibit, if only for a few minutes, before the report is presented. The exhibit is just beyond the Convention Hall and consists of nine special designs which have been submitted by different manufacturers, from which it is expected that it will be possible to select one standard design.

In 1911 the coupler committee was authorized to prepare a standard design. Since that time it has given considerable attention to studying the weak points of couplers on roads

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where the service is exceptionally severe, and has worked jointly with the coupler manufacturers in outlining the requirements and specifications for a standard design.

Six companies have designed couplers, which according to their experience will best fill these requirements, and they are on exhibition so that the members may examine them carefully and come to some conclusion as to the most satisfactory design. The companies are the Buckeye Steel Castings Company, American Steel Foundries, Gould Coupler Company, The McConway & Torley Company, National Malleable Castings Company and Monarch Steel Castings Company. It is also proposed to change the contour in order to strengthen the coupler, and templates are on exhibition showing the changes which are recommended for consideration.

VALUATION BOARD NEEDS MECHANICAL EXPERTS.

The Interstate Commerce Commission has issued applications for the examinations of men acquainted with railroad operation and construction who desire to enter the government service in connection with the work of appraising the physical property of the railroads. The commission wants a large staff of structural, electrical, mechanical, railway signal, and civil engineers, inspectors of car equipment and motive power, and architects. The salaries will range from $1,080 to $4,800, but as the work mainly takes them away from Washington expenses will be allowed while on duty. July 21 has been fixed as the closing date for the filing of applications.

M. C. B. ASSOCIATION OFFICERS 1911-1912.

President. C. E. Fuller, A. G. M., Union Pacific Ry.

Vice-presidents, M. K. Barnum, G. S. M. P., Illinois Central R. R.; D. F. Crawford, G. S. M. P., Penna. Lines; D. R. MacBain, S. M. P., L. S. & M. S. Ry.

Treasurer. Jno. S. Lentz, M. C. B., Lehigh Valley Ry.

Secretary, Jos. W. Taylor, 390 Old Colony Building.

Executive members, Henry LaRue, M. C. B., C., R. I. & P. Ry.; R. E. Smith, G. S. M. P., Atlantic Coast Line R. R.; C. E. Chambers, S. M. P., Central R. R. of N. J.; F. W. Brazier, S. R. S., N. Y. C. & H. R. R. R.; C. A. Schroyer, S. C. D., C. & N. W. Ry.; Alex. Kearney, A. S. M. P., Norfolk & Western Ry.

M. C. B. ASSOCIATION COMMITTEES.

STANDING COMMITTEES.

Arbitration.—J. J. Hennessey (Chairman), M. C. B., C. M. & St. P. Ry.; T. W. Demarest, S. M. P., Penna. Lines; J. S. Lentz, M. C. B., Lehigh Valley R. R., So. Bethlehem, Pa.; M. K. Barnum, Chicago; F. W. Brazier, S. R. S., N. Y. C. & H. R. R. R.

Revision of Standards and Recommended Practice.—T. H. Goodnow (Chairman), A. S. C. D., C. & N. W. Ry.; W. E. Dunham, Supervisor M. P., C. & N. W. Ry.; W. H. V. Rosing, Asst. to V. P., St. L. & S. F. R. R.; C. E. Fuller, A. G. M., Union Pacific R. R.; T. M. Ramsdell, M. C. B., Ches. & Ohio Ry.; O. C. Cromwell, M. E., Balto. & Ohio R. R.; O. J. Parks, G. C. I., Penna Lines.

Train Brake and Signal Equipment.—R. B. Kendig (Chairman), G. M. E., N. Y. C. Lines; B. P. Flory, S. M. P., N. Y. O. & W. Ry.; E. W. Pratt, A. S. M. P., C. & N. W. Ry.; R. K. Reading, S. M. P., Penna. R. R.; L. P. Streeter, Air Brake Engr., Ill. Cent. R. R.

Brake Shoe and Brake Beam Equipment.—Chas. H. Benjamin (Chairman), Purdue University; C. D. Young, Eng. Tests., Penna. R. R.; R. B. Kendig, G. M. E., N. Y. C. Lines.

Coupler and Draft Equipment.—R. L. Kleine (Chairman), C. C. I., Penna. R. R.; G. W. Wildin, M. S., N. Y. N. H. & H. R. R.; F. W. Brazier, S. R. S., N. Y. C. & H. R. R.; F. H. Stark, Supt. Pittsburgh Coal Co.; J. F. DeVoy, A. S. M. P., C. M. & St. P. Ry.; H. L. Trimyer, M. C. B., S. A. L. R. R.; B. Julien, G. F. C. D., Union Pacific R. R.

Rules for Loading Materials.—A. Kearney (Chairman), A. S. M. P., N. & W. Ry.; R. E. Smith, G. S. M. P., A. C. L. R. R.; L. H. Turner, S. M. P., P. & L. E. R. R.; W. F. Kiesel, Asst. Mech. Engr., Penna. R. R.; J. M. Borrowdale, S. C. D., Ill. Cent. R. R.; C. N. Swanson, S. C. S., A. T. & S. F. Ry.; G. H. Gilman, M. C. B., Northern Pac. Ry.

Car Wheels.—Wm. Garstang (Chairman), S. M. P., C. C. C., & St. L. R. R.; W. C. A. Henry, S. M. P., Penna. Lines; A. E. Manchester, S. M. P., C. M. & St. P. Ry.; R. W. Burnett, G. M. C. B., Can. Pac. Ry.; R. L. Ettenger, C. M. E., Southern Ry.; J. A. Pilcher, M. E., N. & W. Ry.; O. C. Cromwell, M. E., B. & O. R. R.

Safety Appliances.—C. E. Fuller (Chairman), A. G. M., Union Pac. Ry.; A. Stewart, G. S. M. P. & E., Southern Ry.; A. LaMar, M. M., Penna. Lines; C. B. Young, M. E., C. B. & Q. R. R.; H. Bartlett, G. S. M. P., B. & M. R. R.; M. K. Barnum, Chicago; W. O. Thompson, M. C. B., N. Y. C. & H. R. R. R.

SPECIAL COMMITTEES.

1. Car Trucks.—J. T. Wallis (Chairman), G. S. M. P., Penna. R. R.; J. R. Gould, G. S. M. P., Ches. & Ohio Ry.; E. W. Pratt, A. S. M. P., C. & N. W. Ry.; R. W. Burnett, G. M. C. B., Can. Pac. Ry.; Jas. Coleman, S. C. D., Grand Trunk Ry.; J. J. Tatum, S. F. C. D., B. & O. R. R.; G. A. Hancock, G. S. M. P., St. L. & S. F. R. R.

2. Prices for Labor and Material.—F. H. Clark (Chairman), G. S. M. P., B. & O. R. R.; G. E. Carson, D. M. C. B., N. Y. C. & H. R. R. R.; C. F. Thiele, G. C. I., P. C. C. & St. L. Ry.; Ira Everett, G. F. C. R., Lehigh Valley Ry.; S. T. Park; H. E. Passmore, M. M., T. & O. C. Ry.; J. F. Dunn, A. G. M., Oregon Short Line R. R.

3. Train Lighting and Equipment.—T. R. Cook (Chairman), A. E. M. P., Penna. Lines; C. A. Brandt, M. E., C. C. C. & St. L. Ry.; Ward Barnum, Elec. Engr., L. & N. R. R.; J. H. Davis, Elec. Engr., B. & O. R. R.; C. H. Quinn, A. E. M. P., N. & W. Ry.; D. J. Cartwright, Elec. Engr., Lehigh Valley R. R.; E. W. Jansen, Elec. Engr., Illinois Central R. R.

4. Train Pipe and Connections for Steam Heat.—I. S. Downing (Chairman), M. C. B., L. S. & M. S. Ry.; C. A. Schroyer, S. C. D., C. & N. W. Ry.; T. H. Russum, S. P. C. D., B. & O. R. R.; J. J. Ewing, M. E., C. & O. Ry.; W. C. Arp, S. M. P., Vandalia R. R.

5. Nominations.—F. W. Brazier (Chairman), S. R. S., N.Y. C. & H. R. R. R.; A. W. Gibbs, C. M. E., Penna. Lines; C. A. Seley, Chicago, Ill.; C. A. Schroyer, S. C. D., C. & N. W. Ry.; F. H. Clark, G. S. M. P., B. & O. R. R.

6. Arrangements: C. E. Fuller, A. G. M., Union Pacific Ry.

7. Tank Cars.—A. W. Gibbs (Chairman), C. M. E., Penna Lines; Thos. Beaghan, Jr., M. C. B., Union Tank Line; J. W. Fogg, M. M., B. & O., Chgo. Ter. Ry.; S. K. Dickerson, S. M. P., L. S. & M. S. Ry.; C. E. Chambers, S. M. P., C. R. R. of N. J.; E. J. Searles, S. M. P., B. & O. R. R.; Wm. Schlafge, G. M. S., Erie R. R.; C. A. Shoemaker, G. S. German-American Car Lines.

8. Specifications for Tests of Steel Truck Sides and Bolsters for Cars of 80,000, 100,000, and 150,000 Pounds Capacity.—E. C. Schmidt (Chairman), University of Illinois; J. S. Sheafe, Engr. Tests, Illinois Central R. R.; C. D. Young, Engr. Tests, Penna. R. R.

9. Capacity Marking of Cars.—C. E. Fuller (Chairman), A. G. M., Union Pacific R. R.; M. K. Barnum, Chicago; A. W. Gibbs, C. M. E., Penna. Lines; F. H. Clark, G. S. M. P., B. & O. R. R.; D. R. MacBain, S. M. P., L. S. & M. S. Ry.

10. Lettering Cars.—D. F. Crawford (Chairman), G. S. M. P., Penna. Lines; F. H. Clark, G. S. M. P., B. & O. R. R.; F. A. Torrey, G. S. M. P., C. B. & Q. R. R.; D. R. MacBain, S. M. P., L. S. & M. S. Ry.

11. Damage to Freight Equipment by Unloading Machines.—

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P. F. Smith, Jr. (Chairman), S. M. P., Penna. Lines; J. J. Tatum, S. C. D., Balto. & Ohio R. R.; E. A. Westcott, S. C. D., Erie R. R.; I. S. Downing, M. C. B., L. S. & M. S. Ry.; J. J. Birch, D. C. I., Norfolk & Western Ry.; C. S. Morse, M. C. B., Wheeling & Lake Erie R. R.

11. Air-brake Hose Specifications:—M. K. Barnum (Chairman); J. R. Onderdonk, Engr. Tests, B. & O. R. R.; J. J. Birch, D. C. I., N. & W. Ry.; C. D. Young, Engr. Tests, Penna. R. R.; A. J. Cota, M. M., C. B. & Q. Ry.; I. S. Downing, M. C. B., L. S. & M. S. Ry.; T. H. Goodnow, A. S. C. D., C. & N. W. Ry.

13. Conference with the Association of American Railway Accounting Officers:—D. F. Crawford, G. S. M. P., Penna. Lines; C. E. Fuller, A. G. M., Union Pacific R. R.; M. K. Barnum.

14. Revision of Present Specifications:—C. D. Young (Chairman), Engineer Tests, Penna. R. R.; J. S. Sheafer, Engineer Tests, Ill. Cent. R. R.; J. W. Taylor, Secretary.

15.—Car Construction:—W. F. Kiesel, Jr., (Chairman), A. M. E., Penna. R. R.; C. A. Seley, American Flexible Bolt Co.; A. R. Ayres, G. M., E., L. S. & M. S. Ry.; S. G. Thomson, S. M. P. & R. E., Phila. & Reading Ry.; C. E. Fuller, A. G. M., Union Pacific R. R.

THE TRACK EXHIBIT.

A most interesting feature of this year's track exhibit is the inspection locomotive of the Philadelphia & Reading. This locomotive was built at the Reading shops of the company and is of the Atlantic (4-4-2) type, with screw reverse gear and piston valves. It is electrically lighted throughout, has nickel plated cab fittings and is very handsomely finished. Beside the steel postal car built for the Chicago, Milwaukee & St. Paul by the American Car & Foundry Company, there are included in this exhibit a Southern Pacific box car equipped with the Van Dorn steel end, a gondola car with the Ditchfield door operating gear and the Standard Car Truck Company's four-point bearing flat car. There is also a flat car containing the Jacobs-Shupert and radial stay fireboxes which were used in the Coatesville tests last year, and an electric locomotive built by the General Electric Company and the American Locomotive Company for the Butte, Anaconda & Pacific.

CORNELL DINNER.

Thirty-one alumni of Cornell University and two guests met for their eighth annual dinner in Atlantic City on Friday evening at the Marlborough-Blenheim. B. P. Flory, '95, superintendent of motive power, New York, Ontario & Western, presided as president. Songs, stories and a discussion of educational policies in connection with training for a railroad career enlivened the meeting. It was decided to invite a representative of the faculty of Sibley college to address the meeting in 1914. C. P. Storrs, '95, Storrs Mica Company, was elected president for the next year. The success of the meeting was largely due to the activity of A. S. Lewis, Cleveland-Chicago Car Roofing Company.

The following were present: B. P. Flory, '95, president, superintendent of motive power, New York, Ontario and Western; F. F. Gaines, '95, superintendent of motive power, Central Railroad of Georgia; R. L. Gordon, '95, Standard Steel Car Company; F. M. Whyte, '89, Hutchins Car Roofing Company; A. S. Lewis, '02, Chicago-Cleveland Car Roofing Company; R. S. Cooper, '03, Independent Pneumatic Tool Company; H. A. Rogers, '03, Woven Steel Hose and Rubber Company; G. W. Ristine, Jr., '01, Pressed Steel Car Company; H. H. Gilbert, '07, Pressed Steel Car Company; F. L. Stryker, '03, North Western Malleable Iron Company; F. H. Park, '92, Westinghouse Air Brake Company; J. N. Mowery, '99, Keystone Lubricating Company; C. D. Young, '02, Engineer of Tests, Pennsylvania; C. B. Goodspeed, '08, Buckeye Steel Castings Company; J. H. Mitchell, '96, Pressed Steel Car Company; E. A. Averill, '00, *Railway Age Gazette;* G. T. Johnson, '06, Buckeye Steel Castings Company; L. B. Jones, '04, assistant engineer of motive power, Pennsylvania Lines West; F. N. Bard, '04, Barco Brass and Joint Company; E. B. Clark, '94, Celfor Tool Company; J. H. Wynne, '98, American Locomotive Company; L. H. Snyder, '06, Dixon Graphite Company; W. E. Dunham, '95, supervisor motive power and machinery, Chicago & North Western; A. R. Ayres, '00, General mechanical engineer, New York Central Lines; G. S. Goodwin, '99, mechanical engineer, Chicago, Rock Island & Pacific; C. P. Storrs, '95, Storrs Mica Company; R. R. Harrison, '08, Watson Stillman Company; Walter Smith, '08, Delaware & Hudson; A. C. Morgan, '90, Chicago Varnish Company; J. F. DeVoy, '93, assistant superintendent of motive power, Chicago, Milwaukee & St. Paul; W. G. Ransome, '99, The Bettendorf Company. The guests were T. R. Cook, Wisconsin, '00, assistant engineer of motive power, Pennsylvania Lines West, and J. H. Thomas, Standard Paint Company.

PAST PRESIDENTS, M. C. B. ASSOCIATION.

I. W. Van Houten	1867-68-69, 1873
F. D. Adams	1870-1871
M. C. Andrews	1872
Leander Garey	1874-1885
B. K. Verbryck	1885-1887
Wm. McWood	1887-1890
Jno. Kirby	1891-1893
E. W. Grieves	1893-1895
J. S. Lentz	1895-1897
S. A. Crone	1897-1899
C. A. Schroyer	1899-1900
J. T. Chamberlain	1900-1901
J. J. Hennessey	1901-1902
J. W. Marden	1902-1903
F. W. Brazier	1903-1904
W. P. Appleyard	1904-1905
J. E. Baker	1905-1906
W. E. Fowler	1906-1907
G. N. Dow	1907-1908
R. F. McKenna	1908-1909
F. H. Clark	1909-1910
T. H. Curtis	1910-1911
Alexander Stewart	1911-1912

DEATH OF ANDREW S. CROZIER.

Andrew S. Crozier, attached to the New York office of the American Steel Foundries as salesman, died suddenly of heart failure in the room of his hotel at Atlantic City Saturday evening. Mr. Crozier seemed to be in his usual good health during the day. He retired to his room in the early evening to dress for a dinner engagement, but did not appear at the appointed time. He was found lying on his bed and a hastily summoned physician pronounced him dead.

Mr. Crozier had been associated with the American Steel Castings Company and its successor, the American Steel Foundries, for the past sixteen years. He came from a fine Philadelphia family and was always highly regarded in business and social circles. He had never married. He was born at Rockdale, Pa., March 16, 1863. He was a member of several societies. He was a Mason, a Shriner, a member of the Camp Bradbury Sons of Veterans, a member of the Machinery Club, the Railroad Club in New York and the New England Railway Club. His brothers, William M. and H. D. Crozier, took the body to Ridley Park, Pa., where the funeral services were held.

PENNSYLVANIA SHOPMEN GIVE BAND CONCERT.

A band concert was given yesterday morning and afternoon in the entrance hall of the Million Dollar Pier by the Enola Pennsylvania Railroad Y. M. C. A. band, composed

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entirely of shopmen employed by the Pennsylvania Railroad at the Enola shops.

The band was organized about four years ago with 15 pieces and has since been increased to 45 pieces. It has played every year at the principal conventions in the state of Pennsylvania and has given many special concerts. Supported by the Y. M. C. A. at Enola, it is now almost self sustaining, receiving no assistance from the railroad company except free transportation. The band was organized by H. G. Hassler, now president and general manager of the band, who is foreman of the car shops at Enola and much of its success is due to his efforts. Enola is a town of 1500 inhabitants and no other town of its size in the state has a band of its size and quality. The band is directed by George F. Tyrrell, a retired army officer.

MIKADOS FOR THE LEHIGH VALLEY.

The first Mikado locomotives built by the Baldwin Locomotive Works for the Lehigh Valley were put in service in 1903. These engines were equipped with balanced slide valves and Stephenson link motion, and used saturated steam. The road has recently received, from the same builders, 17 locomotives of the same type which use superheated steam, and are equipped with piston valves, and Walschaert gear. They are large engines of their

Powerful Slow Speed Freight Locomotives; Lehigh Valley.

type, and represent a decided increase in capacity over the previous ones.

The total equivalent heating surface of the new locomotives, according to the usual method of calculation, is 6472 sq. ft. For an increase in total weight of 38 per cent., there is an increase in tractive effort of 33 per cent. and of total heating surface of 81 per cent. The ratio of tractive effort to total heating surface is 12.2 for the design of 1903, and 8.95 for the new engines. This represents an increase in relative steaming capacity of 36 per cent.

The locomotives illustrated have a ratio of adhesion of 4.02 and with driving wheels 56 in. in diameter they are especially suitable for heavy, slow speed service. As previously indicated, however, the boiler power is relatively high, and the design is suitable for long hard runs where there is a constant demand for steam.

The boiler has an extended wagon top, and the firebox is of the modified Wootten type without a combustion chamber. It is exceptionally large, as the depth, in front, is 87½ in., while the grate area is 100 sq. ft., and the firebox heating surface 274 sq. ft. In the design of 1903, the front end of the firebox was immediately over the rear pair of driving-wheels; but in the new locomotives the box is back of the wheels, and full advantage has been taken of the opportunity to gain depth. The sides and crown are of 5-16 in. plate, in one piece. The sides and roof of the outside box are also in one piece, the thickness being ½ in. The fuel used is a mixture of bituminous coal and fine anthracite, and it is fired through two circular doors which are placed 38 in. apart transversely. The grate is composed of table bars, arranged in three groups, supported at the sides of the firebox and on two intermediate longitudinal bearers. The bars of each group rock in three sections. No drop plates or water bars are used with this arrangement.

The front end of the firebox crown is supported from two T-bars hung on expansion links. All the staybolts in the throat, with the exception of those in the bottom horizontal row, are flexible; no flexible bolts are used in the sides or back. The small boiler tubes are spaced with ¾ in. bridges. The superheater is unusually large, is of the Schmidt top-header type, with 43 elements, and provides 1101 sq. ft. of superheating surface. Steam is conveyed to the steam chests through outside pipes.

The cylinders are bushed and are fitted with circulating and vacuum relief valves. The steam distribution is controlled by 14-in. piston valves; these are driven by the Walschaert gear, and are set with a lead of 5-16 in. The link and reverse shaft bearings, on each side of the locomotive, are combined in a steel casting which is bolted to the guide yoke. The Ragonnet power gear is applied, the cylinder being bolted to the boiler barrel forward of the firebox. Contrary to the usual practice in locomotives with Wootten fireboxes, the cab is placed at the rear end. The furnace is of such width that it would be difficult to locate a hand reverse lever in a convenient position, but by employing the Ragonnet gear the lever can be mounted on a bracket bolted to the back head of the boiler. Such an arrangement is convenient for the engineman, while it leaves room for a satisfactory grouping of cab fittings.

The frames are of .40 carbon steel, 5½ in. wide, with single front extensions measuring 11 in. deep under the cylinders. The equalization system divides between the second and third pairs of driving-wheels. The spring hangers at this point are pinned to lugs which are cast on a wide frame brace. Strong transverse bracing is also placed at the second and third pairs of driving-pedestals, and under the front end of the firebox, where the rear frames are spliced to the main frames. The brace here carries the radius-bar pin for the back engine truck, and also supports the expansion plate for the mud-ring. The rear truck is of the Rushton type, with inside journals. The spring rigging is arranged with six leaf springs on each side, one being over each driving-box, and one in front and one in the rear of the trailing truck. This provides ample spring support at the rear end, and should insure easy riding.

These locomotives were built in accordance with specifications and drawings prepared by the Railroad company. They have been specially designed to meet conditions existing on the heavy grade sections of the line, and, where practicable, use details

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interchangeable with those of locomotives previously built. They constitute an interesting step in the development of eight-coupled anthracite burning locomotives.

Some of the principal dimensions are given in the following table:

Cylinders, diameter and stroke	27 in. x 30 in.
Driving wheels, diameter	56 in.
Driving journals	9 in. x 14 in.
Steam pressure	175 lbs.
Boiler, diameter	83¾ in.
Tubes, number and diameter	264—2¼ in.
Flues, number and diameter	43—5½ in.
Length of tubes and flues	21 ft.
Heating surface, tubes and flues	4,547 sq. ft.
Heating surface, total	4,821 sq. ft.
Grate, area	109 sq. ft.
Weight, total	321,800 lbs.
Weight on drivers	232,300 lbs.

NEW VICE-PRESIDENTS OF M. M. ASSOCIATION.

Two new vice-presidents were elected at the closing session of the Master Mechanics' Association, both of whom had previously served upon the executive committee. These were E. W. Pratt, the second vice-president, who is assistant superintendent of motive power and machinery of the Chicago & North Western, and William Schlafge, the third vice-president, who is general mechanical superintendent of the Erie.

E. W. PRATT,
Newly-Elected Second Vice-President, M. M. Association.

Mr. Pratt was born at Fort Atkinson, Wis., on June 2, 1869. He is a graduate of the mechanical engineering department of Lehigh University. Before attending college and during his vacations he was engaged with the Chicago & North Western on field work in civil engineering and with the Elgin, Joliet & Eastern during its construction. For a short time after leaving college he was engaged in the manufacture of varnish and lubricating oils at San Francisco, Cal., and during 1890-1 was a designing engineer of the Western Electric Company at Chicago. Following this he was general superintendent of the Chicago Hardware Company for about a year, and from 1892 to 1899 was general air brake inspector of the Chicago & North Western. He has been connected with that road ever since and in the following capacities: 1899-1901, engine house foreman at Chicago; 1901-2, general foreman at Ashland, Wis.; 1903, master mechanic at Mason City, Iowa; from 1903 to January, 1909, master mechanic of the lines west of the Missouri River, with headquarters at Missouri Valley, Iowa. In January, 1909, he was made assistant superintendent of motive power and machinery, which position he now holds. Mr. Pratt became a member of the association in 1903.

WILLIAM SCHLAFGE,
Newly Elected Third Vice-President, M. M. Association.

William Schlafge, the new third vice-president, was born in Berlin, Germany, October 11, 1868, and after receiving a common school education continued it by attending night school. He first entered the railway service in the machine shops of the Lehigh Valley, at Packerton, Pa., and remained with that company until 1897, when he went to the Minneapolis, St. Paul & Sault Ste. Marie shops at Minneapolis as an apprentice. After finishing his apprenticeship he was engaged as a mechanic and foreman in several railway and contract shops, and in 1893 returned to the service of the Soo as an engine house foreman at Gladstone, Mich. He resigned this position in 1898 to go with the Escanaba & Lake Superior as a locomotive fireman; later he was made an engineman, and was then promoted to the position of master mechanic. He next went with the Baltimore & Ohio at Newark, Ohio, as an engine house foreman, and three years later was promoted to general foreman in charge of the locomotive and car departments, with headquarters at Chicago Junction, Ohio, remaining in that position until 1893. In March

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of that year he was made general foreman of the Erie at Port Jervis, N. Y., and in 1894 was made master mechanic at Jersey City, N. J. In December, 1906, he was made master car builder with headquarters at Meadville, Pa., and a few months later was promoted to the position of general master mechanic, and then to that of assistant mechanical superintendent. In October, 1907, he was made mechanical superintendent of the Erie Grand division and the New York, Susquehanna & Western, with office at Jersey City. When Mr. Rumney left the Erie early in 1912 to go with the Rock Island, Mr. Schlafge was promoted to the position of mechanical superintendent. Mr. Schlafge became a member of the Master Mechanics' Association in 1904.

STEEL POSTAL CAR.

The American Car & Foundry Company, New York, is exhibiting an all-steel postal car, built for the Chicago, Milwaukee & St. Paul. It conforms to the latest specifications of the United States post office department in construction, floor plan and interior fixtures and was among the first cars built under the specifications and approved by the post office committee. It is designed with trussed side frames to carry the load, the truss consisting of a 6 in. x 4 in. x $\frac{3}{8}$ in. angle side sill, a 5 in. x 3 in. x $\frac{5}{16}$ in. angle side plate, 3 in x 2 in. x $\frac{5}{16}$ in. angle side posts and 3 in. x 2 in. x $\frac{1}{4}$ in. angle and 4 in. 5.25 lb. channel side braces with suitable reinforcements at the side door openings.

The center sills are of the fish belly type and are designed to absorb the end shock and carry the center sill loads between the bolsters and cross-bearers, from which points it is transferred to the side trusses. The center sills are 26½ in. deep at the center and consist of two $\frac{9}{16}$ in. web plates 25½ in. deep, spaced 18 in. apart and reinforced by four bottom flange angles 3 in. x 3 in. x $\frac{5}{8}$ in., two top flange angles 4 in. x 3 in. x $\frac{5}{8}$ in. and a top cover plate 30 in. x ½ in. The cross-bearers are located 18 ft. 2 in. apart, and consist of a ¼ in. web plate with a 3 in. flange at the top, a 3 in. x 3 in. x ¼ in. angle reinforcement and a 16 in. x ¼ in. cover plate. The bottom flange is reinforced by two 3 in. x 3 in. x ¼ in. angles which are continuous between the side sills and pass below the center sill flange angles. The combined body bolster and platform is of steel and was furnished by the Commonwealth Steel Company. The floor beams are 3 in. 4 lb. channels riveted to the center and side sills, and the floor supports are channels of the same size and are covered with No. 14 gage steel upon which is secured 1 in. hair felt insulation; between this insulation and the floor is $1\frac{5}{16}$ in. air space. The floor consists of two courses of $\frac{13}{16}$ in. floor boards nailed to stringers which are bolted to the floor supports and center sill cover plate.

The end framing is designed especially strong to prevent telescoping and consists of 12 in. 31.5 lb. I-beam vestibule posts reinforced by 4 in. 5.25 lb. channels, end door post stiffeners and a $\frac{3}{16}$ in. pressed steel door post cover, which is screwed to wood furring. The intermediate end posts and corner posts are 4 in. 10.3 lb. Z bars and the corner post cover is a $\frac{3}{16}$ in. pressed plate; the end sheathing is ⅛ in. plate which is riveted to all the posts. The end framing members are securely riveted in pockets cast in the combined end sill and double body bolster at the bottom, which takes care of the bottom reactions and distributes any shock throughout the longitudinal members of the underframe. At the top they are secured to a built-up end plate consisting of ¼ in. plates and a 4½ in. x 3 in. x $\frac{5}{16}$ in. angle ramp carline which is further reinforced by a ¾ in. anti-telescoping plate $21\frac{13}{16}$ in. wide, flanged at the outer side and extending from side plate to side plate to distribute the

Interior of Chicago, Milwaukee & St. Paul Steel Postal Car.

top reactions from the end posts through the longitudinal roof members.

The side sheathing consists of ⅛ in. plate, spliced at the belt rail which is a ¼ in. x 4 in. plate in a continuous length between the door openings and a 4 in. 5.25 lb. channel which is framed between the posts. The letter board is ⅛ in. plate reinforced at the bottom by a 2 in. x 2 in. x $\frac{5}{16}$ in. angle and at the top is riveted to the side plate, the same rivets fastening a U-shaped eaves moulding to which the roof sheets are riveted. The roof is of the clere-story type and has 3 in. x 3 in. x ¼ in. angle deck sills running the full length of the car and riveted to the carlines. The carlines are 1¾ in. x 1¼ in. x $\frac{5}{16}$ in. angles extending from side plate to side plate in one piece

Steel Postal Car for the Chicago, Milwaukee & St. Paul.

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and arranged in pairs. The upper deck roof sheets are No. 14 steel, and the lower deck sheets No. 16 steel insulated with three-ply salamander which is secured by wood furring.

The interior finish of the car is entirely of steel, the sides being lined with corrugated iron. The outer window sash are removable and all sash are made of wood and provided with screens as required by the railway mail service standards; the sliding side doors are of wood, and the H. W. Johns-Manville Company's three-ply salamander insulation is applied to the inner side of all outside sheets; there is a dead air space between the sheathing and inside finish. Ventilation is obtained by 6 in. Utility ventilators. The car is lighted by electricity, the head end system of current supply being used and is also equipped with two battery boxes of 16 cells each. The principal dimensions as follows:

Length over end posts	60-ft. 10½ in.
Length inside	60-ft. 1 in.
Width over side sills	10 ft. ¾ in.
Width inside	9 ft. 2¾ in.
Weight of car body	80,580 lbs.
Weight of trucks	38,080 lbs.
Weight, total	118,660 lbs.

AN EARLY LOCOMOTIVE BOILER EXPLOSION.

In 1840 one of the small railways, which a few years later were combined to form the beginning of the present Midland Railway of England, purchased eight locomotives from Norris of Philadelphia. The works of Norris later became the Baldwin Locomotive Works. These engines were used on an incline between Bromsgrove and Blakewell, which had a 2.65 per cent. grade and pulled a train of 53¼ tons weight at a speed of 8½ miles an hour. They were of the single driver, inclined cylinder type with a four wheel truck.

Headstones of Engineer and Fireman Killed in a Locomotive Boiler Explosion in 1840.

Shortly after they were put in service, the boiler of one of these exploded, killing the engineer and fireman. These men were probably the first enginemen to be killed by a locomotive boiler explosion. They were buried side by side in a church yard in Bromsgrove, and the friends of the engineer erected a suitable headstone at his grave, on which was carved a reproduction of the locomotive he was driving when killed. This action aroused the friends of the firemen to a similar action.

A short time ago Mr. Fowler, chief mechanical engineer of the Midland, heard that these stones were showing signs of disintegration and he hastened to have photographs of them made. He brought copies of these pictures with him to the convention and the accompanying reproduction is made with his permission.

The inscription on the engineer's headstone reads as follows:

"Sacred to the memory of Thomas Scaife, late engineer on the Birmingham & Gloucester Railway, who lost his life at Bromsgrove Station by the explosion of an engine boiler on Tuesday, November 10, 1840. He was 28 years of age, highly esteemed by his fellow workmen for his many amiable qualities, and his death will be long lamented by all those who had the pleasure of his acquaintance. The following lines were composed by an unknown friend as a memento of the worthiness of the deceased:

"My *engine* now is cold and still,
No water does my *boiler* fill,
My *coke* affords its flame no more,
My days of usefulness are o'er.
My *wheels* deny their noted speed,
No more my guiding hand they heed.
My *whistle* too has lost its tone,
Its shrill and thrilling sounds are gone,
My *valves* are now thrown open wide,
My *flanges* all refuse to guide.
My *clacks*, also, though once so strong,
Refuse to aid the busy throng.
No more I feel each urging breath,
My *steam* is now condensed in death.
Life's *railways* o'er each *station's* past,
In death I'm stopp'd and rest at last,
Farewell dear friends and cease to weep,
In Christ I'm safe, in Him I sleep."

"This stone was erected at the joint expense of his fellow workmen in 1842."

The inscription on the other stone reads:

"Sacred to the memory of Joseph Rutherford, late engineer to the Birmingham & Gloucester Railway Company, who died November 11, 1840; age 52 years.

"Oh! reader stay and cast an eye
Upon this grave wherein I lie.
For cruel death has challenged me,
And soon, alas! will call on thee.
Repent in time, make no delay,
For Christ will call you all away.
My time was spent like days in sun,
Beyond all cure my glass is run.

"This stone was erected by his affectionate relict, 1841."

MILITARY RAILWAY IN MONGOLIA.—Russia has constructed a military railway from Harkatu to Urga and the whole line is divided into four sections, on each of which a barrack has been erected.

NEW RAILWAY IN CHINA.—The railway built by Chinese engineers, and financed by the Chinese themselves, which will connect Pak Kaai, province of Kwangtung, the port on one of the largest branches of the Canton river with Hong-Kong is now opened for traffic as far as the city of Kongmun, which is only three miles from Pak Kaai.

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LITTLE INTERVIEWS.

"Compounding has not been entirely discarded, although its use is not being noticeably extended. The railways already having large numbers of compounds are finding them satisfactory. One of the most interesting developments in this connection is the application of a superheater to a three-cylinder, four-coupled locomotive by Mr. Fowler, of the Midland. While this engine is not yet in service the general opinion of locomotive engineers in England is that it will be a very successful combination."

"I hope to see the time," said M. Waitt the other day, "when the railways of the United States will to some extent follow the example of those of Europe in the interior arrangement of their day coaches and sleeping cars. The day coaches in Europe are divided into compartments seating four or more persons, instead of being simply one large compartment, as ours are. This makes far much greater privacy. It promotes more satisfactory ventilation, because it is easier to ventilate a compartment satisfactorily to a few people than a big car satisfactorily to a large number of people. It also enables one to choose his company. The argument for the division of sleeping cars into compartments is much stronger still. European travelers regard our large, open sleeping cars as little short of indecent. The man who travels much in Europe soon gets to sympathizing with their point of view."

"I think the exhibits in connection with these conventions have an educational value beyond what most people realize," said James Ogilvie, assistant chief operating officer of the Board of Railway Commissioners of Canada, on Saturday. Mr. Ogilvie is attending the conventions and is staying at the Traymore. "I have been attending the meetings of the mechanical associations for many years," he continued, "and it seems to me that the usefulness both of their sessions and of the exhibition increases steadily year by year. I believe it would pay the railways to bear the expenses of their mechanical men, if that were necessary to get them to come here, and should then make it their duty carefully to inspect every new or improved theory shown. Any mechanical officer who comes here and does not carefully inspect the exhibit makes a great mistake."

Mr. Ogilvie was for twenty-three years superintendent of motive power of the Canada Atlantic, now a part of the Grand Trunk. Following the acquisition of the Canada Atlantic by the Grand Trunk he was master mechanic of the latter road at Port Huron. E. J. Chamberlin, now president of the Grand Trunk, was then its general manager. Mr. Ogilvie was at one time connected with the Canadian Pacific, and had charge of equipping its first shops at Montreal. In his present position he deals for the Canadian Commission, with the regulation of safety appliances, boiler inspection, etc. He has been with the Commission since 1907.

The dinner to be given the Brazilian Minister of Foreign Affairs in New York on June 17 by the American Manufacturers' Export Association which is composed largely of railway supply manufacturers, calls attention forcibly to the opportunities that exist for increasing the foreign market for railway equipment and supplies made in this country. Among the supply men attending the conventions who recently have been abroad trying to broaden the foreign market for their companies is J. Will Johnson, general manager of the Pyle-National Electric Headlight Company. Mr. Johnson spent two months in the late summer of 1912 in Norway and Sweden.

"I don't think we fully appreciate in this country how much, with a reasonable amount of effort and expenditure, we could increase our foreign sales of supplies," said Mr. Johnson this week. "The managements of the railways of Norway and Sweden could gain by introducing the kind of automatic couplers used in this country. Other things, it occurred to me, they could well afford to borrow from us, are some of our types of derails and curtain fixtures. On the other hand, it would be a mistake to assume that we have nothing to learn from the manufacturers and railway managers of other countries. The American visitor in Europe is impressed with the fact that the Europeans avail themselves of many refinements of design and practice which we might profitably imitate. In many respects our railways are superior to those of Norway and Sweden; but I rode 66 miles in 44 minutes on a locomotive on the Swedish State Railways near Stockholm, which shows that they can 'go some' over there."

Lawford H. Fry, the European representative of the Baldwin Locomotive Works, who is visiting the conventions for the first time since 1906, has been particularly interested in the reports and discussion in connection with superheated steam.

"The railways in England," Mr. Fry says, "are all showing much activity in the investigation of this subject, and all of the larger systems are applying superheaters. The fire tube type is being universally used, but several of the roads are trying designs originated by their own engineers. These differ principally in the arrangement of the headers and the method of fastening the pipes. The advantage of the higher degrees of superheat is generally admitted, and most of the designs closely follow the general plan of the Schmidt type, universally used here.

"There is still but one Pacific type locomotive in Great Britain, the 'Great Bear' of the Great Western, and there is but little demand for this type in that country, although there is a constant tendency for the weight of passenger trains to increase. The ten-wheeler is the most popular type for heavy passenger traffic, and probably will be able to meet the demands for some time to come. The very large locomotive will always be forbidden in England because of the small size of the loading gage.

"In freight service there appears no tendency toward larger cars except in exceptional instances. The ten-ton, four-wheel car seems to suit the traffic requirements perfectly. Nearly all freight traffic is high speed, and the heavy, slow "drags" so common here are found in only a few instances. In view of this condition the eight-coupled locomotive is the most suitable, and is generally designed without a front truck, although there are a few examples of the consolidation type in use.

"The Interstate Commerce Commission heartily approves these meetings," said George B. McGinty, secretary of the commission, who has been an interested visitor at the convention throughout the week with several of the locomotive boiler inspectors of the commission. "The railroads have in their hands right now in these meetings the power of preventing further legislation along the lines of standardization. If the Master Mechanics' and Master Car Builders' associations adopt standards wherever they see plainly they are needed, and if the managements of the roads will adhere to the standards adopted, they will prevent public agitation and preclude the people from demanding legislation by Congress which will place additional burdens on the Interstate Commerce Commission to enforce. There is no reason why the commission should be made to bring about standardization when the carriers have it in their own power to do it, and if the roads will only back up the work that is done here by the associations by adopting their conclusions they can forestall legislation on the subject.

"We are gratified to find that the railroad men themselves are giving our inspectors such coöperation. It is rare to meet a master mechanic or a superintendent of motive power who does not give us all the assistance in his power.

"Occasionally we find one who fails to understand our intentions and methods and who objects if one of our inspectors calls his attention to some defect which is outside of our authority. We try to make them understand that we are not anxious to order engines out of service, but that it is our

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purpose, so far as possible, to call attention in an informal way to matters that can be remedied so that they may be cared for before they have a chance to make trouble. If we call attention to a defect, even if it is outside of our authority, and if it is not remedied and an accident ensues, it is, of course, our duty to report that we had called attention to it in advance. When the railroad men understand us we are sure of their coöperation. But they should remember that the commission does not make the laws. It is only required to enforce them and if the carriers had adopted proper standards themselves the laws would not be there for us to enforce them."

A REMARKABLE CAREER AS LOCOMOTIVE ENGINEER.

Among the special guests at the convention is A. Chambers, who retired from the service of the Pennsylvania Railroad on a pension two years ago, at the age of 68, after 51 years of continuous service. For the last 46 years of that time Mr. Chambers was a locomotive engineer and ran his engines over almost the entire system of the Pennsylvania as well as over a number of other roads on special trips. During most of his service he has been assigned to the duty of handling the locomotive on special and inspection trips of the presidents and general managers. He has hauled six Pennsylvania presidents, J. Edgar Thomson, Thomas A. Scott, George B. Roberts, Frank Thomson, A. J.

Left to right—A. Chambers, Retired Pennsylvania Engineer, and W. H. Bennett, Master Mechanic, Juniata Shops, Pennsylvania.

Cassatt and James McCrea, as well as the present president, Samuel Rea, before he was elected to that office, and has attended the funerals of the six former presidents. He also for 39 years presided at the throttle for eight general managers on inspection trips, A. J. Cassatt, Frank Thomson, C. E. Pugh, S. M. Prevost, J. B. Hutchison, W. W. Atterbury, W. H. Myers and S. C. Long.

Mr. Chambers ran the locomotive on the special trains of Presidents Grant, Hayes, Cleveland, McKinley and Roosevelt, and also the Duke of Sutherland, as well as the special train of the Centennial Commissioners in 1876. In that year he was the engineer on the first division of a run made by a special train from Jersey City to San Francisco in 83 hours, his part of the run being from Jersey City to Pittsburgh without stops.

In his entire career as an engineman Mr. Chambers never had an accident and never lost a day through sickness.

He now has two sons in the Pennsylvania service and his father before him was a track supervisor for the same road. Mr. Chambers entered the service in 1861, carrying water for the track gangs when he was 16, and later was made fireman on a wood-burning engine. He was promoted to engineman in 1868 and in 1871 to a passenger run. He continued as a passenger engineer until his retirement on January 1, 1912. For many years his regular run was on the Cincinnati Express from Philadelphia to Harrisburg, except when he was assigned to special trains. Later he ran locals on the Philadelphia division.

Mr. Chambers made his fortieth trip on the general manager's inspection last year in a private car by special invitation from General Manager Long. He has been personally acquainted with all of the presidents and general managers during his period of service as well as the directors who went on the inspection trips and always had a good word for him. A. J. Cassatt was general manager when he entered service, and he remembers James McCrea as a supervisor. One of his first special trips was in 1876 with Col. Scott from Philadelphia to St. Louis.

Mr Chambers has witnessed some wonderful changes in railroading in his time. He thinks the work is much safer now, with signals and other modern appliances, but that it is also more of a strain on a man on account of the higher speed and the greater volume of traffic. His first engine was type "G," with 15 in. x 22 in. cylinders, and 54-in. drive wheels. His last had 18 in. x 26 in. cylinders and 68-in. wheels. He claims to have had the "cleanest engine in the United States," all nickel work, with a cab as neat as a Pullman. It was kept in a special house to be used only on special trips. He wore out four engines in this special service, retaining the same number "937" throughout. The last "937" was new in 1906.

Mr. Chambers is now living at Atlantic City, taking it easy on his liberal pension. He does not look his age and walks for at least an hour every day on the Boardwalk for exercise. He has been bringing officers to the conventions for many years and since his retirement has been a daily visitor to the exhibits where he meets many old friends.

Tokaido Line, Japan.—The construction of the iron bridge with the double line over the Kiso river having been completed the section will be put into active use for traffic immediately. Now the only single track section of the Tokaido line left is the iron bridge over the river Tenryu.

The Amur Railway, Siberia.—The Czar of Russia has addressed to the Governor-General of the Amur Region a message of congratulation on the progress of construction of the Amur Railway, and has expressed his thanks to all Russians engaged on the works. Credits amounting to over $375,000,000 have been voted for this enterprise during the last five years. The railway is expected to be completed in 1915, or, at latest, in 1916. The section as far as Blagoveshchensk will probably be opened for traffic in the course of this year.

Arisan Line, Formosa.—The Arisan railway is one of the most interesting lines in Formosa, and it might almost be said in the Far East. The line was undertaken by the Arisan Works Department of the government of Formosa, and a well-informed critic observes that this mountain railway will elicit favorable remark from the engineering fraternity in many countries. The construction involved steep gradients, sharp curves, a picturesque spiral, and many tunnels and bridges. The entire railway will cover 41 miles, from Kagi to Mount Ari Station—the latter point being 7,000 ft. above sea level. From Kagi to Chikutoki, 9 miles, the grade is two per cent. From Chikutoki, Nimandaira is reached after a 32-mile zigzag climb up the mountains to 7,000 ft., the gradient being five per cent. Nearly the entire line is sinuous, the sharpest curve being 35 degrees. To reach Nimandaira the railway must circle a peak spiral fashion. The spiral construction begins at 1,824 ft. and ends at an elevation of 2,500 ft. Between Kagi and Mount Ari there are 70 bridges, 73 tunnels, and almost innumerable cuts. The Rinnai or forest railway is 18 miles long, is tortuous, and has a gradient of six per cent. This railroad is called the Mount Arisan line, Mount Ari lending its name to the railway as well as to the giant forests that are the objective point of the undertaking.

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Conventionalities.

The "movies" on the Pier are mighty popular all day.

The supercheater white pants have plenty of company now.

O. C. Gayley, vice-president of the Pressed Steel Car Company, arrived Friday evening. He is staying at the Marlborough-Blenheim.

News of the death in Chicago on Friday of Mrs. A. E. Buffum, mother of Mrs. Mark A. Ross, was received by Mr. Ross late Friday evening.

J. French Miller, secretary of the Galena Signal Oil Company, dropped in Saturday, but found it necessary to return to Franklin Sunday.

Vernon Job, manager of the Pacific Coast territory of the Independent Pneumatic Tool Company, is paying his first visit to the M. M. and M. C. B. conventions.

F. H. Clark, general superintendent of motive power of the Baltimore & Ohio, was here a short time for the M. M. Convention, and has returned for the M. C. B. Convention. He is at the Marlborough-Blenheim.

When the *Daily* said in its issue of June 14 that Mrs. J. M. Hopkins and J. M., Jr., were traveling it meant to tell also where they were traveling, but failed to do so. They have been in Europe for some months.

"Votes for Women"—Convention Ladies who on Wednesday Last Rejoiced in the News of the Passage of the Illinois Suffrage Bill.

Top row, left to right—Mrs. Charles D. Jenks, Mrs. Burton W. Mudge, Mrs. W. J. Tollerton, Mrs. L. A. Richardson, Mrs. J. S. Sheafe.

Bottom row, left to right—Mrs. B. A. Clements, Mrs. F. O. Bunnell, Mrs. J. P. Landreth.

On Saturday morning Chairman Yardley, of the enrollment committee, was presented by the members of his committee with a handsome stickpin—a sapphire surrounded by four diamonds. E. T. Sawyer, a member of the committee, made the presentation.

Blake C. Howard, who has attended the conventions during the past three or four years with his father George E. of the Commonwealth Steel Company arrived Sunday afternoon. This year he comes as the St. Louis representative of Mudge & Company.

"Votes for Women"—Compelled to Smile when the News was Received from Illinois.

Left to righ—J. S. Sheafe, Eng. of Tests, Illinois Central; J. P. Landreth, Chicago Manager Garloch Packing Company; E. A. Park, Supt. Motive Power & Equipment, Peoria & Pekin Union.

T. H. Goodnow at the time of the Conventions last year was with the Armour Car Lines. This year he comes as superintendent of the Car department of the Chicago & Northwestern. Mr. Goodnow was last year's president of the Western Railway Club.

David J. Champion, vice-president and general manager of the Champion Rivet Company, more familiarly known as "Dave" Champion, is unable to get to the convention this year. He is compelled to stick close to the new plant of the company at East Chicago, soon to be put in operation.

J. E. Muhlfeld, formerly general superintendent of motive power of the Baltimore & Ohio, and later vice-president of the Kansas City Southern, is attending the conventions this year. He is now located in New York City and is engaged in special and consulting work.

R. A. Bachman, vice-president and general manager of the Edison Storage Battery Co., motored down from New York the latter part of the week and is stopping at the Dennis. Mr. Bachman has just bought a new National and is taking considerable pleasure in feeling its pulse.

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George Durham, master mechanic of the Delaware, Lackawanna & Hudson at Scranton, Pa., is among the Lackawanna representatives at Atlantic City this year. The superheater slide valve locomotive which is giving such successful service on that road is operating on his division.

We miss the smiling face—and box of cigars—of our friend Stephen C. Mason, secretary of The McConway & Torley Company. In writing about his inability to be here because of press-

W. C. Arp, Superintendent Motive Power, Vandalia.

ing business engagements, Mr. Mason says, "It goes without saying that I hope the conventions will be fully up to their previous mark."

Maham H. Haig, mechanical engineer of the Santa Fe, has the reputation this year of giving more earnest and conscientious attention to the exhibits on the pier than any other railroad representative present. If there is anything

W. J. Tollerton, General Mechanical Superintendent, Rock Island Lines, and Mrs. Tollerton.

that he does not know about it when he returns home it will not be his fault.

Among the Rock Island men in attendance at the convention is W. J. Hartman, general air brake instructor. He is especially interested just at this time in the application of high speed brakes to the passenger equipment and in the inspection of a number of new locomotives which are being built for his company.

Left to right—T. Rumney and A. B. Appler, Mechanical Engineers, Delaware & Hudson Company.

Left to right—John E. Davis, M. M., Hocking Valley; H. F. Staley, M. M., Carolina, Clinchfield & Ohio.

Another Good Railway Man Gone Wrong—W. H. Foster (on the Left) Until Recently Master Mechanic of the N. Y. C. & H. R. R. R., Now With the Ashton Valve Company, and N. A. Campbell.

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A. M. Darlow is probably the youngest superintendent of motive power in attendance at the conventions. During the past year he was promoted to that position on the Buffalo & Susquehanna. Previously he had been mechanical engineer and general storekeeper of that road. He was graduated from Cornell in 1905.

W. S. Butler, master mechanic, and H. M. Brown, shop superintendent of the Chesapeake and Ohio at Huntington, W. Va.,

George B. McGinty, Secretary Interstate Commerce Commission.

are taking in the conventions together. During the recent floods on the Ohio river, the water reached a height of several feet in the Huntington shops, and Mr. Brown had a staff of men engaged in building boats for use in getting about the plant.

C. B. Smith, mechanical engineer of the Boston & Maine, found it necessary to return to Boston Saturday evening. He was accompanied by Mrs. Smith. Mr. Smith has had an exceptionally interesting piece of work during the past

Left to right—H. W. Coddington, Engineer of Tests, and John A. Pilcher, Mechanical Engineer, Norfolk & Western.

year in connection with the building and equipment of the new shops at Billerica, Mass.

William Smith, formerly foreman of the North Western at Boone, Iowa, and now with the Delaware & Hudson at Watervliet, N. Y., spent a couple of days at Atlantic City, going home Saturday evening. He has just completed a report on Engine House Efficiency which is to be presented at the annual meeting of the International Railway General Foreman's Association at Chicago in July.

In Chicago the street sweepers wear small lamps on their hats so that drivers of carriages and automobiles will not run them down. It was suggested Saturday morning that George Bourne might have made himself still more conspicuous in his superheater suit if he had arranged with Ostby for an acetylene headlight.

J. S. Turner, of the Pressed Steel Car Company, packed his trunk, locked it, and put the key somewhere. The trunk got here all right; but the key didn't. Now Jack isn't given to swearing. He is, however, characteristically original in his expressions; and "they" say that the amusement he afforded pending the arrival of a locksmith put Barnum & Bailey's clowns in the shade.

R. W. Burnett, general master car builder of the Canadian Pacific, arrived with Mrs. Burnett on Saturday morning. The developing and building of steel passenger cars, improvements in box car construction and extensive additions to the car building plant at Angus are among the more important features of the work in the car department of the Canadian Pacific during the past year.

James Powell, chief draughtsman of the Grand Trunk and

F. O. Bunnell, Engineer of Tests, Rock Island Lines.

secretary of the Canadian Railway Club, is attending the conventions. The Grand Trunk has been noted for its use of two-cylinder compound locomotives, and a number of the consolidation type have been replaced by single-expansion Mikados equipped with superheaters. The Mikados are reported to be giving excellent service in heavy freight service.

Daniel Royse, assistant to W. V. S. Thorne, vice-president and director of purchases of the Union Pacific system, arrived yesterday and began early a tour of inspection of the exhibits. To those who know him, it is almost needless to say that he and John C. Whitridge of the Buckeye Steel Castings Company were together. Messrs. Royse and Whitridge formerly were associated when both were in technical newspaper work.

J. F. Prendergast, master mechanic of the East Broad Top Railroad & Coal Co., is stopping at Haddon Hall. He is quite enthusiastic about the service which is being given by the Mikado locomotives which his road recently received from the Baldwin Locomotive Works, and the all-steel hopper cars which were built by the Pressed Steel Car Co. The East Broad Top is a narrow gage road and undoubtedly the only one with as modern and up-to-date equipment as that which has lately been put in service.

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Lawford H. Fry, European representative of the Baldwin Locomotive Works, is attending the convention for the first time since 1906. Mr. Fry has, during the past few years, published in the *Engineer* and *Engineering* of London some exceptionally valuable articles on locomotive proportions and ratios which have attracted much favorable comment. He will return to his headquarters in London in a couple of weeks.

The Michigan Central is represented this year by W. H. Flynn, superintendent of motive power, and J. A. McRae, mechanical engineer. They are about to place in service a new lot of Mikados which are the first of that type to be used on the M. C.; also some new heavy passenger powers which is similar to the standard New York Central Lines K 3 engines and is considerably heavier than any passenger power which has yet been used on that road.

George Duffey, master mechanic of the Lake Shore & Western, has complete charge of the locomotive and car departments on that road, and is especially interested in the progress of the apprenticeship work at Lima, Ohio. The apprentice school there, which is under the general direction of C. W. Cross, superintendent of apprentices of the New York Central Lines

G. I. Evans, Superintendent Angus Locomotive Shops, C. P. R.

west of Buffalo, is giving instruction to a large number of apprentices with gratifying results.

C. A. Brandt, mechanical engineer of the Big Four, has been pretty busy during the year in supervising the extensions to the freight and passenger car shops at Beech Grove, Ind., and also some additions which have been made to the locomotive shops. He is splendidly equipped for this class of work, as he was in charge of all of the shop engineer's work on the Lake Shore for several years, and is one of the few railroad men who may be classed as experts in this line.

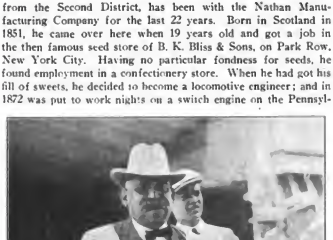
J. Leonard Replogle, vice-president of the Cambria Steel Company, and C. B. McElhany, assistant manager of sales, drove here from Johnstown, Pa., in the automobile of a friend, Mr. Stineman. Mr. Replogle had ordered a new $5,000 Stearns silent Knight touring car which he had intended to bring to Atlantic City. While still in the hands of an expert from the factory, who was testing the car, it upset on a curve and was badly damaged. Fortunately neither the expert nor Mr. Replogle's chauffeur was injured.

I. J. Justice, special inspector on the staff of F. W. Brazier, superintendent of rolling stock of the New York Central & Hudson River, is one of the two men in charge of the exhibit which is being made by the coupler committee near the end of the pier beyond the Convention Hall. He has devoted the greater part of the last six months to the work of this committee. The other representative at the exhibit is T. J. Boring, of the Pennsylvania Railroad. The courteous way in which these two gentlemen are assisting the convention attendants in getting a good idea of the features of the exhibit has been commented on by many of those who have visited it.

J. C. Currie, one of the two new members of the Executive Committee of the Railway Supply Manufacturers' Association

J. H. Manning, Superintendent of Motive Power, Delaware & Hudson Company.

from the Second District, has been with the Nathan Manufacturing Company for the last 22 years. Born in Scotland in 1851, he came over here when 19 years old and got a job in the then famous seed store of B. K. Bliss & Sons, on Park Row, New York City. Having no particular fondness for seeds, he found employment in a confectionery store. When he had got his fill of sweets, he decided to become a locomotive engineer; and in 1872 was put to work nights on a switch engine on the Pennsyl-



C. Phillips, Master Mechanic, Queen & Crescent, Meridian, Miss., and Son.

vania R. R. In 1877 he reached his goal and was given charge of a freight engine. At the time he left the Pennsylvania to go with the Nathan Manufacturing Company he had been pulling the Congressional Limited between Washington and New York for some four years. Committee work at these conventions is not new to Mr. Currie. This is his seventeenth consecutive meeting; and up to a few years ago he did a lot of active work on various committees. During one convention he was treasurer of the Finance Committee.

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George F. Laughlin, General Superintendent, Armour Car Lines.

A. Buchanan, Jr., Supervisor of Equipment, New York Public Service Commission.

L. L. Yates, Superintendent Car Department, Pacific Fruit Express.

MASTER CAR BUILDERS' REGISTRATION.

Beattie, J. H., Supt.-Sea Side House.
Beaumont, H. A., Gen. For. Car Shops, B. & O., Dennis.
Bentley, W. F., Master Car Builder, B. & O., Pennhurst.
Burnett, R. W., General Master Car Builder, C. P. Ry., Marlborough-Blenheim.
Chaffee, F. W., Gen. Car Insp., N. Y. C. & H. R., Dennis.
Chamberlain, E., Manager Clearing House, N. Y. C. Lines, Marlborough-Blenheim.
Coleman, Jas., Supt. Car Dept., G. T. Ry., Dennis.
Cory, C. H., Ex-Supt. M. P., C. H. & D., Dennis.
Covert, M. F., Asst. M. C. B., Swift Refr. Trans. Co., Traymore.
Cromwell, S. A., Supervisor Train Supplies & Express, B. & O., Haddon Hall.
Davis, George G., Supt. Car Dept., C. C. C. & St. L., Dunlop.
Davis, J. H., Electrical Engineer, B. & O., Glaslyn-Chatham.
Demarest, H. N., Gen. Car Insp., Penna., Traymore.
Everett, Ira, Asst. Shop Supt., Leh. Val.
Ferguson, George M., Supt. Lake Terminal, Seaside.
Fisher, W. J., Gen'l Car Insp., St. L. & S. F., Haddon Hall.
Gernert, Henry, For. Car Dept., C. of N. J., Monticello.
Gillespie, W., M. C. B., Central Vermont, Schlitz.
Goodnow, T. H., Asst. Supt. Car Dept., Marlborough-Blenheim.
Grewe, H. F., M. M., Wabash-Pittsburgh Term., Brighton.
Hennessey, J. J., M. C. B., Chicago, Milwaukee & St. Paul, Calfonte.
Jaynes, R. T., M. M., Lehigh & Hudson River, Traymore.
Kapp, W. F., Supt. Shop & Machinery, R. F. & P., Marlborough-Blenheim.
Kent, F. S., General Car Insp., Penna., Marlborough-Blenheim.
Lentz, J. S., M. C. B., Leh. Val.
Lindstrom, C. A., Chief Engineer, Pitts. Allegheny & McKees Rocks, Chelsea.
Lynn, Samuel, M. C. B., P. & L. E., Pennhurst.
McGill, A. M., Asst. S. M. P., Leh. Val., Traymore.
McIntosh William, Retired S. M. P., C. of N. J., Galen Hall.
Manchester, H. C., Supt. M. P., Dela. Lack. & Western, Marlborough-Blenheim.
Muhlfeld, J. E., Marlborough-Blenheim.
Ord, L. C., Gen. Insp., Can. Pac., Haddon Hall.
Passmore, H. E., M. M., Toledo & Ohio Central, Dennis.
Peterson, A. F., M. C. B., Cold Blast Transportation Co., Haddon Hall.
Pfaffin, L., M. M., Indianapolis Union, Biscayne.
Phipps, J. W., M. P., Insp., B. & O., Islesworth.
Rashridge, R. B., Chief Car Inspector, P. & R., Dennis.
Russum, T. H., Supt. Pas. Car Dept., B. & O., Dennis.
Sage, R. V., Brighton.
Schnepel, J. H., Chief Draughtsman, N. Y. C., Pennhurst.
Schultz, F. C., Chief Interchange Insp., Traymore.
Selley, S. H., Gen. For. Car Dept., A. A., Pennhurst.
Sheahan, J. F., Supt. M. P., A. B. & A., Strand.
Shoemaker, C. A., Gen. Supt., German-American Car Lines, Traymore.
Sitterly, W. H., Gen. Car Insp., Penna., Traymore.
Smart, G. E., Dist. Car For., Can. Pac., Traymore.
Smethurst, Thos., S. M. P. & R. S., Inter-Oceanic Ry. of Mexico, 3011 Atlantic Ave.
Smith, R. E., Gen'l Supt. M. P., Atlantic Coast Line, Chelsea.
Stewart, A., Gen'l Supt. Motive Power & Equipment, Southern, Marlborough-Blenheim.
Swanson, Charles N., Supt. Car Shops, Santa Fe, Dennis.
Sweringen, F. H., M. M., Streets Western Stable Car Line, Traymore.
Taylor, Jos. W., Secretary, M. C. B.'s Ass'n, Marlborough-Blenheim.
Thomas, W. H., Honorary Member, Dennis.
Townsend, J. F., Traf. Mgr., Lake Terminal, St. Charles.
Wymer, C. J., General Car Foreman, C. & W. I., Lexington.

MASTER MECHANICS' REGISTRATION.

Allan, Arthur, Supt. Machy., Holden Co., Traymore.
Chamberlin E., Mgr. Clearing House, N. Y. C. Lines, Marlborough-Blenheim.
Daley, W. W., M. M., N. Y. O. & W., Traymore.
Elliott, J. B., M. M., B. & O., Elberon.
Gillis, H. A., Washington, D. C., Seaside.
Kapp, W. F., Supt. M. P., R. F. & P., Marlborough-Blenheim.
McGill, A. M., Asst. S. M. P., Leh. Val., Traymore.
McIntosh, Wm., Retired S. M. P., C. of N. J.
Manchester, H. C., S. M. P., D., L. & W., Marlborough-Blenheim.

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Montgomery, H., M. M., Penna., Boston.
Muhlfeld, J. E., Marlborough-Blenheim.
Passmore, H. E., Master Mechanic, T. & O. C. Ry., Dennis.
Shaehan, J. F., Supt. M. P., A., B. & A., Strand.
Smith, R. E., Gen. Supt. Motive Power, A. C. L. Ry., Chelsea.
Stewart, A., G. S. M. P. & E., Southern Ry., Marlborough-Blenheim.

MASTER CAR BUILDERS' GUESTS.

Allen, C. S., Gen. Frt. Agt., P. N. Lines, Chalfonte.
Allman, W. N., Draughtsman, M. P. Dept., B. & O., Arlington.
Alquist, N. A., Gen. Insp., M. K. & T., Haddon Hall.
Altvater, Chas. P., Gen. For. Pa., Vesta.
Baker, William S., Ch. Clerk to G. M., N. Y. C. & H. R., Haddon Hall.
Barry, Frank J., Gen. Insp., N. Y. O. & W., Traymore.
Bansman, Jno. A., Penna., Marlborough-Blenheim.
Beatty, J. R., Foreman, P. & R.
Best, J. J., Chief Clerk, Phila. & Reading, Ostend.
Beaumont, Chas. A., Ellwood.
Boome, Ammon, Engineering, A. C. R. R., Husted.
Boring, H. L., P. W. Inspector, Penna. R. R., Pennhurst.
Busse, F. W., Ch. Clerk to G. S. M. P., B. & O., Strand.
Busse, H. H., Dining Car Engr., B. & O., Dorwood.
Cady, P. C., Chief Clerk, N. Y. C., 109 New Jersey Ave.
Cannon, J. M., Dis. Manager, Penna., Dunlop.
Collins, Jas. C., Gladstone.
Cooley, LeRoy, Asst. to M. P., C. R. R. of N. J., Haddon Hall.
Coyle, C. H., German-American Car Lines, Haddon Hall.
Cromwell, J. E., Insp. M. P. Dept., B. & O., Arlington.
Daley, W. W., M. M., N. Y. O. & W., Traymore.
Dally, F. M., Foreman, C. R. R. of N. J., Lexington.
Davis, H. W., Agt., Norfolk Southern, Traymore.
Davis, J. H., Elec. Engr., B. & O., Glaslyn-Chatham.
Davis, James P., Gen. Frt. Agt., McKeesport Connecting, Seaside.
Dix, Chas. S., Boilermaker, W. J. & S.
Douglas, J. M., D., L. & W., Wellsborough.
Downs, Joseph K., Engine House Foreman, P. & R., Ramsey.
Duffy, J. F., Insp., I. C. C.
Dykeman, William, Ch. Clerk Pur. Dept., N. Y. C., Haddon Hall.
Ecker, H. G., United Fruit Co. Rys., Pennhurst.
Elliot, J. B., M. M., B. & O. R. R., Elberon.
Ellis, W. M., For. Car Dept., A. G. S.
Ellsworth, G. M., Chief M. P. Clerk, Penna., Glaslyn-Chatham.
Esterbrook, W. H., Public Service Ry., Newark.
Fisher, W. J., General Car Insp., St. L. & S. F., Haddon Hall.
Flannagan, Harry, Great Northern.
Gallagher, F. S., Asst. Eng., N. Y. C., Rudolph.
Gillis, H. A., Consulting Engineer, Seaside.
Goodfellow, Jos., Foreman, Penna.
Halfert, M. W., Ch. Insp., American Ry. Assoc., Haddon Hall.
Hawk, R. R., Auditor, Cold Blast Trans. Co., Haddon Hall.
Healy, M. E., Foreman, B. & O., Willard.
Heddinger, J. W., Machinist, Penna. R. R., Pennhurst.
Hendley, C. W., Dennis.
Hill, Samuel W., Special Accountant, B. & O., Sterling.
Hinkens, E. H., Gen. For., B. & O., Dunlop.
Holtz, E. W., Supt. of Equipt., Bay State Ry. Co., Marlborough-Blenheim.
Houseman, F. V., Machinist, P. R. R., Sterling.
Hubbell, C. C., Pur. Agent, D., L. & W., Shelburne.
Jett, E. E., M. C. B., Chalfonte.
Johnson, E. E., C. C. Mech. Engr., B. & O., Arlington.
Jones, L. R., Foreman, C. R. R. of N. J., 804 Atlantic Ave.
Keen, C. G., Eng. M. W., Penna., Haddon Hall.
Keen, C. G., American Rys., Haddon Hall.
Kelly, R. J., General Foreman Car Dept., Long Island, Chalfonte.
King, John H., C. C. M. of W., N. Y. O. & W., Phillips.
Kline, D. W., Engineering, Atlantic City, Husted.
Litchfield, T. E., Draughtsman, M. P. Dept., B. & O., Islesworth.
Lively, B. F., Mgr. Lenoir Car Works, Southern, Dennis.
McCraken, J. T., M. P., Interborough R. T., Rudolf.
McKay, D. A., Patteuman, N. Y. C. & H., 109 New Jersey Ave.
McMunn, W. R., Chief Clerk S. R. S., N. Y. C. & H. R., Marlborough-Blenheim.
Maher, N. D., Vice-President, N. & W. Ry., Private Car.
Mason, J. H., Road Foreman of Engs., C. R. R. of N. J., Lyric.
Maurer, W. R., M. E., N. Y. N. H. & H. R., Haddon Hall.
Merkel, A. L., Foreman, A. C.
Montgomery, H., M. M., Penna., Boston.
Moses, E. P., Chief Car Draughtsman, N. Y. C. & H. R.
Mulling, E. E., S. M. P. & C. Dept., Northern Ry. of Costa Rica, Pennhurst.
Mundorf, Samuel, Foreman Car Inspector, Penna. R. R., Silverdale.
Nation, J. D., T. Eng., Penna.
Norton, A. W., Draughtsman, B. & O., Arlington.
Parker, William V., Foreman Car Repair, W. J. & S.
Phelps, W. G., Asst. P. A., Pa. Lines, Traymore.
Pierson, E., Traveling Fireman, C. R. R. of N. J., Lyric.
Pratt, S. J., Gen'l Roundhouse For., D., L. & W., Lexington.
Press, W. J., Mech. Eng., N. T. R., Marlborough-Blenheim.
Rhodes, Robert S., Elec. Dept., N. Y. C., Runnymeade.
Robertson, E. J., Supt. Car Dept., Soo Line, Traymore.
Robertson, F. C., Pullman Co., Dennis.
Rogers, J. W., Elec. Supt., Penna.
Schaefer, F. H., Chief Clerk, L. S. & M. S. R. R., 109 S. New Jersey Ave.
Scatchard, H., General Storekeeper, N. & W. Ry. Co., St. Charles.
Schmidt, F. W., S. P., Strand.
Shelton, F. M., Supervisor, D., L. & W., Traymore.
Smith, J. J., Loco. Insp., B. & O.
Smith, R. J., District For. & Passenger Agt., Southern Pacific Company, 112 South Jackson Ave.
Spratt, Thomas, Asst. to Purchasing Agent, N. & O., Traymore.
Spreng, O. F., Leh. Val.
Stewart, V. R., Chief Draughtsman, N. Y. C. & H. R.
Resch, H. P., Offs. Passr. Train Master, Penna.
Trappe, W. C., Electrician, Penna.
Trievel, Geo. J., Foreman, Penna.
Walsh, C. E., Chief Clerk, Penna. Line, Traymore.
Weis, F. A., For. C. of N. J., Dunlop.
Weisbrod, R. K., Haddon Hall.
Wertz, Cyrus, For. Lt., Penna.
Whitsell, W. B., Draughtsman, B. & O., Kenderton.
Williams, R. J., Supt. Shops, Big Four, Marlborough-Blenheim.
Wood, Horace, C. C. to P. A., Seaboard Air Lines, Shelburne.
Zerbee, S. J., Supervisor of Safety App., C. C. C. & St. L., Arlington.

NEW LINE FOR MANCHURIA.—Governor Chang-hsi-lan is said to have been authorized to build a light rail line for military use between Hsinmintun and Fakumen. Engineers have been sent out to start a survey of the proposed line.

STRAITS SETTLEMENTS RAILWAYS.—Beginning on January 1, 1912, the railways of the Straits Settlements came under the management of the Federated Malay States Government. The terms called for a lease of 21 years at an annual rental of $95,200, subject to septennial revision. It is proposed to sell the railways to the Federated Malay States Government, and a joint committee has been considering the question of the price to be paid.

RAILWAY CONSTRUCTION IN KOREA.—Sixty-one miles of the railway to Chohwon, a station on the new line between Seoul and Gensan have been completed and opened to traffic. At the Gensan end of this line about 10 or 15 miles of road are now being operated, and vigorous work is being prosecuted on the intervening route. It is expected that through communication between Seoul and Gensan will be available for trains by November, 1913.

NORTHERN RAILWAY, SIAM.—The sum allotted for new construction on this railway during 1913 is more than twice as large as that for 1912. The explanation of this is that it has now been decided to push on with the construction of the line as far as Chiengmai, the chief town of Northern Siam. In previous reports it was stated that, owing to the difficult and less-paying nature of the country which the railway had then reached, it had been arranged for construction to be temporarily suspended when the line had advanced to a place called Dene Chai, about 139 miles southeast of Chiengmai. This was done in the interests of railway finance, in order to prevent any serious diminution in the dividend paid by the line; for a rapid and continuous extension through the less thickly populated parts of the country must, unless time is allowed to develop traffic, adversely affect the dividend-paying capacity of the whole railway. The necessary period for this purpose having now elapsed, it has been deemed opportune to continue the work of construction northwards; hence the increased allotment this year, which is made out of the unexpended balance of the last loan of $15,000,000 taken in January, 1907.

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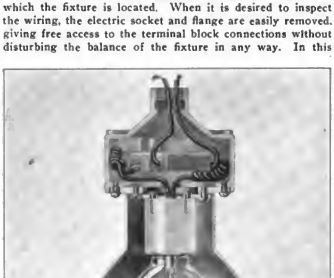
ELECTRIC LIGHTING FIXTURE FOR VESTIBULES.

Much of the expense involved in the inspection of electric light wiring on modern steel railway cars is unnecessary and is frequently the result of insufficient consideration of small details. With a steel ceiling it is often difficult to obtain access to electric wiring without involving the labor of removing the entire lighting fixture. This is particularly true as regards electric vestibule lighting fixtures and aside from the time and labor involved, the fixtures may be injured and the finish on the vestibule ceiling marred. The Safety Car Heating & Lighting Company, New York, has recently brought out an electric vestibule lighting fixture which has been designed particularly to give easy access to the electric wiring and also to provide for the most improved method of conduit construction. The illustration shows a section of this unit and it will be noted that a junction box is employed, having a terminal block for making connections to the circuit on which the fixture is located. When it is desired to inspect the wiring, the electric socket and flange are easily removed, giving free access to the terminal block connections without disturbing the balance of the fixture in any way. In this



Electric Fixture for Lighting Car Vestibules.

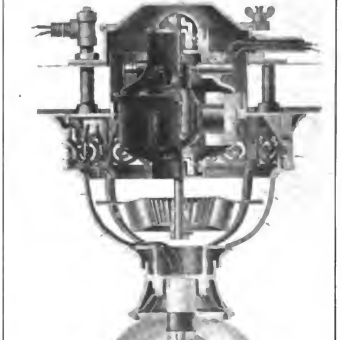
manner the fixture becomes actually a permanent part of the car, which is a very important consideration in steel car construction. The reflector, which also remains permanently in the car, is of white enamel and easily cleaned; it is securely fastened to the junction box at the top and to the ceiling of the vestibule at the bottom. A similar type of fixture employing the same method of wiring is made by this company for use as a pendant for saloons, dining car kitchens and other locations where glass reflectors are not required.

EFFICIENT BROACHING MACHINE.—At the exhibit of Manning, Maxwell & Moore is shown a broaching machine made by J. N. Lapointe Company, New London, Conn. It is used for cutting internal gears; keyways, square or multiple spline holes for sliding gears as well as a considerable range of external work. It will cut keyways from the smallest to the largest size at the rate of 40 to 100 per hour. These can be either straight or tapered, or of the dove tail type. Internal gears up to 6 in. in diameter can be broached at the rate of 25 to 50 per hour.

COMBINED ELECTRIC FAN AND LIGHTING FIXTURE.

The use of fans for cooling and ventilating railway cars is a problem which has, up to the present, never been satisfactorily solved. The usual method employed is the installation of one or more bracket fans at each end of the car, which subject the passengers to drafts and do not produce effective ventilation, as the breeze is unequally distributed throughout the car. Large paddle fans are also used in many cases, particularly in dining cars, and while the results obtained with this type of fan are better than with the bracket fans, their appearance is unsightly and the mechanism requires considerable attention for its proper maintenance.

The Safety Car Heating & Lighting Company, New York, has developed a type of ceiling fan which may be used alone



Combined Electric Lighting Fixture and Fan.

or in combination with a lighting fixture as shown in the illustration.

The design of the fan portion of the fixture is the result of very careful study and experiments to control the direction of the air which is circulated. As the fan is located in the top portion of the fixture it is partially concealed by the ornamental work and does not detract from the appearance of the lighting fixture. The air is drawn in along the ceiling and thrown out at an angle of 45 deg., as shown by the arrows. The fan is driven by a ball bearing electric motor mounted in the ceiling in such a way as to be accessible from the roof and lubrication, renewal of brushes, etc., can be accomplished by opening the cover from the outside of the car.

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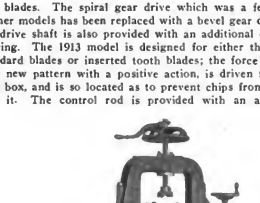
COLD CUT-OFF SAW.

The Lea Equipment Company, Philadelphia, Pa., has made a number of improvements in its cold cut-off saws, which are embodied in the 1913 model. A large tank is provided in the frame to accommodate the lubricating compound and is so designed that none of the lubricant will find its way to the floor. The swing arm is equipped with a new style of wearing plate to facilitate the removal of the

Lea-Simplex Cold Cut-off Saw.

saw blades. The spiral gear drive which was a feature of former models has been replaced with a bevel gear drive and the drive shaft is also provided with an additional outboard bearing. The 1913 model is designed for either the use of standard blades or inserted tooth blades; the force pump is of a new pattern with a positive action, is driven from the feed box, and is so located as to prevent chips from getting into it. The control rod is provided with an additional



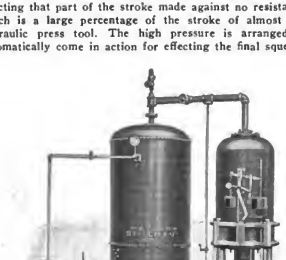
Lea-Simplex Saw Showing Motor Application.

steady bearing and the feed mechanism has automatic, as well as manual, control. The indicator dial formerly used has been replaced with an indicator rod which permits the operator to know at any time how much feed he is using. The yoke is of a heavier design than formerly and is provided with a large slot which permits movement of the screw in a direction parallel to the saw blade, thus providing a better adjustment of the blade to the stock. The V-blocks are now made in two parts and are separate from the table; they are intended for use in fastening either round, square or structural shape.

HYDRO-PNEUMATIC ACCUMULATOR.

With an increase in the number and size of tools operated by hydraulic pressure, the weighted type of accumulator used in connection with this service has grown to a very large and cumbersome size. The problem becomes especially complicated if it is necessary to locate the accumulator on the upper floors of a building.

An accumulator which is designed to contend with conditions that make the weighted type undesirable, is being exhibited by the Watson-Stillman Company, New York. This design has no heavy weights, and operates without shock; while occupying little space it is claimed it will do everything that a weighted accumulator will do. Furthermore, it provides two pressures. A low pressure is used for effecting that part of the stroke made against no resistance, which is a large percentage of the stroke of almost any hydraulic press tool. The high pressure is arranged to automatically come in action for effecting the final squeeze.



Hydro-Pneumatic Accumulator.

This combination of pressures is obtainable without complications in the operating valve or gear, and is entirely automatic in its action.

This type of accumulator is shown in the illustration. In the center is a large tank which is partially filled with water by means of a low pressure pump, the operation of which is controlled by a hydraulic governor which starts the pump and keeps it running until the water reaches a predetermined level, at which point it stops the pump, starting it again as soon as this level is lowered. Above the water is an air pressure of from 180 lbs. to 200 lbs., which is maintained by a special compressor forming part of the equipment. A low pressure feed main is run from the bottom of this tank and carried to the hydraulic tool. Alongside of this tank is the accumulator proper which has two cylinders, a large one at the top for pneumatic pressure and a small one at the bottom for hydraulic pressure. The areas of the pistons are made proportional to the pressures desired and available. There is a high pressure hydraulic pump connected with the

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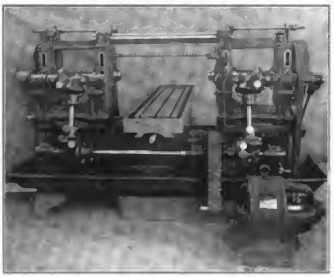
bottom of the accumulator, which is automatic in its action, and is controlled by a governor in the same manner as the low pressure pump. It is thus seen that both pumps are in operation only when a supply is required, and that there is no waste of power or efficiency since a high pressure is not used when a low pressure is sufficient. These accumulators are made in any size for pressures from 300 lbs. to 6000 lbs. per sq. in.

DOUBLE HEAD MILLING MACHINE.

A Lincoln type milling machine, manufactured by the Hendey Machine Company, Torrington, Conn., is shown in the exhibit of Manning, Maxwell & Moore. It is especially adapted to plain milling. As will be seen, the two heads are mounted on a long bed and there is an overhead arm connecting them and providing a rigid support above as well as below the spindles. The cutter spindles are driven through reduction gears from countershafts in hinged



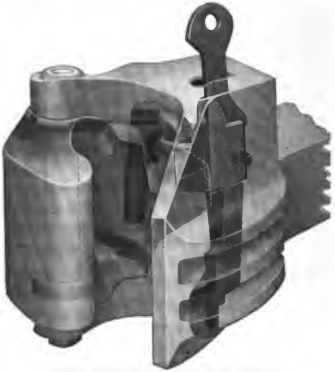
Double Head Milling Machine.

frames. The countershafts in turn are driven by bevel geared connections from a main shaft running along the back of the bed. This shaft is connected to the motor by a silent chain. One of the heads is arranged to slide along the bed. Provision is made for all desirable adjustments in each direction. The design is simple, compact and powerful.

PENN FREIGHT COUPLER.

The McConway & Torley Company, Pittsburgh, Pa., is showing in its exhibit, spaces 501, 503 and 505, a new development of the Penn freight coupler, which has been redesigned to meet the present severe service conditions. The weight of the coupler has been increased over the average M. C. B. coupler from 30 to 40 per cent., depending on the size of the shank, the metal being carefully distributed to produce the best results. The coupler also embodies features of design, which not only contribute towards greater strength, but also tend to prolong the length of service and increase the efficiency in mechanical operation.

The knuckle is so designed that it has ribs engaging shoulders within the coupler head, which relieve the knuckle pin from draft strains, and when the coupler is under a pulling strain of 200,000 lbs. the knuckle pin can readily be removed. The vertical depth of the knuckle hub has been increased from 6 in. to 9 in. and the guard arm has been reinforced to correspond with the general dimensions. The knuckle-opener is of the bell crank type with direct mechanical action, and pushes the knuckle open to its fullest range of movement from either a fully closed or a partially open position; the lock adapted for



Penn Freight Coupler in Lock-set Position.

use with either an overhead or an underneath attachment of the uncoupling lever and has "lock-to-the-lock" and "lock-set

Penn Freight Coupler with Knuckle Wide Open.

features, while another important feature is the large bearing area between the contact surfaces of the locking block and the knuckle. One of the illustrations shows the head of the coupler

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with the locking block raised to the "lock-set" position and the lock held in the uncoupled position by resting on a seat within the coupler head, from which it is dislodged by the closing movement of the knuckle in coupling. The second illustration shows the coupler with the locking block raised to its highest range of movement, bringing into operation the "knuckle-opener," which has pushed the knuckle completely open.

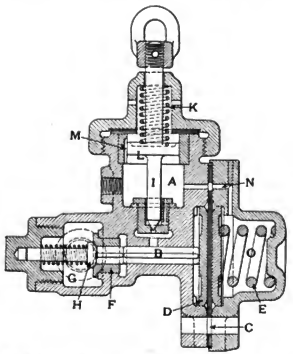
The coupler shown in the exhibit has a slight modification of the present M. C. B. lines. This company is also showing one of these couplers in connection with the exhibit of the M. C. B. Coupler Committee, and also another similar coupler with wide or open lines.

THE SAUVAGE AIR BRAKE SAFETY ATTACHMENTS.

John C. Knight, Inc., has an interesting exhibit of a number of safety devices for air brake work that have been designed by W. H. Sauvage. They do not in any way interfere with the regular operation of the air brake apparatus, nor do they require any changes in the methods of piping and attaching of that apparatus other than the mere connections involved in their application to the system.

They consist of a train line sustaining valve whose object is to automatically sustain the train line pressure at any point high or low at which it has been set, thus giving the engineer control of that pressure at all times ,independent of the position of the engineer's valve, preventing an unnaturally quick action of the triple valve, of an application of the brakes due to the leaking off of the train line pressure.

This may be supplemented by a discharge valve, which serves to accelerate the discharge of air from the train pipe



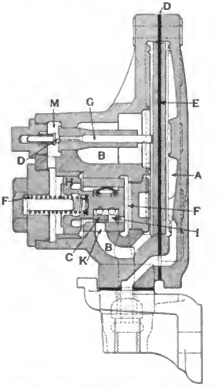
Sauvage Automatic Light and Load Brake Valve.

when the brakes are being applied on long trains only. It consists of a diaphragm to the top of which air from the equalizing reservoir is admitted while the connection to the train pipe comes in beneath. When the two pressures are the same the connection to the valve itself at the diaphragm makes a differential that holds this valve shut. But when the pressure in the equalizing reservoir drops below that of the train pipe, the latter pushes up the diaphragm and opens the valve that allows the air from the train pipe to escape to the atmosphere.

There is also a new form of retaining valve in which a spring is used to hold the valve to its seat instead of the usual weight. It is intended that this shall be attached, either to the triple valve or in the usual position. There is also a gage that is intended to be attached to the brake cylinder showing the pressure of air that exists in it. This is for the convenience of the inspectors and repair men to enable them to determine as to whether the brakes are acting properly or not.

In connection with the brake apparatus under the car there is also a brake cylinder accelerating and sustaining valve, the object of which is to hold a constant pressure in the brake cylinder and prevent leakage from lowering the braking power.

On the engine is an automatic warning and stop valve whose function is to blow a whistle in the cab when the



Sauvage Automatic Locomotive Train Line Sustaining Valve.

train line pressure falls below a predetermined amount which may be considered a danger point. The whistle continues to blow for a number of minutes and meanwhile it is gradually lowering the train line pressure and, unless the engineer takes measures to restore it and stop the whistle, it will continue to lower it to a point where the brakes will be applied and a stop will be necessitated.

One of the most interesting of the exhibits is a valve for varying the braking pressure according to the condition of the car as to whether it is loaded or empty.

There is also a signal valve by means of which the signal pipe is fed from the rear of the train instead of from the front so that when the engineer sees a pressure indicated in the signal pipe gage he knows that the pipes are open for the full length of the train.

Finally there is shown an ingenious angle cock by means of which no cock can be closed throughout the train without applying the brakes, except that on the last car. There are also a number of brake slack adjusters.

The automatic locomotive train line sustaining valve is shown in section in one of the drawings. There are three connections made to the piping of the air brake system. One to the main reservoir, a second to the equalizing reservoir and a third to the train line. The connection to the equal-

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izing reservoir admits air to the right hand side of the diaphragm *D* to the space marked *A*. Air from the train line *B* and air from the main reservoir is admitted to the space marked *M* at the left and also to the backs of the two valves *C* and *D* and also surrounds the slide valve *C* and fills the space to the right of it marked *F*.

When a train line reduction is made and the pressures in the equalizing reservoir and train line have equalized the diaphragm *E* is balanced by the equal pressures on each side of it. If there is any leakage reducing the train line pressure, after that, the diaphragm moves to the left and, through the stem *G*, unseats the valve *D* permitting air to pass directly from the main reservoir to the space *B* thus raising the train line pressure. This holds so long as the valve *D* has a capacity sufficient to supply the leak when this is all that happens.

In the connection to the main reservoir from the space *F* the opening is large and free. From this space to the space *M* the air has to pass through the restricted area left by the clearance or play of the piston *H* in its cylinder. Hence when the draft by the train pipe is more than can leak through this restricted passage the pressure in *M* is lowered and the full main reservoir pressure in *F* moves the piston *H* to the left, carrying with it the slide valve *C*, causing the port *I* in the valve to open the passage *K* to *B*. Thus admitting air direct from the main reservoir to the train pipe. As soon as the pressures on the two sides of the diaphragm are again equalized, the latter moves back into its normal position and all flow of air from the main reservoir to the train pipe is cut off. In this manner a constant train pipe pressure is maintained.

LIGHT AND LOAD BRAKE.

The light and load brake is a simple arrangement by means of which the brake pressure on the wheels can be varied according to the total weight of the car. That is to say, for its light and loaded condition.

The principle of the operation is to use a brake cylinder much larger than would be suited for an empty car of the given weight if the full pressures that are ordinarily used in such a cylinder were employed. The auxilliary reservoir, however, is of the dimensions that would be used for a brake cylinder of the usual size. The result is that for the ordinary service reductions the pressure in the brake cylinder is much less than it would be with the full size reservoir, but the push on the brake road is about what is proper for the light weight of the car. Connected with the main auxiliary reservoir is another one which, by supplementing the first, is capable of raising the brake cylinder pressure up to the proper amount to secure full braking pressure on the loaded car. The method by which this second reservoir is thrown into action is controlled by the valve that is shown in the exhibit.

It is shown in section in one of the illustrations. In the charging of the regular reservoir, air is admitted through the triple valve in the usual manner and from this reservoir there is a connection leading to the point *B* of the light and load valve. Here it comes into contact with the left hand face of the diaphragm whose stiffening plate *D* is held against the seat to the left by the spring *E*. When in this position, it pushes the check valve *F* open and thus makes a free communication between the regular auxilliary and the supplementary reservoir which is connected to the chamber *G*. When the pressure in the reservoirs has reached 22 lbs. the air pressure against the left hand side of the diaphragm *C* presses it against its stop to the right, but the increasing air pressure at *B* still holds the check valve *H* open and the two reservoirs are charged together. As soon, however, as a train pipe reduction is made and air is drawn off from the reservoir to the brake cylinder, the pressure at *B* falls below that at *G* and the regular reservoir alone serves to charge the brake cylinder and the extra supply in the second reservoir is held back by the check valve *H*. This is the method of operation when the car is light.

When the brake is to be applied to a loaded car the stem *L* whose end is in the form of a valve is drawn back and with it the piston *L*. Until this is done the spring *K* holds the valve against its seat and any air pressure that may have leaked into the chamber *A* passes through the leakage groove *M* to the other side of the piston to the atmosphere. But when the piston is drawn back so as to cover the leakage groove, the full air pressure from the reservoir is admitted into the chamber *A* and this holds the piston *L* back against its seat. At the same time the air passes through the passage *N* to the chamber *O* and equalizes the air pressure on the two sides of the diaphragm. The spring *E* then presses the diaphragm to the left and holds the check valve *H* open. This puts the two reservoirs in communication with each other and they serve to increase the brake cylinder pressure accordingly. This continues as long as the piston *L* is held back against its seat. The pulling out of the stem is done by hand whenever it is desired to use the brake for a loaded car.

In order to prevent the application of the load brake to an empty car, the cutting out is made automatically. When the car has been set aside and the pressure in the system has fallen, the spring *K* forces the piston to the right again and by closing the needle valve automatically puts the brake back into the condition for use with the empty car.

SUPPLEMENTAL LIST OF EXHIBITORS.

Automatic Drill Chuck Company, New York, N. Y.—Automatic drill chuck. Represented by G. W. Emrick, Space 541.

Barcalo Manufacturing Company, Buffalo, N. Y.—Non-binding pipe wrench. Represented by K. R. Shadek. Space 307.

Donath Valve Gear Company, Windsor, Mo.—Locomotive valve gear. Represented by Otto A. Donath and Holmes Hall. Space 381.

Grinden Art Metal Company, Brooklyn, N. Y.—Steel interior trim for steel passenger coaches. Space 300.

Kerr, Henry C., Roanoke, Va.—Model of car coupler. Represented by Henry C. Kerr. Space 194.

Rémy Electric Company, Anderson, Ind.—American electric headlight—turbine generator and lamp. Represented by Joseph R. Arnold and Thos. B. Arnold. Space 631.

Siemund-Wenzel Electric Welding Company, New York, N. Y.—One 400 ampere welding machine in operation. Represented by G. S. Stuart, T. Rumney and W. D. Fowler. Space back of 188.

Stark & Company, Jas. P., Toledo, Ohio.—The Carpenter flush door. Represented by Jas. P. Stark and F. T. Carpenter. Space 13.

Wine Railway Appliance Company, Toledo, Ohio.—Locomotive and car specialties. Represented by C. J. Pilliod, Jr. Space 13.

KEY-CONNECTED CAST STEEL YOKES FOR NEW CARS.—During the past two years, a large number of cast steel drawbar yokes have been applied to new cars. These usually weigh from 155 to 195 pounds, depending on the type of drift gear used. With key-connected cast steel yokes it is possible to change the couplers without disturbing the draft gear or yoke, thus avoiding much of the handling in the shop and repair yards which is necessary with the old riveted type of yoke. The rivets which have for years been a source of heavy maintenance expense are entirely eliminated. As regards strength, yokes now manufactured are required to pull not less than 350,000 to 360,000 lbs. ultimate and have an elastic limit of 200,000 lbs. The Buckeye Steel Castings company, Columbus, Ohio, is exhibiting several types of these yokes.

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Railway Age Gazette

DAILY EDITION

Copyright, 1913, by the Simmons-Boardman Publishing Co.

Vol. 54. NEW YORK—JUNE 17, 1913—ATLANTIC CITY No. 24d.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg. LONDON: Queen Anne's Chambers, Westminster.

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United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE that of this issue more than 9,200 copies were printed; that of those more than 5,200 copies, 7,048 were mailed to regular paid subscribers, 200 were provided for counter and news companies' sales; and 1,700 were printed for distribution at Atlantic City and for use as sample copies.

PERMISSION has been granted the committee on brake shoes and brake beam equipment to continue the series of tests on brake shoes which was begun at Purdue University several years ago. These tests have already given results of great value to the association, and the decision to continue them was to be expected. Tests will now be made at a speed corresponding to 65 miles an hour with pressures ranging from 9,000 to 18,000 lbs. These will be with the same types of shoes which were tested at 80 miles an hour in 1910. It is believed that the data to be obtained will allow specifications to be prepared covering shoes for heavy passenger equipment. In the section of the report on brake beams the most important action was the decision to refer to letter ballot for adoption as a standard, the recommendation that the spacing of the brake shoes should be 60 in. with allowable variations of ½ in. either way. The request of the committee that it be instructed to prepare a specification for a brake beam for passenger cars to be submitted for action next year, was referred to letter ballot.

A NUMBER of years ago when the subject of the lighting of the cars of the elevated railways of New York was under discussion and it was proposed to substitute Pintsch gas for oil lamps, Russell Sage asked: "And what shall I do with all the good oil lamps that we have?" There was no reply but, "Throw them away." The feelings of the millionaire at this iconoclastic suggestion are not a matter of record, but may be imagined. It looks very much as though a similar reply would have to be made to Mr. Schroyer's parallel question as to what should be done with all the good 8-inch brake cylinders if the 10-inch is substituted as suggested in the committee's report on train brake and signal equipment. Equipment has been increasing in capacity for twenty-five years, and the end is not yet. If the retirement of cars of 20 and 25 tons capacity from service is brought about, the 8-inch brake cylinder will have to go, even though it may be as good as new. It will simply add one more to the long list of perfectly good appliances that have gone to the scrap heap because they are obsolete and not because of old age or deterioration. As it stands an increase of brake shoe pressure is imperative and that the 8-inch cylinder cannot provide.

THE following sentence appears in President Fuller's address: "Let us consider carefully all the various recommendations which are placed before us for approval, and let us not lend the prestige of this association to anything that will mean increase in maintenance and operation which cannot be satisfactorily defended before the bar of public opinion on the ground of safety and economic progress." This is good advice for the mechanical association and, indeed, for all railway associations. It is still better advice for law-making bodies and railway commissions, because they need it a great deal worse. If the word "commission" were substituted for the word "association" the sentence might appropriately and profitably be framed and hung up on the wall in the office of every commission regulating public utilities in this country. The principle involved is constantly disregarded. It is easy enough to impose requirements on railways in the nominal interest of safety. It is very difficult to adopt only requirements which actually will be beneficial and which will at the same time accomplish the desired end with the minimum cost. In the long run, the public pays in passenger and freight rates the expense caused by every requirement imposed on the railways; and the commissions should take more care to see that the expenses caused are not out of proportion to the results that probably will be secured.

WITH the tendency in recent years toward more refinement and permanency in American locomotive design has come the increasing use of flange joints in pipe connections. It is probable that the reason for the infrequent use in this country in the past of this type of connection has been the need for easy accessibility for repair purpose; but flange joints have long been in general use in Europe and are practically standard in stationary power plant work, and the change has come with the development of the locomotive into a highly efficient power plant and the consequent necessity for more permanency in construction. In the past few years there has also been a surprising increase in the use of non-lifting injectors, due at least in part to the lack of room available in the modern locomotive cab. With the perfecting of the lifting injector and the increase in the size of locomotives, the earlier non-lifting injectors, which were very often difficult to prime and the cause of much waste of water, were discarded by many roads; but the non-lifting injector of to-day is of necessity a great improvement on the early types. Non-lifting injectors are in every day use on a large number of high-power locomotives throughout the country, in many cases providing the entire water supply, and it will be interesting to watch their future development.

IT is interesting to note that President Fuller, in his address, reports that reliable information from several large interchange points indicates that the number of defect cards issued at interchange points has been reduced approximately one-half as a result of two changes in the interchange rules adopted by letter ballot last fall. The first change referred to abrogated the rules which formerly penalized a delivering line for certain defects in cars which, although primarily owning line defects, became "handling line's responsibility" as soon as the cars were offered in interchange. The second change was to add 10 per cent. to the prevailing M. C. B. repair allowances for labor and material charges in order to make it more attractive to repair

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cars while on foreign roads. The delays incident to the enforcement of the carding rule had become unbearable to some companies, while the fact that the existing allowances for repairs were so low as to virtually penalize the repairing road had a most important effect on the number of bad order cars. Both changes in the rules, which were adopted by an almost unanimous vote, but which only became effective on November 1 after strong pressure had been brought to bear against the increased repair allowances by the private car lines, were in the interest of promoting a freer interchange of cars during a time of acute shortage. President Fuller's statement that carding has been reduced by one-half and that the conditions which had caused unnecessary delays were almost immediately relieved, fully bears out the predictions made by the executive and arbitration committees in their resolutions proposing the changes.

IT looks very much as if we were not far advanced from the days of thirty years ago, when the Master Car Builders' Association and the railroad clubs were discussing the relation of the wheel to the rail; when everybody was guessing and nobody knew. Before the first standard contour of wheel tread and flange was adopted there was much talk, much conjecture and high hopes. Then there was more, but not of the same intensity and wide variations of opinion when it was changed as it was done with comparative quiet. But now comes Dr. Dudley, who thinks the present contour is bad for the rail heads and the wheel committee is asked to see what had best be done—stick to the one in twenty taper or go back to the one in thirty-eight, or something else? The mutual effect on wheel and rail has never been studied in minute detail. Cylindrical treads have been used with and without satisfaction, but it does seem as though, had conditions been the same, results must have been identical. The rail effect on the taper and the straight treads is a matter of conjecture and there is little data to support any conjecture that may be made. It is stated and denied that the rail causes a greater tread deformation on the cylindrical tread than on the taper, but no one knows what work has been done seems to indicate that, under the ordinary loads, it is the rail that suffers the greater part of the deformation and that there is little or none of a permanent character impressed on the wheel. We do know, however, that the area of contact between the wheel and the rail is a spot of considerable size; that the load per square inch of area of that contact is well up to and beyond the limit of elasticity of the metal of either the wheel or the rail; that the shape of that area is subject to constant variation as the wheel and rail wear; that the size of the area itself varies with the load, the metal composing wheel and rail, the wear of wheel or rail, and that its point of application runs from one side of the rail head to the other and performs all manner of gyrations around and across the tread, and finally, that every possible cause of variation is subject to change with the weight of the rail, the kind of ballast and the condition of track maintenance. So to the outsider it looks as though the committee had been assigned somewhat of a task when it was asked to determine what had best be done in the matter of wheel tread and do it in a year. But, perhaps, after all, the old assertion that taper is of no moment on a wheel because it so soon disappears and the natural running contour is developed, will hold.

LEAKY CAR ROOFS.

NO problem of car design has attracted more attention in the past few years than that of box car roofs; the result has been a marked improvement in them, and yet not a few railway officers are to be found who feel that there is still much to be desired in this direction. The number of cars now in service which have roofs that will fail under a water test is surprisingly large. One important system on this continent is having a minimum amount of trouble with its box car roofs because it has certain regulations in force which make it necessary to give the roofs frequent attention and thus prevent the development of slight and comparatively important defects. That particular road is fortunate because its cars are not so generally interchanged as those of other roads. If it is not possible to give the roofs systematic and frequent attention in order to keep them in first-class condition, then it is not only desirable, but necessary, that a type of roof be used which will not need such attention.

One of the larger systems has a solid riveted roof, with air spaces at the sides to provide for ventilation, which was applied to about 110 cars a year and a half or two years ago, and has given splendid satisfaction—so great satisfaction, in fact, that cars in service or under order to the number of 10,000, either have or are being equipped with it. The argument is constantly being advanced that it is necessary to have a flexible roof on all box cars to provide against the various stresses to which the superstructure is subjected. The designers of the solid riveted roof under consideration argue that it has been found necessary to develop rigid underframes and that it is just as necessary to have a rigid roof, the former stiffening the box at its lower end and the latter at the top.

If further observation of these cars in service proves as satisfactory as it has on the first cars so equipped, and those in charge must have little doubt as to whether it will or they would not have specified it so freely, then why not go one step further and make an all-steel box car? With a steel underframe, rigid steel roof, and steel members in the side and end frames, it is only a short step further to substitute metal for wooden sheathing. All of which is suggested by the comment in President Fuller's address directing attention to the necessity of giving more attention to the problem of leaky roofs.

STANDARD COUPLER.

MOST encouraging progress toward a standard coupler is shown by the report of the committee on Couplers and Draft Equipment presented at yesterday's session. In keeping with the importance of the subject, the report is one of the most detailed and thorough ever presented to the association. It contained 153 pages, including 148 illustrations and many tables, and gave the essential parts of the discussion at the several joint meetings of the committee and the representatives of the manufacturers.

The development of a new contour which, after further experiment in the laboratory, will probably be recommended for experimental service by all the members, is the most important single feature of the report. This has been termed the Krakau or straight line contour. It provides for a parallel coupler face and face of the knuckle, both perpendicular to the center line of the shank. The advantages claimed for it are that it provides greatly increased strength through the hub of the knuckle and in the front face of the coupler head, and it shortens the average length of the lever arm from pivot to buffing face and will practically stop the bending of the knuckle under buffing shocks. Furthermore, owing to the increase in the longitudinal clearance to ¾ in. when in the coupled position, provision is made for the vertical angling between couplers when passing over humps without putting a strain on the couplers, and, in buffing on curves, as well as on a straight track, the wedging due to the knuckle engaging the face of coupler head and the face of the guard arm of the mating coupler is avoided. The proposed contour will couple at a greater angle than the present coupler.

There seem to be but three disadvantages in the minds of the committee. These are a lesser maximum angle through which the new contour will swing when coupled; the amount of slack in the heads when coupled together; and the fact that the last portion of knuckle closure is accomplished by momentum when coupling on curves. On large radius curves, however, the last objection does not hold as the new couplers will adjust themselves to straight track conditions up to the limit of the side clearance. The fact that the proposed contour gives an initial slack of ¾ in. was the subject of considerable discussion in the

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committee, and to ascertain how serious an objection this might be in regular service, an investigation was made of the amount of slack existing in the present standard couplers which were in service and in good condition. The test of a train of 61 cars on the Pennsylvania showed an average initial slack per coupler of 1.66 in., and a train of 68 cars on the New York Central gave an average slack of 1.39 in. It thus appeared that the proposed 7/8 in. is considerably under the present everyday condition. The report also anticipates the perfection of a wedge type of lock and, with this, it is pointed out that the slack will not increase in service as the present coupler heads were shown to do. In view of the important advantage of the elimination of the distinctive strains set up in the present couplers in hump yards and on tipple tracks, it seems that the 7/8 in. clearance is a strong point in favor of the new lines.

Tests of a proposed wedge lock in a jiggling machine showed it to have a slight tendency to creep, but it was felt that this could be overcome and, therefore, since the adoption of the new contour hinges so much on this feature, the committee has requested that none of the new designs be put in experimental service, which will eventually settle the question of any trouble that may appear in connection with coupling on curves, until it has made further experiments. It will notify the members which couplers are recommended for trial purposes at a later date.

The result of the general investigation of the subject has convinced the committee that the present couplers are entirely inadequate in strength. It is satisfied, however, that the desired increase in strength can be obtained, but that it will necessitate an increase of from 30 to 40 per cent. in the weight.

TO-DAY'S PROGRAM.

M. C. B. ASSOCIATION.
9.30 TO 1.30 P. M.

Discussion of reports on:	
Safety Appliances	9.30 A. M. to 9.45 A. M.
Rules for Loading Materials	9.45 A. M. to 10.00 A. M.
Overhead Inspection	10.00 A. M. to 10.15 A. M.
Car Trucks	10.15 A. M. to 10.45 A. M.
Train Lighting and Equipment	10.45 A. M. to 11.30 A. M.
Train Pipe and Connection for Steam Heat	11.00 A. M. to 11.15 A. M.
Tank Cars	11.15 A. M. to 11.45 A. M.
Specifications for Tests of Steel Truck Sides and Bolsters for Cars of 80,000, 100,000 and 150,000 Pounds Capacity	11.45 A. M. to 12.00 M.
Topical discussion:	
Retirement from Interchange Service of Cars of 40,000 and 50,000 Pounds Capacity	12.00 M. to 12.30 P. M.
Discussion of reports on:	
Capacity Marking of Cars	12.30 P. M. to 1.00 P. M.
Lettering Cars	1.00 P. M. to 1.30 P. M.

ENTERTAINMENT.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Informal Dance, 9.30 P. M.—Entrance Hall, Million Dollar Pier.

M. C. B. ASSOCIATION RAISES DUES.

At the meeting yesterday morning it was announced that the executive committee at its conference last Saturday had decided to recommend increasing the annual dues from $4 to $5 per vote. The rate of $4 a vote does not cover the necessary expenses of the association. The recommendation of the committee was approved by the association.

LOST.

Badge No. 2701 has been lost. Finder please return to Secretary Conway's office.

Black belt, with jet buckle, lost on the pier. Return to Secretary's office.

FUNERAL OF ANDREW S. CROZIER.

The funeral services for Andrew S. Crozier will be held in the Calvary Church, at Glen Riddle, Pa., on Wednesday, June 18, at 3 o'clock P. M. Those who desire to attend should leave from the Broad Street Station of the Pennsylvania R. R., Philadelphia, taking the 1.28 P. M. train on the West Chester Branch, via Media.

M. C. B. SOCIAL GATHERING AND DANCE.

The M. C. B. social gathering and informal dance was held last evening at the Marlborough-Blenheim, under the charge of the following committee: Messrs. Hammond (chairman), Hibbard, Furry, Faure, McClintock, Wardell, Caton and Crowe. Like the previous dances held during this convention it was informal and was very well attended.

ELECTRICAL ENGINEERS INVITED TO VIEW EXHIBITS.

The Railway Supply Manufacturers' Association extended an invitation to the members of the Association of Railway Electrical Engineers attending their semi-annual convention to examine the exhibits on the pier.

The A. R. E. E. badge will entitle each member to admission.

RETURN TRANSPORTATION.

The Pennsylvania has notified members of the M. C. B. Association that transportation home over its lines will be furnished to those entitled to it. The Central of New Jersey offers the same courtesy to members who wish to return over its lines or the Reading, application to be made to C. E. Chambers. A special train of parlor cars for New York will leave Atlantic City on Wednesday afternoon at 2.30 over the Central of New Jersey.

Special provision will also be made on the 2.10 train of the Central of New Jersey for members wishing to return to New York at that time.

LOST BADGES.

The convention badges bearing the following numbers have been lost and they have therefore been cancelled. Admission will be denied to any one attempting to use these numbers: 3635, 2536, 4331, 1145, 2941, 3448, 4361, 2563, 2425, 4336, 3580, 2896.

THE PURDUE DINNER.

The annual dinner of the Purdue men in attendance at the M. M. and M. C. B. conventions was held at the Shelburne on Saturday evening, June 14. The following men were present: Dean C. H. Benjamin and Professor L. E. Endsley, Purdue University; F. B. Ernst, American Steel Foundries; J. P. Neff, American Arch Co.; Garland Robinson, Interstate Commerce Commission; W. L. Robinson and C. B. Woodworth, Baltimore & Ohio; W. H. Winterrowd, Canadian Pacific; E. E. Silk, Bettendorf Axle Co.; Fred Schaff, Locomotive Superheater Co.; W. S. Humes, General Railway Supply Co.; J. R. Mitchell, W. H. Miner, Chicago; Percy Hauser, W. B. Leet, O. D. A. Pease and B. B. Milner, Pennsylvania R. R.; R. J. Himmelright, Locomotive Stoker Co.; B. F. Bilsland, General Electric Co.; and H. A.

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Smith, J. E. Sample and J. M. Lammedee, Railway & Engineering Review, Chicago. The committee, consisting of E. E. Silk, J. P. Neff, L. E. Endsley, W. H. Winterrowd and J. M. Lammedee, having this year's dinner in charge, will arrange for a similar gathering at the time of next year's convention.

COMMITTEE ASSIGNMENTS.

Secretary Taylor announced at the meeting yesterday morning that in accordance with Article VI, Section 4, of the constitution, the executive committee suggested the following names for the committee on nominations: F. W. Brazier, A. W. Gibbs, F. H. Clark, F. H. Goodnow, F. F. Gaines, J. T. Wallis, W. H. Lewis, C. E. Fuller, G. W. Wildin, J. J. Hennessey.

T. M. Ramsdell, R. D. Smith and T. H. Goodnow were appointed a committee on correspondence and resolutions.

The president named the following committees on obituaries: For W. H. Taylor, J. W. Taylor; for H. Schlacks, C. A. Schroyer; for C. F. Gossett, M. W. Seidel; for J. J. Ryan, J. R. Cade; for Harry Coulter, R. L. Kleine.

ANOTHER LETTER FROM MR. LEHON

Atlantic City, N. J., June 16, 1913.

To the Editor of The Railway Age Gazette:

In view of my personal interview and understanding with you in connection with my letter of June 13, I am somewhat surprised at the caption employed by you of "A Criticism, and an Answer."

You know that my letter was an expression of opinion and in no way offered or intended as a criticism; accordingly it was not fair to preface the letter with the suggestion that it was intended as a critieism, although such an interpretation was possible.

Here is one of the greatest conventions held in the country, so ereditable and remarkable that both interests contributing thereto have just reason to be proud of it, and while it may be expedient from your standpoint to minimize whatever apathy and inattention actually exists in regard to exhibits, such a policy is not calculated to remedy the situation, neither will it promote further growth and development.

Everyone who has the courage of his convictions expects to be made "the goat" occasionally and for the opportunity offered me by you to serve in that capacity, I thank you.

Tom Lehon.

[It appears that the editorial comments made by us on Mr. Lehon's letter in the *Daily* of Monday misinterpreted its intent and spirit, and we gladly give space to the above further communication from him.—Editor.]

REGISTRATION IN 1911-'12-'13.

The following table giving comparative figures of registration of the M. M. and M. C. B. Association for the years 1911, 1912 and 1913 will be of interest. The figures are based on official Registration Book No. 4, containing all registrations for the 1913 conventions up to 3.40 o'clock Sunday afternoon:

	1911	1912	1913
Members of M. M. and M. C. B. Assns.	712	647	577
Special Guests	737	453	499
R. R. Ladies	699	330	427
Supply Ladies	399	224	281
Supply Men	1684	1465	1611
Totals	4231	3119	3395

Two hundred and forty-five members of the M. C. B. Association registered before noon Monday morning.

Lo-tung Railway, China.—The first section of the Lo-tung Railway from Lo-yang to Tich-men has been completed, and daily passengers and freight trains between these two stations are now being run.

MEETING OF RAILWAY ELECTRICAL ENGINEERS.

The semi-annual convention of the Association of Railway Electrical Engineers was held at the Hotel Dennis, June 16, Vice-President H. C. Meloy, chief electrician, Lake Shore & Michigan Southern, presiding. President D. J. Cartwright commented on the growth of the association and the constantly widening field for its activities. Much of the work done by it has proved of considerable importance to the M. C. B. Association. The purpose of the association is to study problems that come under its special jurisdiction so that standards may be established that will represent the best practices. While the original work of the association was in connection with car lighting, its opportunities for considering other electrical subjects have greatly increased because of the extended use of electricity in shops and other places on railroads. Secretary J. A. Andreucetti reported an approximate cash balance of $1400 in the treasury and a total membership, including associate members, of 532. There were about 50 members in attendance at the meeting.

A report of progress was offered by the following committees: Data and Information; Dynamo Suspension; Headlight; Illumination; Incandescent Lamp Specifications; Head End Equipment; Organization and Yard Force; Outside Construction and Yard Lighting; Standard Operating Reports; Standards; Rubber Belt Specifications; Shop Practice; Wire Specifications; and Installation of Wiring. The committee on charging of passenger car storage batteries, of which J. R. Sloan, Pennsylvania Lines East, is chairman, presented a full report. Six methods of charging batteries for straight storage were described. The system known as the constant potential system was preferred by the committee and was covered in the report as follows:

A definite fixed resistance is placed in series with the battery and a definite constant voltage is maintained across both battery and resistance.

With this method the ampere hour input is determined by an ampere hour meter operating a circuit breaker to cut the battery off charge. Care must be exercised in determining the proper resistance and voltage to use, and especially must the voltage be held very closely approximating the predetermined value chosen. It may be said in general that the higher the voltage chosen (which conditions the use of the greater charging resistance) the greater will be the permissible fluctuation of voltage. Increased voltage will, however, increase the amount of energy consumed and reduce the amount of the "taper" effect.

The reasons for favoring this system are: The minimum amount of attention is required from the operator who has only to connect the batteries to the charging plant.

The resistance and voltage are taken at such values as to permit using the highest current rate that will not injure the battery, which will be fully charged in a minimum time, while the current being reduced to normal at the end of the charge, excessive evolution of gas at this portion of the charge is avoided, thus maintaining the efficiency of the charge and minimizing the depreciation of the battery.

The elimination of overcharging the battery and so wasting power, as current is automatically cut off on completion of charge.

The results obtained will depend upon the accuracy of the meter and the constancy of the voltage.

This method has the disadvantage that the rate of current flow is affected by the physical condition of the battery, i. e., whether the cells are short-circuited or sulphated by the temperature, level and specific gravity of the electrolyte, age of battery and on whether antimony and certain impurities are present in the cells.

It has the further disadvantage that for the best results it is probable that different terminal voltages and resistance will probably be required for each of the three different types of batteries, viz., Faure, Planté and Edison, although it is believed that very good results will be obtained if the initial charging rate (neglecting the first momentary rush of

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current) does not greatly exceed the three-hour or double normal rate and the final charging rate does not greatly exceed the normal or eight-hour rate of the Planté battery.

Four methods of charging the batteries used with the head end system were considered, the following method being considered the best: A definite fixed resistance on each car is placed in series with the battery anl a definite constant voltage is maintained across both battery and resistance. The ampere hour input is determined by an ampere hour meter compensated for battery ampere hour efficiency, and when the battery is fully charged opens the charging circuit by completing the circuit through the trip coil of a circuit breaker.

The comments under the method mentioned in straight storage apply equally well here.

With the axle generator system the committee recommended a constant battery current with a voltage control, together with an ampere hour meter on each car to indicate the charge condition of the battery and show whether terminal charging is necessary.

R. Norberg of the Willard Storage Battery Company, and also a member of the committee, presented a minority report not agreeing with the method for charging straight storage batteries. He said: "I believe that a great percentage of the batteries that are actually operated are far from normal and batteries of this class would stand a great chance of getting damaged if charged according to your recommended method for straight storage.

"I have no objection to the recommendation theoretically; but I do believe that in practice it is liable to do more damage than good. I would, therefore, suggest that the recommendation be modified to such an extent as to recommend this method as theoretically the best method, where the voltage of the battery is normal and absolutely known. For practical purposes under general service conditions, method E should be recommended."

Method E is as follows: Charging current held approximately constant by manipulation of the rheostat and ampere input determined by ampere hour meter. This meter so designed as to compensate for the ampere hour efficiency of the battery when the battery is fully charged, acting to complete a circuit through the trip coil of a circuit breaker. This breaker when opened cuts the battery off charge.

Other members of the convention agreed with Mr. Norberg. The discussion brought out the importance of the subject, as there are about 8,000,000 batteries in service which represents considerable capital. It was also mentioned that the specific gravity of the battery solution should be carefully watched.

In the report of the committee on illumination was mentioned a series of tests to be made on the Lake Shore & Michigan Southern at Collinwood, Ohio, on all types of reflectors with gas and electric lights. The tests will be very complete and will be in charge of an illuminating engineer. The manufacturers of reflectors will aid the committee in the tests.

In the afternoon S. T. Dodd, General Electric Company, gave an interesting illustrated lecture on gas-electric cars, in which he mentioned the various types of self-propelled cars. A brief historical sketch was given of these cars and a somewhat detailed description of the operation of the latest types. In regard to the fuel or distillate used for the engines be pointed out that the specific gravity specification for such fuel was not reliable, it being only an average of all the mixed distillates. A more accurate specification should be a certain percentage of distillate at one temperature, another certain percentage at another temperature, and so on until the desired blend had been obtained.

G. H. Stickney, of the lamp department, General Electric Company, and also a member of the Illuminating Engineering Society, presented a paper on illuminating engineering co-operation, whereby both the Illuminating Engineering Society and the A. R. E. E. may be greatly benefited. This may be done by joint meetings; representation by papers presented before each association; by the establishment of joint committees on co-operation and a representation of one society in the committees of the other. This scheme has been worked out with other associations with good results.

PROPOSED LINE FOR MANCHURIA.—It is proposed to build a railway from Kirin, Manchuria, to Hailungcheng via Panshihhsien. Chinese capitalists have subscribed to two-thirds of the required capital. All that is left to be done is to raise the remaining third locally, and when this sum is raised, which is, however, considered no easy task in view of the prevailing stringency in the money market, the promoters intend to start work without delay.

ENTERTAINMENT COMMITTEE.

Left to right, top row—Roger J. Faure, W. C. Wardell, H. A. Neally, J. D. Purcell, P. M. Brotherhood, J. M. Crowe, C. D. Eaton, C. J Donahue, W. S. Furry, and W. J. Caton.

Bottom row—Harry S. Hammond, L. B. Sherman, J. P. Landreth, Leonard J. Hibbard, W. K. Krepps, John D. McClintock, Gilbert E. Ryder, and Edward P. Chaffee.

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MASTER CAR BUILDERS' ASSOCIATION PROCEEDINGS.

Includes President's Address, Reports on Standards, Brakes, Brake Shoes, Couplers, Wheels, Interchange Prices, etc.

The first session of the forty-seventh annual meeting of the Master Car Builders' Association was held in the Greek Temple, on Young's Million Dollar Pier, Atlantic City, N. J., on Monday, June 16, 1913.

The president, C. E. Fuller (Union Pacific) called the meeting to order at 9.30 A. M., the Rev. Dr. Newton W. Cadwell invoked the Divine blessing.

ADDRESS OF PRESIDENT FULLER

It affords me pleasure to welcome you to the forty-seventh annual convention of the Master Car Builders' Association. The Master Car Builders' Association from a small beginning has grown to be a great international institution, which is being regarded more and more as the medium upon which this whole country must rely to solve the questions of safety and permanency in methods of car construction and maintenance, and to a greater or less degree those of car operation. To hold its prestige the association must of necessity keep pace with the constant changes in affairs, and boldly step forward in the line of progress.

While we have been lending our best efforts to car construction and to the promulgation of rules which have for their purpose the minimizing of restrictions and delays in the interchange of cars, have we as an association always kept before us the necessity for taking into consideration also the question of reducing the cost of maintenance and operation of equipment? This is essential, you will agree, and it is of paramount importance that this association as a whole, and each of its committees, should weigh the cost and consider carefully the benefits attainable by their adoption before approving or advancing any changes, and especially those that will entail large expenditures.

A number of reports will be presented by standing and special committees for your consideration, and it is hoped they will be afforded careful scrutiny and be given a full and impartial discussion. Let us consider carefully all the various recommendations which are placed before us for approval, and let us not lend the prestige of this association to anything that will mean increase in maintenance and operation, which cannot be satisfactorily defended before the bar of public opinion on the grounds of safety and economic progress. While it may be true that we are surrounded by flattering conditions of prosperity, it is nevertheless true that the expenditures which our companies have been called upon to make, by reason of changes in car construction, have in recent years been enormously increased. Our watchword, therefore, should be "Economy."

C. E. FULLER,
President, M. C. B. Association.

The committee on Standards and Recommended Practices has given very careful and exacting consideration to the problems submitted to it, and has presented a report which will be found both interesting and instructive.

The committee on Car Construction has presented an interesting report, with appropriate recommendations to be submitted for the consideration of the members. A salient feature of this report is the determining of a limit for minimum strepgtb of underframes. This limit is based on the minimum cross-sectional area of center sills, and, when approved, will serve as a basis to define the handling line's responsibility for combination of damages under ordinary usage to such cars as fall below the minimum strength so established. I feel that this committee should be continued, and that it should undertake to consider seriously the building of heavier capacity cars—say of 70 tons capacity—so as to increase the tonnage and enable us to reap

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the benefit of reduced grades and heavier tonnage without increasing the length of our trains.

In freight car construction there has been a decided trend within the last year or so towards single-sheathed box and other house cars, indicating that this type of car is growing in favor. It has the advantage of light weight combined with strength of superstructure, comprising rolled or pressed steel shapes riveted to the underframe, but the problems of the end construction and providing for the shrinkage of lumber in the side and end lining still confront us and must receive our further attention. In view of this it seems questionable whether the solution of the entire proposition is not steel construction for freight car equipment. Speaking of steel construction, in going from wood to steel in passenger car construction probably the most important feature is that of proper insulation, which was largely neglected in the beginning, due principally to a lack of appreciation of the enormous difference between heat conductivity of steel and wood construction. Some types of early steel cars were unsuccessful from a heating standpoint; others have been made comfortable only by the addition of an unusual amount of heating surface, and the question of insulation of steel passenger cars at the present time merits our earnest study.

M. K. BARNUM,
Vice-President, M. C. B. Association.

J. S. LENTZ,
Treasurer, M. C. B. Association.

The Coupler committee has made a report which we believe is worthy of your full consideration, and especially should the question of contour lines be considered, to enable flexibility in passing around sharp curves, consequently reducing undue strains on the underframe of the car, as well as reducing the flange friction. I feel that this committee should be encouraged, and that early action should be taken to adopt a standard M. C. B. coupler.

While this association by letted ballot has adopted wheel tolerances for solid steel wheels as recommended practice, under the head of "Specification Covering Dimensions and Tolerances for Solid Wrought-Steel Wheels for Freight and Passenger Car Service," there is a possibility that this specification should go further and show the desired chemical analysis, together with the methods of test and inspection. In this connection I wish to remark that the Master Car Builders' Association is fully qualified from every standpoint to formulate its own standards and specifications, and I would recommend that a committee be appointed for the ensuing year to take this subject under consideration and make a complete report at the next convention.

With reference to the matter of light weight and maximum weight capacity stenciling of freight cars; the railroads have been rather loath to follow out the original recommendation of the association regarding this method of stenciling. The committee has been confronted with the danger that the universal adoption of the plan would possibly transfer the responsibility for failure of cars of weak construction to the handling line. At the same time it feels the necessity for recognizing the right of companies to adopt this method of stenciling for such cars as are of proper design and physical strength, to enable them to increase the carrying capacity of a very considerable number of cars without any untoward results. It is, therefore, recommended for your consideration that this stenciling be confined to steel and steel-underframe cars with a proper factor of safety in the body structure and trucks.

In the last few years the abuse of the repair card has had considerable attention at the hands of the association, and the executive committee has given this subject consideration during the past year. It is recognized that honesty cannot be legislated into the human race; however, it is believed that if the officials of the various companies will give it out plainly to their subordinates that sharp practices will not be tolerated, the complaint that some companies are making "pencil repairs" to cars will be done away with.

During the past year the American Railway Association through its committee on Car Efficiency reported to the executive committee a serious condition at several large interchange points, brought about by the enforcement of that part of M. C. B. Rule Number 2, which requires that defect cards must be attached to cars at the time of interchange. The delays incident to the enforcement of this rule became unbearable to some companies. Cars were set back for defect cards by

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both sides, and the situation became critical at some locations. It was up to the executive committee to act. It was clearly not possible to rescind that part of the rule requiring that defect cards be placed on cars. The executive committee, after due deliberation, agreed that it was absolutely necessary to reduce the number of defect cards issued. It was the opinion that this could be brought about by making some provision or arrangement, whereby the necessary repairs would be made to the cars by the handling line, so that defect cards would not be required by the receiving line; and by eliminating the carding of owner's defects. Defect cards were being issued for defects which, although primarily "owner's responsibility" became "handling line's responsibility" as soon as the car crossed an imaginary line at the time of interchange. The committee felt that there could be no possible objection raised, nor any injustice done any car owners, by placing the responsibility where it primarily belonged. Again it was a well-known fact that the prices allowed in the rules for both labor and material were not increased in keeping to meet the advances in wage schedules and the increases in cost of materials, nor did the prices in the car interchange rules include any percentage to cover facilities, supervision, or use of tools. To meet the emergency that existed the executive committee, by virtue of the authority given it by the constitution, caused circular number 8, "Result of Special Letter Ballot on Change in the Rules of Interchange" to be issued by the arbitration committee, effective November 1, 1912, by which the existing condition was almost immediately relieved. We have reliable information from several large interchange points indicating that the number of defect cards has been reduced approximately one-half.

It is a well-known fact that the executive committee, through the arbitration committee, is called upon at times to interpret certain parts of the Interchange Rules, also to meet emergencies and to remove misunderstandings that are shown to actually exist to the detriment of prompt interchange of cars, and it has been necessary to issue the executive committee's instruction certain circulars to the members to meet such emergencies. Should there be any doubt in the minds of the members as to whether the reading of article six of the constitution invests the executive committee with authority to so instruct the arbitration committee, I would suggest that a committee be appointed to revise this article and remove the uncertainty.

The past year has been a particularly strenuous one for the members of the arbitration committee; their duties have been arduous and they have had many problems to solve, for which they are entitled to much credit and that the Association is greatly indebted to them for the work they have accomplished. I believe we can do much to lighten the labors of this committee. It has had to contend, especially the last year or two, with cases which were based on the most trivial and technical objections; also in some instances with matters of a nature that should be settled by the contestants themselves, instead of placing the burden on the committee. It is, therefore, hoped that railroads and private car companies will refrain from placing themselves in a position where it would seem they are trying to evade payment of bills on technicalities. Another thing which I might mention under this heading is the method practiced by some roads of delaying payment of bills on technical objections. To remedy this trouble the arbitration committee will submit for your consideration a revision of interchange rule number 91 which we hope will meet with your approval.

The subject of "Salt Water Drippings from Refrigerator Cars" has been discussed for a great many years; we now have a recommended practice. At the present time the damage to track and bridges due to the dripping of brine from refrigerator cars warrants advancing this to standard, and the arbitration committee in its report this year has recommended a time after which no car carrying products which require for their refrigeration the use of ice and salt, will be accepted in interchange unless equipped with suitable devices for retaining the brine between icing stations. This subject is of such importance to the railroads that it is hoped the arbitration committee's recommendation will be adopted by the association and incorporated in the interchange rules.

There is another subject that has been receiving considerable attention of late, particularly by western roads—the retirement of cars of 50,000 lbs. and less, capacity. A great number of these cars are equipped with old style triple valves, and their physical condition as a rule is not such as to make them desirable equipment to be handled in heavy trains over steep grades. This subject will come up at the noonday discussion of topical subjects, and it is to be hoped that this matter will be fully discussed with a view to having each road confine its light equipment to local business.

The necessity of putting car roofs in proper condition is another matter, which I believe should have the attention of the association with a view to taking action that will overcome the trouble being experienced by the roads and the expense incidental to claims being paid on account of leaky roofs.

It is with regret we recall that death has taken during the past year honored members of our association as follows: W. H. Taylor, Henry Schlacks, C. E. Gossett and J. J. Ryan. A committee will be apointed to draw up suitable resolutions for record in our proceedings.

At these annual gatherings, in addition to the opportunity for exchange of ideas and absorption of knowledge, we are afforded further mental treat through the elaborate and up-to-date display of modern railroad machinery and tools which the manufacturers place before us, and I feel they are entitled to our thanks and appreciation. I would urge the members to take full advantage of the opportunity.

In conclusion I wish to express to you my sincere appreciation of the confidence you have placed in me, and assure you I feel it is a great honor to be permitted to preside over these meetings. I wish to express my deep gratitude for the assistance given me by the officers, committees and individuals during the year in conducting the affairs of the association.

ASSOCIATION BUSINESS.

Secretary Taylor then presented his report which showed the membership to be as follows: Active members, 433; representative members, 414; associate members, 11; life members, 21. The number of cars represented in the association is 2,713,630 as compared with 2,593,397 in June, 1912. Thirty-nine railroads and private car lines gave notice during the year of their desire to become subscribers to the rules of interchange governing freight cars, and three railroads advised of their acceptance of the code of rules governing the interchange of passenger equipment. The report of the treasurer, John S. Lentz, showed a balance in the treasury of $627.91. The reports of the secretary and treasurer were referred to an auditing committee consisting of T. M. Rainsdell (C. & A.), T. J. Burns (M. C.), and E. W. Pratt (C. & N. W.).

Secretary Taylor said that on October 30, 1912, the executive committee sent the following communication to the members: In accordance with article 12, section 1, of the constitution, relating to amendments to the constitution, it is proposed that article 6, section 1, be amended as follows:

Section 1, First paragraph. No change; second paragraph, a new paragraph as follows: "The executive committee may exercise such supervision over the standards, recommended practice or rules of this association as may be necessary to meet any emergency that may arise during the year in the conduct of the affairs of the association, such action to be taken only on the unanimous vote of the members of the executive committee."

Third paragraph, revised: "It shall make a report at each convention, which shall cover the action it has taken on such general or emergent supervision and make such recommendations as it may deem necessary on questions of importance to the association."

F. W. Brazier (N. Y. C.): I move that the proposed amendment as read be approved and become part of the constitution. The motion was seconded and carried.

REPORT OF THE COMMITTEE ON NOMINATIONS.

The committee suggested the following: For President, M. K. Barnum, G. S. M. P., Illinois Central; for First Vice-President, D. F. Crawford, G. S. M. P., Penna. Lines West; for Second Vice-President, D. R. MacBain, S. M. P., L. S. & M. S.; for Third Vice-President, R. W. Burnett, G. M. C. B., Canadian Pacific; for Treasurer, J. S. Lentz, M. C. B., Lehigh Valley; for Executive Members, C. E. Fuller, A. G. M., U. P.; T. M. Ramsdell, M. C. B., C. & A.; and C. F. Giles, S. M., L. & N.

The ballot will take place on Wednesday and the tellers will be named on Wednesday morning.

REVISION OF STANDARDS AND RECOMMENDED PRACTICE.

After due consideration of present standards and recommended practice of the association, together with replies from members to the circular of inquiry, and in connection with which we wish to say that very few of same were received; also requests involving standards presented by the secretary your committee desires to report as follows:

AXLE "A" (Standard.)
With Journals 3¼ in. by 7 in. Page 681. Sheet M. C. B. 15.

A member calls attention to investigation of a number of axle failures which have caused derailment on their system, and in which it has been found that they were almost entirely caused by 3¼-in. journals, worn close to the M. C. B. condemning limits. This, of course, referring only to jour-

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nals with "cold breaks," as contrasted with journals "burned off."

From the foregoing it is safe to assume that the M. C. B. condemning limits for the 3¼ in. by 7 in. journals do not provide for the same margin of safety as in the larger sizes, due probably in part to the very heavy mileage that the small journal makes before reaching its condemning limits contrasted by the fact that in the case of the 5½ in. by 10 in. and to a lesser degree the 5 in. by 9 in. journals, are generally condemned by collar wear or journal length before they reach the minimum diameter.

"If this is correct, which I believe investigation on other lines will prove, the M. C. B. Association should increase the condemning limit for the 3¼ in. by 7 in. journals to give a greater margin of safety which I believe is required particularly in winter weather in the northern climates, into which district any of the cars of the southern lines are apt to pass."

The committee does not concur in this recommendation.

AXLES "C" AND "D." (Standard.)
With journals 5 in. by 9 in. and 5½ in. by 10 in. Sheet M. C. B. 15.

A member calls attention as follows:

"There are quite a number of cases of cars of relatively heavy tare weight using 5 in. by 9 in. and in some cases 5½ in. by 10 in journals. From information we have received, I believe particularly in the case of the 5½ in. by 10 in. that the journals seldom reach their condemning limits unless frequently in the 5 in. by 9 in. If it can be shown that the

T. H. GOODNOW,
Chairman, Committee on Revision of Standards and Recommended Practice.

larger condemning limit for journal diameter could be put into force without shortening the present life of these axles and that their freedom from failures even under overload has shown them to have a very considerable margin of safety, is there any reason why the permissible load carried might not be slightly increased—I believe less than five per cent. increase would be sufficient—to enable some existing equipment to carry ten per cent. overload, which is becoming generally customary, without an overload on the journal, particularly as the tendency is to increase the weight of the underframe to meet service conditions which makes it difficult to build stiff cars to carry their nominal capacity with ten per cent. overload and not overrun the journal capacity.

The committee does not concur in this recommendation.

AXLES. (Standard.)
Pages 681 to 684. Sheets M. C. B. 15 and "B."

Through a member, the following communication from Mr. George R. Henderson, consulting engineer of The Baldwin Locomotive Works, was received:

"I desire to call your attention to some investigations which I have recently made regarding the standard M. M. and M. C. B. axles in connection with the operations of the quick action ET brake under emergency application.

"There have been cases of axle failures under tenders and also there have been cases where there seems to be a tendeney of the journal to roll out of the bearing or under the edge of the bearing when a severe application of the brake is made.

"Referring to the question of the strength of the axle, would say that I have investigated the combined action of the brake taken in connection with the worst strains that can occur from the natural loading and wind or centrifugal pressure, which horizontal force has been assumed at 40 per cent. or just sufficient to relieve the rail on the windward side of pressure and throw the whole load on the outer or leeward side rail. Of course this is the worst case that could occur, as any further horizontal strains would cause the car to roll entirely off the track. I find that under these conditions the greatest strains occur at the point just inside of the collar at the inner point of the wheel fit and that this strain amounts to from 22,500 to 23,000 lbs. on the 5 in. by 9 in. and 5½ in. by 10 in. axles. Of course, I see the logic in making the weakest point at this section where a crack could be discovered, which would not be the case if it occurred the other side of the collar next to the wheel hub; however, the stress seems rather high, but the action of the brake shoe coming at right angles to these stresses does not materially affect the outer strains on the axle.

"It is possible with an emergency application of the ET brake, when the brake-shoe pressure is based on 80 per cent. of the light weight of the tender with 50 pounds of air in the cylinder, in accordance with the recommendations of the Westinghouse Air Brake Co., to obtain a shoe pressure equal to about one-third of the normal axle load or maximum load for which the axle is intended. Thus, for the 5 in. by 9 in. axle the pressure horizontally of each brake shoe may amount to 10,000 lbs. under the conditions above stated and, if the tank should be practically empty, there would be very nearly enough side pressure, taken in connection with the journal friction, to roll the axle out of the bearing. In other words for the 5 in. by 9 in. axle there is a moment of 26,700 pounds disturbing force against a static moment of 30,000 pounds tending to maintain it in the bearing, and the 5½ in by 10 in. axle gives a disturbing moment of 36,700 lbs. as opposed to 40,000 lbs. of stability.

"The subject of axles rolling out of the bearings has been considered by the Westinghouse Air Brake Co., and I was recently told by W. V. Turner, the chief engineer of that company, that they were recommending double or clamp brakes on passenger equipment to take care of this trouble. This would be almost prohibitive on freight cars and tenders equipped with freight trucks and it is possible that for these conditions it would be desirable to alter the depth of the standard bearing in order to reduce this tendency of the axle to roll out of the bearing."

The committee refers this to the Committee on Car Trucks.

AXLE "E." (Recommended Practice.)
Page 683. Sheet M. C. B. "B."

A member suggests advancing axle with 6 by 11 journal, designed to carry 50,000 pounds, to standard.

The committee concurs in this recommendation.

SIGNAL LAMP SOCKET. (Standard.)
Page 802. Sheet M. C. B. 26.

In accordance with action of this Association, 1912 Convention, with respect to location of signal lamp socket in relation to exposure of Marker Lamp. The committee, after further consideration of the matter, recommends this as indicated in sketch accompanying, which is at a fixed angle of 45 degrees, and, as well, at a specified distance from the side of ear to the center of socket.

MARKING ON FREIGHT EQUIPMENT CARS. (Recommended Practice.)
Page 804. Sheet M. C. B. "G."

A member suggests that this be advanced to standard, and sheet M. C. B. *G* corrected as to location for marking United States Safety Appliances Standard.

The committee concurs in this recommendation.

MARKING ON FREIGHT EQUIPMENT CARS. (Recommended Practice.)
Page 805. Sheet M. C. B. "G."

The attention of your committee was called to American Railway Association Car Service Rule No. 11, as revised November 20, 1912, which has reference to the weighing of freight equipment, and omits the star indication, with recommendation that the Recommended Practice of this Association be changed to conform.

The committee concurs in this recommendation.

MARKING ON FREIGHT EQUIPMENT CARS. (Recommended Practice.)
Pages 804-805. Sheet M. C. B. "G."

Through the secretary of the association was referred the suggestion of a representative of the American Railway As-

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sociation for a standard for stenciling on cars of date of building, on account of the requirements in regard to the reweighing of cars.

The committee concurs in this recommendation, and suggests that the word "new" be stenciled preceding the word "weight," in accordance with the American Railway Association Car Service Rule No. 11, as amended November 20, 1912.

SPRINGS AND SPRING CAPS FOR FREIGHT CAR TRUCKS. (Recommended Practice.)
Page 903. Sheet M. C. B. "H."

A member suggests adding a spring for the 140,000-capacity freight car truck.

The committee concurs with the recommendation, and refers same to the Committee on Car Trucks.

CLASSIFICATION OF CARS. (Recommended Practice.)
Pages 906-913.

Through the Secretary, request from Mr. G. P. Conard, Secretary of the Association of Transportation and Car Accounting Officers, for assignment of designating symbols for equipment, was received, as follows:

"BM"—MILK CAR.—Exclusively for the transportation of milk, being a car for this purpose and fully equipped for handling in passenger trains.

"ES"—ELECTRIC PASSENGER CAR.—For long hauls or suburban service; multiple unit, and fitted with automatic couplings and air brakes. Operating power, storage battery.

"GR"—GONDOLA CAR.—A car with solid bottom, sides and ends, and open on top; suitable for mill trade.

NOTE TO FOLLOW CLASS "H."

If any of these hopper cars are provided with roof or cover for protection of contents, the letter "R" should be affixed to the regular symbol to designate its special class of service.

"MPE"—COMBINATION BAGGAGE, MAIL AND EXPRESS CAR. A car having three compartments, each entirely separate from the other for handling its individual class of business.

"MPU"—COMBINATION BAGGAGE, MAIL AND EXPRESS CAR. A car having an individual compartment, each entirely separate, one suitable for mail, one suitable for baggage, and one suitable for passengers.

"XI"—BOX CAR, INSULATED.—A box car having walls, floor and roof insulated, not equipped with ice bunkers or baskets. This car ordinarily used for transporting vegetables, freight, etc.

"WWX"—BOARDING OUTFIT CAR.—This includes cars used for boarding' sleeping, or cooking purposes in construction and similar work.

The committee concurs and assigns symbols as indicated.

A member suggests assigning designating symbols to the following class of equipment:

Symbol.	Kind of Car.	Description.
"MWE."	Ballast Spreader and Trimmer.	A car with blades or wings for spreading or trimming ballast.
"MWJ"	Ballast Unloader.	A car equipped with machinery for pulling a plow through cars loaded with ballast.
"MWP"	Pile Driver.	A car equipped with machinery for pile-driving.
"MWK"	Snow Removing Cars.	Cars equipped with any special device for removing snow from between or along side of rails.
"MWM"	Store Supply Car.	A car equipped for handling material to be distributed for railway use.

Following the heading of "General Service Freight Equipment Cars," note to be added, as follows:

Any of the following classes of equipment having special heating appliances for the protection of commodity against freezing, to be covered by affixing the letter "H" to the designating symbol.

"SH"	Horse Car.	A car specially fitted for the transportation of horses in freight service.

The committee concurs in the recommendation, so far as designating symbols are assigned.

NEW SUBJECTS.

The committee has further considered the establishment of a maximum standard or limiting height for the running board of a standard dimension box car, and in view of the variance found, brought about to meet traffic requirements, we do not feel warranted in recommending a standard height for running board in view of the other conditions which enter in connection with this.

A member suggests the necessity for a journal box, brass and wedge for axle with 6 in. by 11 in. journals, so as to complete the Association's approval of the use of an axle with 6 in by 11 in. journal in freight service.

The committee concurs and refers this to the Committee on Freight Car Trucks.

A member calls attention to difficulty experienced with cars with arch bar trucks, or trucks with rigid side frames, and having side bearings located outside gauge of track, and suggests establishing a standard spacing for side bearings.

The committee concurs in this recommendation, with the suggestion that the maximum side bearing spacing should not exceed the rail gage, with a minimum of 44-inch centers, and a minimum clearance between side bearings of $\frac{3}{16}$ inch.

A member calls attention to the necessity of end doors on account of difficulty experienced in having yard clerks obtain seal records of same, due to the inconvenient location and risk of personal injury. Claims are now being paid on account of no end door seal record, and cars are being pilfered by theft through the end doors, which can be entered with the least chance for detection. Is an end door in a standard box car essential? If so, could it not be placed near the side of car where seals could be read from the side ladder?

The committee refers this to the Committee on Car Construction.

The committee, at this time, wishes to submit for consideration, separating the proceedings of the association as at present published, taking out the standards and recommended practice, and have same published as a separate volume.

The report is signed by:—T. H. Goodnow (C. & N. W.), chairman; C. E. Fuller (U. P.); W. H. V. Rosing (St. L. & S. F.); E. E. Dunham (C. & N. W.); O. C. Cromwell (B. & A.); T. M. Ramsdell (C. & A.), and O. J. Parks (Penna.).

During the presentation of the report the chairman stated that the committee wished to withdraw the article referring to Signal Lamp Socket.

T. H. Goodnow (C. & N. W.): Since this report was drawn up, the committee has received several other suggestions, which we could not handle on account of the report having been completed and sent in to the printer. This morning, at a meeting of the committee held this morning, it was decided that there would be included and presented now, as a supplemental report to the convention, the suggestion made by the arbitration committee that the recommended practice on the Collection of Salt Water Drippings be advanced to standard.

DISCUSSION.

D. F. Crawford (Penna. Lines): I would like to ask the chairman of the committee a question. On page 9, in reference to the marking of freight equipment cars, recommended practice, page 804, sheet M. C. B. G, the suggestion was made that on account of the numerous markings which we are compelled to put on the cars a badge plate with small letters be permitted and used as the recommended practice of the association. I notice that a number of railroads, as well as our lines, are building house cars with considerable outside framing. It is a single sheet car with steel frame. This steel frame makes it extremely difficult to put on the car all the markings which are required, in the comparatively large letters required by the recommended practice of the association, and I would like to know what the objection is to putting on a badge plate.

T. H. Goodnow: I believe it was considered that the present markings were practically established in connection with the meeting which was held with the Interstate Commerce Commission inspectors; that it was thought that on account of that they ought to stand at present as included in the proceedings. The Committee did not feel there would be an objection to using the other, but at the same time, on account of the situation it brought about with the present standard in the proceedings, it had better be left as it is.

D. F. Crawford: The marking of the government is United States Safety Appliance Standard, and they permit the use of the badge plate. The other markings, such as the size of the shank of the coupler and the character of the triple-valve, I do not think the government is particularly interested in.

W. E. Dunham (C. & N. W.): I would suggest that the recommendation indicated that all the markings were to be taken care of by a badge plate. We did not feel that was advisable; the general marks on the car we do not think should be reduced to badge plate sizes.

T. H. Goodnow: In connection with Mr. Dunham's remarks, if I recollect rightly, the only samples submitted were Lettered States stenciling.

D. F. Crawford: That is all covered by page 105, which reads that a badge plate 3½ in. x 10 in., with proper marking, may be used instead of penciled stenciling. The technical point may be raised that a great many cars now turned out with the information regarding the air-brake, coupler and brake-beams and other information of that kind, are all turned out with badge plates. I would suggest a modification of that section of the report.

D. MacBain (L. S. & M. S.): It seems to be a good thing to concur in Mr. Crawford's remarks.

M. K. Barnum: It seems to me it would be a good thing to request this committee to consider the markings now placed on the outside of the cars with a view to separating them into two classes, one to be put on a badge plate and the other class to be stenciled on the car in a suitable manner. I would make that as a motion, that the committee be requested to revise that part of their report under those instructions; and that they separate the different items that

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now are placed on the outside of the cars, making two lists, one of which may be placed on a badge plate and the other stenciled on the cars in the proper manner.

C. A. Schroyer (C. & N. W.): Why is it necessary to incorporate that in the recommended practices of the association when it is now permissible, and nobody will be able to tell as to whether it goes on with a badge plate or is stenciled on.

M. K. Barnum: I think it is necessary in order to have uniform practice.

C. A. Schroyer: It seems to me that there would be no uniform way if the matter is left permissible; "may be" does not make it a uniform practice, because we would not like to pay sixty or seventy cents for a badge plate when we can put it on with one cent's worth of paint. If we want to do it, we have the privilege under existing conditions.

D. F. Crawford: If this particular paragraph had not been entered and had been ignored by the committee, I would not have raised the point; the committee raised that point.

T. H. Goodnow: This was submitted to the committee to be considered, they had to consider it, and for that reason it was incorporated in our report.

President Fuller: The point submitted was the safety plates; they only refer to that.

D. F. Crawford: That is already covered and is a standard of the association.

C. A. Schroyer: I want to make a motion, as an amendment to this amendment, that that portion of the committee's report be stricken out entirely, and the standards and recommended practice will then remain as they are now, which will permit a railroad to use the badge plate if desired, or to put the lettering on with paint if desired.

President Fuller ruled that the motion was not in order at the time.

C. A. Schroyer: When will my motion be entertained?

President Fuller: If the motion made by Mr. Barnum is defeated, your motion will be in order.

C. A. Schroyer: Then there will be no occasion for my motion.

T. H. Goodnow: Yes there will, because that will allow the report to stand as at present.

President Fuller: The question is on Mr. Barnum's motion. The motion was lost.

President Fuller: The motion made by Mr. Schroyer is now in order.

C. A. Schroyer: I make that as an original motion and not as an amendment.

E. W. Pratt: It occurs to me there is no provision in our rules for badge plates except for the words "Safety Appliances," or "Safety Appliances Standard." On the contrary, it tells us the letters for all dimensions of cars and capacities, and everything else, and therefore the standards of the association apply to nothing but that one particular item. We have not anything if we carry this motion, because it will not apply to the matter which we have in hand.

W. F. Kiesel, Jr. (Penna.): I would like to suggest as an amendment to that motion that the committee be requested to make standard plans for badge plates which can be used as a substitute for the stencil for such parts, if the badge plates are available.

President Fuller: Mr. Schroyer, will you accept that amendment?

C. A. Schroyer: No, I am not inclined to accept that amendment.

T. H. Goodnow: It seems to me this committee cannot handle Mr. Kiesel's recommendation, as we simply handle the standards. The standards are established as to the style and size of letter and their location, and it is not within the province of this committee to take up the work that Mr. Kiesel proposes; that is for some other or some special committee to handle.

W. F. Kiesel, Jr.: Your committee can refer the matter to some other committee for consideration.

T. H. Goodnow: That will delay the matter another year.

W. F. Kiesel, Jr.: Let it be delayed another year.

E. W. Pratt: You can make one amendment to an amendment, and I amend Mr. Kiesel's motion to the effect that this suggestion be made by the convention to the executive committee, and that the executive committee put this matter into the hands of such committee as they deem proper. That will save a year's delay.

C. A. Schroyer: I accept the amendment.

The amendment was carried.

President Fuller: By the action just taken, it is understood that this report will go to letter ballot for adoption as recommended practice, and the amendment just made by Mr. Pratt will be considered by the executive committee.

TRAIN BRAKE AND SIGNAL EQUIPMENT.

The committee recommends that hereafter all freight cars weighing between 37,000 and 58,000 lbs. be equipped with 10-in. brake cylinders. The committee also believes that the braking power for freight equipment should be made 60 per cent. of the light weight of the car, based on fifty pounds per square inch cylinder pressure. With 10-in. brake cylinders applied to cars coming under the weight limits given, and using the braking power recommended, a total leverage ratio of 9 to 1 need never be exceeded.

The committee corresponded with the air brake companies for the purpose of ascertaining what triple they would recommend for all freight car equipment to be considered as standard. The replies received stated that they would suggest K-1

R. B. KENDIG,
Chairman, Committee on Train Brake and Signal Equipment.

for 8-in. and K-2 for 10-in. equipments as the one to choose for a standard. The advantage to be derived from the adoption of a standard triple valve for all freight equipment and the elimination from service of several different types are so obvious that the committee does not hesitate to recommend that the K-1 and K-2 triples be made the standard for freight cars.

On account of the increased weight and length of passenger trains, the highest degree of perfection in the operation to obtain uniform application and to avoid annoyance from sticking brakes in releasing is more necessary now than ever before. The committee having before it a report of the results of tests made by the Westinghouse Air Brake Company to de-

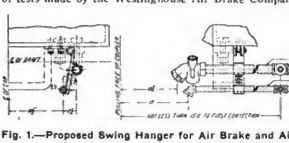

Fig. 1.—Proposed Swing Hanger for Air Brake and Air Signal Pipes at End of Passenger Train Cars.

termine the effect on brake operation of various internal diameters of brake pipe, recommends that no pipe having an internal diameter less than that of 1-in. standard weight be used on passenger cars, and that for all new equipment 1¼-in. extra-heavy pipe be used.

In the case of modern passenger cars, the committee believes that the ends of the brake pipe should be supported by swinging clamps and hangers, so that no trouble from hose parting while train is passing through crossovers will be experienced. Fig. No. 1 illustrates a swinging brake and signal pipe end hanger that has given good service for over two years.

The action of acids and salt water drippings from coal and refrigerator cars falling onto the brake pipe and its fittings causes them to deteriorate rapidly, and it has been suggested

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to this committee that the brake pipe on such cars should be galvanized to protect them. This practice is recommended.

There appears to be a lack of uniformity upon the various railroads in the use of a standard socket or pipe coupling, located 10 in. back of the angle cock in the brake pipe. These sleeves or sockets are furnished in various weights and lengths by different manufacturers, and where short ones are used there is more likelihood of leakage. The committee recommends that Sheet No. 18, showing location of brake pipe, be revised or amplified so as to show a pipe nipple, extra strong, 11½ in. in total length, and a line pipe coupling, extra heavy, 2⅞ in. long, the distance between the angle cock and pipe coupling to remain the same as at present—10 in.

The position of bolting lugs of hose clamps as shown on Sheet Q interfere with the operator's hand when operating the angle cock, and at the coupling end with the steam hose where cars are equipped with both the air and the steam lines. In Fig. 2 is shown the locations of the clamps as the committee believes they should be. The committee believes an M. C. B. specification, providing for the proper application of the clamps to the hose, should be prepared and the drawings on Sheet Q be changed to conform to it.

On account of not carrying out the recommendation made by the committee last year for the adoption of a distinctive hose label, the rearrangement shown on Sheet Q costs more to apply, and, therefore, the committee recommends the design of hose label shown on Fig. 2 for adoption.

There are also many other important brake matters that should be investigated and reported upon, such as Foundation Brake and Gear and Clasp Brakes for Heavy Passenger Equipment, Proper Location of Ends of Brake Pipe with Reference to Pulling Face of Coupler, Distance of Brake Pipe

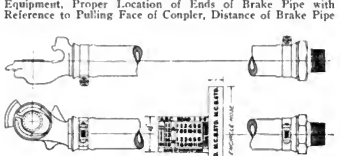

Fig. 2.

front Center of Car Coupler and Height from Rail. The members of the association are earnestly requested to submit to the committee at as early a date as possible matters such as they consider deserving of attention that pertain to the work of the Train Brake and Signal Committee, so that ample time may be had to deal thoroughly with them.

The report is signed by:—R. B. Kendig (N. Y. C.), chairman; R. K. Reading (Penna.); B. P. Flory (N. Y. O. & W.); E. W. Pratt (C. & N. W.) and L. P. Streeter (Ill. Cent.).

B. P. Flory, N. Y., O. & W., presented the report in the absence of the chairman, R. B. Kendig, and in connection with Section Eight, under the heading "The M. C. B. Hose Label," said: Since this report was printed and distributed, we have received a report from the committee on Air-Brake Hose Specifications, showing another label, and it was thought by our committee that the discussion on this particular part would be better left out until the time when the committee on Air-Brake Hose Specifications comes up, as the two labels are quite different.

DISCUSSION.

W. E. Durham (C. & N. W.): I do not quite appreciate why the committee has recommended item Number 3, to the effect that the 1¼ in. extra heavy pipe be used. It seems to me standard 1¼ in. pipe would answer all purposes and certainly would not be as expensive.

D. C. Young (Penna.): In reard to section 2, I would like to ask the committee in submitting this question to letter ballot, when it would become operative as a standard of the association. If it was passed, it would seem to me a great many triple valves would have to be removed from freight cars, that would be perfectly good for service. Therefore, it seems to me, the committee should name some date when this standard would become effective in reference to the question of the application of the valves.

C. A. Schroyer (C. & N. W.): I would say in that connection, it is only in the past few years that we have had a 10 in. cylinder for freight cars. We have a great many hundred freight and refrigerator cars now equipped with an 8 in. cylinder, and this recommendation would knock the whole thing right out. The trouble is, if this association goes on establishing standards, they will cut out our cars; in interchange, this would all have to be cut out, or spend $40. or $50 in brakes. In this, they allow a latitude of 37,000 to 58,000 lbs. on a 10 in. and it cuts down the 8 in. to everything below 37,000; and a large majority of the cars we have in service for freight are between 28,000 and 36,000 lbs.; so now we only have 8,000 limit for 8 in. brakes and 21,000 limit for the 10 in. brakes. It seems to me we should be very careful about this.

E. W. Pratt (C. & N. W.): These have been the recommended appliances of the air-brake companies for several years, and most of the railroads, all the up-to-date railroads, have been adopting these recommendations of the air-brake companies; and this was simply to emphasize that. If it is a recommended practice, it would apply to new equipment for some years to come, and yet be a standard for the association.

C. D. Young: We are one of the up-to-date railroads using the 10 in. cylinder and the K-2 triple valves; but this would apply to all the existing cars with 8 in. cylinders and plain triple-valves; therefore the triple-valves would have to be removed and K-2 triple-valves substituted for them, and I think if the committee would let it apply to new cars built after January 1, there would hardly be any objection to their recommendation. I make such a motion.

C. A. Schroyer: The loss comes in in this respect—the law compelled us to fit up these cars, commencing in 1893. We, as an association, recognized that there is no deterioration in an air-brake, and we allow none when we settle for one. All the cars we are destroying to-day have 8 in. air-brake cylinders on them, all of which are good and usable hereafter; and we have to throw them away and scrap those brakes.

B. P. Flory (N. Y., O. & W.): The committee says K-1 and K-2 standard. I think the word "standard" was hardly the intention of our committee, and it should be "Recommended Practice," and that this matter should be referred to as recommended practice, and for that only. That would, I think, cover all the objections raised.

The motion was seconded and carried.

O. C. Cromwell (B. & O.): I notice in number 5 the last paragraph, that the length of the nipple has been changed from 10 in. to 11½ in. A-1, the M. C. B. cuts specify the 10 in. nipple. Why should we make the change?

E. W. Pratt: The chairman of the committee gives me that information, and asks me to explain it. The M. C. B. cut shows from shoulder to shoulder; this refers to the length of the nipple, including threads, so they are practically identical.

O. C. Cromwell: It simply specifies the 10 in. nipple and shows no points between which the length extends.

President Fuller: On M. C. B. sheet 18 it says 10 in., and the arrow-points show between the fittings.

C. A. Schroyer: Then it would mean an 11½ in. nipple. I think it is all right.

O. C. Cromwell: If you order a 10 in. nipple, you won't get it between the collars. You put in a requisition for a 10 in. nipple; it would be the total length and that is the way it was intended to be in these proceedings.

President Fuller: It does not show it.

O. C. Cromwell: It specifies a 10 in. nipple; and that means full length.

F. F. Gaines (C. of Ga.): We have been at some trouble at getting at a standard nipple, and I think we should stick to what we have.

President Fuller: Does anybody know what they are using?

O. C. Cromwell: We use a piece of pipe 10 in. long.

F. W. Brazier (N. Y. C.): A 10 in. nipple is but 10 in. and not 11. If it is an error in the drawing, would it not be easier to correct that?

O. C. Cromwell: If the drawing shows 10 in. from shoulder to shoulder, it does not show a 10 in. nipple.

W. E. Dunham (C. & N. W.): I make the motion that the cut be corrected to show a 10 in. nipple.

President Fuller: Ten inches in length?

W. E. Dunham: Yes, sir, a ten inch nipple.

O. C. Cromwell: You will have to show how many threads will go into the nipple.

The motion was carried.

T. H. Goodnow: As I understand it now, the nipple is taken out of this report, is it not?

President Fuller: The plate will be corrected to show a 10 in. nipple instead of 10 in. between shoulders.

M. K. Barnum (Illinois Central): I move that this report

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be adopted as revised, with the exception of paragraph 8, referring to the Hose Label which shall be omitted and deferred for discussion until the report of the committee on Air-brake and Hose Specifications is taken up.

The motion was seconded and carried.

BRAKE SHOE AND BRAKE EQUIPMENT.

BRAKE SHOES.

The committee would repeat the recommendation of last year, namely:

"That some further work be undertaken by the association for the purpose of connecting the results obtained under high brake-shoe pressure with those upon which the association's specifications are based."

Previous to 1911 the tests on brake shoes had been confined to pressures of 2,808, 4,152, 6,840 and 12,000 lbs., and to speeds of 20, 40 and 65 m. p. h.

The tests made by the committee in 1910 at a speed of 80 m. p. h., and at pressures of 9,000 12,000, 14,000, 16,000, 18,000 and 20,000 lbs., established new standards for high-pressure and high-speed service.

In order to complete the series and to furnish data for high-pressure specifications, it is desirable that some further tests of an intermediate character should be made on the shoes tested in 1910.

The committee accordingly recommends for this year's program tests on these same shoes at a speed of 65 m. p. h. and at pressures of 9,000, 12,000, 14,000, 16,000 and 18,000 lbs.

The pressure of 20,000 lbs. is not included, since the results obtained in 1910 show that no practical advantage attends the use of pressures higher than 18,000 lbs.

The committee further recommends that from the data thus obtained specifications should be prepared covering the use of shoes in heavy passenger work.

In view of what has been said above, the committee feels that further tests should be made to complete the series and render available for the purposes of the Association the high-pressure work already done.

The committee presented an Appendix showing results of tests made by the New York Central Lines at the laboratory of the American Brake Shoe & Foundry Company, Mahwah, New Jersey.

BRAKE-BEAM EQUIPMENT.

Standard Brake Beam.—The recommendation of the committee in regard to the adoption of standard No. 2 brake beam was rejected. In order to ascertain the reasons for this rejection, and to get further information, the committee addressed a circular letter of inquiry to the members. The replies to this letter as received by the committee have led the committee to make certain changes in Sheet 17-B, as follows:

The hole at the lower end of strut member in Sheet 17-B is drawn dotted as being optional. It will be noted that the hole in the upper end of the head is also dotted. The committee has found by investigation that it will be difficult to reduce the weight of the beam shown in Sheet 17-B enough to make any appreciable saving without the probability of stresses in the compression member, which would be unsafe for commercial open-hearth steel. The committee would indicate that the new brake-beam gage shown in Sheet 17-A was accepted for trial, with a view to adoption as recommended practice by letter ballot. The committee would accordingly recommend Sheet 17-A to be accepted as showing the details of the gages under trial.

The committee would also recommend the beam as shown on M. C. B. Association Sheet 17-B for consideration and trial by members of the Association, with a view of adopting such beam as recommended practice for No. 2 M. C. B. brake beam.

Brake Beams for Passenger Equipment Cars.—In the circular letter the committee asked whether it was desirable to prepare specifications for the test and inspection of brake beams to be used on passenger train cars. The vote on this question was indeterminate. The committee would ask of the Association, therefore, an expression of opinion as to the advisability of preparing a specification for a brake beam for passenger train cars.

Spacing of Brake-beam Heads.—In the opinion of the committee, the spacing of 60½ in. between the brake beam heads is unnecessarily large and allows the brake beam to shift to one side or the other and to bring the brake shoe on one side beyond the tread of the wheel so as to bear on the outside edge and wear to a shoulder. This can easily be demonstrated by comparing the maximum and minimum distances for brake heads with the standard maximum and minimum gages of wheels. The committee would accordingly recommend that an average spacing of 60 in. be adopted in place of 60¾ in., with a maximum spacing of 60⅝ in. and a minimum of 59⅜ in.

The report is signed by:—Prof. Chas. H. Benjamin (Purdue Univ.), chairman; C. D. Young (Penna.), and R. B. Kendig (N. Y. C.).

In connection with the matter of further tests to be made, Prof. Benjamin in presenting the report, said: "I will say in explanation, that the association, for the past two years, has authorized these tests but unfortunately we have not been able to obtain the money with which to complete them. I hope that the association will continue this recommendation and that we may be able this year to make the tests. This will practically complete the work on the tests of brake-shoes for this purpose, and will make our specifications complete."

DISCUSSION.

President Fuller: It is considered best to take up the discussion on the brakeshoes first, and go to the brakebeam equipment afterwards.

F. F. Gaines (C. of Ga.): I would move that the recommendation of the committee be adopted, that is, that further tests be made according to the sections on brakeshoes which have been outlined.

The motion was seconded and carried.

Prof. Benjamin then presented the portion of the report relating to brakebeam equipment, and after reference to the beam, as shown on M. C. B. sheet 17-B, for consideration and trial by members of the association with a view to adopting such a beam as recommended practice for a No. 2 M. C. B. brake-beam, he said: "Another question which was raised was that of making the head stronger; that is, re-enforcing the back of the head, for the reason that the steel-back brakeshoe sometimes breaks in the middle, and brings the pressure on the head in such a way as to subject it to more stress than it was intended for. The committee has considered this point, and would prefer to reduce the clearance which now exists from 1/16 in. to 1/32 in., which would perhaps remedy the difficulty without any change in the size of the head."

After the paragraph headed Brakebeams for Passenger Equipment Cars, Prof. Benjamin said: "The reason for asking this was that the answers to the circular of inquiry were so few and indefinite that the committee got no information, and we would like to have the matter referred to the association for an expression of opinion. In this connection, the Buckeye Steel Castings Company, whose exhibit is located at Booths 603-605 of the annex, has kindly consented to exhibit a brakeshoe with the wheels and brakebeams, so that members can make these comparisons directly on a wheel. The brake is so arranged that the wheels on one end have a maximum spacing and maximum thickness of flange, while on the other end they have a minimum spacing and minimum thickness of flange. There are three brakebeams available, one averaging 59¼, one 60, and one 60¾. These will enable all members who are interested in this to see what the tolerances are and satisfy themselves as to the position which the brakeshoe is liable to have, and as to how much motion it has one way or the other."

After the paragraph on Spacing of Brake-Beam Heads, Prof. Benjamin said: "In supporting this last recommendation, I would say that the increasing accuracy in standardization of the wheels and axles themselves makes it more practicable to limit the spacing of the brake-heads in this way than five or ten years ago."

President Fuller: Some action should be taken on the recommendations of the committee under consideration reading "That the question of preparing a specification for a brake beam for passenger train cars be submitted to the membership of the association for letter ballot." The committee would like the views of the members on this proposition.

O. C. Cromwell (B. & O.): I move that the committee be instructed to prepare such specifications and present them to the association.

(Motion seconded and carried.)

F. F. Gaines (C. of Ga.): I would like to move that recommendation Number four as to its spacing of 60 inches for brake beam heads be adopted as standard and referred to letter ballot.

O. C. Cromwell: I do not think that our present standard should be changed. If you investigate this matter, you will find that you have with 60 inches at the centre of the head, a 1/4 in. clearance between the shoe and fillet of the flange. It is a much more serious matter wearing out the throat of the flanges than wearing the shoes on the outside of the trend. You have established a centre now of 60-1/4 in., you have a gage for it, and the suspension on the trucks is arranged for that; you have the hangers for it, and why go away from it? I cannot see any great necessity for it. We have no trouble with the

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shoes sliding off from the outside treads where we run 60-½ in.

F. F. Gaines: I want to say that our experience has been with the wider gages, 60-½ and 60-¼. We find more throat wear due to the wide gage where the shoe will loop over the face of the opposite side and bring the other shoe tread up into the throat of the wheel, and that will wear the shoe out much more quickly. I would like to see the matter go to letter ballot this time.

The motion of Mr. Gaines was put to a vote and carried.

F. F. Gaines: In reference to recommendation No. 1, this motion we have just put involves a change of sheet 17-A, in regard to the spacing of 60¼ in. there, and I just call the attention of the committee to it. With that in view, I move that the recommendation of the committee be submitted for adoption as standard. It says 60¼ and will have to be changed to 60, if section 4 is adopted according to the recommendation of the committee.

President Fuller: Your motion carries with it a change of the standard, and the matter is before the association for vote by letter ballot for adoption as standard. If section 4 is adopted, it will be necessary to make some changes in other sections to agree therewith.

F. F. Gaines: I move that we adopt recommendation Number 1 as standard, with the change to 60 in., as called for by the other motion.

The motion was adopted.

R. L. Kleine (Penna.): I move that recommendation number two be submitted to letter ballot for adoption as recommended practice.

A. W. Gibbs (Penna.): As I understand the matter, we are not clear on the subject of patents in connection with that brake gearing.

President Fuller: This matter which we are discussing relates to brake beams.

A. W. Gibbs: Recommendation number two says "That No. 2 brake beam, shown in sheet 17-B of this report, receive consideration and trial by members of the association, with a view of adopting such beam as recommended practice for No. 2. M. C. B. brake beam." In that sheet is shown the brake head. The brake head, I find out from reports from one of the legal associations, is covered by two patents, both of which are controlled by the same company, and that the important one is described as follows: "The Harrison patent is the more important one, and covers a brake head having broad attaching lugs with chambered legs, the lugs being cored transversely of the keyway, giving the advantage of strength and uniformity of casting, besides certain alleged incidental advantages in manufacture. The important thing is that this patent contains a claim (No. 6) reading 'A brake head having a shoe attaching lug, extending from side to side of the brake head, said lug having a broad bearing face of substantially rectangular shape and uniform width, the leg portions of said lug being chambered at each side of the key-hole of the lug'."

President Fuller: Can you enlighten us on this matter, Prof. Benjamin?

Prof. Charles H. Benjamin: This matter regarding the patent was called to my attention subsequent to the preparation of the report by Mr. Gibbs, and I wrote to the person who owns this patent, asking what his attitude would be, and received simply a non-committal letter as to the attitude with regard to making this public property. If it is the pleasure of the association, I will read the letter.

Prof. Benjamin: The committee had not intended to precipitate this discussion before the association, but as long as it is before the house, the committee feels bound to give the association all the information in its power.

R. L. Kleine: Inasmuch as the subject before us involves a patent, I suggest that it be referred to the executive committee, in accordance with the constitution, rather than that the matter shall be discussed here on the floor.

President Fuller: That will delay the action on the report of the committee, unless you cut out the head entirely.

R. L. Kleine: I would have to withdraw my motion, under those conditions.

E. W. Pratt: It seems to me that the angle this discussion has reached is something like our standard coupler discussion, and if it would be agreeable to the ideas of the committee, it would seem to me to be a good thing if this association would refer this standard brake beam back to the committee, and the committee be requested to confer with the manufacturers, as well as the coupler committee, and report at the next convention.

C. D. Young (Penna.): I believe that by a slight addition to sheet 17-B, which was prepared in my office, any question of patent arrangements can be easily handled by the executive committee. I believe the matter can then be voted on as recommended practice. I am of the opinion that by a slight change in the drawing, which will not affect in any way the interchangeability of the head with the channel or the head with the tie member, that the whole thing can be settled this year, and I would make an amendment to Mr. Kleine's motion that this question of the patent situation, agreeable to the executive committee, be disposed of before this matter is submitted to letter ballot.

Mr. Kleine accepted the amendment and the motion was carried.

COUPLER AND DRAFT EQUIPMENT.

COUPLER TESTS—STATIC AND DYNAMIC.

The tests outlined in report of last year were conducted by the Pennsylvania Railroad under the direct supervision of C. D. Young, engineer of tests and the chairman of the committee. These tests were started April 3, 1912, and carried along continuously, using Pennsylvania Railroad testing facilities, as well as those of the Baltimore & Obio, the Baldwin Locomotive Works and the Pressed Steel Car Company to expedite the work, and were completed April 24, 1913. A total of 481 tests were made.

The couplers used in these tests comprised those in general use to-day, as well as some reinforced or strengthened couplers which were in course of development, as follows: Pitt, Major, Latrobe, Major Special 103, Gould "Z," Janney "X," Sharon, Krakau, Alliance, Bazeley and Simplex.

With a view of increasing the elastic limit and ultimate strength of the material, experiments were made with heat

R. L. KLEINE,
Chairman, Committee on Coupler and Draft Equipment.

treatment and varying chemistry. All designs of couplers tested were divided in four groups, each group being subjected to the full list of tests. The four groups comprise the following:

A. Couplers of the regular commercial product.

B. Couplers with the best heat treatment and chemistry which coupler manufacturers could recommend in light of their present experience.

C. Couplers unannealed by the manufacturers with 0.35 per cent. carbon low-phosphorus steel, heat-treated by the Pennsylvania Railroad.

D. Couplers unannealed by the manufacturers and made of steel in accordance with their present foundry practice and chemistry, and heat-treated by the Pennsylvania Railroad.

All testing of couplers and separate knuckles has heretofore been made by measuring the ultimate distortion after the final blow as prescribed by the M. C. B. Specifications, but in the tests conducted by this committee, the distortions were measured after each drop or pull and tabulated by so much plus or minus from the original dimensions, the idea being to establish the point at which permanent set takes place and study design therefrom. Fig. 1 shows the location of points, etc.

The results of all the individual tests were plotted graphically as well as summaries of the important dimensions, illustrating permanent set at the various blows or increments of load in each test (jerk, strike, pulling, etc.) for all

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types of couplers under each grade of material. The four grades of material in each coupler were also compared by summary plots for the various tests.

ANALYSIS OF RESULTS OF TESTS.

The following comparisons are based upon the "A" material or the present commercial material used in couplers, and are only of a general nature without going into detail.

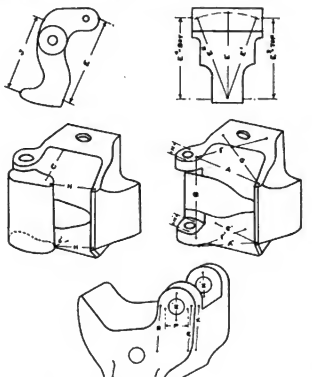

Fig. 1—Location of Points for Testing.

All couplers were given letter designations to represent the names of the couplers tested. Couplers Ta, Ua, Wa, Xa, Xb, Ya and Yc represent couplers of the latest types in general service; couplers Tb, Ub, Yb and Yd represent couplers of increased weight and strength in the development stage, a number of which are in service experimentally.

Pulling Test of Complete Couplers.—Standard M. C. B.

AVERAGE RESULTS OF PULLING TESTS.

COUPLERS—PRESENT.	Permanent Set at "C" (Knuckle Opening) at 150 000 pounds. Inches.	Load at ¼ inch Set. M. C. B. Limit. Pounds.	Ultimate Load. Pounds.
Ta	.252	221,000	289,000
Ua	.282	255,000	320,000
Wa	.292	242,000	260,000
Xa	.362	198,000	249,000
Xb	.371	196,000	232,220
Ya	.283	200,000	280,000
Yc	.332	192,000	231,800
Average	.305	210,571	261,725
EXPERIMENTAL.			
Tb	.102	278,000	448,400
Ub	.098	300,000	300,000
Yb	.159	302,000	340,000
Yd	.112	304,000	404,563
Average	.118	296,000	373,241
Increase		40.6%	42.6%
Decrease	61.3%		

NOTE.—All couplers 5 by 7 inch shank except Ua, which was 5 by 5 inches.

test, 150,000 lbs. pull with limit knuckle opening of 5/8 in. ("C" dimension).

Static Guard-arm Tests (Pulling).—This test was developed on account of the present face test being unsatisfactory from the standpoint of not giving uniform results, mainly due to the variation between the minimum and maximum contour lines, allowing the block to seat higher or lower in the head, thus increasing or decreasing the wedging action. It consists of holding down the guard arm and shank and pulling on the coupler lugs.

Static Tensile Tests of Coupler Lugs.—This test was made to ascertain the strength of the coupler lugs in pulling, each lug being pulled separately on a standard diameter pin placed in the knuckle pivot pin hole.

Tensile Test of Material.—This was a regular tensile test of the material in the couplers, using a piece sawed from shank of each coupler. Microscopic photographs (100 diameters) were taken of a section from both the shank and knuckle of each coupler.

STATIC GUARD ARM TESTS.

COUPLERS—PRESENT.	Spread between Guard Arm and Lugs "A" at 150,000 Pounds. Inches.	ULTIMATE LOAD. Pounds.
Ta	.000	295,000
Ua	.185	216,000
Wa	.192	340,000
Xa	.011	320,000
Xb	.162	280,000
Ya	.176	310,000
Yc	.154	310,000
Average	.126	295,857
EXPERIMENTAL.		
Tb	.096	400,000
Ub	.187	260,000
Yb	*.063	*180,000
Yd	.085	340,000
Average	.113	333,333
Increase		12.7%
Decrease	10.3%	

* On account of Yb coupler being designed not to take any pull on lugs in service, same is not included in the average.

Static Knuckle Tests, Pulling, Separate Knuckles.—This test was made to determine the elastic limit and ultimate strength of the separate knuckles. The knuckles were held in a forging by a standard diameter pin through pivot hole, the knuckle tail blocked on lock-bearing area and dummy engaging pulling face.

TENSILE TESTS OF COUPLER LUGS.

COUPLERS—PRESENT.	TOP LUG.		BOTTOM LUG.	
	Maximum Load Without Permanent Set "N." Pounds.	Ultimate Load. Pounds.	Maximum Load Without Permanent Set "N." Pounds.	Ultimate Load. Pounds.
Ta	160,000	160,000	80,000	226,000
Ua	120,000	251,810	40,000	222,930
Wa	160,000	273,000	60,000	231,000
Xa	80,000	160,000	160,000	216,000
Xb	40,000	147,400	140,000	218,200
Ya			60,000	210,000
Yc	60,000	248,000	60,000	235,300
Average	93,333	206,701	85,714	220,190
EXPERIMENTAL.				
Tb	40,000	178,000	80,000	261,000
Ub	120,000	215,380	100,000	240,000
Yb	140,000	*84,980	240,000	*81,820
Yd	60,000	*80,000	60,000	*120,000
Average	73,000	196,660	80,000	250,500
Increase				13.7%
Decrease	21.4%	4.08%	6.7%	

* Small knuckle pin unable to stand higher loads. Not included in average.

‡ Since these lugs are very thin, the design of coupler not requiring them to take any load, they are not included in averages.

Dynamic Strike Tests, Complete Coupler.—Standard M. C. B. test, three blows of 1,640 pounds falling 5 feet, and three blows falling 10 feet.

Limit of knuckle closure "C" is 1/4 in. on bottom after third blow at 5 feet.

Limit of axial distortion is 1/8 in. on bottom after third blow at 10 feet.

Dynamic Guard-arm Tests, Coupler Body.—Formerly an M.

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C. B. standard test now replaced by face test, three blows of 1,640 lbs. falling 3 feet, and four blows falling 5 feet.
Former limits after fourth blow at 5 feet:
Guard-arm deflection "A" is 7-16 in. on bottom.

TENSILE TESTS OF MATERIAL.

COUPLERS.	Elastic Limit. Pounds per Square Inch.	Ultimate Strength. Pounds per Square Inch.	Elastic Limit Divided by Ultimate Strength. Percent.	ELONGATION PERCENT IN 2 INCHES.		
				Actual	Over Dozed.	Under Dozed.
Ta	36,690	50,320	72.6	10	.....	17.7
Ua	48,140	87,000	55.3	6	.....	10
Wa	36,560	66,210	55.2	13	.....	8.1
Xa	20,860	61,620	33.9	6.5	.....	16.2
Xb	36,070	60,720	59.4	18	.....	5.1
Ya	35,120	64,401	54.5	22	0.3	.....
Yc	31,330	61,740	50.7	13	.....	9.7
Tb	35,550	66,100	53.8	20.5	.....	9.7
Ub	36,320	59,200	61.3	15.5	.....	8.1
Yb	33,130	61,300	54.0	14	.....	8.8
Yd	38,780	67,280	57.6	9	.....	11.8
Average	35,325	64,190	55.0	13.4	.....	8.4

NOTE.—Desired elongation in 2 inches equals 1,400,000 pounds divided by ultimate strength in pounds.

STATIC KNUCKLE TESTS.

COUPLERS—PERMUT.	Greatest Load Before Set Took Place. (Average Top and Bottom) "E" Pounds.	Permanent Set at 150,000 Pounds Load. (Average Top and Bottom) "E" Inches.	Ultimate Load. Pounds.
Ta	120,000	.035	280,000
Ua	100,000	.075	253,860
Wa	80,000	.299	278,310
Xa	80,000	.281	260,000
Xb	80,000	.159	291,850
Ya	60,000	.365	*300,000
Yc	60,000	.278	233,570
Average	82,857	.210	.....
EXPERIMENTAL.			
Tb	120,000	.038	*300,000
Ub	90,000	.057	229,830
Yb	220,000	.000	†400,000
Yd	160,000	.000	†230,130
Average	147,500	.029	.....
Increase	78%	86.2%	.....
Decrease	.....	.....	.....

* Test discontinued account reaching capacity of machine.
‡ Pulling dummy failed.
† Test pivot pin failed, small diameter, account design of coupler.

DYNAMIC STRIKE TESTS.

COUPLERS—PERMUT.	TOTAL BLOWS GIVEN AT		PERMANENT SET "A" (Average Top and Bottom) AFTER.		AXIAL DEFORMITY (Average Top and Bottom) AFTER.	
	5 Feet.	10 Feet.	Third Blow at 5 Feet. Inches.	Final Measurement Inches.	Third Blow at 10 Feet. Inches.	Final Blow. Inches.
Ta	3	3	.468	.969	.812	.812
Ua	3	8	.109	1.812	1.062	1.530
Wa	3	6	.281	1.499	1.531	1.687
Xa	3	6	.025	.780	.906	1.343
Xb	3	2	.265	.499	.....	.562
Ya	3	4	.343	1.140	.781	1.234
Yc	3	5	.140	1.155	.781	1.343
Average	3	4.8	.233	1.155	.979	1.216
EXPERIMENTAL.						
Tb	3	9	.104	.767	.812	1.124
Ub	3	8	.116	.809	.781	1.281
Yb	3	10	.074	.783	.437	1.968
Yd	3	5	.116	.562	1.156	1.468
Average	3	8.0	.102	.730	.796	1.460
Increase	.....	66.6%	.....	.....	.....	20%
Decrease	.....	.....	56.2%	35.7%	18.7%	.....

Axial distortion is 1⅞ in. for 5 by 5 in. shank, 1½ in. for 5 by 7 in. shank, measured on bottom.
Dynamic Face Tests, Coupler Body.—Standard M. C. B. tests, three blows of 1,640 lbs. falling 5 feet, and two blows falling 10 feet.

DYNAMIC GUARD ARM TESTS.

COUPLERS—PERMUT.	TOTAL BLOWS GIVEN AT		PERMANENT SET "A" (Average Top and Bottom) AFTER.		AXIAL DEFORMITY (Average Top and Bottom) AFTER.	
	3 Feet.	5 Feet.	Fourth Blow at 3 Feet. Inches.	Final Measurement Inches.	Fourth Blow at 5 Feet. Inches.	Final Blow. Inches.
Ta	3	4	.452	.452	2.062	2.062
Ua	3	4	.265	.265	1.874	1.874
Wa	3	6	.406	.593	1.343	1.843
Xa	3	3	.....	.590	.....	1.014
Xb	3	2	.....	.468	.....	.468
Ya	3	6	.437	.718	.874	1.343
Yc	3	12	.296	.828	1.281	2.281
Average	3	5.3	.371	.562	1.487	1.698
EXPERIMENTAL.						
Tb	3	19	.061	.342	1.281	Shank broken.
Ub	3	6	.197	.240	.875	Shank broken.
Yb	3	36	.028	.198	1.375	3.312
Yd	3	15	.140	.487	1.187	2.124
Average	3	19.0	.106	.318	1.179	2.718
Increase	.....	258%	.....	.....	.....	60%
Decrease	.....	.....	71.4%	43.4%	20.7%	.....

DYNAMIC FACE TESTS.

COUPLERS—PERMUT.	TOTAL BLOWS GIVEN AT		PERMANENT SET "A" (Average Top and Bottom) AFTER.		AXIAL DEFORMITY (Average Top and Bottom) AFTER.	
	5 Feet.	10 Feet.	Second Blow at 10 Feet. Inches.	Final Measurement Inches.	Second Blow at 10 Feet. Inches.	Final Blow. Inches.
Ta	3	4	.609	.828	.406	.531
Ua	3	2	.....	.562	.187	.187
Wa	3	1	.....	.484	.....	.156
Xa	3	2	.....	.476	.....	.375
Xb	1	0	.....	.....	Head Broken.	Head Broken.
Ya	3	5	.515	.718	.187	.250
Yc	3	3	.640	.718	.187	.250
Average	2.7	2.4	.588	.631	.268	.291
EXPERIMENTAL.						
Tb	3	6	.475	.639	.218	.468
Ub	3	4	.536	.759	.343	Head Broken.
Yb	3	7	.211	.351	.000	.468
Yd	3	3	.276	.276	.000	.125
Average	3	5	.374	.504	.140	.353
Increase	11.1%	108%	.....	.....	.....	21.3%
Decrease	.....	.....	36.4%	20.1%	47.7%	.....

DYNAMIC JERK TESTS.

COUPLERS—PERMUT.	TOTAL BLOWS GIVEN AT		PERMANENT SET "A" (Average Top and Bottom) AFTER.		AXIAL DEFORMITY (Average Top and Bottom) AFTER.	
	5 Feet.	10 Feet.	Third Blow at 10 Feet. Inches.	Final Measurement Inches.	Third Blow at 10 Feet. Inches.	Final Blow. Inches.
Ta	3	5	.374	.468	.156	.202
Ua	3	1	.....	.343	.....	.281
Wa	3	10	.328	.765	.202	.202
Xa	2	0	.....	.110	.....	.062
Xb	3	2	.....	.281	.....	.171
Ya	3	11	.327	.780	.093	.437
Yc	3	10	.406	.889	.156	.156
Average	2.8	5.5	.359	.515	.151	.216
EXPERIMENTAL.						
Tb	3	47	.123	.709	.062	.140
Ub	3	8	.324	.419	.093	.000
Yb	3	12	.453	.755	.124	.281
Yd	3	27	—.021	+.148	.093	.343
Average	3	24.7	.228	.539	.070	.191
Increase	7%	349%	.....	.....	.....	.....
Decrease	.....	.....	36.5%	1%	53.6%	11.6%

Limits after second blow at 10 feet:
Guard-arm deflection "A" is ¾ in. on bottom.

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Axial distortion is 9/16 in. for 5 by 5 in. shank, 7/16 in. for 5 by 7 in. shank, measured on bottom.

Dynamic Jerk Tests, Complete Couplers.—Standard M. C. B. test, three blows of 1,640 lbs. falling 5 feet, and three blows falling 10 feet.

Limit after third blow at 10 feet: Knuckle opening at "C" is 3/4 in., measured on bottom.

Dynamic Knuckle-strike Tests, Separate Knuckles.—Standard

DYNAMIC KNUCKLE STRIKE TESTS.

COUPLER—PRESENT.	TOTAL BLOWS GIVEN AT		PERMANENT SET CONVERSION "E" AFTER		
	4 Feet.	5 Feet.	Third Blow at 4 Feet. Inches.	Third Blow at 5 Feet. Inches.	Final Measurement. Inches.
Ta	3	3	.107	.....	.325
Ua	3	4	.057	x	x
Wa	3	8	.088	.464	1.020
Xa	3	1	.070	.....	.070
Xb	3	2	.100	.....	.309
Ya	3	3	.110	.....	.435
Ye	3	21	.020	.400	2.540
Average	3	6	.079	.432	.766
EXPERIMENTAL.					
Tb	3	25	.000	.032	.211
Ub	3	8	.035	x	.150
Yb	Not Tested—Small Pin Hole.				
Yd	Not Tested—Small Pin Hole.				
Average	3	16.5	.017	.032	.180
Increase	0	175%			
Decrease			78.5%	92.6%	76.5%

x Unable to take measurements on account of pin bending.

M. C. B. tests, three blows of 1,640 lbs. falling 4 feet, and three blows falling 8 feet.

Limit after third blow at 8 feet: No limit on deflection, but knuckle must not break.

Dynamic Knuckle-jerk Tests, Separate Knuckles.—Standard M. C. B. test, three blows of 1,640 lbs. falling 3 feet, and two blows falling 6 feet.

Limit after second blow at 6 feet: No limit on deflection, but knuckle must not break.

"A," "B," "C" AND "D" MATERIALS.

As stated, the foregoing analysis of tests cover only the "A" material. The "B," "C" and "D" materials, comprising

DYNAMIC KNUCKLE-JERK TESTS.

COUPLER—PRESENT.	TOTAL BLOWS GIVEN AT		PERMANENT SET ELONGATION "E" AFTER.		
	3 Feet.	6 Feet.	Third Blow at 3 Feet. Inches.	Second Blow at 6 Feet. Inches.	Final Measurement. Inches.
Ta	3	8	.102	.437	.865
Ua	3	6	.143	.460	.675
Wa	3	5	.231	.608	1.010
Xa	3	7	.125	.417	.480
Xb	3	1	.330	.....	.330
Ya	3	6	.250	.700	1.260
Ye	3	5	.125	.566	.851
Average	3	5.4	.196	.531	.810
EXPERIMENTAL.					
Tb	3	17	.044	.213	.405
Ub	3	1	.090	.....	.090
Yb	Not Tested—Small Pin Hole.				
Yd	Not Tested—Small Pin Hole.				
Average	3	9	.062	.213	.597
Increase	66 6%				
Decrease			68.4%	59.9%	26.3%

varying chemistry and special annealing or heat treatment, showed, in general, much higher tests, both static and dynamic, as compared with the "A" material or the commercial product of the manufacturers. The following comparison on the pull test will serve as an indication of the results of this special treatment, although the dynamic tests are not as uniform as the pulling tests. It is thought to design the standard coupler on the basis of the present commercial steel, reserving the advantages to be gained by heat treatment for future strengthening of the coupler or detail parts.

"A" = annealed by manufacturers.

"B" = heat-treated by manufacturers.

"C" = approximate .35 per cent. carbon, heated to 1,600 deg. F., quenched in water, annealed at 1,100 deg. F.

"D" = approximate .25 per cent. carbon, heated to 1,600 deg. F., quenched in water, annealed at 900 deg. F.

Pulling Test of Complete Coupler.—Standard M. C. B. test, 150,000 lbs. pull with limit knuckle opening of 9/8 in. ("C" dimension).

ROAD TESTS.

Road-service tests were conducted with couplers of present type on freight cars and with couplers of both present and the experimental design on freight locomotive tenders on the Pennsylvania. The freight car couplers were applied to 100,000 pounds capacity steel hopper cars in the coal trade between the bituminous mines in western Pennsylvania and tide water, a service comprising grade and flat country as well as hump-yard classification. The tender couplers were

PULLING TESTS OF COMPLETE COUPLERS.

COUPLER—PRESENT.	PERMANENT SET AT "C" (KNUCKLE OPENING) AT 150,000 POUNDS. In Inches.				ULTIMATE LOAD IN 1,000 POUNDS.			
	"A"	"B"	"C"	"D"	"A"	"B"	"C"	"D"
Ta	.252	.076	.008	.093	260.0	322.6	290.0	289.8
Ua	.282	.125	.070	.177	280.0	321.9	328.0	328.4
Wa	.292	.369	.145	.222	260.0	272.2	270.0	280.0
Xa	.302	.225	.298	.262	248.0	260.0	270.0	336.0
Xb	.371	.426	.366	.346	232.2	250.0	276.0	292.0
Ya	.283	.246	.217	.267	289.0	310.0	320.5	346.0
Ye	.352	.166	.049	.079	231.8	270.0	290.0	335.2
Average	.305	.233	.161	.207	261.7	283.8	277.5	343.9
EXPERIMENTAL.								
Tb	.102	.074	.091	.050	448.4	461.5	438.5	480.0
Ub	.098	.057	.095	.101	300.0	388.8	432.0	440.0
Yb	.150	.126	.062	.064	340.0	400.0	420.0	390.0
Yd	.112	.126	.070	.122	404.5	420.0	479.8	436.0
Average	.118	.101	.084	.084	373.2	402.8	442.8	436.5
Increase					42.6%	41.9%	59.6%	26.9%
Decrease	61.3%	56.7%	47.8%	60.9%				

applied to 7,000-gallon steel tenders in general heavy freight service on the Western Pennsylvania Division, between Altoona and Pittsburgh, which includes heavy grade service.

These couplers were also laid off as shown in Exhibit 1, the bar and parts stenciled and plate labeled, and inspected and measured once every month to determine their operation and ability to withstand service, and thus draw comparisons between the static and dynamic tests with road-service tests.

The road tests of couplers on tenders in freight service develop in the shortest space of time the defects as well as the relative life of couplers; this is brought out very promi-

SUMMARY OF ROAD TESTS OF CAR COUPLERS.

COUPLERS.	BAR NO.	DATE.	DAYS in Service	C	C'	H	H'	E'	E''
Ta	620	4- 1-13	246	+ 18	+ .11	+ .04	+ .07	+ .06	+ .05
Ta	621	4- 1-13	246	+ 16	+ .07	+ .06	+ .12	+ .07	+ .04
Ua	600	4- 1-13	246	+ 15	+ .20	+ .11	+ .18	+ .08	+ .05
Ua	601	4- 1-13	246	+ 17	+ .14	.....	+ .11	— .08	.....
Wa	604	5- 6-13	281	+ 16	+ .24	+ .20	+ .24	+ .01	+ .07
Wa	605	5- 6-13	281	+ 13	+ .23	+ .14	+ .27	— .02	+ .14
Xa	608	4-21-13	266	+ 27	+ .16	+ .14	+ .16	+ .05	+ .07
Xa	609	2-28-13	243	+ 14	+ .10	+ .07	+ .18	— .01	— .04
Ya	612	5- 6-13	281	+ .22	+ .19	+ .14	+ .16	+ .07	+ .08
Ya	613	5- 6-13	281	+ 16	+ .12	+ .13	+ .26	.....	+ .01
Ye	616	4- 8-13	253	+ .08	+ .11	+ .04	+ .11	— .02	— .01
Ye	617	4- 8-13	253	+ .15	+ .13	+ .06	+ .12	— .02	+ .03
Average, all bars			260		+ .16	+ .15	+ .09	+ .16	.....
					+ .155		+ .125	.....	.....

nently by referring to the logs of these tests.—[Not reproduced.—Editor.] It is surprising to note the short life of couplers of the present type in this service, as well as the relatively longer life that is being obtained from the experimental couplers.

Summary—Freight Car Couplers.—Summary of measurements, showing deflections at "C," "H" and "E" of the twelve couplers of present type in freight car service at last reading. All these couplers were in service at the last reading.

CONFERENCES WITH MANUFACTURERS.

While the committee was engaged in conducting the foregoing tests, as well as gathering data on the breakage of couplers in service, the gage of couplers, efficiency of knuckle

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throwers and lock-sets, slack in couplers, etc., the coupler manufacturers were experimenting along the lines of tentative specifications bearing on the important and fundamental principles involving the detail design of coupler and parts which the committee had previously decided should be incorporated, as far as practicable, in the standard coupler. These tentative specifications had been submitted to the coupler manufacturers for their consideration at the first joint meeting, held March 4, 1912, and were as follows:

Knuckle.—No strain on the knuckle pin. A minimum of 6 sq. in. knuckle-bearing area on the lock, to be central with the knuckle face. That the back thrust should be taken on the shoulders of the knuckle hub and on the back of the knuckle shank. That lost motion between the knuckle and lock (1/4 to 3/8 in. now allowed by M. C. B. specifications) be eliminated if possible. That a smaller knuckle pin than the present standard be used as a pivot pin only, thus making it possible to increase the section through the knuckle hub and coupler lugs.

Lock.—Wedge type, to take up wear. One piece, if possible. Lock-bearing area on wall of coupler to be 6 sq. in. minimum. Top and bottom unlocking arrangement.

Knuckle Throw.—Bell crank type, which will throw the knuckle from any position and follow it out to the full open position.

Lock Set.—Preferably on some stationary part of the coupler head instead of on a movable part.

Coupler Head.—To be designed to conform to the above details.

Subsequent to the conference of March 4, 1912, joint meetings were held at Altoona, Pa., with the coupler manufacturers on April 26 and May 15, 1912, the results of which were recorded in the report to the last convention.

At a meeting of the Coupler Committee, held at Altoona, October 22, 1912, it was decided that sufficient data were at hand taken from couplers in service, as well as from the tests being conducted, to enable the committee to proceed with the coupler manufacturers in designing the proposed standard coupler.

The joint committee of representatives of coupler manufacturers and the committee accordingly held meetings to discuss and decide upon details and fundamentals of design, such as operation, contour lines, strength of the various parts, dimensions of knuckle hub and knuckle pin hole, location of knuckle pin hole and lock set, and type of knuckle thrower, etc. Much discussion ensued on these points which are pertinent to design, each one influencing the other to such an extent that full development of any one will handicap the other.

The harmonizing of ideas between the committee and the mechanical representatives of the coupler manufacturers, who have praetically devoted their whole life to coupler design, and each previously working along different lines, was gradually accomplished in many of the details.

At a meeting on November 19, 1912, at the suggestion of Mr. Bush, the fundamentals to be used in the design of the coupler or couplers were discussed, taking the Coupler Committee's recommendations as a basis, and the following decided upon:

Knuckle:

1. The knuckle should be of uniform strength throughout and should provide for a pull of 200,000 lbs., not exceeding the elastic limit.
2. That the greatest dimension possible through hub is most efficient and desirable.
3. That the point of fulcrum should be as far forward as possible.
4. The center of pivot should not be far from the neutral axis at the hub and toward the back of knuckle.
5. The knuckle should be so designed in connection with other parts as to permit of relieving stresses on pivot pin under pull of 200,000 lbs., without permanent set.
6. Knuckle should be so designed that back thrust should be taken on shoulders of hub and back of shank of knuckle.
7. Bearing areas for locking, pulling and buffing should be sufficient to avoid distortion of the surface.
8. The center line of vertical dimension of knuckle tail at lock-bearing surface should coincide approximately with the center line of vertical dimensions of head and knuckle face.

Lock:

1. A. Wedge type, to take up wear.
   B. Straight lock.
2. One piece, if possible.
3. There shall be no portion of the lock or lock lifter which may be possible to kink in operation
4. Lock to be adaptable for top or bottom uncoupling arrangement.
5. Lock must not be cored within the knuckle-bearing area in order that crushing will not take place.
6. Lock must be so designed as not to twist or roll under tension.
7. Lock which requires a reversal of motion in locking is undesirable.
8. Bearing areas for the knuckle and coupler wall should be sufficient to avoid distortion of the surfaces.
9. Lift of lock to be kept as small as possible.
10. Lock must be so designed as to avoid creeping from the locked position.

Lock-set:

1. Preferably on some stationary part of the head rather than on any movable part.
2. Lock-set must be so designed that the lock will not be dislodged by jarring, due to uncoupling or switching.
3. Lock-set should preferably be arranged so that the lock can be dislodged by hand.
4. Lock-set should be dislodged at about 60 per cent. of the total swing of nose of knuckle.

Knuckle Throw:

1. Bell crank type, which will throw the knuckle from any position and follow it out to the full open position.

Mr. Bush was of the opinion that if a much stronger coupler is designed, having a wedge lock and resultant closer fitting, and decreasing dimensions between nose of knuckle and guard arm, more clearance between the face of knuckle and the contour line of head should be allowed by taking a little off of nose of knuckle and putting it on the hub

At a meeting on December 16 and 17, 1912, the question of determining beforehand the length of head of the standard coupler was brought up and it was decided that this should remain as hitherto, between 9¼ in. and 12¼ in., keeping as near the former as possible.

The question of height of coupler head and total lift was also brought up, and it was decided that this should be investigated on locomotives, passenger and freight cars, with a view of establishing a limit.

The subject of contour lines was taken up. The National Malleable Casting company went into the proposition very thoroughly and Mr. Krakau presented the subject in a very able manner, distributing to each member present a set of 38 blue-prints, each of which was discussed in detail.

The data on coupling and curving was obtained on a special machine built for this purpose by the National Malleable Casting company, whose representatives also brought to the meeting an extensive set of adjustable wooden templates to illustrate the contour lines. The coupling and curve tests were all made without having any side clearance in the carrier iron, in order that they would be strictly comparative. Among the advantages claimed for this straight-line contour are:

1. Ideal for buffing forces in having the coupler face and front face of knuckle parallel to each other and both perpendicular to the centre line of the coupler shank. Elimination of buffing forces of the nose of the knuckle against the coupler face of mating coupler, distributing it along the whole of the face of both couplers and eliminating the wedging condition of the knuckles bearing at the same time on both the guard arm and the face of the mating coupler, which causes the splitting of the coupler faces.
2. Greater diameter of knuckle hub, wherein lies the limitation of knuckle strength.
3. The total number of degrees in the following series of coupling tests was 77 for two straight-line contours, 68 for two M. C. B. contours, and 67 for the combination of an M. C. B. contour coupling with a straight-line contour.

a. Both knuckles open ..... } When machine is angled toward
b. Moving knuckle open ..... } knuckle side of moving coupler.
c. Stationary knuckle open ..... }
d. Both knuckles open ..... } When machine is angled toward guard
e. Moving knuckle open ..... } arm side of moving coupler.
f. Stationary knuckle open .... }

4. The clearance between the coupler face of one and the front of the knuckle of mating one of two straight-line contours is about 7/8 in., which represents initial slack. This initial slack in a coupler having a wedge lock would not increase in service as the present M. C. B. couplers do, and most of it is required for vertical angling. This would eliminate the destructive strains set up by vertical angling in the M. C. B. contour lines in hump and tipple operations.

The proposed contour line will provide about 7/8 in. initial slack between two such contour couplers, whereas the slack between two M. C. B. standard contours of mean contour lines is 5/8 in.

At a meeting on February 18, 1913, several members feared this increase in initial slack as being destructive to the coupler in starting trains, but the advocates of the pro-

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posed contour explained that the initial slack in this proposed contour would not be materially increased by service when accompanied by a wedge type of lock in the coupler.

It was also claimed that most of this initial slack of 3/8 in. is required for vertical angling of couplers in going over summit of yard humps and coal wharfs, and that couplers of present M. C. B. contour lines are being greatly distorted and damaged in operations of this nature.

Most of the members favored the proposed contour lines, providing this initial slack would not prove detrimental; therefore, to accurately ascertain the slack per coupling in couplers in present service the following test was decided upon and carried out: A mixed train of 61 empty cars and an engine was taken in "WJ" west-bound empty receiving yard, Altoona, Pa., and cars separated a distance of about 6 feet, the following data being taken for each end of the car:

Car.—Initials, number and type.

Coupler.—Name, age—old or new, and size of shank.

With the coupler locked the dimensions "C" and "H" were taken both with the knuckle pulled out by hand against lock, and pushed back by hand, also the distance from guard arm to nose of knuckle with knuckle in full open position. The

TESTS OF SLACK IN COUPLERS.

		Minimum. Inches.	Maximum. Inches.	Average. Inches.
1. "C"—Knuckle pulled out against lock by hand	P. R. R.	3 1/2	4 3/8	3.73
	N. Y. C.	3 1/4	4 3/8	3.55
	M. C. B. Std.	3 3/8	3 11/16	3.344
2. "C"—Knuckle pushed back by hand	P. R. R.	2 5/8	3 1/8	3.03
	N. Y. C.	2 11/16	3 1/8	3.02
3. "H"—Knuckle pulled out against lock by hand	P. R. R.	4 1/8	5 1/16	4.93
	N. Y. C.	4 1/2	5 1/8	4.84
	M. C. B. Std.	4 11/16	4 15/16	4.625
4. "H"—Knuckle pushed back by hand	P. R. R.	3 11/16	4 5/8	4.24
5. Full opening of knuckle—Guard arm to nose of knuckle	P. R. R.	8 3/8	10 11/16	9 1/4
6. Average play of knuckles, measured on "C"—Item 1 minus Item 2.	P. R. R.	0.70		
	N. Y. C.	0.53		
7. Average slack per coupling. Train stretched with locomotive.	P. R. R.	1.66		*
	N. Y. C.	1.22		
	C. M. & St. P.	6.57		

8. Total slack in couplers—P. R. R. Train—61 couplings, 8 feet, 6 1/4 inches.

9. Total slack in train—P. R. R. Train—61 couplings—including couplers and draft gears, 49 feet, 4 1/2 inches.

10. *Character of equipment measured on

P. R. R.—61 old cars and locomotive.	N. Y. C.—109 cars, new and old.	C. M. & St. P.—26 new cars.

P. R. R. Train—61 Cars and Locomotives.	N. Y. C. & H. R. R. R. Trains.
32 steel and steel underframe cars.	136 couplers measured on old cars—Average slack per coupling 1.39 in.
29 wooden cars.	82 couplers measured on new cars—Average slack per coupling .96 in.
123 couplers measured—117 old, 6 new.	These new cars were built since March 1912, 21 of which couplers were on cars built in December, 1912.

SUMMARY (EXCLUSIVE OF NEW CARS).

Test On.	Number of Couplings.	Average Slack Inches.	Maximum Slack Found. Inches.	Average Gauge. Inches.
P. R. R.	61	1.66	+2 5/8	4.93
N. Y. C. & H. R.	68	1.39	*2 3/4	4.88

+ Gauge of couplers in this coupling, 5 7/8 inches and 5 3/4 inches.

* Gauge of couplers in this coupling, 5 inches and 5 3/4 inches.

cars were then coupled and bunched, setting brakes on several cars on both ends to insure the bunching, and each coupler was centrally punched on top of head just back of face and on longitudinal centre line of coupler; that is, one coupler of each coupling was centre-punched on its centre line and with a pair of dividers set at 6 5/8 in., and with the centre-punch-hole on one coupler as a centre, an arc was described on the other coupler and then centre-punched thereon at that coupler's centre line, thus getting a uniform distance of 6 5/8 in. between these two points. The train was then stretched by a locomotive and brakes set on several cars on both ends to insure the stretching, then the distance between the centre-punched marks of each coupling above referred to was trammed and the difference between this distance and the original 6 5/8 in. as laid off with cars bunched is the slack per coupling.

The accompanying table shows the information obtained, as well as similar data taken by the N. Y. C. & H. R. R. R. and the C. M. & St. P. Ry.:

These tests showed that slack per coupling in couplers in service greatly exceeds the slack per coupling as given in the proposed straight-line contour.

Vertical Angling—Vertical angling on humps and the slack available and its location in the contour lines was illustrated by T. J. Boring, who also showed that the most severe hump on the P. R. R. is one having a 4.80 per cent. grade on one side of apex and a 3.07 per cent. grade on other side (equalling a 7.53 per cent. grade adjacent to a level), which with 9-in. face knuckles would require 21-32 in. slack in contour lines neglecting the ever variable vertical curve at the apex which the overhang of the cars would often span. Considerable argument ensued concerning the amount of slack available in M. C. B. contour lines for vertical angling as to whether the slack proper in the lines should be counted once or twice. It was demonstrated and finally agreed that 7-32 in., the clearance in the mean M. C. B. lines, is all that is available for vertical angling, with the understanding that the couplers are in tension at the time when the top of the pulling face of both knuckles are in contact with each other, which would be at the vertex of any hump having same grade on both sides and couplers of the same height. When the latter conditions are not present the knuckles will assume the mentioned position a short distance either side of the summit of the hump. It was also demonstrated and agreed that the slack per coupling with couplers in bunched position available for starting trains is 7-32 in., which is clearance in the mean M. C. B. contour lines, plus an equal amount, 7-32 in., taken from back lash of couplers plus the very small amount which may be developed by the knuckles rotating on the coupling point after the second 7-32 in. just mentioned is taken up.

At this meeting a compromise was made in the location of the knuckle pivot pin hole and ½ in. back of coupling line was decided on for the present.

It was also decided that the height of the coupler head above the centre line of the shank be set at 8¼ in. tentatively and to be further investigated.

The subject of the depth of the knuckle hub brought forth considerable discussion, especially relative to using the external one-standard head and particularly the knuckle for both passenger and freight, which Mr. Brazier strongly contended for. With a knuckle hub depth of 10 in. the height above centre line of shank would be 5 in. of the knuckle hub depth plus 2 in. for coupler lug, totaling 7 in., allowing that knuckle pivot pin would be applied from below; this 7 in. would curve under the buffer plate of passenger cars and 3 in. should also be allowed there for clearance, to allow for variation in coupler height. The making of an unsymmetrical head such as offsetting head below centre line of shank, etc., was mentioned, but finally it was decided to design the standard freight car coupler and later design a passenger head to take same knuckle if possible.

The depth of knuckle hub was set at 10 in., not counting pivot pin protector lugs, should any be used. To do this it will probably be necessary to reduce the 200,000 lbs. elastic limit previously decided upon as desirable. (This was subsequently reduced to 9 in.)

Depth of Coupler Shank:—It was decided that the Coupler Committee would thresh this out among themselves. In the meantime we will consider 6 by 8 in. shank for new cars and 5 by 7 in. shank for existing cars.

When Lock-set Is Dislodged:—The tripping of lock-set at 6¾ in. measured perpendicularly from guard arm to nearest point of knuckle nose was decided tentatively at the December, 1912, meeting. Adopted at 6¾ in.

Full Opening of Knuckle:—It was suggested that this be in line with coupler lug parallel to centre line of coupler, but was finally decided at 9 in., with ¼ in. variation either way measured perpendicularly from guard arm to nearest point of knuckle nose. The question was brought up that the end of guard arm only takes half of the guard-arm movable point of the M. C. B. contour gage. It was stated that this was intentional, but no change was decided at this time.

Lift of Locking Pin:—It was decided that the maximum total lift, should be same as present M. C. B. maximum lift, 6 in., operated either top or bottom.

COUPLING TESTS, COMPARING PRESENT M. C. B. STANDARD AND PROPOSED STRAIGHT-LINE CONTOUR

Full-size steel couplers having the various contour lines were used, and the tests were made on a machine specially built for determining the greatest possible degree of horizontal angling between two couplers and for testing coupling operations between them when in line or at an angle.

The end of the machine supporting one coupler is sta-

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tionary, and the other coupler is mounted on a carriage arranged to move longitudinally by means of compressed air on a short track, supported in a frame which is pivoted at the inner end, and capable of swinging laterally at the outer end, the pivot being in vertical alignment with the pulling

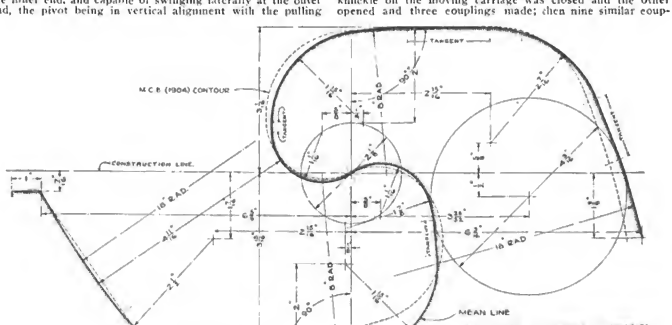

Fig. 2—Proposed Straight Line Contour for Wedge Lock.

faces of the two knuckles when coupled. Thus the couplers can be angled relatively, and coupled and uncoupled in various positions. Each degree of angularity is shown by an indicator at the outer end of the swinging frame. The couplers are designated hereafter as being on the "moving carriage" or on the "stationary" end of the machine, as the case may be, and the sheets also indicate whether they were held rigidly in the carry irons, or were given the M. C. B. clearance of 1¼ in. on each side.

Each test was conducted as follows: Two couplers were placed in alignment with both knuckles open and coupled three times; then the knuckle on the moving carriage was opened, the other closed, and three couplings made; then the knuckle on the moving carriage was closed and the other opened and three couplings made; then nine similar couplings were made after swinging the moving carriage one degree to one side; the carriage was swung one degree further each time and similar couplings made at each degree, until a degree was reached at which couplings could no longer be made; then the moving carriage was swung one degree on

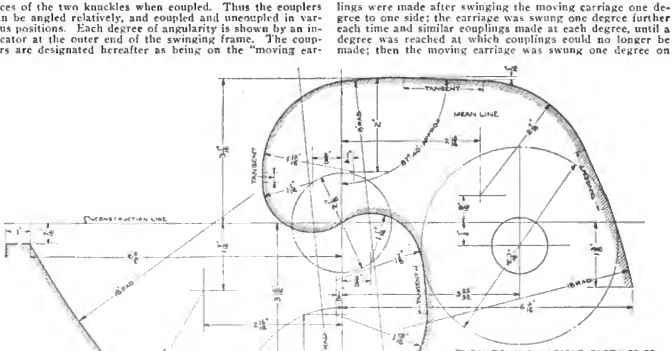

Fig. 3—Proposed Straight Line Contour for Straight Lock.

the other of the center and similar couplings made at each degree on that side.

This test was made with two couplers having the M. C. B. contour operating together, with two having the proposed straight-line contour and also with two couplings, one hav-

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ing one contour and the other the other contour, and in the case of two different contours, first with one contour on the moving carriage and then with the other thereon, so as to test all the different combinations in precisely the same manner and avoid any variations in results. After each test was made with the couplers held rigidly in the carry irons, so as to determine what could be accomplished with the lines alone, a similar test was made after giving the couplers the total side clearance of 2½ in. When side clearance was provided, couplings were considered to have failed if they could not be made without moving the couplers laterally in the carry irons by hand.

The speed of the moving carriage was regulated so that it was uniform throughout the test, and from two to three miles per hour.

Figs. 2 and 3 show the proposed straight-line contours, the former for a coupler with wedge lock, the latter for a coupler with straight lock. The difference between the two is entirely on the outer buffing face of the knuckle, and is due to the fact that the wedge lock holds the knuckle tightly shut in locked position so that the knuckle tail cannot be pushed back away from the lock, and the outer face of the knuckle then has only one position, whereas the tail of the other knuckle has movement back of the straight lock when in locked position and when the knuckle is buffed back as far as possible its outer face, which should then be at right angles with the longitudinal axis of the coupler, is not in the same position as when the knuckle is pulled out against the lock, which latter position is the one gaged and the one which must be considered in a diagram of the line. Therefore, slightly different lines are necessary for the two kinds of coupler. In the exhibits illustrating contour lines the proposed lines as well as the present M. C. B. lines are the "mean" lines. All the couplers tested had the mean line.

made for the vertical angling between couplers when passing over humps, etc., without putting any strain upon the couplers; at present there is not nearly enough clearance for this purpose, and strains are put upon all the parts when the knuckles are stretched in passing over humps and dips. The proposed straight-line contour with ⅞ in. longitudinal clearance will permit couplers having a 9-in. depth knuckle face to angle 5 degrees 35 minutes, which will permit them to pass freely over a change in grade of 9.7 per cent.

Fourth: In buffing on curves, as well as on a straight track, there is never any wedging action due to knuckle engaging face of coupler head and face of guard arm of mating coupler. With the present M. C. B. line, couplers are distorted and broken on this account.

Fifth: The proposed straight-line contours gave a higher total number of degrees at which couplings could be made as compared with M. C. B. contour.

Some of the Disadvantages are:

First: Lesser maximum angle which straight-line contours will swing when coupled together.

Second: Last portion of knuckle closure is accomplished by momentum when coupling on curves, instead of by contact of knuckle with face of mating coupler, but on the larger radius curves the couplers will adjust themselves to

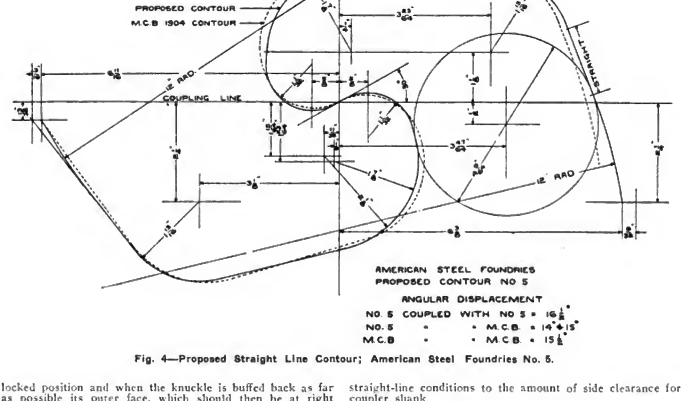

Fig. 4—Proposed Straight Line Contour; American Steel Foundries No. 5.

There are several advantages in the proposed straight-line contour as compared with the present M. C. B. contour.

First: There is provision for greatly increased strength through the hub of knuckle, and also in the front face of coupler head.

Second: The outer face of knuckle has a continuous buffing bearing across face of coupler head at right angles to longitudinal axis of coupler, thus making the average length of lever arm from pivot to buffing face much shorter than that in the M. C. B coupler, and by means of the continuous bearing and the short lever arm practically stopping the bending of the knuckle under buffing strains.

Third: By increasing the longitudinal clearance between two couplers when coupled together to ⅞ in. provision is made for the proper straight-line conditions to the amount of side clearance for coupler shank.

Third: Amount of slack in starting trains.

The proposed straight contour line was approved by all members of the M. C. B. Coupler committee and three of the coupler manufacturers, while two of the latter had not replied and the American Steel Foundries criticised same and submitted their No. 6 contour as one which would give better results, it being a compromise of straight-line face and M. C. B. face with other modifications over present M. C. B. contour.

Since the contour lines are so vastly important and the earnest desire of all is to arrive at the best contour possible, the chairman decided to give the American Steel Foundries No. 6 contour a try-out, hence the meeting at Cleveland was called to try out and test the various contours and decide upon one as our unanimous recommendation to the M. C. B. Association. The American Steel Foundries agreed to ship to the National Malleable Castings Company at Cleveland two couplers having the No. 6 contour and two couplers having present M. C. B. contour, all with recommended location of knuckle pivot pin.

The first day of the meeting two couplers with proposed straight-line contours and two couplers with present M. C.

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B contours were tried out in the machine, mating with themselves and with each other, and during the second day of the meeting two couplers having the American Steel Foundries No. 6 contour were tried out with themselves and with couplers having present M. C. B. contour, both for angling and coupling.

The trials were very closely observed and all points previously brought out and those appearing during the trials were freely and very generally discussed. The American Steel Foundries No. 6 contour gave the greatest range of horizontal angling and coupling, but was not considered satisfactory when compared with the straight lines for taking care of the buffing shocks, and R. E. Janney, representative of the American Steel Foundries, withdrew his No. 6 contour in favor of his No. 5, (Fig. 4), which does not take metal off face of present M. C. B. contour, though it embodies the other modifications for increased strength across knuckle hub and increased angling. It was agreed and proven by tests that with the contour departing from present M. C. B. by taking metal off coupler face, when coupling with present M. C. B. on straight track and the M. C. B. knuckle open, there will not be contact between nose of M. C. B. knuckle and face of mating coupler throughout the act of coupling, but will require momentum during the last ¼ inch (depending upon design) of locking of M. C. B. knuckle (this does not apply when the knuckle of the straight-line contour is open and the M. C. B. knuckle closed); also that contours with decline of coupler face reduced over present M. C. B. mating with its kind, will require this momentum in closing when couplers are angled.

In summing up the trials, each representative present voiced his views, and it was decided that the proposed straight-line contour and a contour not reducing incline of coupler face but embodying enlargement in diameter of knuckle hub and other slight changes over present M. C. B. contour as represented by the American Steel Foundries No. 5 contour, should be given a large and thorough trial in service, with the feeling that if the proposed straight-line contour couplers gave no general trouble in coupling it should be adopted, otherwise we should hold to a contour having incline of coupler face not reduced over present M. C. B. contour and make the best of it in buffing, even though it was not designed for sustaining the enormous shocks imposed in buffing in service.

STRENGTH OF COUPLERS.

The general investigation of coupler conditions and the result of tests—static, fatigue and coal—conducted by the committee, as well as the great number of couplers and parts requiring renewal, demonstrates beyond a doubt that the present coupler is inadequate in strength to meet the increased demands placed upon it, consequently considerably curtailing its life, which is aside from the desirability of reducing the number of designs to a minimum. The investigations and developments made during the past year have satisfied your committee that the required increase in strength can be accomplished, but the weight of the coupler will necessarily have to be increased from 30 to 40 per cent.

EXHIBIT OF COUPLERS.

Immediately back of Convention Hall, at the north side of the Pier, the committee has on exhibition various designs of couplers embodying the specifications jointly agreed upon between the coupler manufacturers and the committee, the manufacturers having designed the working parts according to their ideas to meet these specifications. It is now essential to select from these various general designs to be tried out in service during the coming year to definitely determine the best contour lines, efficiency of operation and strength of the various parts, with a view of harmonizing the designs and eliminating the details that prove unsatisfactory, to the end of establishing the standard coupler. The committee desires the members of the Association to make a critical examination of the couplers in this exhibit and give to the coupler committee the benefit of their criticisms and recommendations.

EXPERIMENTAL COUPLERS.

After the committee has selected the couplers to be placed in service to be tried out experimentally, and the service tests show that no serious defects exist, the members will be notified which couplers can be recommended for trial purposes, so that a general trial, in limited quantities, can be made by the railroads to ascertain their suitability for general service; this trial to be preferably conducted on locomotives. Until this announcement is made, the committee must earnestly request the railroad representatives not to apply any new or experimental types of couplers on freight cars which involve new designs unless the parts are interchangeable with present couplers in service, as by so doing it will forestall the work of the committee and, for various reasons, possibly prevent the Association from arriving at a successful issue of the one-standard coupler.

The report is signed by.—R. L. Kleine (P. R. R.), Chairman; G. W. Wildin (N. Y., N. H. & H.); F. W. Brazier (N. Y. C.); J. F. De Voy (C. M. & St. P.); F. H. Stark (Pittsburg Coal Co.); H. L. Trimyer (S. A. L.), and B. Julien (U. P.).

After reading the report Mr. R. L. Kleine said: The tests of the couplers are not of those couplers shown in the exhibit, but they were the early stages in the development of which these couplers are the refinement. Now, if you will refer to the report I will indicate a few of the important dimensions used throughout these tests. The important dimensions are the C dimension, from the mating face of the knuckle face of the coupler, and the H dimension, known as the gage dimension; and in the knuckle-stretch, the E dimension, which is from the nose of the knuckle to the lock of the knuckle.

Referring back you will find two curves, the present grouping and the earlier experimental. We had an average permanent set of .3 in.; and in the experimental set an average of .1, or a decrease of 61.8 per cent. In the ultimate average load of the present couplers, we have 301,000 lbs., and in the experimental couplers, 373,000 lbs. an increase of 42.6 per cent. The static guard-arm test, which is a new one, was developed because of the unsatisfactory state of the present face test from the standpoint of not giving uniform results, mainly due to variations between the minimum and maximum contour lines, allowing the block to seat higher or lower in the head, thus increasing or decreasing the wedging action. It consists of holding down the guard-arm and shank and pulling on the coupler lugs The average ultimate load is 295,000 lbs. for the present couplers and 333,000 lbs. for the experimental couplers.

DISCUSSION.

F. W. Brazier (N. Y. C.): Although a member of the coupler committee, I want to say that perhaps you do not realize the amount of work and the care and attention, as well as the expense that the Pennsylvania Railroad has gone to in connection with this report. I have not the least doubt that that company has spent over $30,000 and each member of the committee has had to substitute on the committee, and each of these persons have worked for a period of at least six months on the report. There are lers. Is it not time that we got down to a standard coupler? Mr. Kleine and Mr. Wallis of the Pennsylvania have been so energetic and consistent in this work that they are deserving of more than ordinary praise. Mr. Kleine has given his time and thought to it night and day. We must come down to one standard form of knuckle which will fit into any coupler.

J. F. DeVoy (C. M. & St. P.): While I do not care to discuss the report at all, as a member of the Coupler Committee, it appears to me that after the representatives of the railroads have gone through this report and seen the amount of work that has been done, they should at least give their moral support to one of the greatest works that has been done in this association. I do not want to claim any credit whatever; I do not know that I have ever seen a man who has so tenaciously stuck to a subject as the chairman of the Coupler Committee, Mr. Kleine. He has been ably assisted by Mr. Young and Mr. Wallis, who have given their thought and attention to the matter and furnished every appliance that could be given to facilitate the work of the committee. Nothing has been said in the report which is contrary to the interests of the manufacturers There has been nothing suggested in any way that the manufacturers cannot live up to. I believe every member of this association should go home, and insofar as he is able, get the support of his company in the purchase of a coupler which will conform to the recommendations of this committee.

J. J. Hennessey (C. M. & St. P.): I move that the recommendation that no railroad shall purchase or put into service any of these experimental couplers until they have received the final recommendations from the coupler committee, be carried out.

C. A. Schroyer (C. & N. W.): Does that mean experimental couplers which may be brought forward? Does it mean not to exclude the couplers we are now using, but to exclude experimental couplers that are not in line with what our committee is going to recommend?

R. L. Kline: The purpose of that suggestion is that we do not want at this time to place in service strengthened couplers which take other knuckles and other detailed parts, and thus increase the number of couplers we already have on the market; and furthermore, not to place any of these experimental couplers in service until the committee has had an opportunity to go over them and make an examination

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and investigation of them, and say to the members which one they should try.

Mr. Hennessey's motion was put to vote and carried.

President Fuller: We will be glad to hear from any of the coupler manufacturers, if they will confine their remarks to the mechanical features of the couplers and not refer to the name of the manufacturers.

F. F. Gaines (C. of Ga.): I would like to ask the chairman of the committee one question regarding the new contours proposed. The report does not remark very largely on the fact that if you are going to couple with the present M. C. B. knuckle, and the present M. C. B. knuckle has to be opened, you must depend on the impetus given it to close. Some of the present M. C. B. knuckles are gravity knuckles and have a spring in them. There are a lot of them in the country. It looks now as if we would get into trouble on that point.

R. L. Kleine: The committee absolutely taboos springs in couplers. There are some passenger couplers with spring locks, and in that case it would be a decided detriment to use the straight lines with a spring-lock arrangement, but the committee does not recommend a spring-lock arrangement. These contour lines, of course, will be for the new couplers, and also for the couplers we are now using. However, if the new coupler is adopted, it will be the standard, and you will not have to apply that contour line to the passenger car coupler, as we believe the passenger car coupler can be developed from the freight car coupler and possibly use the same lock and knuckle.

F. F. Gaines: I had no reference to passenger car couplers, but to freight car couplers. There are many which I do not believe will couple unless you have an impact all the way home. I do not want to decry the coupler at all, but I want to call attention to the one fact, because if we have to go in to close the knuckle by hand, we will be in the wrong place.

R. L. Kleine: We do not contemplate any closing by hand. We believe the ordinary coming together of the two couplers, with the slowest speed at which the cars can move the two cars, will close the coupler by impact, and after we have experimented with the coupler further, if we find that it does not, we will not recommend it to the association. For that reason we ask for a tryout, rather than suggesting it for recommended practice; and it can be tried out, irrespective of the adoption of a standard coupler, as the same coupler can be made with the two contour lines, that is, a coupler with the contour lines suggested in the report, and also with the present contour lines.

C. A. Schroyer (C. & N. W.): I have gone through that thing for so many years that I feel a little fearful in undertaking to interfere with our present contour lines. The contour line as adopted and used today was shaped in such a way as to obtain the closing of the knuckles without having any slack between the drawbacks or as little as foundry practice would permit. In this report they show that there is a large amount of slack existing in the cars in operation today. That is due to the bending of the guard-arm of the knuckle, the wearing of the wearing-faces of the knuckle, and the wearing face of the pin. In the new knuckle, it is proposed to do away with that slack; but it is proposed to give slack by other means. The right drawbar was used as a result of tests made at Burlington, where it was found there was a destructive shock and breaking in two of a train, which was a very dangerous thing. I am afraid of this today under the conditions we propose to adopt in the new coupler, which are practically the conditions which exist in the old coupler. I want to caution the committee to go carefully in the matter of changing the contour lines in any perceptible degree; the question of changing the lines to the extent of changing the bulging places is very important. We took out wedge lugs twenty years ago because we could not keep them in position. Many methods were tried to prevent it, but none were successful, and while you may have an anti-creeping device on these, they are not so positive in their action as to prevent it.

Col. Ralph W. Pope: The whole subject has been so admirably presented by the chairman of the committee, that we manufacturers have nothing to add; but we stand in the position of your servants, doing what we can to help the good work on.

Mr. Janney: I do not think there is anything we can add to the report. There is a great deal to be discussed which is not included in the report, but it is not material. We are all working as hard as we can and probably when the next convention comes around, we will have one coupler to submit.

R. L. Kleine: Mr. President, I move the recommendations for the changes in standard be submitted to letter ballot.

The motion was seconded and carried.

CAR WHEELS.

The committee submitted last year a proposed specification governing dimensions and tolerances for solid wrought-steel wheels for freight and passenger service, which specifications have been since adopted as recommended practice. As explained in last year's report, these specifications did not include rules governing the process of manufacturing the chemical and physical properties of the material, or analysis and tests. The determination of these questions has constituted the major part of the committee's work this year.

The specification has been revised to include all additions and changes and copy of the complete specifications are attached. It will be noted that no specification is given for physical test of steel wheels as the committee has been unable to determine a proper physical test for solid wrought-steel wheels. A number of experimental tests have been made but sufficient data have not been obtained to decide upon this question. The committee expects to continue its investigations on this subject and report to the next convention.

SPECIFICATIONS.

Specification for solid wrought carbon steel wheels for freight and passenger car service.

MANUFACTURE.

1a. *Process.*—The steel shall be made by the open-hearth process.

1b. *Discard.*—A sufficient discard shall be made from the top of each ingot from which the blanks are made, to insure freedom from injurious piping and undue segregation.

CHEMICAL PROPERTIES AND TESTS.

2a. *Chemical Composition.*—The steel shall conform to the following requirements as to chemical composition.

	ACID.		BASIC.	
Carbon	0.60 —0.80		0.65 —0.85	per cent.
Manganese	0.55 —0.80		0.55 —0.80	per cent.
Silicon	0.15 —0.35		0.10 —0.30	per cent.
Phosphorus	not over	0.05	not over	0.05 per cent.
Sulphur	not over	0.05	not over	0.05 per cent.

2b. *Ladle Analyses.*—To determine whether the material conforms to the requirements specified in Section II, an analysis shall be made by the manufacturer from a test ingot taken during the pouring of each melt. A copy of this analysis shall be given to the purchaser or his representative.

2c. *Check Analyses.*—A check analysis may be made by the purchaser from any one or more wheels representing each melt and this analysis shall conform to the requirements specified in Section II. A sample may be taken from any one point in the plate; not two samples may be taken, in which case they shall be on radii at right angles to each other. Samples shall not be taken in such a way as to impair the usefulness of the wheel. Drillings for analysis shall be taken by boring entirely through the sample parallel to the axis of the wheel; they shall be clean from scale, oil, and other foreign substances. All drillings from any one wheel shall be thoroughly mixed together.

2d. *Limits of Segregation.*—The segregation of either element of carbon, manganese, and phosphorous must not exceed 6 per cent of the ladle test of the same melt or any part forming the thickness of the plate and tread and rim of the wheel.

TOLERANCES.

3. Wheels should be furnished rough bored and with faced hubs and have a contour of tread and flange as rolled or machined according to recommended practice Sheet M. C. B. C. They should conform to dimensions specified within the following tolerances:

3a. *Height of Flange.*—The height of flanges should not be more than 1/8 in. over and must not be under that specified or 1 in.

3b. *Thickness of Flange.*—Thickness of flange shall not vary more than 1/8 in. over or under that specified.

3c. *Throat Radius.*—The radius of the throat shall not vary more than 1/8 in. over or under that specified.

3d. *Thickness of Rim.*—The thickness of rim to be measured between the limit of wear groove and the top of the tread at the point where it joins the fillet at throat of flange. The average thickness of service metal of all wheels in any shipment must not be less than 1 3/4 in. measured from the limit of wear groove to top tread. The thickness of rim should in no case be less than 1/4 in. under that specified.

3e. *Width of Rim.*—The width of rim shall not be more than 1/4 in. less nor more than 1/8 in. over that specified.

3f. *Thickness of Plate.*—The thickness of the plate of the wheel shall not be less than 3/4 in. at the point where the plate joins the fillet at the rim and not less than one in. at the point where the plate joins the fillet at the hub. Intermediate minimum thickness to be proportional.

3g. *Limit of Wear Groove.*—The limit of wear groove to

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be located as shown in Sheet M. C. B. *C.* recommended practice.

3h. *Diameter of Bore.*—The diameter of rough bore shall not vary more than 3/16 in. above or below that specified. When not specified the rough bore shall be ¼ in. less in diameter than the finished bore subject to the above limitations.

3i. *Hub Diameter.*—The hub diameter may be either 10 in. or 11 in. in diameter as specified with a maximum variation of ⅛ in. below. The thickness of the wall of the finished bored hub shall not vary more than ⅜ in. at any two points on the same wheel.

3j. *Hub Length.*—The length of hub shall not vary more than ⅛ in. over or under that specified.

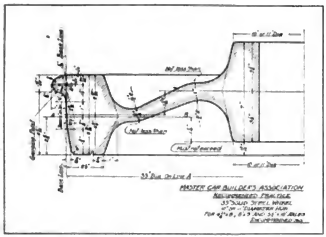

Fig. 1.—Recommended Practice for 33 in. Solid Steel Wheels For 5 1-2 in. x 10 in. Axles and Under.

(The 36 in. and 38 in. wheels have the same dimensions except for the diameter.)

3k. *Depression of Hub.*—The depression of the hub must be made so that the distance from the outside face of the hub to the line *AB* shall not exceed 1 11/16 in. for wheels used on 5½-in. axles and under and 1 1/16 in. for wheels used on 6 in. by 11 in. axles.

3l. *Black Spots in Hub.*—Black spots will be allowed within 2 in. of the face of the hub, but must not be of such depth

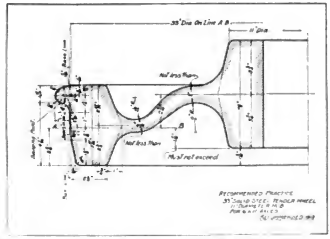

Fig. 2.—Recommended Practice for 33 in. Solid Steel Wheels for 6 in. x 11 in. Axles.

(The 36 in. and 38 in. wheels have the same dimensions except for the diameter.)

that they will not bore out and give clear metal at finished size of bore.

3m. *Eccentricity of Bore.*—The eccentricity between the tread at its center line and the rough bore shall not exceed 1/32 in.

3n. *Block Marks on Tread.*—The maximum height of block marks must not be greater than 1/64 in.

3o. *Rotundity.*—All wheels shall be gaged with a ring gage and the opening between the gage and tread at any one point shall not exceed 1/32 in.

3p. *Plane.*—Wheel shall be gaged with a ring gage placed concentric and perpendicular to the axis of the wheel. All points on the back of the rim equidistant from the center shall be within a variation of 1/16 in. from the plane, of the same gage when so placed.

3q. *Tape Sizes.*—Wheels shall not vary more than five tapes under nor nine tapes over the size called for.

3r. *Mating.*—The tape sizes shall be marked in plain figures on each wheel. Wheels must be mated to tape sizes and shipped in pairs.

3s. *Gage.*—Gages and tape used shall be M. C. B. Standard or Recommended Practice as follows: Wheel circumference measure, M. C. B. Standard, Sheet 16-A Maximum flange thickness gage, M. C. B. Standard, Sheet 16. Minimum flange thickness gage, M. C. B. Standard, Sheet 16. Rotundity gage, M. C. B. Recommended Practice, Sheet C. Plane Gage, M. C. B. Recommended Practice, Sheet C. Gage for measuring service metal, M. C. B. Recommended Practice, Sheet C-1.

BRANDING.

The name or brand of the manufacturer, date, and serial number shall be legibly stamped on each wheel in such a way

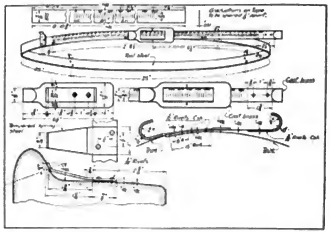

Fig. 3.—Circumference Gage for Steel and Steel Tired Wheels.

that the wheel may be readily identified. The tape size shall be legibly marked on each wheel. Sheet M. C. B. C-2.

FINISH.

5. The wheel shall be free from injurious defects, and shall have a workmanlike finish.

5a. Wheels shall not be offered for inspection if covered with paint, rust, or any other substance to such an extent as to hide defects.

INSPECTION.

6. Inspector representing the purchaser shall have free entry at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturers' work which concern the manufacturer of the material ordered.

6a. The manufacturer shall afford the inspector, free of cost, all reasonable facilities and necessary gages to satisfy him that the wheels are being furnished in accordance with these

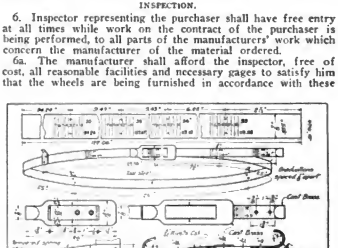

Fig. 4.—Circumference Gage for Cast Iron Wheels.

specifications. Tests and inspection at the place of manufacture shall be made prior to shipment, and free of cost to the purchaser.

6b. The purchaser may make the tests to govern the acceptance or rejection of material in his own laboratory or else-

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where as may be decided by the purchaser. Such tests, however, shall be made at the expense of the purchaser.

6c. All tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

6d. Wheels showing injurious defects while being finished by the purchaser shall be rejected, and manufacturer properly notified.

6e. Samples of rejected material must be preserved at the laboratory of the purchaser for one month from date of test report, in case of dissatisfaction with the results of the test, manufacturer may make claim for a re-hearing in that time.

On account of dimension of plates being added to the designs of steel wheels shown in 1912 report, it is recommended that new cuts be made to show the following wheels:—33 in.; 36 in., and 38 in. solid steel wheels for 5½ in. by 10 in. axles and under. (See Fig. 1). Thirty-three in., 36 in., and 38 in. solid steel wheels for 6 in. by 11 in. axles. (See Fig. 2).

The present M. C. B. circumference measure for cast-iron wheels has been found unsatisfactory for using with steel or steel-tired wheels, and a new circumferenee measure as used by most railroads and manufacturers, for taping steel wheels is recommended, as shown in Fig. 3.

It is also recommended that the present standard wheel circumference measure for cast-iron wheels, which has been found unsatisfactory, be discarded and a new design adopted, as shown in Fig. 4.

In last year's report the committee mentioned the question of establishing a maximum gross load for each design of wheel. This had particular reference to failures of cast-iron wheels used on heavy tare weight, such as refrigerator cars. The committee has given this matter further consideration and recommends that the titles of the chilled cast-iron wheels shown on M. C. B. Sheets N, O, and P, be changed as follows:

M. C. B. Sheet N, title to be changed from "M. C. B. Recommended Practice for Cast-iron Wheels for 60,000-pound Cars" to "M. C. B. Association Recommended Practice for 33-inch Cast-iron Wheels for Cars of Maximum Gross Weight, Not to Exceed 112,000 Pounds."

M. C. B. Sheet O, title to be changed from "M. C. B. Recommended Practice for Cast-iron Wheels for 80,000-pound Cars" to "M. C. B. Recommended Practice for 33-inch Cast-iron Wheels for Cars of Maximum Gross Weight, Not to Exceed 132,000 Pounds."

M. C. B. Sheet P, title to be changed from "M. C. B. Recommended Practice for Cast-iron Wheels for 100,000-pound Cars" to "M. C. B. Recommended Practice for 33-inch Cast-iron Wheels for Cars of Maximum Gross weight, Not to Exceed 161,000 Pounds."

The chairman of the committee has received a letter from G. W. Lyndon, secretary of the Association of Chilled Car Wheel Manufacturers, dated January 31, in regard to the question of guarantees of cast-iron wheels. A copy of letter is attached as an appendix to this report.

The report is signed by—Wm. Garstang (C. C. C. & St. L.), chairman; W. C. A. Henry (Penna.); A. E. Manchester (C. M. & St. P.); R. W. Burnett (C. P.); R. L. Ettenger (So. Ry.); J. A. Pilcher (N. & W.), and O. C. Cromwell (B. & O.).

APPENDIX.

January 31, 1913.

William Garstang, Chairman, Master Car Builders' Standing Committee on Car Wheels, Indianapolis, Indiana.

DEAR SIR.—Our association has been endeavoring to uniformize the guarantee on car wheels with particular reference to the relative guarantee to be carried for wheels serving under cars of 30, 40 and 50-ton capacities. The increases in the loads carried by cars which have been put in service in the last twenty years present new conditions of guarantee, and the relative guarantees have never been figured on a scientific basis.

The six-year guarantee under 30-ton cars for 625-lb. wheels has been found satisfactory to maker and user, and this is because the wheel carries relatively a small load per pound of its own weight. When the cars are increased from 30 to 50-tons capacity, or 66⅔ per cent., the conditions of service are 625 to 725 lbs., or 16 per cent., the conditions of service are materially changed, because the tread or running surface of the three classes of wheels, which are your standards, are identically the same, and we contend that it is manifestly unfair to exact the same guarantee for each wheel, particularly by reason of the fact that the cars run relatively the same distance per year, but the tonnage carried by a 50-ton car exceeds that of a 30-ton car by 66⅔ per cent.

One or two railroads have insisted that the wheels under the three classes of cars should carry the same guarantee of six years.

I am attaching you herewith, a statement which will show that a guarantee of 6 years for 30-ton cars, 5 years for 40-ton cars and 4 years for 50-ton cars is a reasonable adjustment of the guarantee question on all classes of wheels. It really figures out 4½ years for 40-ton cars and 3½ years for 50-ton cars.

All we are trying to arrive at is a uniform basis by which we can present this matter to the railroads and arrive at a mutual understanding, and what we are striving for is a fair and reasonable basis of guarantee for the chilled iron car wheel.

I would be very much obliged if you would give me your answer at your earliest convenience.

Weight of car.	Weight of load.	Total weight	Average mile-age per year.	Ton Miles.
30-ton car ..15 tons	30 tons	45 tons	8000	360,000
40-ton car ..20 tons	40 tons	60 tons	8000	480,000
50-ton car ..25 tons	50 tons	75 tons	8000	600,000

30-ton car, 360,000 ton miles, 6 years — 2,160,000 ton miles guarantee.
40-ton car, 480,000 ton miles, 4½ years — 2,160,000 ton miles guarantee.
50-ton car, 600,000 ton miles, 3⅗ years — 2,160,000 ton miles guarantee.

We ask for guarantee:
6 years — 625-pound wheel.
5 years — 675-pound wheel.
4 years — 725-pound wheel.

Yours truly,
Association of Manufacturers of Chilled Car Wheels,
By G. W. Lyndon, Special Secretary.

William Garstang (C. C. C. & St. L.) after reading the report said: I would like to mention that Mr. Dudley, consulting engineer on rails, and wheels and structural materials for the New York Central Lines, in his research for defects in rails, has come to the conclusion that our present contour of the wheel is not a correct one; that the one and twenty contour throws the greater part of the load on the inside of the rail, and on account of this, that the rails are wearing much more rapidly than he thinks they would if we went back to our old contour of one in thirty-eight. In view of the fact that this matter has been brought before the wheel committee, I wish the association would consider that feature while considering the balance of the report.

DISCUSSION.

J. R. Onderdonk (B. & O.): Regarding "Limits of Segregation," the report states that the segregation of either element of carbon, manganese, and phosphorus must not exceed 6 per cent. of the bladle test. I would like to see steel as good as that made by the manufacturers, but I am afraid if we had a 6 per cent. variation, it would be difficult to live up to it. Take the element of phosphorus ,and you have .043; six per cent. of that, would be .0026, with a variation of only 3 per cent. in phosphorus, the probability is that the chemist would not come any closer than that. I would also like to ask, in selecting the elements of carbon manganese and phosphorus, why the element of sulphur was left out?

C. D. Young (C. C. C. & St. L.): The sulphur should have been included in connection with phosphorus. In regard to the .06, it was considered that a limit of segregation of .06 per cent. would be a good thing. It is included in some of the railroads' specifications to-day, although the manufacturers will probably claim that they cannot make a good rail as low as that, but it is a thing we desire to get at.

C. D. Young (Penna.): I question the advisability of putting in a limit on segregation at the present time in our rolled steel wheel specifications. There are two reasons; in the first place, I am quite confident that the limit of .06 per cent. is too close for sulphur and phosphorus, with the present methods of determining commercially, phosphorus and sulphur in the laboratory. Sometimes the error in chemistry would be almost .06 per cent., and that would stand then as a rejection on a lot of wheels. There is another reason from the inspection standpoint, which makes it difficult. At the present time we are accepting our wheels on a .05 phosphorus and sulphur rejection, and we simply say that if the sulphur and phosphorus comes within that rejection limit, the wheels are acceptable and we do not carry the analyses any further. If it is within the limits, the material is accepted. We have been getting very satisfactory results from our wheels. A recommendation of this kind will require the railroads to have their chemistry carried on accurately in order to find whether the melt as determined by the manufacturer agrees with the railroad company's chemistry.

The practice in most of the mills, in getting chemical analyses, is to take the shortest methods possible, and I believe there will be a good deal of confusion in the checking of the heat analysis with the analysis from the botings of the wheels. I would like to make a motion that a recommendation No. 1 be submitted to the association for letter ballot as recommended practice, as printed, leaving out these limits for segregation. I believe we should have some data from people who have had this entire specification in use, showing that they have gotten better service from it than those who have not had it in their specification, before we make it an M. C. B. requirement.

William Garstang: In order that we might vote on the report as a whole, would it not be well for someone who has had considerable experience in this matter to suggest

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what would be a reasonable limit to be used in place of .00 per cent?

J. R. Onderdonk: I do not think that is a good way to get the segregation. The segregation which gives trouble in the wheel is the variation in the wheel itself, and not a variation of one part of the wheel with another, within small limits. If we put a limit of 10 per cent. on it I do not believe that we would arrive at what we are trying to accomplish. If we want to ascertain the segregation, the better way, I should judge, would be to make an analysis of two different parts of the same wheel, and then put in a limit of possibly 10 per cent. I think we shall have to go as high as that.

C. A. Brandt: Referring to the specifications, the limits of carbon are .06 to .08 per cent.; and of course the ideal method is to limit the variation of carbon to .06 to .08 in the same wheel. I think possibly a good many wheels are manufactured where the carbon might vary to that extent and yet the wheel be desirable; .06 per cent. is pretty close to what is desirable, and one of the important railroads in this country has that clause in its specifications now.

George L. Fowler: I think the suggestion to make the point of segregation two points in three might be very well, if you could pick out those two points, because in a wheel that was made from a slab that was rolled lengthwise of the ingot the line of segregation would be quite different from the segregation of a wheel that was made from a slab cut across the ingot; so I do not see how it would be possible to put in any kind of a specification a rule for picking out the place where the analysis should be made in order to determine the average segregation.

D. F. Crawford (Penna.): In seconding Mr. Young's motion, I had in mind the practical application of this particular point. I happened to know of some rails that gave rather excellent service, and they were examined chemically and very carefully, and it was found that they were quite badly segregated. I do not feel at this time we should put in a limit of segregation until we find out what effect it will have on the service results of the wheels.

President Fuller: The motion before the house is that recommendation No. 1 be approved and submitted to letter ballot, eliminating the limit of segregation.

The motion was put to vote and carried.

E. W. Pratt (C. & N. W.): I move that the balance of the recommendations be approved and submitted to letter ballot.

The motion was seconded and carried.

William Garstang: Before the report on the wheel question, there is a point in connection with the chilled cast-iron wheels which is not touched on in the committee's report, and that is a thickness of the flange of greater dimensions than that described to this association. The wheel manufacturers have asked repeatedly to be allowed to increase the thickness of the flange ⅛ in., an increase of ⅛ in. of metal back of the flange and below the tread line, or between the tread line and the centre of the wheel; but the committee has not considered this request seriously, from the fact that such an increase would interfere with the road conditions in regard to clearances, frogs, switches and crossings.

There are samples of the thick-flanged wheel to which I refer, on exhibition on the pier, and as nearly as I can learn there are several thousand of these wheels in service today. I have been written to on two or three occasions asking what we would recommend be done with such wheels when they are offered in interchange? Personally I think the wheel can be run with safety; in fact, I know it is run with safety. We feel that with the additional ⅛ in. added to the flanges of these wheels we would have a cast-iron wheel of sufficient strength to stand under the heaviest cars contemplated at the present time, and in view of the fact that there are a large number of these wheels in service, I would suggest that the question of opening up the clearances in frogs and crossings and guard-rails be taken up by this association, either through its executive committee or a committee appointed especially for that purpose, with the American Railway Association, with a view of having that association appoint a committee to work with this association, to see whether or not we can get the clearances increased.

I believe that with ⅛ in. more clearance in our frogs and switches, the manufacturers of chilled cast-iron wheels can produce a wheel that is perfectly safe and one which will yield more economical service than any wheel we have on the market; and I would recommend that the matter be taken up by this association with the American Railway Association with regard to getting increased clearances in the frogs and crossings. I mean that as a motion.

The motion was seconded and carried.

President Fuller: Mr. Garstang, you spoke of one other subject, the taper, which I overlooked. Will you bring that up now?

William Garstang: I thought it would be well for the members to consider that feature in discussing that paper. I have taken it up with the Wheel committee, and the committee as a whole did not think that we should change the contour. I have explained to you just what has been discovered by Dr. Dudley, and it is for this association to instruct the committee on that point.

D. R. MacBain (L. S. & M. S.): I believe it would be well for the association to consider this matter of changing the contour from one in 20 to one in 38 very seriously before any decided action is taken. About fifteen months ago, as we were coming out of the winter of 1912, during which time we had a great deal of trouble with shelled-out wheels, and various other ailments of wheels, we made a radical step on the Lake Shore. We took two big club cars and went from the standard cone of 1 in 20 to a cylindrical tread, with a view of getting a more uniform or wider bearing on the top of the rail, and thought we would improve conditions that way. We ran the cars about four months, and during the time they were running, we probably changed all the wheels on the cars, and some of them were probably changed two or three times. It is due to flangeway. It is a question if you can take on more flange area, which you will do if you increase the taper, and stand for the additional wear which the present contour gives on the rail.

A. E. Manchester (C. M. & St. P.): We manufactured several thousand wheels which were straight, and we felt that we were getting the proper results in relation to flange way. When we did go, finally, to the coning, while we did it not to be odd, and not to be doing something different from anybody else, we did not do it for the purpose of improving the wheel as we did not feel that way at the time and do not feel so to-day.

A. R. Ayers (N. Y. C. Lines): This question might be illustrated by a report which Dr. Dudley compiled. A few years ago, before the new contour was adopted, they had in service on the Boston and Albany some wide, flat-topped 95 lb. rails. These rails carried about 350 million tons before they were worn out, and the wear was noticeably flat across the top of the tread. After the one in 20 contour was adopted, there was put into service in some parts of the New York Central & Hudson River some 100 lb. rails which only carried from 24 million to 32 million tons, practically one-third of what the other rails carried, and the wear on such rails was noticeably deeper. In my opinion, the one in 38 taper will flatten until it has the proper area for carrying its load with much less actual flattening of the wheel or distortion of the metal than the one in 20, for the reason that in the one in 20, most of the flattening is one way towards the throat, and the taper is such that that portion of the tread outside of the axial theoretical line of contact does not come in contact with the rail to nearly such an extent as if we used the one in 38 taper.

When heavy wheel loads are used, the question is different from what it is with lighter wheel loads, because the wheel must flatten, as your finger flattens if you press it out on the table. If the loads are very heavy, the flattening is greater than with light wheel loads, and while I do not think that Dr. Dudley was at all hopeful that any definite action could be taken at this time, he wanted to have the matter presented before the convention in its full importance. As Mr. MacBain says, it is largely a question of how much rail expense we are willing to put up with in order to save wheel expense, but the difference in wear with the two treads was so noticeable that it is worthy of a great deal of consideration.

William Garstang: I think there is something besides how much rail wear and how much wheel wear we can stand. I think the contour of the wheel does its best service in starting the wheel running right. It is a question whether a contour of one in 20 or one in 38 will do it best.

J. A. Pilcher (N. & W.): We recently had some wheels put under test with varying tapers, and after the first wear the examination seemed to indicate that they had all reached very nearly the same shape. Of course, the wheel that is nearest to the cylindrical form will probably reach that shape earlier than the others, but they quickly come to the shape of the rail. While in the transitory period they are bound to have an influence on the rail in localizing the load on one side, but the indications are that they quickly conform themselves to the shape of the rail where the taper is not too excessive.

President Fuller: Could not your committee take this subject up during the coming year and give it a little more attention before the next convention?

William Garstang: There is no reason why it should not be done. The committee is a standing committee and our object in bringing this matter before the association was that perhaps some of the members might have had similar experiences with Dr. Dudley and we might get something from them.

A. W. Gibbs (Penna.): The inception of this one in 20

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taper should not be lost sight of. Up to about 1904, the one in 38 taper was the general one, and the breakage of flanges from seams was advancing in leaps and bounds; it scared us very much. The contour in England and on the continent was 1 to 20. Comment was made by many foreigners coming over here as to the great increase in the side wear of rails, which was one-third greater as compared with their own. The study we made indicated that the formation of the seams was due to excessive loads at certain points. The wheels which were cylindrical or nearly so usually ran with one flange against the rail and the other away from it. The idea of introducing the tapered contour was that the wheels should oscillate, as Mr. MacBain stated, and spread the wear over the whole contour. The results obtained, which were shown by the monthly and annual records of wheel failures, indicated that we did accomplish the result, to a large extent, of preventing flange breakages. It was not only to reduce the flange wear, but to reduce the failure from seamy flanges. I think it has done it, and I believe the wrecks and damages from broken flanges will far outweigh any other consideration, and those we have eliminated, to a considerable extent.

O. C. Cromwell (B. & O.): The remarks of Mr. Gibbs simply bear out the experiences we have had. At one time we operated a large number of wheels of the M. C. B. contour tread and the failure of flanges became very pronounced, and we went to a full coned taper of the tread with a very beneficial result.

D. R. MacBain: I move that the Association instruct the Standing Committee on Car Wheels to investigate the subject further and report at the next convention and find out what the different railroads think about the matter.

The motion was seconded and carried.

AFTERNOON SESSION.

Vice-president M. K. Barnum called the meeting to order at 3.05 P. M. in the afternoon session, June 16.

REVISION OF THE RULES OF INTERCHANGE.

Arbitration Cases 881 to 917 have been decided and distributed to the members during the year and are herewith submitted as a part of this report for approval.

RULES OF INTERCHANGE.

At the suggestion of the Arbitration Committee, a committee from each of the railway clubs was appointed to consider jointly the proposed changes. A meeting of this joint committee was held in Chicago on April 14, at which meeting representatives from the New England, Central, Pittsburgh, Canadian, Western, St. Louis and Southern and Southwestern Railway Clubs were present.

At the request of several members of the Association, representing cars of private ownership, a hearing was given by the committee on May 6, 1913, at which representatives of the following companies were present: Armour Car Lines, Morris & Co. Refrigerator Line, Swift Refrigerator Transportation Co., Cold Blast Transportation Co., Street's Western Stable Car Line, Mather Stock Car Co., Western Live Stock Express, Missouri River Despatch.

Rule 1.—F. C. Schultz, chief interchange inspector, Chicago, and Chief Interchange Inspectors' Association suggest change:

"Each railway company must give to foreign cars while on its line the same care as to inspection, oiling, packing, adjusting brakes and repairs that it gives to its own cars."

The Joint Club Committee concurs in the first suggestion, with the exception that the word "running" precede the word repairs. The Arbitration Committee also approves.

Rule 2.—The committee would recommend that the second paragraph be changed to read as follows:

"Empty cars offered in interchange must be accepted if in safe and serviceable condition, the receiving road to be the judge. Owners must receive their own cars when offered home for repairs at any point on their lines, subject to the provisions of these rules."

The committee recommends Section (b) of Rule 2 be changed to read as follows:

"Cars loaded with explosives shall be handled in accordance with the regulations of the I. C. C.

"Leaking tank cars containing inflammable liquid must be repaired or transferred without any unnecessary movement, or at nearest available point, with least possible risk.

"Tank cars (empty or loaded) shall be rejected if the safety valve is not stenciled to show it adjusted, etc., within the time limit required by paragraphs 5, 6 and 7 of the M. C. B. specifications for tank cars."

The committee suggests that section *C* read as follows:

"Cars improperly loaded, when not complying with the Rules for Loading Material, or when transfer or rearrangement of lading is necessary."

Rule 5.—W. H. Lewis suggests changing the word "shall" to "must" and "should" to "must." The committee approves.

Rule 7.—The Western Railway Club Car Foremen's Association, Chicago, and Chief Interchange Inspectors' Association suggest change as follows:

"When repairs of any kind are made to foreign cars a billing repair card must be made out. This card must specify fully the repairs made and reason for same, the date and place where made and name of road making repairs; also show location of parts repaired or renewed, as per Rule 14.

"If no bill is to be rendered the billing repair card must be attached to the monthly bill, with the words "No bill" written across the face of the card."

The Joint Club Committee does not approve. The Arbitration Committee approves recommendations with the modification that the word "billing" shall precede word "repair" in the first line.

Rule 8.—The committee would recommend that Rule 8 be changed to read as follows:

"The billing repair card shall be made in duplicate, the original to be known as billing repair card and the duplicate to be known as record repair card, and to be on forms shown

J. J. HENNESSEY,
Chairman, Committee on Arbitration.

on pages 103 and 104, the items of repairs to be in handwriting."

Rule 9.—The committee recommends that the rule be changed to read as follows:

M. C. B. Couplers, or Parts Thereof, R and R:
New or secondhand.
Size of shank.
(Where 12¼-in. head coupler is applied or removed it must be so stated.)
Yoke, stem or key attachment.
Wheels and Axles, R and R:
Cast-iron, cast-steel, rolled or forged-steel or steel-tired wheels.
New or secondhand.
Cause of removal (see Rule 10).
Journal Bearings:
Solid, filled, or other kind, R and R.
Length of journal.
Box number (see Rule 14).
Metal Brake Beams or Parts Thereof, R and R:
Make or name of beam.
New or secondhand.
Complete, or part or parts.
Cause of renewal.
Part or parts scrapped.
Brake Shoes Applied:
Cast or reinforced back.
Triple Valve, R and R:
Make and type.
(Need not be shown when cleaned only.)

Rule 10.—The committee recommends that after word "groove"

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add "or preferably by gage shown on M. C. B. Sheet *C1* of the Recommended Practice."

Rule 12.—The committee recommends changing the rule to read as follows:

"Joint evidence card showing copy of billing repair card, covering wrong repairs, when wrong repairs have been corrected, shall be sent to the company issuing such billing repair card, and it shall issue M. C. B. defect card."

Rule 14.—The committee recommends eliminating from this rule any reference to repair card to conform to action on previous rules. In connection with the recommendation to permit the use of a cardholder, the committee believes that eventually a cardholder will be developed which will satisfactorily answer all purposes, but such cardholder should be a standard of the Association, and the property of the Association for the sake of uniformity. The committee does not agree to the introduction of a diagram for locating defects, as it does not feel that the accurate location and extra work entailed therewith is justified.

Rule 15.—The committee recommends that words "repair card" be changed to read "billing repair card."

Rule 17.—F. C. Schultz, C. I. L., suggests that a pamphlet be issued by the Committee on Standards showing brake beams which meet the M. C. B. requirements.

The Pittsburgh Railway Club suggests adding after the fifth paragraph the following: "Cars built after September 1, 1913, not equipped with either No. 1 or No. 2 brake beams will not be accepted in interchange."

The committee concurs in the suggestion of Mr. Schultz that a pamphlet be issued by the Committee on Standards showing brake beams which meet the M. C. B. requirements, these brake beams to be used on all new cars built after September 1, 1914. The recommendation of the Pittsburgh Railway Club is approved, except that the committee would recommend that the date be changed from September 1, 1913, to September 1, 1914.

Rule 20.—Twin City Club; J. E. Keegan; Central Railway Club; Pittsburgh Railway Club, and Western Railway Club suggest in first paragraph, last portion, eliminate the words:

"Any company finding cars not within the limits of standard height for couplers may repair and charge the owners."

The committee concurs in these recommendations.

Rule 21.—F. C. Shultz, C. I. L.; Car Foremen's Association; Chief Interchange Inspectors' Association, and Western Railway Club suggest adding to rule:

"When repairs are chargeable to car owners."

The committee approves the suggestion, but would recommend that the wording be changed to read, "when owners are responsible for the defective condition of the roof."

Rule 28.—J. E. Keegan, S. M. P., G. R. & I. Ry.; Pittsburgh Railway Club, and Central Railway Club suggest: Change last two lines to read:

"Not stenciled showing the capacity or maximum weight, or limit weight 1 or limit weight II."

The committee recommends that the suggestion be adopted.

Rule 29.—The committee recommends amending this rule by striking out the words following "applied" as follows: "under conditions which make them chargeable to the owners"; also to amend that portion of rule reading "diameter of journal must be ¼ in. greater" to "diameter of the journal must be at least ⅛ in. greater," in order to prevent, under any conditions, the application of axles which may be practically worn to the limit.

Rule 32.—The committee suggests that the rule be made vacant, because a car with missing coupler can not be offered in interchange. The charge which may be made for missing coupler, etc., is provided for in Rule 95.

Rule 36.—Canadian Railway Club: New rule, under delivering companies' duties:

"No car to be accepted in interchange with journal bearings other than M. C. B., standard on cars built after September 1, 1914."

The committee approves of this suggestion.

The committee also recommends a new rule as follows:

After September 1, 1915, cars not having stenciled on them the date when built new, will not be accepted in interchange.

The committee at the request of the General Managers' Association would recommend a new rule as follows:

After September 1, 1914, no car carrying products which require for its refrigeration the use of ice and salt will be accepted in interchange unless equipped with suitable device for retaining the brine between icing stations.

Rule 37 to 42, incl.—In regard to various recommendations made to eliminate the combinations under Rules 37 to 42, inclusive, the committee feels that this change would be too radical to be justified at the present time.

It however, recommends the elimination entirely of Rule 38, because there are very few cases in which the damaged pocket is a factor, except when due to local weak design or inferior material. Similarly, the reference to the pocket in Rule 39 should be omitted. The committee also suggests the omission of the reference to the coupler attachment in the second note at bottom of page 30, following Rule 42.

Rule 43.—The committee suggests the following change:

Owner's Responsibility { "Any damage to the underframe of all-steel or steel underframe cars, unless such damage occurred in wreck, derailment, cornering or side-wiping, and except unconcealed fire damage."

Rule 44.—The committee recommends that Rule 44 be made vacant for the reason that under Rule 2 such cars should be rejected in interchange.

Rule 49.—The committee recommends the omission of reference to repair card and the addition of joint evidence cards in this rule.

Rule 50.—W. H. Lewis suggests that this rule be eliminated, as it is covered by Rule 20. The committee approves the suggestion.

Rule 51.—W. H. Lewis suggests that this be eliminated, as rule 18 covers it.

The committee suggests that the rule be made vacant.

Rule 52.—The committee suggests changing the first paragraph to read:

"Rimming boards in bad order or insecurely fastened. Bolts, rivets or screws be used on parts required.

Also, change third paragraph to read:

"Handholds or grabirons must be of wrought iron or steel. In applying on repairs they must be secured by bolts or rivets.

Rule 54.—The committee suggests that the last line of this rule read: "Also quick-action triple valve, pressure-retaining valve and an efficient hand brake."

Rule 55.—The committee recommends that this rule be eliminated, for the reasons given under Rule 33.

Rule 56.—J. E. Keegan, S. M. P., G. R. & I. Ry.; Central Railway Club, and Western Railway Club suggest substituting Rule 66 in order to place it in its proper place.

The committee approves the suggestion, namely, placing the rule under Rule 56, now vacant, thus putting the rule in its proper place.

Rule 57.—The committee suggests that this rule be changed to Rule 58, and be changed to read as follows:

Delivering Company Responsible { RULE 58. Missing air-brake hose; missing or damaged cylinders, reservoirs, triple valves, angle cocks, cut-out cocks, brake pipe strainers or dirt collectors, pressure-retaining valves, release valves, pipe, pipe fittings, or any parts of these items, except as specified in Rule 59.

Rule 58.—The committee recommends that Rule 58 be changed to Rule 57 and that the first note following the rule be omitted.

The committee recommends that second note following present Rule 58 be amended as follows:

The committee on air-brake hose specifications will submit to the association recommendations for new air-brake hose label, and if the association adopts this label the arbitration committee recommends that after September 1, 1914, no new hose should be purchased or applied unless it bears the revised label, it being understood that the adoption of this recommendation will not penalize any hose now in service or in stock at this time.

Rule 59.—The committee would suggest a revision of this rule as follows:

Owners Responsible { RULE 59. Air hose burst, torn or worn out; air hose labels illegible or missing from wear; air-hose couplings that become defective in fair usage; release valve rods defective or missing; leaky pipe or pipe fittings account rust or seams; broken pipe or pipe fittings account insecure fastenings; defective interior parts of cylinder or triple valve; failure or loss under fair usage of other parts of brakes.

Rule 62.—The committee recommends the elimination of the words "and so labeled" and to allow the balance of the rule to remain as it is.

Rule 65.—The committee recommends change in Rule 65 as follows:

"Journal bearings (regardless of previous condition) and journal-box bolts which require renewal, when delivering company is responsible for change in wheels and axles."

Rule 65.—The committee recommends changing this rule as follows:

"Cast sliding, cast-iron or cast-steel wheels, if spot is 2½ in. or over in length, or if there are two or more adjoining spots, each 2 in. or over in length, the same responsibility to apply to mate wheel, regardless of length of slid spot."

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Rule 86.—The Pittsburgh Railway Club suggests adding the 6 in. by 11 in. axle to this rule:

Capacity.	Journal.	Wheel Seat.	Center.
"FOR CARS MARKED WITH CAPACITY:			
140,000	5½	7½	6¼
FOR CARS MARKED MAXIMUM WEIGHT:			
210,000	5½	7½	6¼
FOR TANK CARS MARKED LIMIT WEIGHT I.			
210,000	5½	7½	6¼
FOR TANK CARS MARKED LIMIT WEIGHT II.			
210,000	5½	7½	6¼

This is approved by the committee.

Rule 89.—The committee recommends the elimination of Rule 89, for the reason that amended Rule 13 covers this rule.

Rule 90.—The committee recommends the elimination of the first paragraph of Rule 90, as it is already provided for in Rule 13, and would also recommend eliminating the third paragraph of Rule 90 on account of the abolition of the repair card.

Rule 93.—The committee on conference with the association of american railway accounting officers suggests changing rule to read:

"Separate bills must be rendered for cars destroyed. All charges for repairs made to cars account of owner's defects, defect cards and rebuttal authorities must be consolidated against any one company into one bill.

"Separate statements to be made:

"1. For owner's defects for each calendar month.

"2. For all charges based on defect cards, including rebuttal charges.

"NOTE.—Totals only of these statements to be shown on the recapitulation."

The committee recommends that present Rule 93 be abrogated, and recommends in its place that new Rule 93, as proposed by the joint committee from the M. C. B. Association and the Association of American Railway Accounting Officers, be adopted.

Rule 95.—The committee recommends the restoration of the third paragraph of this rule shown on page 56 reading:

"Brake levers, lever guides, top and bottom brake rods, whether or not they are lost with the brake beam" to comply with changes made in previous rules and because it is only consistent to feel that if the brake beam when lost is in good condition, the further details as stated above should also be in good condition.

Rule 99.—The committee recommends that this rule read as follows, in order to make it plainer and to conform to Rule 86:

"If car owner elects on account of improper repairs to remove M. C. B. standard axles suitable to the marking of the car, he shall make charge for secondhand axles, and allow credit for secondhand axles if they are in good order. If M. C. B. standard axles unsuitable to the marking of the car are removed, they should be credited as scrap regardless of their condition. Axles removed below the journal limits for cars marked capacity, limit weight or maximum weight, as per Rule 86, should be credited as scrap when removed."

Rule 104.—The committee recommends changing Rule 104 to read as follows:

"Secondhand M. C. B. coupler or parts, or secondhand metal brake beam, may be used in repairs, but must be charged at 75 per cent. of value new.

"Secondhand M. C. B. coupler or parts removed, must be credited at 75 per cent. of value new. Credits shall be confined to the body, lock, knuckle and knuckle pin, whether secondhand or scrap.

"Secondhand parts of metal brake beams removed must be credited at 50 per cent. of value new.

"In applying new M. C. B. coupler or new metal brake beam it shall be so charged, whether or not it be of same make as that removed."

Rule 105.—The committee suggests the elimination of revised Rule 106 as shown on Circular No. 8 giving result of letter ballot on changes in the rules and restoration of old Rule 106. (See page 66 of the 1912 code) reading as follows:

"No percentage to be added to either labor or material."

Rule 111.—The committee recommends the following change at the bottom of page 86 and top of page 87:

The following basic units must not be used in rendering bills in the foregoing schedule but may only be used in determining cost of other combinations of air-brake repairs not mentioned, for the reason that the present wording is misunderstood.

Rule 112.—The committee recommends rewording this rule, as follows:

"The company on whose line the bodies or trucks are destroyed shall report the fact to the owner immediately after their destruction, and shall have the option of rebuilding or setting for the same."

Rule 115.—The committee approves the recommendation eliminating word "axles" in the second paragraph and concurs in the recommendation changing word "designate" to "nearest," for the reason that such change is in accordance with conference ruling No. 224 of the Interstate Commerce Commission.

The committee suggests changing the last paragraph to read:

The underframe of damaged steel and steel underframe cars, when intact and in serviceable condition, may be forwarded to the owner on defect card, in which case it must be accepted by the owner.

Rule 120.—The committee recommends that wording of the first paragraph of this rule be changed to read as follows:

"A car unsafe to load account of general worn-out condition due to age, decay or corrosion, shall be jointly inspected by the handling line and a representative of owner or a disinterested line whichever can be most conveniently obtained by handling line. If inspectors agree that home route cards are justifiable, joint inspection statement shall be sent to owner, showing in detail all defects found on car, also an estimate of cost of temporary or partial repairs necessary to make car safe to move. Upon receipt of this information, owner shall either furnish two home route cards or authorize destruction of car. When issuing home route cards, car shall be short-routed per Car Service Rule 3, paragraph (f), at owners' expense, and owner shall be responsible for necessary repairs to make car safe to move. If owner elects to have car destroyed, the handling line shall allow credit for all material at M. C. B. scrap prices, less labor cost of destruction.

"The joint inspection and home route cards will apply in cases of direct or indirect connection except where car is already at junction point with car owner's line, in which case owner must accept car per Rule 2."

Rule 121.—The committee recommends that rule 119 be consolidated with Rule 121, and that the consolidated rule read as follows:

"When the body or trucks of a foreign car are destroyed in wreck or accident, the owner shall, upon request, furnish statement of depreciated value of body and trucks separately.

"If the car is not destroyed, and the owner elects upon request, to furnish home route cards for its movement it shall be short-routed as per Car Service Rule 3, paragraph (f) to point designated by owner, at the expense of the company on whose line the car was damaged. A joint inspection should be made at said designated point, and settlement made on the basis of the M. C. B. rules."

Rule 131.—The committee suggests that the new rules go into effect October 1, 1913, for the reason that under the operation of the rules from January 1, only about three months' experience would be had with them prior to having recommendations made for changes in the rules.

PASSENGER CAR RULES.

Appendix—Rule 3.—The committee recommends that icing and lubrication be stricken from the items forming line expenses, for the reason that each line interested should be individually responsible for lubrication and icing while the car is on its line. Terminal cleaning is accepted because cleaning of this character is only done at the point where the car starts.

Appendix—Rule 6.—The committee suggests changing rule to read:

"Each operating line at interest may charge one journal bearing only per journal per trip. The following information must be specified on billing repair card or on the bill itself:

"Whether solid, filled, or any other kind, removed and replaced.

"Length of journal.

"Box number."

Appendix—Rule 12.—The committee on train lighting suggests that the following instructions covering repairs to electric-lighting equipment on passenger cars be added to Rule 12, page 129:

"For repairs to electric-lighting equipment on cars in interchange or leased cars, the instructions issued by the manufacturer of the apparatus should be strictly adhered to. In the absence of any agreement, the material furnished and applied must be of the manufacturer's make."

The committee approves the above suggestion.

The report is signed by:—Jos. W. Taylor, *Secretary.*

Chairman Barnum: This special session is called to take the place of the conference that has hitherto been held in the Marlborough-Blenheim Hotel on the afternoon or evening of the first day, to canvass the Arbitration committee's report prior to its presentation by that committee at the regular session of the second day. This action is in accordance with a suggestion made last year for the purpose of obtaining a record of the discussion on the changes in the rules.

The Arbitration committee has had an unusually arduous series of meetings during the past year, not only for the purpose of considering the arbitration of cases, but especially on account of the large number of changes that were suggested in the rules. There were, I believe, 280 changes in

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the freight car rules, which number 131. These changes applied to about 95 of the 131 rules, and while the suggestions have in many cases not been adopted, they have, we believe —I say that as a member of the Arbitration committee— been very carefully considered.

To show this I wish to state that at one time the Arbitration committee met for seven days and altogether did nine days' work in actual sessions on this report, in addition to the time spent traveling by those members who live outside of Chicago, and some extra work that was done outside of the meeting. You can, therefore, understand the problem that was presented to them, and if there are some changes recommended which have been disapproved, or some changes which have been approved that did not meet with your ideas, you will appreciate that it is not surprising.

In order to give the utmost consideration to all suggestions, the Arbitration committee held two separate meetings to discuss propositions made by the private car line representatives for some changes in the rules as they were in effect last year, and for some objections to changes that were proposed in the rules as covered by this report; as the result of these conferences, considerable modifications were made in the original form of the report.

It has been the object of the Arbitration committee in revising the rules this year, to make as few changes as seemed necessary to bring them up to date, and at the same time keep them as simple as possible to avoid any unnecessary complications. One suggestion, which may not be understood, was that the rules be changed to go into effect October 1, instead of November 1, as heretofore. The object of that was to give the secretary more time to get the rules printed and distributed, and also to give the railroads more opportunity to post the inspectors on the changes in the rules. September 1 has left insufficient time to get the rules out and have them well discussed before they went into effect. That will be one of the recommendations which you will be asked to pass upon.

The first part of the Arbitration Committee's report covers the cases arbitrated during the year. Arbitration cases 881-917 have been decided and distributed to the members during the year, and are submitted as part of this report.

I. S. Downing: (L. S. & M. S.): I move they be accepted. The motion was seconded and carried.

Chairman Barnum: The secretary has a communication which he will read to you. The Arbitration committee has been advised that Rule 30 has been acted upon by the American Railway Association and if you will turn to the report, the committee wishes a change there, recommending the adoption of American Railway Association Rule 11. That is the rule in regard to weighing cars, and when our report was made, we did not understand that that rule had been finally settled upon.

I have already said that the Arbitration committee had met the representatives of the private car lines on two occasions and discussed some changes which were made in the rules, and as they still feel that there are certain rules which affect them seriously, and which are not in the form at present shown in the report, they are not altogether satisfactory. The Arbitration committee, with your approval, will follow the plan that the private car line representatives be given a hearing at the beginning of this meeting on those rules which are especially applicable to them, and the secretary will read the communication which they have sent.

Secretary Taylor then read the following communication:

To the Members of the M. C. B. Association:

The undersigned companies, after representing to the various committees who have had charge of the changes in the M. C. B. rules of interchange, find that certain recommendations will be made to this convention which will affect most materially the operation of the cars we represent.

By reason of the non-reciprocal arrangement as between cars of individual ownership and railroad companies, these changes discriminate against the individually owned cars in favor of the railroads. We recognize the fact that it is not in our province to dictate or interfere with any code of rules covering the handling of railroad companies' cars; we only ask that when the reciprocal feature does not exist that exceptions be made for our relief.

The various changes which have been made in the rules in years past have increased the expenses to such an extent that we are now frankly stating to the association that the recommended changes will prevent the continued operation of cars of individual ownership except at a loss. We do not believe that it is the desire of the association to legislate out of existence this special equipment, and we request your earnest consideration of the question involved. Therefore, we present herewith a list of our objections and ask the association to give us the relief which we must have:

Rule 3.—Do not omit reference to rules 33 and 55.

Rules 33-55.—Do not eliminate these rules.

Rule 64.—Reinstate as in effect previous to Nov. 1, 1912.

Reason.—So far as the railroads are concerned, the elimination of these rules as proposed is reciprocal, but on cars of individual ownership such arrangement does not exist and therefore protection should be given. This can be accomplished by continuing the reference to rules 33 and 55 in rule 4, by retaining rules 33 and 55, and restoring rule 64 as in effect prior to November 1, 1912, making such provision as will restrict the application to cars of individual ownership if so desired.

Rule 36.—Referring to application of brine retaining tanks, time allowance is entirely too short. The perfecting and application of a device satisfactory for the safe handling of lading cannot be accomplished in the alloted time.

Rule 94.—Change the last sentence to read—"but no bill shall be rendered unless repairs are made or car withdrawn from service." The reason is this. In view of the growing sentiment to withdraw light capacity cars it is unjust and inconsistent to require that they be repaired before owners can recover on defect card covering badly damaged cars.

Rule 98.—Restore price of second-hand wheels and make no change in labor charge for application.

Reason: It is unfair to car owners to allow scrap value only for second-hand wheels removed. The present labor allowance is ample to cover cost.

Rule 117.—Add to proposed changes on depreciation of wooden car bodies (first paragraph), "except cars covered by rule 118." Make no change in seventh paragraph of 1912 rules.

Reason: Cars designed for special purposes must be frequently rebuilt to protect their lading and consideration should be given this rebuilding in figuring their depreciation which at most does not exceed six per cent. yearly or 60 per cent. of their total value.

The communication is signed by Armour Car Lines, Swift Refrigerator Transp. Company, Morris & Company, Cold Blast Transportation Company, Kingan Refr. Line, St. Louis Refr. Car Company, American Cotton Oil Company, Street's Western Stable Car Line, Pacific Fruit Express and German American Car Company.

Chairman Barnum: In order to make definite progress in this work, I think we better take action as we proceed, on each recommendation separately. I think it will not be necessary to make separate motions on these rules; it is agreeable to the business of the meeting is to consider them in order. We might first hear from the representatives of the private car lines as to their reasons for making the recommendations.

DISCUSSION.

H. L. Osmond (Morris & Co.): The members of the private car lines represented here and at the meeting before the Arbitration committee, were given a full consideration by that committee, but at the same time there has been enormous pressure brought to bear by railroad companies with the idea eventually of making everything an owner's defect, wrecks and derailments, perhaps, excepted.

I want to repeat what we said in our communication to you. We realize it is not our business what rules you make as to the handling of your affairs, but we at the same time are compelled to furnish a special equipment for the handling of our business, and when we offer you a car, it is subject to your and only your inspection, and everything must be on that car before you will accept it. If there is anything missing, or any defect which you feel makes a car unsafe to run, you refuse to accept the car. We are absolutely powerless, but it seems to us that it is no more than fair to return that car after it is unloaded at its destination, in as good conditions as you take it from us, ordinary wear to be excepted.

F. F. Coughlin (Armour & Co.): We appreciate the conditions and circumstances under which the Arbitration committee has worked in making rules that will take care of the interchange of cars as between railroad companies, and it is somewhat unfortunate that we have to have our cars in this interchange; but it is a necessary condition.

These suggestions have been made to take care of the cars of individual ownership, the idea being that this missing material can be taken care of at our expense while it is on your line. Its waste does not benefit anybody and it is a very large item of expense to us. It means that we have to accept the cars home with this material missing or lost when, by a little care, probably, on the part of the handling line, you would be able to preserve and restore the car to us in good condition, and at our expense.

H. L. Osmond: There is one thing I omitted to say, and that is with relation to the financial question. I do not know whether you gentlemen realize the position we are in. To start with, we are forced to build this special equipment. There has been absolutely no change in our compensation for the use of these cars for years past; on

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the other hand, our average haul and in consequence, our earnings, are decreasing every year. We earn nothing like as much on these cars as we used to; one of th reasons is that America has lost the English dressed beef trade. We have been driven out of the market by the Argentine; they can raise cattle cheaper than we can in America. We have had to hunt up a market in this country to take care of our output. We have established branch houses at nearby points through our packing centres. In the year 1912, we shipped over 3,000 carloads of beef to branch houses in Chicago, on which we derived not one cent of revenue. In addition to that, we shipped over 6,000 carloads of dressed beef to nearby points in so-called refrigerator cars. These cars average a haul of 74.7 miles each. In addition to our earnings going down all the time, you all will admit that the changes which have been made in these M. C. B. rules, under which we have to live, have increased our expenses until today, the points of shipment being so near together, we are literally struggling for existence.

We have had to make reports to the Interstate Commerce Commission, and I showed in the year 1912 earnings of 4.71 per cent. on the money invested in our car lines. So far this year, covering the first five months, the average bills against us have increased 80 per cent. over the first five months of 1912. We have got to the point this year where I doubt very much whether we will be able to show 2½ per cent. I believe you will admit we are entitled to a fair return on the money invested in these cars.

J. J. Hennessey (C. M. & St. P.): In the Arbitration committee's report, we gave the reasons why we did not concur in the various arguments which came to us, and I feel that it is up to the convention now to talk. We put in an enormous amount of labor trying to get these rules to harmonize and we tried to be as just as possible.

F. W. Brazier (N. Y. C. & H. R. R.): The gentleman who last spoke must admit that the equipment is in bad shape, as the bills coming in are so heavy. Since we have been here we have had four cars out of one of our trains for defective arch bars; that will go in as repairs against owner of these cars.

A. LaMar (Penna.): I would like to answer Mr. Brazier on that point. You all know our labor is costing more than it did a year ago, and so is material, and I will leave it with Mr. Brazier to say if our equipment is not in better shape than it was a year ago.

J. J. Hennessey: That is what I wanted to bring out:—whether you thought these were real repairs, or whether you thought we were making "pencil repairs" as someone has designated them.

T. W. Demarest (Penna. Lines): If I understand the proposition of the car lines in reference to rule 4, it is the re-establishment of rules 33 and 55. If you will consider the reasons given for the omission of these rules, I think you will be in a position to answer as to rule 4. As to rule 33, it covers the missing couplers, and you cannot offer an interchange of a car with a missing coupler; they also understand that you cannot offer an interchange of a car with a defective brake attachment, and for that reason they have asked for the omission of rule 55. If their understanding is correct on those two details, you must omit the rules; those reasons are given in their report.

I. S. Downing (L. S. & M. S. Ry.): Where?

T. W. Demarest: Under rules 33 and 55.

I. S. Downing: There are just two reasons, one is improper workmanship and the other is lack of care. I do not see why the private line people should not stand for a missing hook or a missing brake hanger or shoe. If the private line is responsible 40 miles away from a point where interchange takes place, they are responsible there; I think the Arbitration committee's recommendation should be adopted.

M. F. Covert (Swift & Company): The cars could not be offered in interchange; I do not know what was meant by interchange movement. We have a considerable number of cars returned to us with brake beams and shoes missing, which were torn off, no doubt, by some obstructions on the track. I do not see why the private car line should not be re-embursed for that when the car is returned; and if the railroads repair and replace that material at their own expense, instead of sending the car home to us, there would probably be no objection.

T. W. Demarest: Mr. Covert, you are talking about the rule as it is at present. If you omit that rule, you will not get your car home with a brake beam missing. The handling company will repair that and charge you under rule 95.

E. Chamberlain (N. Y. C. Lines): The gentleman has made a statement representing the private car line. I am in doubt as to whether the 80 per cent. of equipment controlled by this company has had steel underframes and betterments of that character, and as to the increase of M. C. B. bills. Perhaps the gentleman can throw some light upon the character of the bills that accumulated. The natural sequence would be when you placed a steel underframe under the car and made other betterments, that your M. C. B. bills would be less. I cannot quite assimilate the reasons.

M. F. Covert: As I understand, Mr. Demarest, rule 95 has gone back, and you make the handling line responsible for the missing brake material?

T. W. Demarest: The present rule 33 reads as follows:

"Material missing from bodies of cars offered in interchange, except grain doors, water troughs and attachments, all inside parts or concealed parts of cars; also nuts, body truss-rod, saddles on bolsters, roof boards, side and end fascia, wooden door caps, hatch covers, vent slides and ventilated side and end doors, unless the car is stenciled for such door."

Now, if that rule is omitted, the delivering company cannot give you your car home with that material missing, but they must supply the material and bill you under rule 95 for the labor only. So you only get your car home in the condition provided for in rule 33 for the reason that the Arbitration committee believes it is not the intent of the rule to deliver the car home with defective material. That is in reference to rule 55, but in rule 33 it is the missing coupler. If that is understood, rules 33 and 55 should be omitted and private car lines would be benefited.

T. H. Goodnow (C. & N. W.): The only injustice done the private car lines is in the question of credit. If you tear their brake beam or other parts from the car, you will have that in your possession. It is true you can make the repairs and deliver the car and they have to stand for the bill. As I understand it, they wish to get a defect card when the car is delivered. It seems to me that if an individual car owner got some credit for the parts in the possession of the railroad company, it doesn't make any difference whether the railroad makes the repairs and bills for it, or the owner takes the car himself and makes the repairs.

T. W. Demarest: I would again like to call attention to the fact that the discussion does not pertain to whether rules 33 or 55 should be omitted from rule 4. If the Arbitration committee's reasons are good, the rules must be omitted; and it seems to me there should be no further discussion.

Chairman Barnum: I think it is for the benefit of all concerned to have as thorough a discussion as possible; if there are misunderstandings, this is the time to clear them up.

T. H. Goodnow: There is a lot of material which has not been charged when missing, but has been credited as interchange. The question of the missing roof is accepted as a defect, and the coupler we cannot deliver unless under special arrangements we go to our own shops.

F. H. Stark (Montour Railroad): I appreciate that we are a little out of order in talking on this rule; but the private car interests are after some redress in some manner. I appreciate that the Master Car Builders themselves are not in position to correct matters so as to make the ownership of private cars break even. We have heard here to-day regarding the earnings on refrigerating cars, in which they state that they doubt whether they can make 2-½ per cent. There was a time when the railroads failed to provide equipment for carrying coal, and the coal operators were induced to purchase cars. Later on, the Interstate Commerce Commission wiped out all the special consideration accorded the private car owners, and today any company that owns coal cars will lose.

We might say "Missing material is owner's responsibility, except when offered to the owner." That will not do because it will put the burden on the delivering line, and I do not see how this association can correct the trouble. I would suggest that the matter be referred to a committee for their consideration.

The Interstate Commerce Commission is getting data on the purchase, cost of maintenance and revenue from private cars, and as a matter of fact, people owning coal cars cannot help but sustain the loss anywhere from $30 to $50 a car per year under the present conditions. They do not get their own proportion of the railroad company's equipment; they have to take all classes of cars, including cars owned by other private lines. They are the victims of circumstances, and I do not see how you can correct the trouble without having it go before the American Railway Association as to the matter of increased compensation.

The cars are sometimes held two months in a switching district, which in some cases includes 40 miles, and the owner does not get any compensation whatever, and has to pay for all the necessary repairs to the cars while they are in the switching district.

Chairman Barnum: I will state on the part of the Arbitration committee that it was suggested at some of the conferences

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we had that an exception be made in the case of the private car lines, and that we make a rule covering the interchange of cars between the railroads, especially covering the missing material, and where these cars belong to private car lines make an exception when the car was returned to the owner. That matter was considered carefully, and discussed thoroughly, and the Arbitration committee felt that it would be inconsistent. This is a very important subject, and the Arbitration committee has been, theoretically, lying awake nights over it, and we should have a full discussion, because everyone here is interested as well as private car lines. It is a matter that is worthy of very careful consideration, and I think we should take plenty of time to thresh it out.

T. W. Demarest: In reference to the point brought out by Mr. Barnum, as to the feasibility of making one set of rules to cover private line cars, and another set to cover railroad owned cars, I think every member of the Arbitration committee consulted with the legal department of his road before giving that thought up. As a result of such consultation we did not feel it advisable to make any difference between the treatment of a private car line car and a railroad owned car, in interchange.

H. L. Osmond: I fail to see why an exception cannot be made in favor of the private car lines. You start out and take our cars on a mileage basis, which is certainly different from the basis on which you settle among yourselves for the use of railroad cars. In settling for a destroyed car, while it is settled for according to M. C. B. rules, it is a different method of settlement than for a destroyed railroad car.

Chairman Barnum: I think you are mistaken. It makes no difference whether a refrigerator car is owned by a railroad company or a private car line, it is settled for on the same basis.

H. L. Osmond. The fact is you settle for the use of the car on a different basis.

E. Chamberlain: Will the gentlemen give us a concise idea on the cause of the increase in his bills? Why has there been an increase in the M. C. B. bills, and for what defects were these bills incurred?

H. L. Osmond: We do not claim that our equipment is in an ideal condition. I do not think anyone has equipment he thinks is in an ideal state.

E. Chamberlain: You do not claim the highest degree of efficiency; you say that 80 per cent. has been equipped with steel underframes.

H. L. Osmond: Yes, 80 per cent. has been equipped with steel underframes.

E. Chamberlain: Why, then, the enormous increase and accumulation of bills?

H. L. Osmond: The traffic is heavier.

J. J. Tatum (B. & O.): I have always had a great deal of confidence in the consideration which the Arbitration committee has given to matters of this sort. It has been said that the enormous accumulation of bills is due to the present M. C. B. rules, and it has also been said that 80 per cent. of certain equipment has been improved by applying steel underframes and side truck frames, and that the cost to maintain the equipment has come almost within five per cent. on the investment. May I ask if the cost of maintaining this equipment has actually resulted in but a five per cent return on the investment? It may be that the application of these steel underframes and side truck frames and other betterments applied to the cars has added to the cost and reduced the earnings on the investment; but later on the advantages to be obtained from these betterments will reduce the expense of maintenance.

I am inclined to believe that the right course to take is to refer the matter to a committee. We should find what is the real cost of maintaining private line cars under the M. C. B. rules in effect, in accordance with the billing for repairs and with these renewals, and we should find what these betterments are costing; we can then tell what the earnings are on the money invested.

H. L. Osmond: I want to make it clear to you, gentlemen, and especially to Mr. Chamberlain, that we have not increased 80 per cent. in our total expenses the first five months of this year as compared with the same period of last year, but it is an increase in the total bills against us.

I will answer the last speaker by saying that we do not charge to car repairs, the cost of steel truck sides or steel underframes. That is charged to equipment account.

M. F. Covert: Five years ago, the cost of maintaining our cars, not including any betterments, steel underframes or steel truck sides, was around $75, and now it is $115. per car.

H. L. Osmond: Mr. Stark suggested a committee to investigate this private line question. I do not believe you gentlemen realize what we are up against, but we are trying to make it plain to you. We said to the Arbitration committee, when we gave them figures, that we would be glad to have them go over our books. We are entitled to consideration, and I, for one, will be glad to see a committee appointed.

W. T. Demarest: The rules as proposed by the Arbitration committee this year are more in favor of the private car owners than the rules they are working under. Whatever changes have been made, have been made in their favor.

W. T. Demarest: When you gentlemen appeared before us in Chicago, you made one strong point about brake material which was missing from trucks. That point was particularly emphasized, and we have covered that in rule 95 by restoring it to what it was before November 1 last.

M. F. Covert: There is a point I do not understand, as to what is to be done with cars delivered with this material missing. How will you get it? The rules, I think, prevent those deliveries.

W. T. Demarest: We are talking about the proposed changes and not the present rule.

M. F. Covert: There are a lot of railroads delivering to us in Chicago, and the cars have to go eight or ten miles. If they tear off a couple of brake beams in our yards, then that material is missing. Are we to send the car back? They have no inspectors.

J. J. Hennessey: This expression of "tearing off material" is worth while making an answer to. Tearing off a brake beam is unfair usage, and a railroad is responsible for anything in the way of unfair usage, and if the private lines do not protect themselves, they are responsible.

C. R. Ord (C. P.): It is not clear just what the private car lines are suggesting in reference to the particular rule of interchange under discussion. It will appear that the discussion on the matter is unnecessary if they take the necessary steps to protect themselves. It would be my understanding that they have the right to refuse to accept a car with that material missing, to comply with the interchange rules in the two cases referred to. If there is any necessity for further discussion we would like to know just what definite recommendation they have to make regarding the rule.

H. Boutet. (Cincinnati Rys.): A good deal of reference has been made to missing brake material. One of the speakers referred to three or four cars being cut off on his line since he was here. I kept a record of brake beams falling on one division and I find that two brake beams have fallen. Upon investigating these cases, I found that the rods were of malleable iron, and all the outer casting of the iron was eaten off; they failed to keep the car in proper condition, the draw-bars fell down, and we had to break up the car. If the private car owners would take better care of the cars, they would not have so much missing material, and we would not be called upon to make repairs as often as we are.

M. F. Covert: That brings us back to the point where the railroads have the benefit of making the inspection. If it is not safe to return the car, you can make repairs and charge the owner.

T. H. Goodnow (C. & N. W.): I would like to see any railroad or private car line in Chicago start in and refuse to receive cars because a brakebeam is missing. If the car is left at the repair point, the receiving road has the right to take it and put the brakebeam on, whether it is a private car line or not.

F. W. Brazier: I think we are satisfied with the explanation made, that there is no great hardship in adopting the recommendation of the Arbitration committee.

H. L. Osmond: I have not been convinced in any way, and to bring this matter to a focus, will move that the president appoint a committee to investigate this entire question, and that in the meantime, we continue on the present code of rules.

D. F. Crawford: If I understand this situation, this book of interchange rules assumes to legislate for cars and not for the earnings of cars. The gentlemen have very properly stated that their earnings are insufficient to meet their expenses, and therefore they need some increase in rating. The M. C. B. A. has no authority whatever over the situation, as representatives of the railway companies, to appoint any committee to look into the question of the difference between the earnings and the expenses of the private car companies. The American Railway Association is the only association that I know of that can take up that subject. As I see it, the question before us is, is this a proper code of rules, to interchange cars, to keep them moving in interchange and in safe condition to haul a load? Each company owning the cars bears its share of the burden in keeping them in a safe condition.

As to the appointment of this committee, or to any investigation, I am heartily in favor of any investigation that will bring

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out the facts, but as I see it, a motion cannot be entertained by the chairman to give consideration to the difference between expenses and earnings of the private car lines.

Chairman Barnum: I think Mr. Crawford is absolutely right in his point of view, and in regard to the matter of missing material, the idea all the way through has been that that material will not be missing under fair usage from cars that are well built and properly maintained. That principle has been growing in the development of the interchange rules during the last few years, and many of the members of the M. C. B. Association with whom I have talked, feel that they should be carried even further than they have been up to this time; but in the application of the principle, it has been modified to some extent in this report in order to make such concessions as seem possible and consistent to the private lines where there was a question as to whether they would suffer more than the railroads would in extending that principle.

D. R. MacBain (L. S. & M. S.): While the gentlemen from the privately owned car lines are speaking of their increasing expenses, I wish to mention the increasing expense of betterments and the providing of facilities for the movement of cars that the railroad companies are standing up under. I think the provisions and suggestions of the Arbitration committee are absolutely just, and would move that the recommendation of the Arbitration committee as regards rule four be approved.

M. F. Covert: So far as this association is concerned, it might disregard the financial side of the thing, but I would like to appeal to the members to consider what it means. Is it right or wrong to take my car and lose material off it and bring the car back to me without giving me a cent for the lost material? That is the proposition, so long as the financial end is not to be considered by this association.

Chairman Barnum: I do not feel authorized to answer the question, but from what I have gathered from the discussion, it is not the intention or proposition to do that.

Mr. MacBain's motion to adopt a report of the committee on Arbitration with reference to rule four was put to a vote and adopted.

Secretary Taylor: The next suggestion is: Rule 4; do not omit reference to rules 33 and 55; rules 33 and 35 do not eliminate these rules.

Chairman Barnum: Unless there is some objection, I make the ruling that this matter is involved in the motion of rule 4.

Secretary Taylor: They also ask rule 64 to be reinstated as in effect previous to November 1, 1912.

Chairman Barnum: I think this calls for separate action.

J. L. Hodson (Grand Trunk): Does not action on rule 4 cover that? It says "Any missing material." It does not specify what material.

Chairman Barnum: There was a question in my mind as to whether it did or not.

J. L. Hodgson: I move that the action on rule four be taken as covering the recommendation for rule 64.

The motion was seconded and carried.

Secretary Taylor: The private car lines state as follows:

Rule 35: referring to application of brine retaining tanks. Time allowance entirely too short; the perfecting and application of a device satisfactory for the safe handling of lading can not be accomplished in the allotted time.

Chairman Barnum: Will the Arbitration committee explain their action in regard to that?

J. J. Hennessey: We have made our recommendation.

Chairman Barnum: You have the recommendation of the Arbitration committee, and the request of the representatives of the private lines. What do you wish to do about this rule?

H. L. Osmond: In explanation of our request, you gentlemen know what kind of stuff we ship; it is perishable freight. We have got to protect that freight. We give you a carload and you do not touch it. You simply hook an engine on the carload, and away you go with it. It is up to us not only to load the car at our own expense, but ice it, and see that our refrigerating plant in the car is in proper shape to take care of the load. I want to assure you that we have been working hard on that question, and we have tried to dispose of this issue at all. We were willing to go ahead and equip these cars with brine retaining tanks, but we cannot do it in the time you have given us.

Chairman Barnum: How long have the packing companies been working on this proposition already?

H. L. Osmond: Morris & Co. have worked on it for over two years. We had to get some kind of a device that is fool-proof and could not be tinkered with from the outside, and our brine allowed to escape. We have been applying this device to every car that we have put through our shops, and that means, that we have to throw away half the ice tanks that are in these cars, because when you couple up two tanks with this valve, unless your tanks are in good condition, they will not stand the connection. If we put the new ice tanks in our cars, it means an expense of $64, and these rods and valves that we are putting in cost $18 a car; that is an expense of over $80 on every car. We have got to pay for that out of our earnings and the camel's back is pretty nearly ready to break.

Chairman Barnum: About what per cent. of your company's cars have been equipped with this arrangement?

H. L. Osmond: On our beef cars we have equipped less than 10 per cent. We first had to find the device. You must get something that will not freeze up, start with you have to test a device for a year before you know that it will serve your purpose.

M. F. Covert: We have 788 cars fixed up to date.

Chairman Barnum: What per cent is that of the total?

M. F. Covert: About 3 per cent. of the beef cars and about 8 per cent. of the total number of cars. It is only recently that we have been able to get anything that was satisfactory. There are several different design of valves but they would leak, and that is a thing we must guard against. We are equipping the cars with the valves just as fast as we change the tanks.

Chairman Barnum: How long do you think it will take to complete that work?

M. F. Covert: At least three years. That valve cannot be applied to any tank; it also takes a different design of hatchway.

G. F. Laughlin: As to brine tanks, you can appreciate our position when I say we are now testing our fifth device. We experimented with different devices, some outside, and some inside the tanks. We found the valves inside the tanks were prone to close up with accumulations of salt, etc. The tamping of the ice destroyed the mechanism of the valves, and the valves located on the outside are subject to freezing from condensation.

We have in our storeroom 1,600 valves which were purchased for application to our cars, and after some 280 were applied, we found they only ran about 3 per cent. perfect. It is of no use to put in a valve that will not do the work. It is a source of expense to the company that puts it in, and it does not help the railroad company. The valve which is put in must be one which operates readily from the top, and can be understood by any class of labor, positive in its closing, and equally positive in its opening to allow all of the water to flow out. During the winter months the cars are refrigerated with from 2,000 to 3,000 lbs. of ice in them which it will be necessary to handle in order to apply these valves. You can imagine what that means with a daily receipt of from 150 to 250 cars. We want to put these valves on, but we want to put them on in the right way, and the time allotted is not sufficient.

Chairman Barnum: Our Arbitration committee have extended the time from September 1 to October 1 next year.

G. F. Laughlin: We are thankful for that, but any extension in the winter months does not help us.

I. S. Downing: I believe the Association has recommended practice for taking care of brine. If our recommended practice is not any good it should be thrown out.

Chairman Barnum: The recommendation simply gave general rules, and did not attempt to present anything in the way of a specific device. The private car line representatives are correct in their statement that they have had to work out the details, and I believe that they are also right in the statements of the difficulties they have met in finding something entirely satisfactory.

E. W. Pratt: We all appreciate the assistance which the private refrigerator car owners gave the committee on refrigerator cars. Without their aid, we would have been a long time in getting results. To further show that appreciation, I make a motion that the date be extended to September 1, 1915, and if the other rule carries, that will be until October 1, 1915.

H. L. Osmond: I want to emphasize Mr. Laughlin's statement, that we can only do this work in the summer. This summer is half gone, practically, and if you extend that time only until September 1, 1915, we have a portion of this year and the summers of 1914 and 1915 in which to do the work. I do not believe we can accomplish it in that time. I am fair in this, and I think the gentlemen should be fair to us, and I offer an amendment that the date be made September 1, 1916.

G. F. Laughlin: That does not mean we will wait until September 1, 1916, before we start on this work, but we do not want to harness ourselves up to a proposition that we cannot pull. The general managers association has expressed a feeling that little or no progress has been made toward controlling the salt water drippings. They are not fully advised, possibly, of the difficulties which we were encountering or they would not have drawn that conclusion. It was at their request that this matter was taken up and the date set for September 1, 1914.

Chairman Barnum: The Arbitration committee felt that could it be, if necessary, deferred next year, before the time arrives,

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the same as has been done in similar cases. The time has been advanced, and I think that Mr. Pratt's motion making the time September 1, 1915, should be carried, and the private car lines will not be hurt at all; in the meantime they can make such progress as is possible in the work.

H. L. Osmond: To show my good will, I will withdraw my motion with the understanding that we be given two years from now to show that we have made progress and that having made satisfactory progress, we may make application for a further extension of time.

Mr. Pratt's motion was stated and carried.

Secretary Taylor: The next is rule 94, changing the last sentence to read: "But no bill shall be rendered unless repairs are made, or car withdrawn from service." That is the report of the Arbitration committee.

M. F. Covert: It has been no light capacity car which was returned to us in bad condition, but we have had two cars returned recently with the bodies right down to the floor, and all that was returned to us was the steel underframe. Under this rule, we could get a defect card which the railroads could insist upon giving. If we tore the car down, it would mean that we would have to build it all the way up.

Chairman Barnum: Mr. Hennessey, what was the intention of the Arbitration committee in covering such cases.

J. J. Hennessey: In such a case, it seems to me that if the steel underframe of the car was returned in good condition and it was covered by a defect card, that there was no reason why it should be destroyed, but it should be repaired under the defect card. On the other hand, if the car was beyond repair, then it should be so settled for on the basis.

G. F. Laughlin: Under the proposed change, 119 takes the place of that rule. There is no provision for the apportionment under that condition. Does the Committee understand that we must rebuild that car under the same number? In building a car, it is necessary to handle it under "equipment," to put it under a new number.

J. J. Hennessey: I think the private lines would have a first right to build that car and use any number they wish to. If two private lines consolidated, the Master Car Builders could not consistently say that your cars must all maintain the old number; but if I had a car practically worn out and you accepted it home, under a defect card, then you could not. It also provides for joint inspection in those cases.

J. S. Downing: If the private car people wanted to put in a better underframe and a better upper structure, I do not see anything to prevent them putting in a whole new truck or an underframe and billing for the upper structure, as far as the card called for.

G. F. Laughlin: With the new style underframe and new style truck and new number on the truck, we are not returning the same car; then the question is, our original bill remaining on the defect card. Our light capacity cars could not be operated.

J. L. Hodgson (G. T.): Is it not the general understanding that where a defect card is given and the owner elects to make some changes, he is entitled to bill for the part that the defect card calls for if he reconstructs a car?

J. J. Hennessey: Yes.

F. W. Brazier. (N. Y. C. & H. R. R.): The difference between the value of the car we destroyed and one you wanted to put in, you and I could settle that between ourselves. I would like to ask if you have had any trouble so far with any railroad in such matters?

M. F. Covert: No, sir, we have not.

G. F. Laughlin: The defect card calls for just the items that were destroyed. The point we wanted to bring out was that the railroad company was responsible for that amount of repairs, and if we put that amount of repairs in, we were entitled to bill on the defect card construction; and you could bill on the cash value. We all of us, private car lines as well as railroads, have some light-capacity cars. There is a general sentiment to withdraw these. If we had a car come in with a broken end post or side post and so forth, and if we get that in the shop, we prepare a defect card for all damage and we decide that we shall dismantle that car. It is not a case of the car with a body destroyed. If we elect to tear that down instead of repairing it, we feel we are entitled to the bill on that defect card.

J. J. Tatum (B. & O.): As I understand our friend's question, if a car comes in damaged and he destroys that car, he can build the car by dismantling.

H. T. Bentley (C. & N. W.): Mr. Hennessey made the point clear. If the gentleman wants to tear the car down, he can have a joint inspection, an appraisement, and then bill according to the agreement and on the basis of the M. C. B. rule.

G. F. Laughlin: Can we?

Mr. Bentley: The proposed rules give that.

A. Sternberg (Wabash): No, rule 94. I understand that the gentleman gets a car from the Wabash, and the upper structure of the car is in such condition that they elect to tear it down. If that originally was a 30 ft. car and he makes it into a 34 or a 40 ft. car to bring it up to date, he has no right to claim on that defect card.

J. J. Hennessey: I stated very clearly that you should build as originally constructed—that would not permit the taking of a 30 ft. car and making a 40 ft. car out of it.

T. H. Goodnow: It is a fact that you cannot get a defect card on some cars, and it is up to the point practically where you would naturally condemn the car. The repairs are made, and that class of cars is perpetuated; while on the other hand if it was something you were responsible for, rather than put the $100 or $125 in that car, you would tear the car down and put it in a new car. It seems to me to be possible to reimburse the car owner to some extent for possibly twelve or fourteen months' service which he has lost out of that car; but at the same time it would be a saving to the road which did the damage to have some basis of settlement for the months of service the car owner is out.

E. Chamberlain: Does the gentleman expect this association to extend its paternal authority to the private car owners and to have this rule operated as by a corporation? If that is his logic, in what position would it place this organization? There has been some talk about rebates, and that might work in that category.

T. H. Goodnow: I have made several such settlements as that in the last year. Some roads will do it and some will not.

R. B. Smith (A. C. L.): As I understand the purpose of the defect card, it is to reimburse the car owner for damage. Now, what is the difference between a car coming home for damage done on another road and the same kind of car coming home without that damage, if in both cases the car owner elects to tear it down?

T. H. Goodnow: The car that comes home in that condition is probably a sixty thousand pounds capacity car, seventeen or eighteen years old, and it may have had an old roof replaced; it comes home and some company is kind enough to give you a defect car for all the sills, and you have a car after repairing that you can get eighteen months more service out of.

F. H. Stark: I would like to second the remarks of Mr. Goodnow. At the Pittsburgh Railway Club we discussed that feature and the consensus of opinion was that the car owner should not be reimbursed to the full amount of the damage estimated on the defect card, but that the car owner might be authorized to render a bill for fifty per cent. of the damage. In that case the car owner would no doubt dismantle the car, owing to its light capacity.

Chairman Barnum: Mr. Hennessey, if you, as Chairman of the Arbitration committee, would explain the general principle which has been followed in cases of this sort it might clear up this matter.

J. J. Hennessey: It has been a ruling principle, ever since the rules were first incorporated, that unless the repairs were made a bill should not be rendered. One of our old cars came home, just as one of the speakers said, in such a condition that we were practically going to destroy it. We simply made repair it, because of that damage is covered by a defect card. Are we not perpetuating a class of cars that is not very desirable. You will either repair the car and charge it to the man that damaged it, or destroy it and let it go.

J. J. Tatum (B. & O.): Suppose we start out with this proposition—we have a damaged car and we will settle in accordance with the M. C. B. rules to the extent of that damage. The car may be one of 40,000, 50,000 or 60,000 capacity. The record value of that car may be $200, and the cost to repair may be $300. Is it fair that you would expect any railroad company to give you $300, for a car which you say yourself is only worth $200?

C. E. Fuller (U. P.): I think the discussion illustrates that it is a good thing to keep the old 30,000, 40,000 and 50,000 lbs. capacity cars at home and if you do it, you will not have trouble of this kind. It costs money to tear a car down.

D. R. MacBain: As I view this matter, the railroads have entered into a contract, one with the other, that they would restore any damage occurring, up to the complete destruction of the car, and that is not changed in the proposed change by the Arbitration committee.

As regards any betterment of the old standard, we would have to consider that in an entirely different light, if we want to retire any class of cars we have. I think it is fair that the rule should stand as recommended.

R. L. Kleine (Penna.): I second that motion

Chairman Barnum: The question is as to whether the rec-

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ommendation of the Arbitration committee in regard to rule 94 shall be modified or shall be approved.

The recommendation was adopted.

Secretary Taylor: The next suggestion is in reference to rule 98.

T. W. Demarest: Does not that come in with the report of the committee on Prices?

Secretary Taylor: We have the report of the committee on Prices to cover this afternoon.

T. W. Demarest: This is part of the Price committee's report.

Chairman Barnum: If there is no objection, we will discuss this rule 98 in its order at the present time, and let it apply on the other report. We are talking about the communication from the private car lines. It has been decided to close up this communication completely.

R. L. Kleine: The recommendation of the change in the rule by the Price committee seems advisable that is that we have an average graded price, instead of a second-hand price, and a scrap price for the wheels. It is difficult to determine just what a second-hand, and a scrap wheel is. That is between the man on the repair tracks and the man at the wheel mounting press, and for that reason, the average graded price for each wheel removed was suggested, and I would move you, that the recommendation of the Price committee be adopted.

G. F. Laughlin: In the event of that not being adopted, what would have been the allowance?

J. J. Tatum: The matter has been gone into very thoroughly, and we decided the scrap value of that wheel would have been reduced. In order to avoid that, that in the case of such wheels as were worth while using, that we place a value on the wheel as between the scrap value and the second-hand value.

Chairman Barnum: All in favor of approving the Price committee's recommendation say aye, contrary-minded, no. (The motion was carried).

Secretary Taylor: The next recommendation of the private car lines is Rule 117.

G. F. Laughlin: That is one point that has always affected us. I presume it has affected anyone who has rebuilt to the extent we have. We have torn out cars after spending $400 or $500 on them. If they were damaged or destroyed the next day, there was no consideration given to the extent of the repairs made. In other words, that $500 was lost as far as that company was concerned. On account of the lading the cars carry we cannot allow them to depreciate to the extent shown in the report. We have to rebuild them at frequent intervals and keep them in shape for carrying fresh meat products, and in view of the fact that this rebuilding is necessary we think the depreciation value of 60 should stand as it always has.

J. J. Tatum: The price committee has made recommendations in regard to this depreciation. We feel that the depreciation recommended is a fair one, but the committee does not feel it has a right to tell the railroad and the private car owners that it is a fair depreciation, for the reason that we have not had an opportunity to study this recommendation carefully; and we feel that full consideration should be given to that portion of the recommendation of the committee in regard to the depreciation.

J. J. Hennessey: I am inclined to feel that as far as refrigerator cars are concerned that the depreciation is too much; and as it has come before this association it says, "Private line cars." Now, refrigerator cars are not the only cars—there are stock cars, coal cars and other cars that are not carrying perishable goods; and it could be arranged with the price committee to keep the depreciation at the old figure on refrigerator cars.

Mr. F. H. Clark (B. & O.): It might be important to consider the recommendations of the Price Committee on the subject of depreciation. We arrived at certain conclusions which are embodied in the report. Our recommendation would be, as far as wooden refrigerator car bodies are concerned, to fix the depreciation at 7 per cent. unless steel sills were built, in which case it would be made 6 per cent. for depreciation. But on the other hand some of our friends say the steel sills are not being built on some of the cars. But I would suggest that a vote be taken upon the recommendation of the Price Committee as to the case of wooden car bodies without steel centre sills; and wooden car bodies with steel centre sills, and depreciation of trucks, we recommend 7 per cent. depreciation. For all metal trucks, a 6 per cent. depreciation.

President Fuller: The past two questions are really Price-Committee questions, and as this last question of depreciation is one which has been covered by the Price Committee, I think it might be well to defer action on that until the other questions are taken up, and then take them all up together.

C. E. Fuller: I move that the report of the arbitration committee be accepted with the exception of the Weighing Rule which is changed. (The motion was carried.)

PRICES FOR LABOR AND MATERIAL.

The committee decided it proper to submit two propositions to be voted upon for Rule No. 98:

First: It is proposed that wheels be settled for, when removed for renewal, on a flat eredit rate, in place of having secondhand and scrap prices as heretofore. Flat rate proposed is:

One 36-in. cast-iron wheel.....$5.25
One 33-in. cast-iron wheel..... 4.75

Voting against this proposition will indicate that the present rule will remain without change, except regarding change in price for rolled-steel wheels being reduced from $21 new to $19.50.

Second: It is proposed that cast-steel wheels be settled for when removed for renewal on a flat eredit basis, as follows:

One 33-in. cast-steel wheel.....$4.75

A vote against the proposition means that there will be no rate for secondhand or scrap cast-steel wheels.

The committee also recommends that Rule No. 116 be changed as regards to settlement price for all steel freight-car bodies in place of settling as heretofore on a price per car body, that the car body be settled for on a pound basis, using the builder's weight of the car when built new. The price recommended is $0.0325 per pound, and the value of car so placed be subject to yearly depreciation as per Rule No. 117.

Rule 98.—Bills rendered for wheels and axles shall

F. H. CLARK,
Chairman, Committee on Prices for Labor and Material.

be in accordance with the following schedule of prices for material, with the proper debits and credits:

One 36 in. cast-iron wheel	$10.50	$ 7.25	$5.25	$10.80		$5.25
One 33 in. cast-iron wheel	9.00	7.00	4.75	9.00		4.75
One 33 in. cast steel wheel				19.50		4.75
One 32 in. forged or rolled steel wheel	21.00	.....	4.50	19.50	.....	$4.50
One axle 140,000 lbs. (New item)				25.50	$15.25	9.00
One axle 100,000 lbs.	20.00	12.00	7.50	19.50	11.75	6.75
One axle 80,000 lbs.	16.00	10.00	6.50	16.50	10.00	5.75
One axle 60,000 lbs.	14.00	7.75	5.25	13.00	7.75	4.50
One axle 50,000 lbs. (or under)	10.00	5.00	3.00	10.00	5.00	3.50
And with an additional charge for all labor for each pair of wheels and axles removed from all types of trucks				2.25		
Removing, turning and replacing a pair of forged or rolled steel or steel tired wheels for all types of trucks				3.25		

Rule 101.—The committee suggests that item for labor in this rule be changed from 24 cents per hour to 28 cents per hour. If the recommendation of committee in regard to this change is not accepted, the report should be returned for revision, for the reason that all prices in Rule No. 107 have been arranged on the 28-cent hourly basis. On account of the increased labor rate providing for overhead charges and use of facilities, the committee would recommend the elimination of the ten per cent. additional charge to net total of bills authorized last year.

The following changes are recommended by the committee: Under repairs of steel or steel parts or composite cars;

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change "All rivets ¾-in. diameter or over, 12 cents net per rivet, which covers, etc.," to read "All rivets ¾-in. diameter or over, 14 cents net per rivet, which covers, etc."

Change—"All ¾-in. rivets and less than ¾-in. diameter, 7 cents net per rivet, etc.," to read: "All rivets ¾-in. diameter and less than ⅝-in. diameter, 8 cents net per rivet, etc."

Change—"Straightening or repairing parts in place on damaged cars, also any part that requires straightening, repairing or renewing, not included on rivet basis, 24 cents per hour," to "Straightening or repairing parts in place on damaged cars, also any part that requires straightening, repairing or renewing, not included on rivet basis, 28 cents per hour."

New Items.

REPAIRS TO STEEL TANKS OF TANK CARS.	
Labor for repairing and testing, per hour	$0.40
Steaming, per tank	0.75
Water for testing, per 1,000 gallons	0.06

In making repairs to cars on a rivet basis the cost of removing and replacing fixtures not secured by rivet but necessarily removed in order to repair or renew adjacent defective parts, should be in addition to the rivet basis, rules covering wood car repairs to govern.

Rule 109.—The committee suggested that this rule be changed to read: "When it is necessary to apply any M. C. B. coupler complete, on account of a broken or missing knuckle or lock, the usual labor charge for replacing a coupler can be made.

"When one or more carrier iron bolts over 6 in. long are replaced and pocket coupler at same end of car is removed and replaced, the regular charge for applying carrier iron bolts should be reduced one-fourth hour for each bolt."

Rule 110.—The settlement prices of new eight-wheel cars shall be as follows, with an addition of $27.50 for each car equipped with 8-in. air-brake equipment and $35.00 for 10-in. air-brake equipment. The road destroying a car with air brakes may elect to return the air-brake apparatus, including such attachments as are usually furnished by the air-brake manufacturers, complete and in good condition. The following new items have been added:

Self-clearing hopper, 30 tons, but not less than 40 tons	$295.00
Self-clearing hopper, 40 tons, but not less than 50 tons	315.00
Self-clearing hopper, 50 tons capacity and over	400.00

The lengths of the cars above mentioned refer to lengths over the end sills. In the case of double-deck stock cars, $25 may be added to the prices given above for stock cars.

The paragraph reading: "Where the capacity of any car other than 60,000 lbs. or 80,000 lbs. per cent. should be added to the above prices for the car bodies" should be eliminated.

Change paragraph reading: "When cars of 60,000 lbs. capacity or over, and so stenciled, have trucks with journals 4 in. or over, etc." to read: "When cars of 60,000 lbs. capacity or over, and so stenciled, have trucks with journals 4¼-in. or over, etc."

Change the last two lines of the paragraph reading: "When cars are equipped with metal center sills, the following prices shall be added to the values of bodies for cost of such metal sills:

10 in. or less	$60
Over 10 in.	80"

To read:

10 in. or more	$80
Less than 10 in.	60

The committee also recommends that Rule 116 be changed in regard to the settlement for all-steel freight car bodies, and in place of settling as heretofore on a price per car body, that the car body be settled for on a pound basis, using the builder's weight of the car when new. The price recommended is $0.0325 per lb., and the value of car so fixed subject to yearly depreciation, as per Rule No. 117.

To the prices for box or stock cars with metal underframe and steel framed composite superstructure, add $50 if built with sheathing boards on outside, or $100 if built with sheathing boards on inside only.

Trucks.	Present Prices.	Proposed Prices
80,000 lbs. capacity, but under 100,000 lbs., all metal, per pair, but under 140,000 lbs.	$400.00	$350.00
100,000 lbs. capacity or over, but under 140,000 lbs., all metal per pair	425.00	375.00
140,000 lbs. capacity or over, all metal, per pair		600.00

Prices include brake beam complete, truck levers, dead lever guides and bottom connection rods. For trucks with steel or steel-tired wheels, an additional allowance of $112 per car shall be made. All trucks in service of 60,000 lbs. capacity or over, which consist entirely of metal with the exception of the spring plank, shall be known hereafter as all-metal trucks.

The following changes in depreciation rates were proposed:

In the case of wooden car bodies the depreciation due to age shall be figured at 7 per cent. per annum upon the yearly depreciated value.

In the case of wooden car bodies with steel center sills the depreciation due to age shall be figured at 6 per cent. per annum upon the yearly depreciated value.

In case of all steel car bodies the depreciation shall be figured at 5 per cent. per annum upon the yearly depreciated value.

The depreciation on the tanks or tank cars for handling non-corrosive substances shall be 4 per cent. per annum. For tanks of tank cars handling corrosive substances, the depreciation shall be 5 per cent. per annum upon the yearly depreciated value.

The depreciation of trucks other than all metal shall be figured at 7 per cent. per annum upon the yearly depreciated value.

The depreciation on all metal trucks shall be figured at 5 per cent. per annum upon the yearly depreciated value.

The allowance for depreciation on wooden car bodies shall in no case exceed 80 per cent. of the value when new. The allowance for depreciation on steel underframe or all steel car bodies shall in no case exceed 60 per cent. of the value when new. The allowance for depreciation on trucks other than all metal shall in no case exceed 70 per cent. of the value when new. The allowance for depreciation on all metal trucks shall in no case exceed 60 per cent. of the value when new. The allowance for depreciation of wooden car bodies with steel center sills shall in no case exceed 70 per cent. of the value when new.

Passenger Equipment.

Rule 7.—Change to read: "No labor charge shall be made for applying brake shoes, incandescent bulbs, gas domes, gas globes, small gas bulbs, gas bowls, gas fixtures, journal bearings, hose (air, steam or signal), mantles, tips, filling lamps, charging batteries, gasing tanks, icing or coaling cars."

The report is signed by:—F. H. Clark (B. & O.), chairman; G. E. Carson (N. Y. C. & H. R. R.); Ira Everett (L. V.); E. F. Dunn (O. S. L.); S. T. Park; H. E. Passmore (T. & O. C.), and C. F. Thiele (P. C. C. & St. L.).

F. H. Clark read the following after presenting the report: I would like to include in the report of the Committee a communication from the General Secretary of the American Railway Association as follows:

"At the session of the American Railway Ass'n held on May 21, the following resolution was adopted:

'Resolved, that in view of the increase in the per diem rate and the cost of cleaning and switching freight cars, this Association recommends to the Master Car Builders' Association that the charge for re-weighing and re-marking foreign freight cars should not be less than $1 for other than stock cars and not less than $1.25 for stock cars.'"

That we want to include as a change in Rule 107. The present corresponding prices being 75c to $1, we propose to increase them to $1 and $1.25.

Discussion.

A motion was adopted to accept the report with the exception of the recommendations as to depreciation which is to remain the same as last year; and to incorporate it in the rules of interchange.

FREIGHT CAR REPAIR BILLS.

The committee appointed to confer with the subcommittee of the Association of American Railway Accounting Officers regarding freight car repair bills, recommends that the following rules of that association be observed when rendering or correcting bills:

A. Bills should not be rendered for amounts less than 25 cents in aggregate, but charges for items less than 25 cents may be held until they amount to that sum, provided the aggregate is rendered within 60 days.

B. No bills should be returned for correction on account of incorrect car numbers, but shall be passed for payment at once and the alleged errors in car numbers brought to the attention of the company rendering same within 60 days from date of receipt of bill.

The billing company shall furnish correct car reference, or shall issue within 30 days counter charge authority, as per Form 1 attached.

C. No bills shall be returned for correction on account of other error or questionable charges unless the net amount involved exceeds 10 per cent. of the total amount of the bill, but shall be passed for payment at once and the alleged error brought to the attention of the billing company within 60 days from the date of receipt of the bill. The billing road must

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furnish proper explanation or shall issue, within 30 days, counter charge authority on Form 1.

D. Undercharges shall be similarly adjusted on regular authority of the company against which the bill has been rendered.

E. When bills are returned for correction, all defect cards and billing repair cards, except those in question, must be retained by the company against which the bill has been rendered.

FORM 1.

M. C. B. ASSOCIATION—COUNTERBILLING AUTHORITY.

(NAME OF RAILROAD)

Place.....191..

This will Authorize the.....Railroad Company to counterbill the.....Railroad Company.....Dollars to offset overcharge in our bill No.....Amount, $.....

$.....

This authority must be attached to bill. Signature of person issuing.

This report is signed by:—D. F. Crawford (Penna. Lines), chairman; C. E. Fuller (U. P.), and M. K. Barnum.

This report was adopted.

ABUSE OF THE REPAIR CARD.

A committee, representing the Association of American Railway Accounting Officers and Master Car Builders' Association, met at the LaSalle Hotel, Chicago, April 8, 1913, to consider the subject, particularly as to alleged irregularities practiced by some railroads in rendering bills for repairs to cars. A letter from F. A. Delano, receiver of the Wabash, was read carefully, and his suggestions were given due consideration. It was the unanimous opinion of the joint committee that the handling company should not be expected to assume the expense in connection with the application of M. C. B. knuckles, air hose, brasses, etc., as the committee felt that this plan would not furnish the desired relief, but on the other hand would place a burden on those railroads which aim to keep their cars in first-class condition for service by imposing additional expense of partially maintaining the cars of other railroads who do not maintain their own cars in a serviceable condition.

It is believed that in some instances the price for labor and material established by the Master Car Builders' Association are less than cost, if supervision, the use of facilities and tools and other shop expenses are taken into consideration. This has a tendency to cause some car owners to encourage the making of repairs to cars by the handling company. Therefore it is suggested that the Master Car Builders' Association make such changes in the allowances for labor and material as will more nearly represent the actual cost of repairs. To enable the car owners to make a check of the car repair bills on the basis of car days, it is recommended that Rule 93 be changed to read as follows:

"Separate bills must be rendered for cars destroyed."

All charges for repairs made to cars account of owners' defects, defect cards and rebuttal authorities must be consolidated against any one company into one bill.

Separate statements to be made: First, For owners' defects for each calendar month; second, For all charges based on defect cards, including rebuttal charges.

NOTE.—Totals only of these statements to be shown on the recapitulation.

If the above rule, as amended, is complied with, it will, it is believed, enable a car owner to readily ascertain from time to time the exact amount charged his company for car repairs per car day on any line in any given period. The joint committee is of the opinion that no practical method can be devised to check car repair bills, by which dishonest practices can be positively detected, and, further, is unwilling to believe that dishonest methods are being employed, excepting in isolated cases.

It is the opinion of the joint committee that the interchange rules of the Master Car Builders' Association as now formulated, if honestly followed, are perfectly fair and equitable to all car owners, and it is further believed that the enforcing of honest methods in connection with repairing of cars and making repair bills is something which is to a very large extent under the control of the ranking officials of each company. The recommendation of the joint committee therefore is that the officer in charge of the mechanical department of each railroad and company look into the practice of making repairs to foreign cars and rendering bills for such cars repaired on his own line, with a view of seeing that the work is honestly performed, and also that the bills are rendered only for defects for which the car owner is responsible.

The committee approves the foregoing report and recommendations of the joint committee, and recommends that rule 93 be changed in accordance therewith at this convention, and recommends further that the attention of all members be again called to the resolution passed in 1909, with the request that where any evidence of improper use of the repair card is available that it be submitted to the executive committee for appropriate action.

The report is signed by:—D. F. Crawford, (Penna. Lines), chairman, C. E. Fuller, (U. P.), and M. K. Barnum.

Discussion was deferred to a later session.

MASTER CAR BUILDERS' REGISTRATION.

Acker, C. B., Car Foreman, Pittsburg, Shawmut & Northern, Monticello.
Acker, Chas. L., M. M., Toledo Terminal, Lexington.
Barba, C. E., Asst. Engineer, Penna., Haddon Hall.
Barrett, C. D., Asst. Engineer M. P., Penna., Chalfonte.
Barrett, R. W., M. C. B., N. & S., Lexington.
Blair, H. A., Gen'l Car Inspt., Balt. & Ohio, Lexington.
Borrowdale, J. M., Supt. Car Dept., Ill. Central R. R. Brighton.
Bossworth, W. M., M. Engineer, Kansas City Southern, Raleigh.
Bottomly, Ed. S., Chief Joint Car Insp., C. V. and B. & O., P. & J., Lexington.
Boyden, N. N., M. M., Southern, Shelburne.
Boyer, Chas. E., Gen'l Car Insp., Penna. R. R., Runnymeade.
Bundy, C. L., Gen'l For., D. L. & W., Haddon Hall.
Burch, J. J., District Car Inspt., Norfolk & Western, Shelburne.
Burns, T. J., Asst. Supt. M. P., Mich. Central R. R., Traymore.
Carmer, J. R., Gen'l. Foreman, Phila. Balt. & Wash., Haddon Hall.
Carr, W. K., General Car Inspt., N. & W., Traymore.
Carson, G. E., District Manager Car Builder, N. Y. C. & H. R., Traymore.
Case, S. T., M. C. B., N. Y. C. & H. R., Pennhurst.
Caton, T. W., Gen'l Car Insp., Western Maryland R. R., Monticello.
Combs, S. W., M. C. B., Cuba, Traymore.
Combs, W. B., M. M., Macon, Dublin & Savannah R. R. De-Ville.
Cooper, F. R., S. M. P., Kansas City Southern, Arlington.
Courson, J. F., Gen'l Foreman Wall Shop, Penna., Brighton.
Corinth, A. B., Gen'l Inspr., Atlantic Coast Line, Lafayette.
Craig, A., General Foreman, Boston & Maine R. R., Dunlop.
Craig, James, Chief Draughtsman, Boston & Maine, Dunlop.
Dauterest, T. W., Supt. M. P., Penna., Brighton.
Deibert, John H., Foreman Car Reprs., L. V. Ry., Boswell.
Deyot, Frank, Asst. Gen. Foreman, N. Y. C. & H. R., Pennhurst.
Dickinson, F. W., M. C. B., B. & L. E. R. R., Lexington.
Donohue, Thos., Dir. Gen. Car For., N. Y. C. & H. R., Lexington.
Dow, Geo. N., Gen. Mech. Insp., N. Y. C. Lines.
Downing, I. S., M. C. B., L. S. & M. S., Traymore.
Eberle, Wm. F., Gen. For., Penna., Chalfonte.
Elliott, B. F., M. C. B., Havana Central, Traymore.
Everett, Ira, Asst. Shop Supt., L. V. Ry.
Friese, N. L., Gen. For., N. & W., Marlborough-Blenheim.
Fritts, J. C., M. C. B., D. L. & W. R. R., Traymore.
Fryer, C., Gen. For. Car. Dept., N. Y., O. & W. R. R., Traymore.
Gray, G. M., Supt. M. P., B. & L. E., Marlborough-Blenheim.
Grove, P. L., Asst. Engr. M. P., P. R. R., Chalfonte.
Haig, M. H., M., Topeka & St. Fe, Traymore.
Hall, W. H., Chief Car Insp., C. R. R. of N. J., Monticello.
Hartman, F. B., Gen. Equip. Insp., Southern, Arlington.
Hayes, A. C., Gen. Car For., N. Y. Lines, Penn hurst.
Hendry, John, M. C. B., Grand Trunk Ry. System, Traymore.
Henry, J. M., M. M., Penna., Chalfonte.
Hodgson, J. L., M. C. B., Grand Trunk Ry., Traymore.
Irvin, T. B., M. M., C. R. of N. J., Brighton.
Jackson, O. S., Supt. M. P., C. T. H. & S., Dennis.
Jansen, E. W., Elec Engr., Ill. Cen. R. R., Dennis.
Johnson, J. O., Foreman Car Repairs, Southern Ry., Arlington.
Keagy, C. O., Genl. Foreman, N. Y. R. R., Haddon Hall.
Kimmett, M. A., Genl. Foreman Car Dept., C. R. R. of N. J., Lexington.
Kipp, A., Genl. Car Inspt., N. Y., Ont. & W., Traymore.
Knox, W. J., M. Engineer, B., R. & P., Brighton.
McConville, H. A., Insp. F. C. R. L. & N., Lexington.
McCully, B. N., Foreman Car Dept., N. Y., P. & N., Haddon Hall.

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McKinsey, C. R., Genl. Car Inspt., P., B. & W., Runnymede.
Marden, J. W., Supt. Car Dept. (Retired), B. & M., Chalfonte.
Mercur, R. E., Traffic Manager, Traymore.
Michael, J. B., Master Mechanic, So. Ry., Shelburne.
Millar, E. T., Genl. Car Inspector, B. & M. R. R., Chalfonte.
Miller, E. B., Genl. Car Insp., B. & O. R. R., Lexington.
Miller, R. S., M. C. B., N. Y. C. & St. L., Traymore.
Milton, J. H., Supt. Car Dept., C., R. I. & P. Ry., Lexington.
Morse, C. S., M. C. B., W. & L. E., Brighton.
O'Brien, W. J., M. M., Kanawha & Michigan.
O'Donnell, T. J., Arbitrator, N. Y. C. Car Shops, Pennhurst.
Orehard, J. H., Foreman Car Dept., D. & H., Bothwell.
Osman, H. L., Supt. Car Dept., Morris & Co. Refr. Lines, Traymore.
Ott, W. B., Asst. Engr. M. P., P. R. R., Chalfonte.
Painter, J. H., Shop Supt., A. C. L., Chalfonte.
Peiffer, Charles E., Genl. Car Inspt., B. R. & P., Brighton.
Perine, D. M., Supt. Motive Power, Penna., Traymore.
Quinn, C. H., Asst. Engr. M. P., N. & W., Dennis.
Rasbridge, R. B., Chief Car Inspector, P. & R., Dennis.
Rockfellow, W. E., General Car Foreman, N. Y. C. & H. R. R. R., Pennhurst.
Rommel, Geo., M. M., Phila. & Reading.
Schmidt, E. C., Haddon Hall.
Schwartz, C. L., Asst. General Manager, Dunlop.
Schrader, J. R., General Foreman, N. Y. C. & H. R. R. R., Pennhurst.
Shackford, J. M., Chief Draftsman, Del., Lackawanna & Western R. R., Marlborough-Blenheim.
Shearer, R. D., Asst. General Div. Car Foreman, N. Y. C. & H. R. R. R., Lexington.
Small, J. W., Supt. M. P., Seaboard Air Line Ry.
Smith, Abram E., Asst. M. C. B., Union Tank Line, Shelburne.
Smith, B. T., General Foreman, West Jersey & Seashore, Schlitz
Smith, H. J., General Car Inspector, Del., Lackawanna & Western R. R., Monticello.
Stark, F. H., Supt. R. S., Montour R. R., Chalfonte.
Sternberg, Adam S., General Inspector Car Dept., Wabash, Haddon Hall.
Stow, Fred. T., Asst. Supt., Delray Connecting R. R., Lexington.
Sumner, E., M. M., Northern Central, Chalfonte.
Tatum, John J., Supt. Freight Car Dept., B. & O., Chelsea.
Thiele, Chas. F., General Car Inspector, P. C. C. & St. L., Pennhurst.
Thompson, W. O., Master Car Builder, N. Y. C. & H. R. R. R., Marlborough-Blenheim.
Totten, E. C., Dist. General Car Foreman, N. Y. C. & H. R. R. R., Pennhurst.
Brimer, Geo. Van, Supt., Colo. & Wyoming, Haddon Hall.
Vittum, J. E., Chief Joint Inspector, Columbus, Rys., Arlington.
Walsh, J. F., C. & O., Traymore.
Westervelt, Jos., M. C. B., N. Y. C. & H. R., Lexington.
Wilson, R. D., Asst. Chief Car Inspt., Phila. & Reading, Monticello.
Yergy, J. P., General Car Inspt., Penna., Dennis.

MASTER MECHANICS' REGISTRATION.

Barrett, C. D., Asst. Engr. M. P., Penna. Chalfonte.
Beamer, James A., M. M., Penna., Chalfonte.
Caracristi, V. Z., C. E., D. & H. Co., Marlborough-Blenheim.
Combs, W. B., M. M., Dublin & Savannah R. R., DeVille.
Demarest, T. W., Supt. M. P., Penna. Lines, Brighton.
Ferguson, L. B., M. M., V. S. & P. Ry., Monticello.
Gallaway, W. S., M. M., B. & O.
Gray, Guy M., Supt. M. P., B. & L. E., Marlborough-Blenheim.
Henry, J. M., M. M., Penna., Chalfonte.
Hildreth, F. E., M. E., Vandalia R. R., Dennis.
Jackson, O. S., Supt. M. P., C., T. H. & S. E. Ry., Dennis.
McGuire, J. J., Gen. For., B. & O., Lexington.
Mechling, J. E., M. M., Vandalia R. R., Haddon Hall.
Meister, C. L., M. E., Atl. Coast Line, Dennis.
Orghidan, Const., M. I., Roumanian Govt., Chelsea.
Osborne, Harry O., M. M., C. R. I. & P., Haddon Hall.
Small, J. W., Supt. M. P., Seaboard Air Line Ry.
Sumner, Eliot, M. M., Northern Central, Chalfonte.
Thompson, W. O., M. C. B., N. Y. C. & H. R. R. R., Marlborough-Blenheim.

M. C. B. GUESTS.

Adams, J. W., Gen. For. M. Dept., B. & O., Monticello
Ainsenosh, H., Gen'l Foreman, B. & O. R. R., Spiedel.
Akers, M. E., Car Foreman, B. & O., Lexington.
Anderson, J. W., General Car Inspt., S. A. L.
Andrus, C. H., M. M., Penna., Jackson.
Axtell, C. D., Gen. For. Elec. Dept., D. L. W., Dennis.
Baker, Horace, Gen'l Manager, Q. & C. Route, Marlborough-Blenheim.
Baker, Robt., Son of Gen'l Manager, Q. & C. Route, Marlborough-Blenheim.
Barwis, J. McC., Gen'l For. Pass. Car Inst., Penna., La Belle Inn.
Baumbush, A. J., Gen. For., N. Y. C. & H. R. R., N. Y. H. & H. R. R. R., Pennhurst.
Beyer, O. S., R. I., Chalfonte.
Bigelow, E. F., For. Painter, N. Y. C. & H. R., Dunlop.
Bixby, O. M., Chief Draftsman Electrical Dept., N. Y. C. & H. R., Lexington.
Borfeli, Elmer A., Head Car Draughtsman, P. & R., Albemarle.
Boker, Wm. S., Chief Clerk to G. M., N. Y. C. & H. R., Haddon Hall.
Bromley, Joseph, Inspector, Inter-State Commerce Com.
Brubaker, H. H., M. P. Clerk, Penna., Chalfonte.
Bugg, B. L., Asst. General Manager, A. B. & A., Marlborough-Blenheim.
Burr, H. S., Supt. of Stores, Erie, Dennis.
Burton, G. H., Asst. M. M., W. J. & S., Chalfonte.
Butler, L. W., G. F. C. D., Seaboard, Marlborough-Blenheim.
Campbell, J., Insp. Test Dept., Southern, Chalfonte.
Caracristi, V. Z., Chief Eng., D. & H. R. R. Co., Marlborough-Blenheim.
Carter, B. D., Car Foreman, Virginia, Kentucky.
Carty, F. J., N. E., B. & O., St. Charles.
Casey, J. T., Foreman, P. R. R., Wistle.
Courson, C. L., Foreman Car Dept., Penna., Planters.
Coyle, C. H., German American Car Co., Haddon Hall.
Craig, John D., Inspector, B. & M., Dunlop.
Davis, W. H., M. E., N. Y. O. & W., Chalfonte.
Day, M. R., Gang For., B. & O., Beauvier.
Dette, R. E., For. Mach. Shops, Penna., Blythe Cottage.
Donahue, C. M., M. P. Clerk, Penna., Chalfonte
Donlin, W. M., Asst. Treas., P. & L. E., Traymore.
Donoghue, C. H., For. Car Dept., N. Y. C., Arlington.
Ferree, H. W., Gen. For. Car Shops, P. & L. E., Pennhurst.
Fosnor, G. N., C. C. M. M., Cumb. Valley, Chalfonte.
Frazer, Wm. H., Pur. Agts. Dept., Penna.
Garratt, L. W., C. C. to Supt. M. P., P. & L. E., Pennhurst.
Garrity, J. W., Jr., Insp., Penna., Chalfonte.
Jellison, B. T., Pur. Agt., C. & O., Chalfonte.
Jones, J. W., Asst. C. C. to P. A., B. & O.
Kimmett, A. D., M. M., Lack. & Wyoming, Lexington.
Kern, Wm., Foreman M. P. Dept., B. & O., Strand.
Kidd, C. M., Gen. Air Brake Ins., Norfolk & Western, Shelburne.
Lee, F. H., Gen. Car For., B. & O., Lexington.
Lichtenfels, Philip H., For. Car Repairs, Penna. R. R., New Ocean Hall.
Lovell, D. H., Supt., Penna., Haddon Hall.
McGary, A., Chief Electrician, N. Y. C. & H. R., Rudolf.
Malham, G. L., Foreman, Penna. R. R.
Mercer, J., Blacksmith, B. & O., Ebbett.
Mervine, J. B., Clerk M. P. Dept., Penna., Traymore.
Miller, H. L., Car Foreman, B. & O., Lexington.
McLaren, W., Asst. Supt., Pullman Co., Shelburne.
Maddox, C. W., Chief Car Inspt., C. & O., Chalfonte.
Monan, Wm., Gen. Foreman, B. & S. Ry., Pennhurst.
Noble, H. S., Asst. Road Foreman of Engs., Penna., Chalfonte.
O'Brien, Vollard, Kanawha & Mich.
Pendleton, Edw., Chief Interchange Inspt., Peoria & Pekin Terminals.
Rogers, Herbert, Mech. Eng., T. & N. O.
Shone, W. B., Insp. Car Dept., N. Y. C. & H. R., Lexington.
Snyder, J. F., Chief Clerk to V. P., N. & W., Marlborough-Blenheim.
Stewart, W. T., Vice-Pres. & Gen. Mgr., Gulf & Ship Island, Haddon Hall.
Train, A. H., Special Insp., N. Y. C. & H. R., Pennhurst.
Townsend, J. F., Traffic Mgr., Lake Terminal R. R., 429, St Charles.
Thompson, Harry, N. Y. C. & H. R. R., Marlborough-Blenheim.
Wadsworth, Geo. P., Haddon Hall.
Warren, H. M., Elect. Eng., D. L. & W., St. Charles.
Weldon, A. T., Inspt., W. J. & Seashore.
White, Frank B., Foreman Phila. Terminal Div., E. & W. Penn. Div., Elberon.
Wigstman, F. A., Special Apprentice S. M. P. Dept., Penna., Dennis.
Williamson, C. H., Draftsman, Penna. R. R., Seaside.

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Conventionalities.

John F. Snyder, chief clerk to the vice-president of the Norfolk & Western, came in on Sunday morning.

A. B. Lacy, purchasing agent of the Virginian railway, accompanied by Mrs. Lacy, who is visiting the conventions for the first time, are stopping at Haddon Hall.

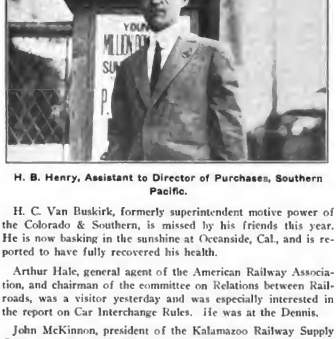
William G. Phelps, assistant purchasing agent of the Pennsylvania Lines west of Pittsburgh, is making his first visit to the conventions.

N. D. Maher, vice-president in charge of operation on the Norfolk & Western, arrived Friday evening, and spent Saturday and Sunday in Atlantic City.

Mrs. Walter E. Coffin came from Cleveland to join Mr. Coffin in Atlantic City Sunday night. She will spend several weeks in visiting relatives in Pennsylvania before returning home.

Grant W. Spear, vice-president of the Dearborn Chemical Company, accompanied by Mrs. Spear and their daughter, Miss Emily Spear, will sail July 1 for a visit of three months in Europe.

Thomas J. Burns, master car builder of the Michigan Central, arrived yesterday afternoon and is stopping at the Traymore. This is his first trip to Atlantic City. He is accompanied by Mrs. Burns.



H. B. Henry, Assistant to Director of Purchases, Southern Pacific.

H. C. Van Buskirk, formerly superintendent motive power of the Colorado & Southern, is missed by his friends this year. He is now basking in the sunshine at Oceanside, Cal., and is reported to have fully recovered his health.

Arthur Hale, general agent of the American Railway Association, and chairman of the committee on Relations between Railroads, was a visitor yesterday and was especially interested in the report on Car Interchange Rules. He was at the Dennis.

John McKinnon, president of the Kalamazoo Railway Supply Company, and an honorary director and ex-president of the National Railway Appliances Association, has been an interested visitor to the conventions this week. He is stopping at the Wiltshire.

T. F. Barton, master mechanic of the Lackawanna at Kingsland, N. J., who is attending the convention, has in his charge some of the new fast freight Pacific type locomotives which are being used in manifest service on that road. Another interesting feature on his division is the use of brick arches in the hard coal burning Pacific type locomotives.

Rodney Evans, who retired several years ago as purchasing agent of the Pittsburgh & Lake Erie, has been quite ill during the past year and came to Atlantic City several weeks ago to benefit from the change in air. He is stopping at the Chalfonte.

B. B. Milner, assistant master mechanic of the P., B. & W. at Wilmington, Del., says that the division with which he is connected had a lively time during the week of the inauguration. In spite of the heavy pressure under which it was working everything went off in fine shape.

J. S. Stringham, Capt. Charles Gifford and Neil MacDonald, of the Monarch Steel Castings Company, are quartered at the Marlborough-Blenheim. The ferocious looking lion in their exhibit is not a real, live lion, though it looks the part and though it has frightened small children.

S. K. Diekerson, superintendent of motive power of the Big Four, had some interesting experiences in the recent flood. Several of the engine houses were badly flooded but in all cases, except for a few unimportant locomotives, the power was placed so that the flood could not injure it.

J. T. Carroll, assistant general superintendent of motive power of the Baltimore & Ohio, and Mrs. Carroll, are at the Marlborough-Blenheim. They are accompanied this year by little golden-haired Virginia Carroll and Master Carroll. The little ones are great favorites among the guests at the hotel.

L. A. Richardson, Mechanical Superintendent, Rock Island Lines.

E. Beyer, brother of O. S. Beyer, Jr., of the Rock Island Lines, spent two or three days looking over the exhibits and seeing Atlantic City. He is in steamship service and had some interesting stories to tell of conditions in the ports of Mexico at which his steamer stopped and of the refugees that they brought away with them.

F. H. Stark, superintendent of the Montour Railroad, will soon be an officer of a real railroad. The Montour is now being extended so as to connect with all the railroads entering Pittsburgh, and when it does it will be the only railroad which can boast of this accomplishment. Over 1000 men are now employed on the construction work. The railroad will be operated entirely independently of the Pittsburgh Coal Company, of which it has always been a part.

In discussing the untimely end of Andrew S. Crozier, of the American Steel Foundries, Bert Waycott and Harry Frost, two old timers, remarked that insofar as they could recall, the death of Mr. Crozier was the first, at least in more than 20 years, to have occurred at one of these meetings. In a way this is remarkable. There are several thousands of us; and what with the

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chances for accident on one hand, and the danger of unusual and unseasonable viands on the other, an occasional death would not have been contrary to the law of average.

W. J. Press, mechanical engineer, National Transcontinental of Canada, is a visitor at the conventions. The National Transcontinental is the portion of the Grand Trunk Pacific between Winnipeg and the Atlantic Coast, which is being constructed by the Canadian government, and Mr. Press has charge of the shop, engine house and other mechanical matters over the entire distance. A part of the Winnipeg end of the line has been in operation by the company for some time and it is expected that additional sections will be turned over for operation during the year.

Among the convention visitors who arrived on Sunday is Samuel T. Fulton, vice-president of the Railway Steel Spring Company, a man who has left the railway service and risen rapidly in the supply business. Mr. Fulton was for several years assistant to President B. L. Winchell, of the Rock Island. At the time of the separation of the Rock Island and Frisco he became connected with the Railway Steel Spring Company as western manager, and on March 1, 1912, was made general sales agent at New York, from which position he has just been promoted to vice-president. He is staying at the Strand.

Robert P. Lamont, president of the American Steel Foundries, attended the conventions most of last week. He attended the M. M. meetings and made a careful examination of the exhibits. In leaving for New York Mr. Lamont expressed the opinion that in points of interest and educational benefit the convention and exhibits surpassed the record over all previous years. George E. Scott, vice-president of the American Steel Foundries, motored to Atlantic City from Chicago. Rumor says all existing automobile records between Chicago and Atlantic City received a shattering when Mr. Scott stopped his machine in front of the Marlborough-Blenheim.

Mr. and Mrs. W. A. Blanchard are, as usual, at the conventions and are stopping at the Marlborough-Blenheim. Mr. Blanchard

Left to right—Mrs. C. H. Terrell, C. H. Terrell, Assistant Superintendent of Motive Power, Chesapeake & Ohio, and T. Kilcoin, Foreman Boilermaker, A. C. & I.

spoke enthusiastically about the exhibits and contrasted the present splendid display, occupying some 90,000 square feet, with the showing made by the supply men some twenty years ago when most of the manufacturers were accustomed to take their exhibits with them to the conventions. Mr. Blanchard, for the American Steel Castings Company, exhibited for the first time at Old Point Comfort a locomotive frame. It was the heaviest exhibit ever taken to the conventions, and Mr. Blanchard had considerable difficulty in installing it. The negro helpers were afraid the casting would fall on them and absolutely refused to touch it. It was then that some of the master car builders and master mechanics came to Mr. Blanchard's assistance, took off their coats and in a short time the exhibit was in its proper place.

Among the special guests of the M. M. and M. C. B. Associations attending the convention is Dwight C. Morgan, vice-president and general manager of the Pittsburg & Shawmut. As chief engineer of the Minnesota Railroad Commission Mr. Morgan a few years ago made the valuation of the Minnesota railways which was so conspicuously involved in the Minnesota rate case decided last week by the Supreme Court of the United

C. H. Kenzel, Purchasing Agent, Elgin, Joliet & Eastern.

States. Mr. Morgan's attitude in that case has commanded respect in all quarters as being eminently fair throughout as he declined to accept the theories either of the commission or of the railways alone but was guided entirely by his ideas of justice to both sides. Since completing the valuation work for that commission four years ago Mr. Morgan has been working 16 hours a day developing and rehabilitating the property of the Pittsburg & Shawmut and the Pittsburg, Shawmut & Northern, the underlying securities of which are owned by the P. & S. This has included the building of about 100 miles of extensions, now completed with the exception of 17 miles. The property serves a rapidly developing bituminous coal region and the roads will this year handle from 3½ to 4 million tons of coal. Mr. Morgan is accompanied by Mrs. Morgan.

Among the arrivals Sunday morning were Sam Lynn, master car builder, and Harry W. Ferree, general foreman of the car department of the Pittsburgh & Lake Erie. A considerable amount of equipment has been added to the steel car shop at McKees Rocks, Pa., during the year, including a new flange press, three punches and a shear. Just now the old 50,000 lb. capacity steel cars are being rebuilt at the rate of eight a month. This rebuilding includes the application of new floor and hopper sheets, and in some cases the reinforcement of the center sills. It is expected that the old side sheets will wear as long, if not longer, than the new floor sheets. During the summer the building for steel car work will be extended, practically doubling its capacity. When the shop was first put in operation several years ago only a small part of it was required for steel car repairs, but the increased number of these cars in use and the fact that the older cars are now needing heavy repairs have not only made it necessary to do the heavy repairs on the wooden equipment elsewhere, but have required the above mentioned increase in capacity. Heavy repairs to wooden equipment are now being made north of McKees Rocks, near the works of the Pressed Steel Car Company. A new shop is also being built at Struthers, Pa., to make repairs to wooden coal cars as they are received from other roads and before they are sent to the mines for loading.

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VARIABLE LOAD BRAKE.

A brake of this type that permits of a variation in brake shoe pressure according to the load on the car to which it is applied has been developed by the Bettendorf Company, Bettendorf, Iowa. The advantages claimed for it as compared to the present brake arrangement are: Increased braking power when the car is loaded and a corresponding decrease when not loaded, thereby reducing the tendency to slide the wheels; increased braking power of one truck if that truck is loaded heavier than the other; ease of maintenance and renewal of its parts; automatic in action, and the less likelihood of pulling mixed trains in two on an emergency application of the air brakes.

The device is based on the idea of applying the brake

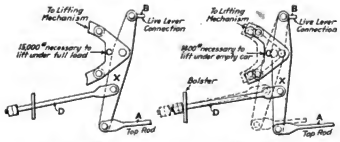
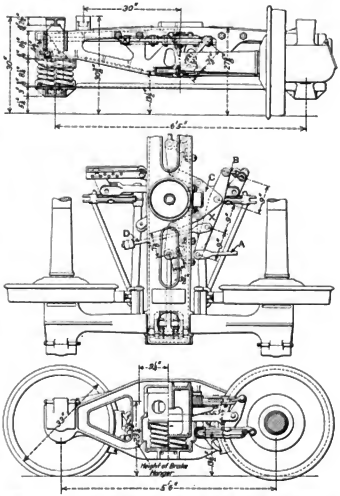


Fig. 1—Car Loaded. Fig. 2—Car Unloaded

Arrangement of Levers for Light and Loaded Car.

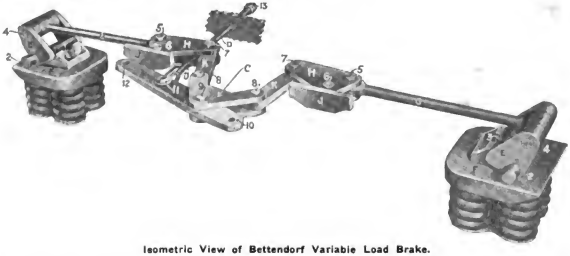
cylinder and lever proportions for the desired load weight brake power and utilizing a series of parts (which are capable of lifting the car body) as a fulcrum for one of the levers. This fulcrum will not move unless the brake cylinder force becomes equal to some predetermined percentage of the downward force due to the weight of the car body and the load thereon, but when the brake cylinder force does not exceed the predetermined amount the car body will be lifted and the before mentioned lever through the movement of its primary fulcrum assumes a new position in which a supplementary fulcrum comes into play.

The action of the parts is clearly shown in the accompanying illustrations. Lever *X* has four connections; *A* is is the brake cylinder rod, *B* is the live lever connection, *C* is the connection to that series of parts capable of lifting the car body, and *D* is a connection that anchors the lever *X* when *C* moves, causing the lever to fulcrum at the pin connection between *D* and *X*. When the car is loaded to its lever connection, than when the fulcrum is at the *D* connection. When the car is not loaded there will be sufficient force at *C*, when the brakes are applied, to lift the car—and *C* will move to the position shown in Fig. 2—allowing the



Bettendorf Variable Load Brake as Applied to Truck of 50-Ton Capacity Car.

nuts on the end of the rod *D* to bear against the back of the bolster causing the lever *X* to fulcrum at its pin connection, with the rod *D*.



Isometric View of Bettendorf Variable Load Brake.

capacity the arrangement, shown in Fig. 1, will apply. Connection *C* will not move and will act as the fulcrum for lever *X*, and there will be a greater force applied at *B*, the live

Assuming that it takes a force of 1,400 lbs. at *C* to lift the empty car, we will have, with a 3,000 lb. pull on the rod *A* and the length of lever as shown on the general drawing,

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a pull at C sufficient to lift the car and a resultant pull at B of $\frac{3{,}000 \times 9 - 1{,}400 \times 9}{18} = 2{,}200$ lbs.

With the loaded car it will take 15,000 lbs. at C to raise the car, which is not available under the above conditions, C will then act as the fulcrum giving a resultant pull at B of $\frac{3{,}000 \times 18}{9} = 6{,}000$ lbs.

By means of this scheme the load of the car body plays a part in determining the effective force at the brake shoes and both the amount of brake cylinder force and weight of the car body and the load thereon is necessary for the determination of the brake shoe force.

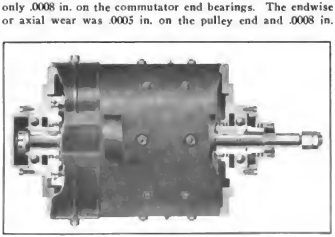
If 1,400 lbs. is the resistance offered by the empty car body when the car is lightly loaded the resistance will increase as the load increases. Hence the 1400 effective at C with an empty car will gradually increase as the load increases, and in so doing effects the resultant force at the top of the live lever so long as the brake cylinder force is sufficient to lift the car body and load thereon.

This lever combination with its many variations, makes it possible to secure almost any desired range of empty and load weight brake power for any constant air brake cylinder force, and especially so when a spring is interposed to partially balance the lifting force at C for the empty car body.

The system of levers, operating from C, for lifting the car is shown in the general drawing. This device is being exhibited at the Bettendorf booth (200) and although somewhat similar to that shown last year contains several improvements.

BALL BEARINGS ON AXLE LIGHTING GENERATORS.

The Safety Car Heating & Lighting Company, New York, has made measurements recently of the ball bearings of an axle lighting generator used constantly on a car that made a total of 137,933 miles up to March 7, 1913. These measurements show a radial wear, or wear at right angles to the axis of the shaft, of only .0005 in. on the pulley end bearings, and only .0008 in. on the commutator end bearings. The endwise or axial wear was .0005 in. on the pulley end and .0008 in.

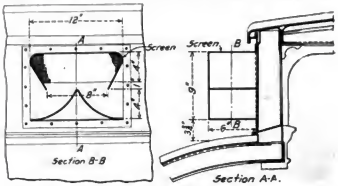


Axle Lighting Generator Equipped with Ball Bearings.

on the commutator end. The eccentricity of the pulley end bearings was .0002 in. and the commutator end bearings showed no eccentricity. Considering the severe service and exceptional conditions under which axle generators operate this is a remarkable showing and this company states that all their ball bearing generators are ivin equally satisfactory service. It is also claimed that the saving in the cost of lubrication and labor by the use of ball bearing generators soon absorbs the extra expense involved in their application.

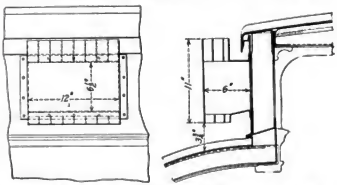
UTILITY VENTILATORS.

The Railway Utility Company, Chicago, is exhibiting a new type of intake ventilator which can be applied to either arched or clere-story car roofs, as shown in the illustrations. Whichever direction the car may be running the air



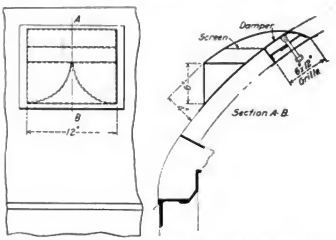
Utility Intake Ventilator Applied to a Postal Car with Clere-story Roof.

striking the chute is thrown upward and creates a pressure in the chamber in the upper part of the ventilator. It then passes into the car through a screen, but cinders, rain, snow, etc., are dropped and carried out at the other side,



Utility Exhaust Ventilator Applied to Clere-story Roof.

as there is no place for them to lodge; the air loses its velocity in the pressure chamber and the heavy particles are dropped in much the same way that sand is deposited by a river at certain points, or that snow is drifted. There is



Utility Intake Ventilator Applied to a Postal Car with Arched Roof.

a certain amount of leakage of air down the chute of the ventilator, and a suction caused by this also helps to remove the foreign substances. The incoming air is passed

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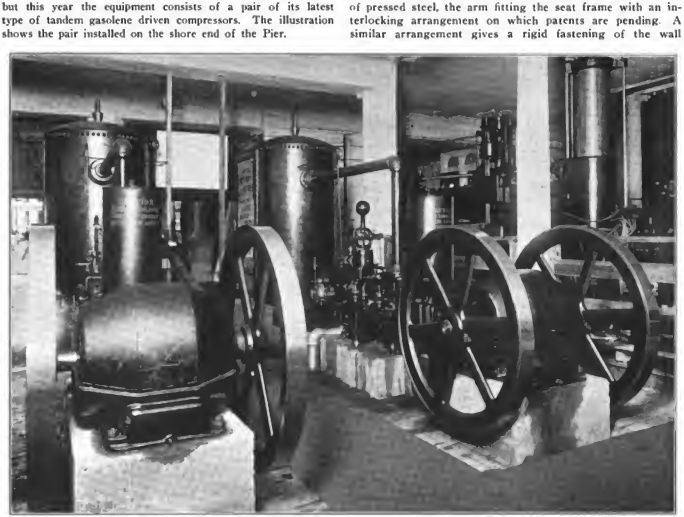
into the car in such a manner that it does not cause drafts or currents. The usual deck sash may be used on the inside as a means for controlling the admission of air or, if desired, a pressed steel register is furnished. The exhaust ventilators are removed a considerable distance from the intake ventilators so that there will be no tendency to take the air directly from one ventilator to the other without passing it through the car. The improved Utility exhaust ventilator is shown in one of the illustrations.

TANDEM GASOLENE DRIVEN AIR COMPRESSOR

The Chicago Pneumatic Tool Company, Chicago, is furnishing compressed air for the exhibitors, as is the usual custom, but this year the equipment consists of a pair of its latest type of tandem gasolene driven compressors. The illustration shows the pair installed on the shore end of the Pier.



Air Compressor Plant for M. M. and M. C. B. EXHIBIT.

The gas cylinder is on the rear end and the air cylinder is just ahead of it, the gas piston being direct connected to the air piston. The gas and air cylinders are bolted together by outside tie rods which make possible a simple gasket arrangement between the two cylinder joints and reduces the leakage troubles.

The lubricating system is of the self-oiling type. The air intake valves are of the Corliss type, being mechanically operated and designed to give ample openings for the entering air. The compressor is provided with a combination speed and pressure regulator and the choking type of air control. With this arrangement the gas consumption is controlled by the pressure and speed, and the amount of air to be drawn in is regulated according to the presure.

The compressors installed here have a capacity of 150 cu. ft. of free air per minute. They are rated at 30. I. h. p. and have 11½ in. gas cylinders, 8 in. air cylinders and a 12 in. stroke. The machine occupies a floor space of 11 ft. x 3 ft. 8 in. and has an approximate weight of 5,000 lbs. These machines are adapted for small capacity plants and have given splendid results in construction work. They may be mounted on a truck and be used as a portable machine, as well as a stationary plant.

STEEL CAR SEATS.

Among the exhibits of the Heywood Brothers & Wakefield Company, Wakefield, Mass., is a sample of the seat recently adopted by the New York, New Haven & Hartford for its latest steel passenger cars. This seat is made with pressed steel cushion, and back frame, and has pressed steel back corner sockets. The pedestal base and aisle end are also of pressed steel, the arm fitting the seat frame with an interlocking arrangement on which patents are pending. A similar arrangement gives a rigid fastening of the wall end of the seat frame to a pressed steel wall fixture which is permanently attached to the side of the car. The seat is attached to the monolith floor by means of a plate and binding ring on which patents are also pending. A distinctive feature of this seat is the wide arm cap which materially adds to the comfort of the passenger. The backs are upholstered plain without headroll and are sufficiently high to afford a rest for the head if desired.

NON-BINDING WRENCH.

The Barcalo Manufacturing Company, of Buffalo, N. Y., is exhibiting a pipe wrench possessing several new and interesting features. It is of simple construction, and contains but five parts, any one of which can be instantly replaced should occasion so require. It has no springs or rivets, and is so constructed as to absolutely prevent binding.

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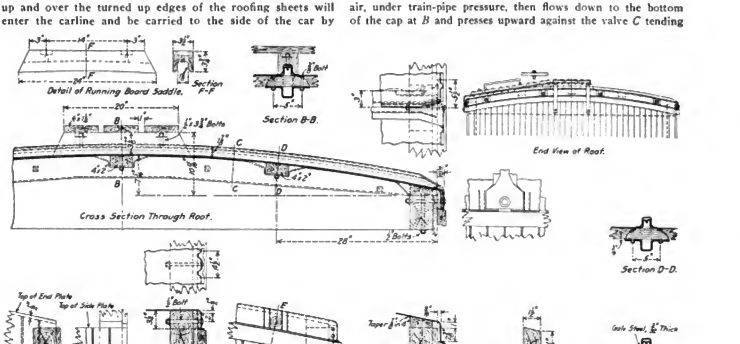
FLEXIBLE ARCHED METALLIC ROOF.

The Franklin Railway Supply Company, New York, has recently developed a new form of its flexible metallic car roof, known as the arched type. The carlines are made of 3/16 in. steel plate pressed to a U section and tapering in depth from the center of the car to the side plates. The carlines are attached to the side plate in such a manner as to give the minimum width of fascia and thus provide maximum clearance at the eaves. The roofing sheets are arched and continuous between the side plates; they are made of No. 16 gage galvanized steel and the edges adjacent to the carlines are turned up and then down. The upturned edges of the roof sheets are covered by galvanized steel carline caps, made from No. 13 gage steel and arched to the contour of the roof. Their ends are turned down over the ends of the carlines, at which point they are attached by horizontal bolts. It is claimed that with this construction any water which may get under the caps and work its way up and over the turned up edges of the roofing sheets will enter the carline and be carried to the side of the car by gravity, the carline extending beyond the side plates for this purpose. The down-turned portions of the roofing sheets extending over the side plates are spaced a distance from the plates in order to allow the sheets to move independently of the car frame; this movement occurs when the car is in service, due to the twisting action. The ridge pole and purlines are continuous from end to end and it is recommended by the manufacturers that these members be made of wood where wooden side plates are used, but that a steel ridge pole and purlines be used when steel side plates are applied.



Franklin Arched Type Flexible Metallic Roof.

ACETYLENE MANTLE LAMP.

An acetylene mantle lamp, which is just being introduced in this country, is being exhibited by the Commercial Acetylene Railway Light & Signal Company, of New York. It was invented by G. Dalen, of Stockholm, Sweden, who was also the inventor of the sun dial and flasher that was awarded the Noble prize last year. A mixer used in connection with the light, and which may be installed either under or on top of the car body, provides a mixture of air and acetylene in proper proportions according to a predetermined formula. A pilot flame which uses one-third of a cubic foot of gas in 24 hours is used for lighting the lamps. No electric spark is required, and all of the lights may be lighted at one time by means of a push button in the saloon.

The lamp gives off very little heat, and the mantle will not carbonize when the gas is turned off slowly. A 90 candle power light requires about ½ cubic foot of gas per hour.

AUTOMATIC TRAIN-LINE ACCELERATING AND BRAKE CYLINDER SUSTAINING VALVE.

This valve, which is being shown by John C. Knight, Inc., New York, serves to accelerate the reduction of pressure in the train line when the brakes are applied and to maintain a uniform pressure in the brake cylinder. The method of connecting it to the brake system and its operation is as follows:

Connection is made with the train pipe at the point *A*. The air, under train-pipe pressure, then flows down to the bottom of the cap at *B* and presses upward against the valve *C* tending to unseat it. The spring *D* exerts a pressure upon the top of this valve equal to an air pressure of 40 lbs. per sq. in. so that the valve becomes a differential valve, closing when the difference between the pressure above and below the valve is less than 40 lbs. per sq. in. Hence, when there is 70 lbs. of air in the train pipe the valve *C* will be held open ntil the chamber occupied by the spring *D*, up to the needle valve *E* is filled with air at a pressure of 30 lbs.. The flow of the air to the needle valve is checked by a choke bore *F* placed above or below the spring *D*. The object of this will be explained later.

Again direct connection is made to the brake cylinder at *G*. When the brake cylinder is under atmospheric pressure only, there is no movement of any of the parts except as already stated. But, when the train pipe pressure has been reduced and the triple valve has admitted air to the brake cylinder, the air, under pressure from the latter, enters at the connection *G*, and presses up against the diaphragm *H*. This diaphragm is held in place by the ring *I* and is stiffened by the plate *K*, which is drawn down to it by the bolt *L*. This diaphragm has a lift of about 1/32 in. and, as it lifts, it must compress the spring *M* and, in doing so, it raises the needle valve *E* from its seat, thus per-

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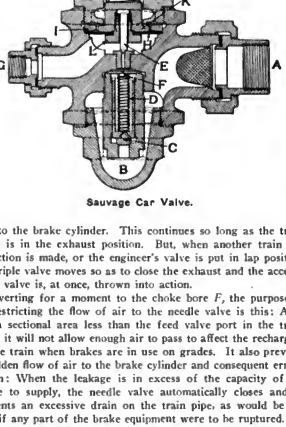
mitting the air to flow from the train line into the brake cylinder. This reduces the train line pressure and in consequence causes the triple valve to move and admit more air to the brake cylinder, until the differential of 40 lbs. between the train line and brake cylinder has been reached, when the valve *C* is again closed and the draft of air from the train pipe is stopped.

The valve acts, then, only to maintain the brake cylinder pressure until a ten pound reduction has been made in the train pipe, holding a pressure of from 20 to 23 lbs. in the brake cylinder, beyond which it is inoperative. Of course, it is understood that these figures in service are dependent upon the amount of differential at which the valve is set as well as the highest train line pressure that is used, and when once put in place it cannot be tampered with or changed.

The opening *N* at the top of the valve is connected to the exhaust pipe from the triple valve. If, then, the retaining valve is open, the action of the valve is as stated. But when the retaining valve is closed the pressure in the exhaust pipe below, it enters at *N*, passes down through the choke and supplements the pressure of the spring *M* to force the diaphragm *H* down and close the needle valve *E* so that there is no flow from the train



Sauvage Car Valve.

line to the brake cylinder. This continues so long as the triple valve is in the exhaust position. But, when another train line reduction is made, or the engineer's valve is put in lap position, the triple valve moves so as to close the exhaust and the accelerating valve is, at once, thrown into action.

Reverting for a moment to the choke bore *F*, the purpose of its restricting the flow of air to the needle valve is this: As it has a sectional area less than the feed valve port in the triple valve it will not allow enough air to pass to affect the recharging of the train when brakes are in use on grades. It also prevents a sudden flow of air to the brake cylinder and consequent erratic action: When the leakage is in excess of the capacity of the choke to supply, the needle valve automatically closes and so prevents an excessive drain on the train pipe, as would be the case if any part of the brake equipment were to be ruptured. In case of an emergency application, the valve *C* acts as a check valve to prevent the flow of air from the brake cylinder to the train pipe, which is then reduced to atmospheric pressure.

At any differential that this valve may be holding in the brake cylinder, whether it be high or low, the question may be raised as to whether, with a constant brake cylinder leakage, which this valve is automatically maintaining by means of air taken from the train line, it would not tend to set the brakes still harder until equalization took place. This would occur were it not for the locomotive "sustaining" valve, whose functions and operations are described elsewhere.

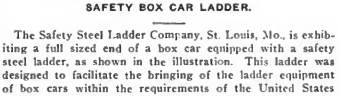
When the regular 15 lbs. retaining valves are used the connection of *N* to the exhaust pipe is necessary; but, when special retaining valves holding 25, 30 or 50 lbs. are used this connection is omitted and *N* is left open direct to the atmosphere.

Finally when all conditions are normal and a ten pound reduction is made there is no action of this valve; but if, on any car, there is an excessive piston travel so that the pressure does not come up at once, then the valve comes into play and builds the pressure up immediately to what it should be.

The value of this valve lies in its ability, when a train is descending a long grade, to hold the brake cylinder pressure in what amounts to a straight air condition of application, with a uniform pressure, making it possible for the engineer to leave his brake valve handle in running position, charging the auxiliary reservoirs, and, at the same time holding up any leaks that there may be in the brake cylinders or their connections, and preventing the speed of the train from becoming excessive, while recharging. This, in conjunction with the locomotive trainline sustaining valve allows the engine driver to raise or lower the brake cylinder pressure according to the conditions of the grade permitting him to know the cylinder pressure that he is maintaining at all times, either in application or release position when the retaining valves are in use.

EXPANSION BORING TOOL.

Among the tools which are being exhibited by the Davis Boring Tool Company, St. Louis, Mo., is an expansion car wheel boring tool that is intended for car building or other large shops that have great numbers of wheels to bore to standard gages or to fit axles. This tool has the cutters so placed that when the roughing cutters pass through, the finishing cutters enter immediately, so that the boring of the wheel is accomplished



Davis Special Expansion Tool for Boring Car Wheels.

in two separate cuts, but with one continuous feed. As soon as the finishing cutters have passed through the wheel, it is chamferred to prevent it from cutting the axle while being pressed on. It is claimed for this tool that it has bored twenty cast iron wheels per hour, for 5½ in. by 10 in. axles, in two separate cuts. In addition to boring tools for general service, this company is also exhibiting a tool for boring driving wheel centers and tools for use on turret lathes and boring machines.

SAFETY BOX CAR LADDER.

The Safety Steel Ladder Company, St. Louis, Mo., is exhibiting a full sized end of a box car equipped with a safety steel ladder, as shown in the illustration. This ladder was designed to facilitate the bringing of the ladder equipment of box cars within the requirements of the United States Safety Appliance Law. The rungs are riveted to stiles made from bar steel, and those parts of the ladder on the body of the car are spaced to a convenient position by putting cast iron furring spools back of the stiles on the intermediate bolts and by bending the stiles outward from the bottom bolts where necessary. Spacing on top of the car roof is effected by bending the projecting stiles parallel with the

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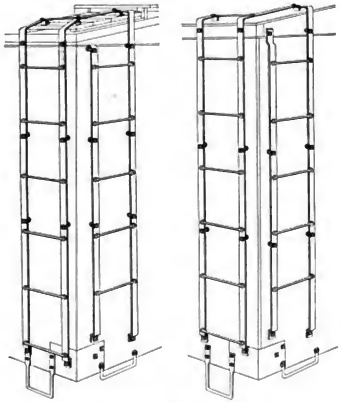
roof, and by further bending the stile ends downward. The top construction differs somewhat for wood and metal roofs, but in both instances the roof grab irons are a solid part of the main ladders and require no holes in the roof. On wooden roofed cars the stile ends of the side ladder bear squarely on the roof and the stile end of the end ladder

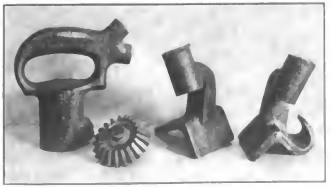


All-steel Safety Box Car Ladder.

is bolted to the side ladder stile, thus leaving no part on which trainmen would be apt to catch their feet or clothing. On metal-roofed cars, an equally safe arrangement is effected by bolting the side ladder stile ends to the brakeman's platform.

SMALL STEEL CASTINGS.

The Standard Steel Castings Company, Cleveland, Ohio, has recently been formed for the production of steel castings, weighing from one pound to 1,000 lbs. Special care is used in making the models to provide a finished casting



Steel Castings Made by the Standard Steel Castings Company.

free from sand holes, thereby making a casting that may be easily machined. The illustration shows a group of castings just as they were taken from the molds. The casting at the right was bent cold and was unannealled, no cracks developing into the casting. No sand blast is required to clean these castings. The converter process is used in making the steel and the company makes a specialty of blank gearing and small parts. The foundry is in charge of John H. Davis, formerly superintendent of the foundry for the Otis Steel Company. The new plan is provided throughout with new equipment and has a capacity of 15 tons per day. The company has produced successfully castings 3-16 in. thick.

HEAVY DUTY BACK GEARED SHAPER.

Among the machine tools in the exhibit of the Cincinnati Shaper Company, Cincinnati, Ohio, is a 32 in. back geared shaper adapted for round house work, and especially locomotive driving boxes. It is equipped with a draw cut head and, in addition, has an extended circular feeding head for driving box work, which also works on the draw cut prin-

Back Geared Shaper for Driving Box Work.

ciple. The table is provided with a tilting top, and the machine is equipped with a crane of 1,000 lbs. capacity for lighting the work in and out. A constant speed motor is used, and is belt-connected to the shaper, which is driven through a gear box. A planing attachment for rod brasses is also provided. The weight of this machine is 9,200 lbs.

BURGLAR-PROOF DEVICES.—A burglar-proof stop, lock and hasp arrangement, as well as a burglar-proof bracket for car doors, is being exhibited by the Camel Company, Chicago. The former arrangement prevents the splitting out of the door stop at the front edge of the door and has a burglar-proof sealing arrangement. The bracket is so designed that it is impossible to remove it while the door is in the bracket.

MAJOR COUPLERS.—At the Buckeye Steel Castings Company's exhibit, Booths 603-605, a comparison is made between the experimental coupler developed by this company, as its part of the work of the M. C. B. Coupler committee, and its present Major top-lift and under-lift couplers. The Major couplers are probably as heavy as any of the couplers now in use. But in the experimental design, much greater strength and weight are provided and special attention has been given to the further development of the under-lift or side operation and the possibility of doing away entirely with the over-head operating rods and chains.

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Railway Age Gazette

DAILY EDITION

Copyright, 1913, by the Simmons-Boardman Publishing Co.

Vol. 54. NEW YORK—JUNE 18, 1913—ATLANTIC CITY No. 24c.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE that of this issue more than 9,200 copies were printed; that of those more than 9,200 copies, 7,048 were mailed to regular paid subscribers, 300 were provided for counter and news company sales; and 1,700 were printed for distribution at Atlantic City and for use as sample copies.

IN the abstract, every railroad should build good cars and keep them in good repair, and the Master Car Builders' Association apparently proposes to do all it can to see that they do it. All the members that have investigated the subject carefully seem to find that it is costing them decidedly more to have their cars repaired away from home, although the prices allowed are, in some case, claimed to be below the actual cost. The extension of the list of owner's defects each year makes the total continually increase and the great advantage of having the highest class of equipment, properly maintained, is beginning to be more thoroughly appreciated. The elimination of the requirement of applying a repair card will also tend to increase the tendency toward better repairs.

AT the closing session of the Master Mechanics' convention last week a letter was read from a committee of the International Railroad Master Blacksmiths' Association asking the members of the M. M. Association to send their blacksmith foremen to the convention which meets at Richmond, Va., August 18. F. F. Gaines spoke in favor of the idea and asked for a closer co-operation with the smaller and more highly specialized mechanics' association. He had found that such of his foremen as attended the different conventions returned home with a supply of good ideas, which, when put into practice, saved more money than it cost to send the delegates to the conventions. There can be little question on the part of those who are accustomed to attending the meetings of these associations, but that Mr. Gaines is right and that the railroads generally should adopt the policy of their progressive roads which not only allow their men to attend such conventions, but encourage them to do so, there can be no question. It might be a good idea to require a report from each foreman on those features that had interested him and which he believed could be adopted by his road with good results—this report to be either in written form to his superior or to be presented at one of the foremen's meetings which are now held at regular intervals on many roads. A survey of the situation six months after the convention, with the idea of finding just what results could be credited to the information and inspiration gained from attendance at the convention might reveal some interesting facts.

THERE have been two or three additions made to the official list of enrollment this year that have contributed materially to the value of the list and which have been the subject of much commendation. First in value stands the classification of railway officials by the roads with which they are connected. This has made it possible for those seeking a representative of any road to ascertain who is here, and if the particular man whom it is desired to see is about, to pick the next best from those present. Then the list of exhibitors with their space numbers, and a plan of the pier, and the list of the member companies of the Railway Supply Association have contributed their own quota to the convenience of the list.

THE discussion on the overhead inspection of freight cars yesterday morning was interesting as showing the difficulty of advance inspection whereby one road should attempt to inspect and choose cars for service on a connecting line. The unavailability of the statistics of one road as a means of checking efficiency on another is a matter of common acceptance, and so it is not surprising that the association should balk at the idea of adopting a card that would imply that the standards of one road could be made to guide in the acceptance, by another line, of cars intended for loading with flour or grain. The American Railway Association asked for a report on the subject and a most able one has been presented. Further action will depend on the wishes of that association as the question is largely one of operation. The M. C. B. Association stands ready to co-operate in any way it can.

IN the report on Car Trucks the committee states that the distance of the side bearings from the center line on various types of cars will receive consideration in connection with the design of the standard bolster. In view of the fact that this distance is recognized as having great influence on the riding qualities of tenders, as well as on their liability to a freedom from derailment, it seems that it cannot fail to be of vital importance in the designing of freight cars as well. There is no apparent reason why a box car with a lading of high center of gravity should not have its rail holding qualities influenced in identically the same manner as a tender. To be sure, the distance between truck centers is greater and there are other modifying conditions that may lessen the influence of side-bearing location as a cause of derailment. But the influence or tendency must exist just the same, and it seems as if these could hardly be any subject more worth a careful and thorough investigation than this one of side-bearing location.

THE experiment of keeping the exhibits open at night was tried Monday. It was not a success. Unfortunately, however, the experiment was tried under extremely unfavorable conditions. The M. C. B. Association on that day had both morning and afternoon sessions. The afternoon session lasted until 7 o'clock. The members naturally were very tired after this long day's work; and by the time they had got their dinner it was pretty late. But for these circumstances, doubtless a larger number of railway men would have visited the exhibits on Monday evening. One plan which has been suggested to give the railway men a better oppor-

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tunity to visit the exhibits is that of having on each day one session from 10 to 12 a. m. and another from 2 to 4 p. m. It is reasoned that they would then have some time before the morning session began, and also some between the morning session and lunch time, and that as they would be on the Pier attending the afternoon session, they would naturally find it convenient to spend some time among the exhibits following the afternoon session. This is an interesting plan which merits consideration.

MANY prophesies have been made as to the possible length of life of all-steel freight cars, and its estimates have varied over a wide range. Steel freight cars in considerable numbers have now been in service since 1896, and from the observations which have been made of their condition it can safely be said that the life of the floor and hopper sheets will vary from fifteen to twenty years, and that the life of the rest of the car will be double that of the floor sheets, or from thirty to forty years. New floors and hopper sheets can be put in a hopper car at an expenditure of roughly $75 for material and $50 for labor—a total of about $125. When this is done the cars are said to be in practically as good condition as when new. The mistake was made in many of the cars which were designed in the earlier stages of steel freight car development—and in some of the later stages as well—of making the center sill constructions too light and in not using a cover plate or heavy box girder construction. When new floor sheets are applied it is therefore necessary in some cases to reinforce the center sills, but this is not generally the case. Naturally, as the steel cars in service have grown older, and more and more have been built, it has become necessary for roads to provide more extensive facilities for making repairs to them. The steel car shop of the Pennsylvania at Altoona has been doubled in size within the last two years; only about one-quarter of it, however, is used for repairs to old cars, the rest of it being used for the building of new equipment. The Pittsburgh & Lake Erie expects to double the size of its steel car repair shop during the coming summer.

FALSE ECONOMY IN FREIGHT CAR CONSTRUCTION.

IN discussing the proposed retirement from use in interchange service of freight cars of 50,000 lbs. capacity and less, F. W. Brazier stated in a resolution which he introduced that the railroads should start with a good car and then maintain it; and D. F. Crawford later gave it as his belief that if cars are properly repaired there will be little trouble experienced in the abuse of the repair card. There are freight cars of large capacity in service today that are a disgrace to the designers and owners and yet the policy of cutting the first cost down to the last dollar continues on many roads. When cars are intended for operation in long trains and hump yard service, with the heavy locomotives now in general use, they should be given the benefit of the best possible engineering skill and experience; much has been said on this subject, but there are still many railroad managers who will not listen to a proposal to spend even a very few dollars extra per car when they must realize, if they have studied their repair bills and have any confidence in the judgment of their car department officers, that those few dollars would be returned many times over in the reduction of maintenance costs.

It is this false economy employed in first cost that is responsible for a very large percentage of the cases of leaky roofs, broken doors, pulled out drawbars and racked superstructures and broken trucks that are daily causing train delays, overtime and increased car maintenance expenditures. Some cars of this type are known among repair men the country over; these men know that the cars are poorly built and that it is impossible to make repairs on them that will put them in satisfactory condition, and they consequently make only what repairs are absolutely essential, hoping that the cars will then run to their destination. In most cases they do not, but are again marked bad order at the next terminal—if indeed they are not set out along the road—and so it goes on in a succession of delays and temporary repairs.

Every car department man should miss no opportunity to bring home where they are most needed the facts concerning this policy. No opportunity should be neglected, in the Master Car Builders' Association conventions and elsewhere, to overturn this idea of false economy to which some of our railroad officers cling so tenaciously and which is the greatest cause of the enormously increased cost of car maintenance. Cases are not lacking where railroads buy the best locomotives available, and reduce to the last possible cent the expenditure for new cars to be handled by those locomotives, a policy as inconsistent as it later proves expensive.

LOW CAPACITY CARS IN INTERCHANGE.

WHAT the members arguing in favor of the suggestion to retire from interchange service all cars of 40,000 and 50,000 lb. capacity really desire is a reduction in the accidents and delays due to weak equipment in heavy tonnage trains. There is no doubt that this trouble is serious, and immediate steps should be taken to correct it, but it hardly seems that the selection of certain capacity cars for execution is the fair way of doing it. No one objects particularly to their capacity; it is their weakness that is criticised. Certain classes of traffic require cars of 40,000 lb. and 50,000 lb. capacity, and in any case there would have to be exceptions made to any rule of interchange based on capacity. The first motion suggested excepted cars with metal underframes and metal trucks and it was later suggested that refrigerator cars also be excepted. This is but an example of what exceptions would continue to arise when the rule was put in force. It is comparatively simple to build a wooden underframe on short cars of any reasonable strength and simply because it is wood is no indication of weakness. There have been a number of instances where 60,000 lb. and 80,000 lb. steel underframes have been too weak to withstand the shocks received in service. In some cases certain railroads are now refusing to accept some cars in interchange which are marked 60,000 lb. and 80,000 lb. capacity and make it a practice to transfer the loads and send the cars back.

It thus seems that a rule based on capacity when wooden underframes are used does not answer the requirements any better than a rule with no exception. What is really needed is a car that will stand up to the requirements of modern traffic conditions, be its capacity 30,000 lb. or 140,000 lb. This brings up the question of determining a standard minimum strength for freight cars and this in turn largely hinges on the draft gear and its attachments. If such a minimum strength can be specified, cars of the lower capacities can be stenciled and the rules could allow the refusal to accept all cars below 60,000 lb. capacity which are not stenciled as being of the required strength. Improper stenciling would not be difficult to discover and the Arbitration committee could quickly settle the matter.

Metal trucks should be required under all cars offered in interchange and a rule to this effect would cause no great inconvenience or expense to anyone.

The decision of the convention was to refer the whole subject to a committee for investigation and to then refer it, with recommendations, to the American Railway Association. While cars are, of course, built of a capacity and size to suit the requirements of the traffic department, their strength and form of construction are entirely within the control of he mechanical department. If no attempt is made to legislate certain capacities out of existence it would seem impossible to settle the question within the Master Car Builders' Association.

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TO-DAY'S PROGRAM.

M. C. B. ASSOCIATION

9.30 A. M. TO 1.30 P. M.

Discussion of Reports on:	
Damage to Freight by Unloading Machines	9.30 A. M. to 10.00 A. M.
Air-brake Hose Specifications	10.00 A. M. to 10.30 A. M.
Revision of Present Specifications	10.30 A. M. to 11.30 A. M.
Car Construction	11.00 A. M. to 11.30 A. M.
Unfinished business; Reports of Committees on Correspondence, Resolutions, and such other committees as may be named during the convention	11.30 A. M. to 11.45 A. M.
Election of officers	11.45 A. M. to 1.30 P. M.

Adjournment.

LOST.

A 4 by 5 Premo B camera with film pack has been lost in the Hotel Dennis or on the pier. Five dollars reward will be given if the finder will return to Edward Wray, Advertising Building, Chicago.

CORRECTIONS IN THE DISCUSSION OF THE REVISION OF THE RULES OF INTERCHANGE.

In discussing the letter from the private car lines in connection with the report of the Arbitration committee on the Revision of Rules of Interchange, Monday afternoon, the remarks ascribed to H. Boutet, of the Cincinnati Railways, on page 1456, should have been credited to F. W. Brazier, superintendent of rolling stock of the New York Central & Hudson River.

The final motion in connection with the report of the Arbitration committee on the revision of the rules of interchange was not reported quite accurately yesterday. It was made by C. E. Fuller and should read: "I move that the report of the Arbitration committee be accepted, including the modification of the recommendation of the committee in rule 30 referring to the reweighing and relettering of cars." The motion was carried.

M. C. B. DANCE.

The M. C. B. dance was held last evening in the entrance hall of the Million Dollar Pier, with the following committee in charge: Messrs. Landreth, (chairman), Brotherhood, Ryder, Purcell, Eaton, Donahue, Chaffee, Sheridan and Sherman.

B. & O. CLUB MEETING.

Because of the afternoon session of the Monday meeting of the M. C. B. Association it was necessary to postpone the B. & O. Club meeting from 3.30 to 5.30 P. M., and even then the late session of the association prevented a large attendance at the club meeting. Because of this no action was taken on the report of the committee on constitution and by-laws and it was continued until next year. C. F. Giles was re-elected president and C. L. Sullivan was re-elected secretary.

MR. BRAZIER MISQUOTED ON COUPLERS.

In the discussion of the report on Coupler and Draft Equipment, page 1446 of the June 17 *Daily*, a line was dropped in the print shop from the remarks of F. W. Brazier, making one of the sentences incomplete. In commenting upon the fact that it was about time to adopt a standard coupler, Mr. Brazier stated that there were now 433 different patents of couplers in use on the railways of this country, and asked, "Is it not time that we got down to a standard coupler?"

PENNSYLVANIA RAILROAD Y. M. C. A. BAND, OF ENOLA, PA., COMPOSED ENTIRELY OF SHOPMEN OF THE P.R.R.

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PRESENTS FOR ENTERTAINMENT CHAIRMAN KREPPS.

Shortly after the regular morning meeting of the entertainment committee Tuesday, Chairman Krepps was summoned to appear in the executive committee room on the steel pier. There he found assembled the members of his own committee, who presented him with a slight token of appreciation of his able leadership during the conventions. The gift consisted of a gold mounted cane and umbrella on both of which appeared the following inscription:

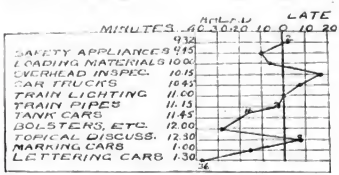
> Presented to Chairman W. K. Krepps by the members of the Enrollment Committee. M. M. and M. C. B. Conventions, Atlantic City, New Jersey, 1913.

Mr. Krepps was surprised and delighted with the beautiful remembrance.

REGISTRATION AS SHOWN BY BOOK No. 5.

Official registration book No. 5, containing all three associations up to 5.20 P. M. Monday, told an interesting story. It showed that there were registered 362 members of the M. M. Association, 325 Master car builders, a total of 687; 690 special guests, 508 railway ladies, 309 supply ladies and 1704 supply men, a total of 3,898. The totals in book No. 5, therefore, show that at the time of its going to press there were 140 more members of the railway associations and special guests present this year than in 1912, and a total increase in registration of 385.

KOWLOON-CANTON RAILWAY, CHINA.—No special development has been made on the Kowloon-Canton Railway, with the exception that Great Britain bought a tract of land comprising about 340,000 sq. ft. last June at the cost of $1,762,615 to prepare for the expansion of Kowloon station when the Canton-Hankow line is completed.



Joe Taylor's Time Study of the Performance at Yesterday's Session.
(Not an Agricultural Report!)

TRANSPORTATION COMMITTEE.

Top row, left to right—Walter Greenwood, Texas Co.; J. T. Anthony, American Arch Co.; A. W. Brown, United & Globe Rubber Mfg. Co.; H. N. Turner, Kay & Ess Co.; Wm. T. Hawley, U. S. Light & Heating Co.; M. F. Ryan, Pittsburgh Spring & Steel Co.; F. S. Hiland, Patton Paint Co.; J. F. Schurch, Railways Materials Co.; J. J. Toomey, Bail Chemical Co.

Bottom row, left to right—C. F. Elliott, Acme White Lead & Color Works; C. R. King, Pittsburgh Steel Products Co.; J. H. Kuhns (Chairman), The Republic Rubber Co.; George Hull Porter, Western Electric Co.; G. P. Berger, Gould Coupler Co.; Geo. A. Nicol, H. W. Johns-Manville Co.

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MASTER CAR BUILDERS' ASSOCIATION PROCEEDINGS.

Includes Reports on Loading Materials, Overhead Inspection, Trucks, Train Lighting, Retiring 20- and 25-Ton Cars, etc.

The Tuesday morning session was called to order at 9.30 A. M., by President Fuller.

SAFETY APPLIANCES.

Owing to the magnitude of the safety appliance work and the many complications entering into it, the committee does not feel that at this time it can render any report other than a general statement of the conditions. Investigation develops that the roads are making diligent effort to equip their cars with safety appliances to meet the requirements of the law. The committee earnestly recommends that the importance of this matter be kept before the members.

In some instances it was found that the stenciling "United States Safety Appliances" on the cars was not being done in accordance with M. C. B. Sheet G, and for the benefit of all concerned the committee recommended to the arbitration committee that a note be added after Rule 52, on page 34 of the M. C. B. Code, which will indicate the location and manner of stenciling cars equipped with United States safety appliances.

The committee recommends that no further changes be made for the present in the interchange rules so far as safety appliances are concerned.

The report is signed by—C. E. Fuller (U. P.), chairman; A. Stewart (So. Ry.); A. La Mar (Penna.); H. Bartlett (B. & M.); M. K. Barnum; W. O. Thompson (N. Y. C. & H. R.), and C. B. Young (C. B. & Q.).

DISCUSSION

F. F. Gaines, (Cent. of Ga.):—I move that the committee be continued and instructed to look into the question of whether it is going to be possible or not—in case we do not all come under the rule in time—of getting an extension. I think this committee should look into the question of getting an extension or continuation on some points—the coupler question particularly.

President Fuller:—That suggestion will be referred to the executive committee.

RULES FOR LOADING MATERIALS.

The committee recommends change in the title of the code of rules, from "Rules for Loading Materials," to "M. C. B. Loading Rules."

Rule 7.—This rule should be changed to read: "Lading will not be accepted if placed on top of box or stock cars. If lading is placed on top of wooden cars having sides not more than 30 in. high, and not less than 3 in thick," and so on.

Rule 10.—(Second paragraph) Change the word "should" to "must," which would make this paragraph read as follows: "If the idler is a flat car of wooden construction its capacity *must* not be less than that of the carrying cars."

Rule 17.—Add "and must conform to Rule 51." to the end of the rule.

Rule 18.—In order to make this rule agree with the Safety Appliance Laws it should be made to read as follows:

"A group of cars must have at least one accessible and operative hand brake for two or three cars; or two hand brakes for more than three cars.

Rule 30.—This rule should be changed to read as follows:

"Material in open cars requiring special staking or clamping and all material carried on two or three cars, must always be examined by a competent inspector before the cars are moved from the loading point. If an inspector is not stationed at the loading point, the agent must give notice to the proper authority when the cars are loaded, so proper inspection may be arranged for. The object of such inspection is to see that these regulations have been complied with."

Rule 67.—Rule changed to read:

"Flat cars loaded with cross ties, fence posts or similar short material, will not be accepted for shipment, unless otherwise agreed."

Rules 69, 70, 71.—These rules are changed to read as follows:

"*Rule 69.*—If the load extends more than 12 in. above end or end gate at center, each pile must be tied across by at least 2 binders. Each binder is to be fastened to each tie in passing over the load (see Rules 70 and 71 for manner of securing binders)."

"*Rule 70.*—When wire is used it must not be less than good ¼ in. diameter and but one strand may be used, the wire to be secured to the side of car at least three nails or staples, or to stake pockets, or through holes in top of flange on side of steel cars, or fastened to outside edge of first tie projecting above car side."

"*Rule 71.*—When sapling is used it must be of green timber, split, and not less than 1½ in. wide on the split or flat side. The ends of the sapling must extend at least 12 in. below car side and be securely fastened to each tie with nails in passing over the load."

Rule 74A.—The following new rule has been added:

"*Rule 74A.*—Small steel plates and similar material loaded in box, stock or gondola cars—the load should be uniformly distributed over the floor of the car. In no case should the amount of load placed between the body bolsters and either end of car exceed 15 per cent. of the capacity of cars with wood underframing, and 20 per cent. of the capacity of cars with steel underframing."

Rule 81-D.—To make this rule conform to Fig 33-B, after the word "car" in fourth line should be inserted "On the same side of car two (2) straight-grain hardwood pieces 4 in. by 6 in. to be securely fastened to car side; the other side supported by three (3) vertical straight-grain hardwood posts 6 in. by 8 in. in section and of sufficient height that when plates are placed diagonally across the car they will extend from one side across to full width of upright posts."

Rule 82.—Add to the end of this rule the following:

"Where the weight of overhang is not excessive and material very flexible, a 6 in. by 8 in. post of sufficient length may be bolted to inside of end of car to support overhang in lieu of sliding pieces placed on adjacent car."

Rule 85.—This rule should be changed to read as follows:

"The method of loading as shown by Figs. 34, 35, and 36 may be made use of to load long lattice girders, box girders, columns, one-half roof trusses and similar material, in lengts not to exceed 65 ft., overhang not to exceed 16 ft.—height and width to conform to Rule 25, if the material would be injured if loaded on more than one car. From a point of safety in transit, it is a very undesirable method and should be used only when absolutely necessary."

Rule 91.—Change side clearances from 18 in. to 22 in. to conform to changes in Rule 51.

Rule 93.—In order to cover triple loads of long flexible material, this rule should be changed to read as follows:

"Long flexible material like plates, etc., which can not be loaded as shown in Fig. 24, must be loaded on two (2) bearing pieces and two (2) or more sliding pieces as in Figs. 41, 42, 43, 43-A and 43-B. The sliding pieces must be 4 in. lower than the bearing pieces and must have flat iron ½ in. by 6 in. secured to the upper side, either with spikes or lag screws at each end. These iron pieces which are intended to facilitate carving must extend at least 22 in. beyond each side of the lading and must be coated with grease before the lading is placed upon them. The bearing pieces must be secured to the car and the material clamped together in the same manner as described in Rules 72 and 80 to prevent it from shifting."

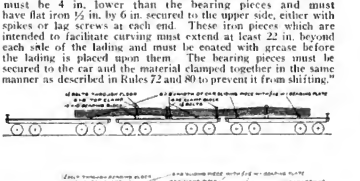

Fig. 1—Loading of Long Flexible Material on Flat Cars and Gondola Cars.

Rule 98.—The last sentence should be changed to read: "Rolling freight must be loaded longitudinally with car and must be chocked to prevent end and side motion."

Rule 103.—"All structural material and plates more than 60 ft. long, also," should be eliminated, as this class of lading is covered by Rule 93.

Rule 112.—The following should be added to this rule:

"Pipe 8 ft., or less in length, side and end protection must be provided."

Rule 112-A.—On account of the difficulty experienced handling pipe where small sizes have been placed inside of larger pipe, a rule prohibiting the practice has been sug-

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gested to read as follows, and shown as second and third paragraphs of Rule 112-A:

"Wrought-iron pipe of the smaller sizes, approximately 1½ in. in diameter and less, should not be loaded inside of larger sizes of pipe, unless below the ends or end gates of cars."

"Wrought-iron pipe of the smaller sizes, approximately 1½ in. in diameter and less, should not be loaded on top of the larger sizes of pipe, unless the load is below the ends or end gates of cars, except where the smaller pipe is securely tied in bundles."

Rule 112-B and 113-A—Omit the last sentence in brackets, reading: "(See Rule 112 for wiring and staking)."

Rule 115-A.—Add after the word "Pipe" the last word on page 105 the following: "Provided that blocking more than 10 in. in height will not be required."

Rule 116—This rule has been revised to conform to the present method of loading as follows:

"Blocking of more than 10 in. in height will not be required, but on loads of pipe 3 ft., or over in diameter the blocking must be staked by suitable chocking."

Rule 117-A.—This rule should read as follows:

"Gondola cars. Galvanized-iron culvert pipe of all sizes, for size and number of stakes to be used see Rule 12 and 112. When mixed sizes are loaded on the same car, the small size pipe when possible, should be placed inside the large size. In loading galvanized pipe Rule 9 must be complied with."

Rule 117-C.—This rule should read as follows:

"Mining cars and similar vehicles; the length of cars being equal to or greater than twice the height of car side, it loaded in gondola cars on ends, the broad side or bottom must be loaded parallel with car side and securely blocked against side of car. The ends should be brought together in a cone shape. Each pair of cars or vehicles must be securely fastened together on each side with a board not less than one by 6 in. bolted to each car or vehicle with one ⅝-in. bolt, the entire load to be tied together with four strands, two wrappings of good ⅛-in diameter wire. The blocking

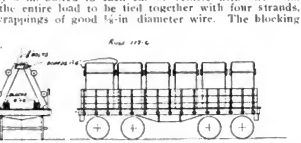

Fig. 2—Manner of Loading Mining Cars and Similar Vehicles in Gondola Cars.

must be of sound timber not less than 6 in. by 6 in. square. Fig. 61-A shows substantially how the load is to be secured."

On page 108, first line under the heading "End Protection," should be changed to read as follows:

"Cars not provided with end stake pockets the necessary, etc.," and after "or" in first line on page 109, the word "two" should be inserted.

Rule 121.—Last sentence in second paragraph should be changed to read as follows:

"End blocking to be not less than 6 in. in height, bolted to car floor and securely cleated." Fig. 64-B should be changed to conform to the above change in the rule. Four inch blocking is not sufficient to hold boilers and tanks over 8 ft. in diameter on flat cars.

Rule 121-A.—Should be added to the code to cover shipment of smoke stacks on same car with boiler. This rule to read as follows:

"When smoke stacks are shipped on same car with boiler, not less than 4 in. by 4 in. stakes should be applied to each side of car, and each pair of stakes tied together with one inch by 8 in cross braces, nailed to each side of stakes with 3 tenpenny nails. The smoke stacks should be loaded on top of cross braces and securely wired to them with ⅛-in. diameter wire. The projection of stakes above cross brace should not be less than one-half the diameter of smoke stack."

Rule 121-B.—This rule should read as follows:

"Engines, machinery and vehicles shipped on their own wheels, should have wheels securely chocked fore and aft and longitudinal sills placed on the inside of wheels and securely fastened to floor of car. Struts should be used to prevent the heavy parts of the engine shifting endwise. One end of the strut should be placed against some strong protection on engine, machine or vehicle—the other end securely fastened to floor of car."

Rule 122.—Fig. 64 shows three horizontal tie braces, instead of one.

Rule 122-A.—The 2 in. by 4 in. diagonal braces to axel journals now shown in Fig. 66-B and 66-C, should be eliminated and angular chocks 8 in. in height against wheel tread, spiked to car floor, should be substituted.

Rules 127 and 127-A.—These rules should read as follows:

"*Rule 127.*—Hewed ties 8 ft. or more in length, or sawed ties of lengths 8 ft. to 12 ft. or similar material which does not conform to Rule 126, may be loaded longitudinally in four tiers, as per Fig. 71, in which case the ends of the tiers next to the end of car and end of ties projecting into the doorways must rest on bearing pieces not less than 6 in. thick laid crosswise on floor of car. If the length of car is such that ties can not be piled in four tiers, three tiers may be used as shown in Fig. 72, in which case the spaces between the tiers must be blocked to prevent any shifting of the middle tier. When loaded in three or four tiers as indicated the door protection strips need not be applied.

"*Rule 127-A.*—Sawed ties more than 12 ft. in length (see rules for loading lumber)."

Rule 132.—A paragraph should be added as follows:

"To protect the ends of cars loaded with greased shaftings, boards 2½ in. thick, full width of car and to height of lading, should be securely nailed to end of car."

Rule 133.—This rule to read as follows:

"If box cars are used for loading heavy machinery, such as lathes, planers, boring machines, etc., each machine should be blocked by securely nailing to floor of car 2 in. by 4 in. hardwood strips fore and aft, to prevent shifting endwise."

New Rule 134.—Automobiles should have gasoline and water tanks emptied and batteries disconnected. If electric automobiles, remove batteries. Place automobile in car parallel with sides of car. See that front wheels are in line with back wheels. Set brakes. The lower third of tires should be wrapped with at least two thicknesses of good burlap to prevent chafing. Secure each wheel with bands of good strong material (canvas preferred) fastened with 2 in. by 4 in. by 12 in. sound wood blocks, placed on each side parallel with wheel, and securely nailed to car floor to prevent bands from pulling loose. Each wheel should be chocked fore and aft with angular chocking one-third the height and 2 in. wider than wheel. The chocking on each wheel should be tied together with a board on each side of wheel, securely nailed to the chocks. To preserve alignment of the front wheels, small ropes tightly drawn should be fastened from the top of one wheel to the bottom of the other. Burlap should be placed around wheels under rope to protect paint. When shipped without tires, no part of the wheel except center of rim should come in contact with the chocking. In addition to chocking referred to, an iron band not less than 1¼ in. wide and not less than 18 gage in thickness should be passed over top of wheel and securely fastened to chocking.

The report is signed by:—A. Kearney, (N. & W.), chairman; R. E. Smith, (A. C. L.); L. H. Turner, (P. & L. E.); W. F. Kiesel, (Penna.); C. N. Swanson, (A. T. & S. F.); G. H. Gilman, (No. Pac.), and J. M. Barrowdale, (Ill. Cent.).

In presenting the report, Mr. Kearney said: "Rule No. 93 is to be modified to the extent that we will allow a uniform plate of 1⅜ in. Under Rule No. 117-A, there should be added to the code to cover shipment of galvanized "corrugated sheet" iron culvert pipe."

The committee had a meeting yesterday, and received some other suggestions relating to changes in the M. C. B. Loading Rules. The committee would like to embody the following changes in its report:

Rule 1-A.—Add to first sentence fourth line, "or rolled or built up steel sections of equal strength."

Rules 15-A, B and C.—Make reference to the use of "sliding pieces" as well as "bearing pieces".

Rule 14-E.—Make reference to 15-C.

Rule 15-E.—In order to make the rule correspond to the figures, it should be changed as follows:

"For twin or triple loads of long flexible material, such as plates or similar lading, requiring two or more sliding pieces in addition to the bearing pieces, the weight of lading must not exceed one-half the capacity of car, and must conform to Figs. 41, 42, 43, 43-A and 43-B.

"For material of less flexibility such as heavy channels and I-beams, see rules 15-A, B and C, and Figs. 39 and 40.

"For Tee and girder rails 60 to 65 ft. long, loaded on flat cars, having four or more stress rods or on gondolas with deep ends, the lading may equal the marked capacity of car."

Rule 32.—add to end of second section: "Or rolled or built up steel construction."

Rule 34.—change to read: "The preferable distance between bearing pieces under lading on two or more cars is 7-10 the total length of lading, with allowable variation from 6-10 to 8-10."

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Fig. 12.—Add to the heading, "Rule 91."

Fig. 20.—Omit the words "in bundles" in notes.

Add Fig. 33-A to second line of heading to table covering maximum weight of load.

Fig. 43.—Add the word "flexible" to heading, after the word "material."

Rule 74.—Reference to Fig. 29 should be omitted.

Rule 76.—Reading should refer to Fig. 33-*A* as well as Fig. 24.

Rule 78.—Change the words "bearing pieces" in the second line to "clamping pieces."

Rule 93.—Page 83 first line, change to 7/8 in. x 6 in.

Rule 94.—Change words "bearing piece" in sixth line to "clamping piece."

Rule 100.—Add "see rule 93 for sliding pieces and sliding irons."

Rule 101.—Omit.

Fig. 59.—Change cut to show 3 instead of 4 pairs of stakes to illustrate the rule rather than the exception.

Rule 81-B.—Add words "structural bars and shapes." after "plates" in first line.

Fig. 46.—Change heading to read: "Structural material loaded on flat cars or top of sides of gondola cars."

DISCUSSION

I. S. Downing, (L. S. & M. S.): Under Rule 121-B it says: "Engines, machinery and vehicles shipped on their own wheels should have wheels securely chocked fore and aft, and longitudinal sills placed on the inside of wheels and securely fastened to floor of car." A little further down, it says "securely fastened to floor of car." Inspectors generally understand when you say "shipped on their own wheels," that the thing will run on the way like a crane. We had a serious accident on account of a crane loaded on a flat car, the wheels of which were securely locked, but the machinery of the crane was not locked. It was only covered by canvas, and in going around the curve, the machinery of the crane became free, and a serious accident was caused, and I think we should specify that the gearing of these cranes should be blocked.

A. Kearney: It is the intention to cover that point by an illustration which will show how that class of shipment is to be handled.

M. K. Barnum: I suggest that in Rule 121-B the word "shipped" be changed to "loaded";—"Engines, machinery and vehicles loaded on their own wheels."

A. Kearney: That is acceptable to the committee. (The report was referred to Letter Ballot).

OVERHEAD INSPECTION OF BOX CARS.

The committee on Rules for Loading Materials, to whom was last year assigned the formulation of rules for the overhead inspection of box cars for loading, was forced to present a report of progress at the last convention on account of its inability to satisfactorily cover the field a subject of so much importance seemed to warrant. With the assistance of the American Railway Association, the General Managers' Association of the Southeast, and others, a great deal of data showing in a general way what was taking place, and what claims were resulting from damaged and defective equipment, were secured; however, the statistics submitted at that time and those subsequently obtained seem to be much the same, except perhaps in quantity, rate of increase and losses sustained.

On account of the many damage claims presented, with the attendant difficulties in adjustment, often by reason of uncertainty in some instances as to the proportion of the claim that might belong to the condition of the car at the initial point of loading, and how much originated on the line of the road, its treatment, etc., it seemed proper to mention at the outset that the solution of the problem evidently narrows itself down to the important factor of inspection, selection and proper preparation of the car at the loading station. The committee found itself confronted with innumerable difficulties and objections offered by railroads explaining that latitude must be allowed on account of possible unwarranted interference to movement where unnecessary time might be consumed selecting and preparing equipment, especially where the supply and opportunity to obtain equipment is of considerable moment. It is still further argued that such a proscribe might result in embarrassment if any specific and more stringent rules are established for the erating and inspection of equipment, even though the work be confined to cars for shipment of only certain commodities readily damaged by water, or leakage losses. At all events, it seems to be the general opinion, at least in certain localities, that steps might be profitably taken working to the standardization of rules and requirements for the selection and inspection of equipment required for certain shipments, and it is the opinion of the committee that if it is going to be possible to secure improved conditions along this line, they are most likely to be obtained by confining attention to shipments readily damaged by moisture, eliminating for the present the consideration of other commodities, at least until some systematic rule can be established and gotten under way.

It has been the idea of the committee that a composite card acceptable to the roads now following the practice of securing certificate of inspection cards will be the first solid ground reached in working to a uniform practice and if the interest of such roads can be secured in this direction, the proposition will be readily given the necessary impetus to carry it as far as it can be employed with profit and without danger of being used beyond the point of economy. Working to this end the committee has secured what is supposed to be a complete list of roads using certificates of inspection cards. They are as follows: Great Northern; Chicago, Burlington & Quincy; Chicago Great Western; Chicago, Milwaukee & St. Paul; Minneapolis, St. Paul and Sault Ste. Marie; Illinois Central; Atchison, Topeka & Santa Fe and St. Louis & San Francisco.

The Great Northern, Chicago Great Western, and Chicago, Milwaukee & St. Paul use only one form of card and the card used by each road is practically the same, and is given below:

C. M. & St. P. Ry.
This car
No..... Initial.....
FOR FLOUR.
Inspected by.....
Date..... 191.....

There have been no special instructions issued by these roads as to the inspection to be made, a specially trained man being selected for the work.

The C. B. & Q. are using four different forms of inspection cards, one being for flour, cement, grain, rough freight; one for flour, one for cars fit for grain and one for cars not fit for grain. There are no specific instructions for inspection issued. The master mechanics are instructed to have the empty cars inspected and carded according to their condition and the requirements of traffic.

The M. St. P. & S. S. M. is using two inspection cards, one for cars suitable for flour loading, and one for cars not suitable for flour, grain or merchandise. The instructions relative to the use of these cards are that the cars are to be given a special interior and exterior inspection to see that sheathing, lining, flooring, roofing, doors and fittings are in good condition; any small holes found in the floor are to be cleated over, care being taken to bevel the edges of the cleats to prevent damage to flour sacks. Cars with a bad odor, due to carrying hides, oil, etc., are not to be used for flour. Cars otherwise O. K'd with the exception of having small oil spots on the floor are to be painted over with quick-drying paint. All projecting nails, spikes or bolts to be removed or driven in to prevent damage to flour sacks, and all cars are to be swept out thoroughly clean. Cars fit for flour loading are to be carded O. K., and the numbers and initial of such cars are to be turned in to the agent.

The Santa Fe is using two inspection cards, one for flour and one for grain loading. There is no difference in the make-up of the cards, except that one is printed in red and the other in green. The Santa Fe instructions relative to the use of the inspection cards are as follows:

Where car inspectors are located, cards will be furnished the inspectors, and at the stations where there are no car inspectors, the local agents, or their representatives, will inspect all cars for grain and flour loading. If after proper inspection cars are found to be in suitable condition for grain and flour loading, a card is to be attached to the car door, three feet from the bottom of the door. Switchmen or local crews should be prohibited from placing at loading docks, platforms, or elevators, an empty car which does not have one of these cards attached. When a car has been inspected and card placed thereon and placed at loading dock, and when shipper or his representative has inspected the car and accepted same for loading, the card will be detached and returned to the representative of the company, and shall be attached to and filed by the agent with duplicate bill of lading or shipping instructions. Shippers must be notified when a car is made empty at their plant that the car must not be loaded until it has been inspected and necessary card attached. The Santa Fe is now contemplating the use of another form of inspection card which will be made up in manifest form so that shippers can have a copy for their use.

The Frisco Lines are using three forms of inspection cards, and an abstract of the instructions follows: The roads must be carefully inspected to ascertain if waterproof, the doors to see that they fit tight, and are in good condition. The doors should be pulled shut and inspected for leakage. The doors of all cars loaded on Frisco rails and on foreign line rails for movement via Frisco, must be wedged, papered and striped in the following manner: Drive one wedge

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between each door shoe and the door, which will force the door up against side of car. After the wedges have been applied, a strip of odorless asphalt paper, 11 in. wide, must be applied over the openings of the car door, that is, one strip on each side of the door and one on the top of the door, the paper to be held in place with narrow wooden strips. A standard grain door section is seven ft. long and 20 in. wide. Usually three or more sections are used for each door. They should be placed in position and nailed to the door posts with 8-penny nails. Large nails or spikes must not be used. Care should be exercised to see that the doors fit closely, and that there are no holes in them. Nails protruding from door posts must be pulled out so that the grain doors will fit closely. Grain doors made of light material must not be used for the bottom or middle section, account pressure being greater on these sections. Doors made of good strong lumber should be used. Burlap will be furnished by the store department upon receipt of proper requisition, cut in strips eight ft. long and 40 in. wide for the doors, and 3 ft. long and 40 in. wide to cover the draft bolts. Two strips 8 ft. long should be used to cover the grain doors. This leaves 6 in. over each end of the grain door for tacking to the side of the car. The lower strip should be allowed to lap on the car floor 8 to 10 in. in order to make a leak-proof joint. It must not be tacked to the car floor. The top strip should lap over the lower strip from 4 to 6 in., and should not be tacked to the grain door. Wooden strips will be furnished with the burlap to tack the ends to the side of the car. The short pieces of burlap are to be tacked over the draft bolts and held in place by short strips of wood tacked around the edges. Burlap should be applied loosely and not stretched tight across the boards, so that it can give and not tear from the bulging of the doors.

While the general practice seems to be to use cards bearing printing in large letters showing a specific commodity, or in some cases one or two products, the committee did not seem to be able to readily get away from a card on which provisions are made for the designation of the shipment for which the car is inspected and made suitable without introducing more than one card, which is not wanted unless it cannot be avoided. A sample of such a card, representing the result of a combination of all the cards, with their instructions, is as follows:

A. B. & C. Ry.
This Car
No..... Initial.....
O. K. FOR SHIPMENT OF COMMODITIES.
Under.....Classification.
Inspected by.....
Date.....191.... Station.....
(Size of card, 6 by 8 inches.)

The committee points out the three apparent classifications of lading for which the box car is on some roads and in some localities receiving special attention before loading. The three following classifications were given as covering the situation at least until improvement can be suggested and worked out.

CLASSIFICATION *A*.—Flour and sugar.

CLASSIFICATION *B*.—Bulk grain.

CLASSIFICATION *C*.—Lime, cement, plaster; boxed, sacked and crated packages of seeds, coffee and merchandise; hay, dry goods and notions; high grades of finished lumber; tobacco, furniture, household goods and certain grades of tin and galvanized iron.

In the arrangement of the above classification, the items shown under *A* have been grouped together in order to secure cars which might be necessary for such shipments, i. e., those free from soiled floors and interiors carrying odors liable to damage the goods; whereas cars selected for classification *B*, intended for bulk grain, clearly indicate by their character what might be suitable for their safe transportation; likewise classification *C*, covering the commodities mentioned, could be safely transported in a car which, while it should be tight, need not necessarily be as carefully selected as to other conditions as a car for classification *A*.

On the back of the cards, inspection instructions should be printed as follows:

INSPECT AS TO

Classification *A*.	Classification *B*.	Classification *C*.
Leaky roof.	Leaky roofs.	Leaky roof.
Loose siding.	Loose siding.	Loose siding.
Loose roof boards.	Loose roof boards.	Loose roof boards.
Shifted roof sheets.	Shifted roof sheets.	Shifted roof sheets.
Broken door stops.	Broken door stops.	Broken door stops.
Leaky doors, tops and sides.	Leaky doors tops and sides.	Leaky doors, tops and sides.
Broken end posts.	Broken end posts.	Broken end posts.
Broken or loose door posts.	Broken or loose door posts.	Broken or loose door posts.
Floors soiled by oil, grease or any material carrying odors likely to damage lading.	Holes in floor and around center sliders and draft bolts.	Protruding nails on floor and lining, bolts.

METHOD OF INSPECTION BEFORE LOADING.

(A) Inspection to be made at point of loading whenever practicable.

(B) At point of distribution from which car is forwarded to loading station, and again by Agent.

(C) Cars received and unloaded at station where no inspectors are located, should be inspected by the Agent.

Aside from the Master Car Builders' inspection of car, including roof, running boards, air brakes, safety appliances, and running gear, as well as the external inspection of sides, ends, doors, ventilators and windows an internal inspection must be made of the roof and siding, with doors, ventilators and windows in closed position.

1. Search for light indicating openings and cracks which might produce leaks.

2. For loose, damaged and broken boards, loose knots, knot holes, bad joints, etc.

3. For all nails and bolts extending above surface of floor and lining and nails protruding through roofing.

4. Search for water stains indicating cracks and air spaces.

5. Search for cracks sufficient to admit storm water beating through opening, also for openings and bad joints around window and doors.

6. Examine for metal sheets out of position along edge of subcarlins or down from edge of ridge pole.

7. Search for small holes in metal roofs due to rust or small openings in roof from other causes.

8. Doors must open and close properly.

The floors should be clean, dry and free from defects sufficient to admit moisture, and any fouling by previous shipments, such as fertilizer, oils, and other freights which would damage more perishable commodities. If the centerpin is uncovered, it might be necessary to cover it with a piece of board, depending entirely upon the character of freight to be loaded. Inspect closely for defects in framing which might, by reason of their weakness, allow the sheathing to be readily broken or damaged.

After a car is thoroughly inspected and known to be in good condition and suitable for the transportation of the commodities in the classifications, the inspector or agent, as provided for, making the inspection or able to certify to the condition of the car, must make out the prescribed certificate of inspection card and tack it to the car just under the car number. After the car is placed and accepted for loading, the certificate of inspection card must be detached from the car and delivered to the Agent before bill of lading is issued. The card must finally be attached to the agent's office copy of bill of lading or shipping ticket, for future reference in case of question arising as to the condition of car before loading.

Inspection of car bodies, doors, and the placarding of bad roofs, etc., as well as making notation of the extent of damage, is at present given attention; but it is also true that the general results seem to indicate that improvements can be made and higher efficiency obtained, since it seems to be generally accepted that any observation, inspection, and amount of prevention can be more economically directed at the time of selection and preparation of the car than through repeated repairs and attention to cars en route, only to find the car arriving at its destination offering opportunities for criticism and possibly heavy damage claims. Hence the fact remains that the successful launching of any systematic and uniform practice hinges upon a closer inspection of equipment as to the physical condition of the superstructure for the loading of certain commodities, and such inspection should be made in the best possible manner, to meet local conditions.

SUPPLEMENTARY REPORT.

The foregoing report was forwarded to the eight railroads now using a certificate of inspection card, inviting from them criticisms and suggestions as to what might be further offered in the committee's report. The real object, as explained to them, was to obtain their views upon the conclusions reached by the committee, and to further ascertain if in their judgment a uniform plan and the uniform cards, as suggested by the committee, will meet the requirements; furthermore, if they would be willing in the interest of uniformity to use it in lieu of what might now be their practice.

The committee failed to secure unanimous approval of the inspection card recommended. While the majority of the roads agree to the arrangement of the card, and the plan covering its use as suggested, others think that better results can be obtained by using separate cards for each classification, either printing on the card the commodity to be handled, or by using cards of different colors. The main objection raised against a single card for the three classifications is on account of requiring the inspector to write the letter *A*, *B*, or *C*, indicating the classification; and there is still another objection raised, as it contemplates requiring the switchmen or trainmen to read the card and ascertain from the information written thereon the class of commodity the car is suitable for handling.

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The committee found that a schedule for such an inspection was feasible, as has been shown in the report, and that the requirements can be made to very readily fit in with whatever final form and plan of handling the card is adopted; but has not been so successful in working out a card satisfactory to all railroads. The use of colored cards would seem to be perfectly practicable, and would not necessarily disturb the fundamental inspection plan proposed, provided it would be considered better to relieve the inspection force from writing the classification *A*, *B*, and *C* on the card (which as a matter of fact is practically nothing); and requiring as a substitute the carrying of a larger number of cards so as to designate the classification by color. It would seem that even such an arrangement could be worked out and still obtain a uniform practice; but it is the opinion of the committee that since it has gone about as far as it can in the consideration of this subject from a mechanical point of view, that the subject should be referred to the American Railway Association, or that a committee be instructed to handle it in conjunction with that Association. The report is signed by:—A. Kearney (N. & W.), Chairman; R. E. Smith (A. C. L.); L. H. Turner (P. & L. E.); W. F. Kiesel, Jr. (Penna.); J. M. Borrowdale (Ill. Cent.); C. N. Swanson, (A. T. & S. F.); G. H. Gilman (N. P.).

DISCUSSION

C. N. Swanson, (A. T. & S. F.): As a member of this committee, I would say that we have received communications from our operators and transportation officials. I will read one of them:

"Your letter of May 12, addressed to Mr. Raymond as chairman of the coopergage committee, enclosing a copy of your letter of April 21, to Messrs. Lehman and Purcell regarding overhead inspection, and the adoption of a uniform inspection card."

Uniformity of action, if well directed on the part of all railroads in the matter concerning car maintenance, is commendatory because:

First: It serves to develop a more general understanding of car defects, their nature, and what to the ordinary inspector to-day may seem trivial, will in the future be cause for the payment of thousands of dollars in claims for damage done when loaded with certain commodities under certain conditions. A Santa Fe car inspector today may be the inspector of another railroad tomorrow. If he learns to do his work right on the Santa Fe, he will be more valuable to the other railroad he is employed by, if they work along the same line as we, and to the same end.

Second.—It is one more step in the ultimate direction of co-operative endeavor along which road railroads must travel if they are to attain maximum results in the operation of their properties. There is no more reason why the railroads whose interests otherwise are foreign, should not work together for the common good of all, when the upholding of a common economic principle rests in the balance, than there is of two divisions of the same railroad.

Third.—Aside from this, I am in favor of the uniform card, because it is designed to meet all conditions and will do so far better than our present individual grain and flour inspection card. The use of such a card by all railroads would develop into a great good, and in the event it is adopted by the M. C. B. Association, I trust its adoption by the various railroads who are members of that Association may be forthcoming at an early date.

F. F. Gaines: I move that the committee be continued, and the matter referred to the American Railway Association, with the understanding that this committee stands ready to co-operate with them in everything they can. (Motion seconded).

T. H. Goodnow, (C. & N. W.): Is the proposed card supposed to carry any empties in the way of exchange; that is, by delivering cars to other roads on orders. If this card is intended to protect the line receiving those empties in moving the cars into the train-loading territories to ensure good cars? Or is it simply intended to be used by the road in selecting their individual cars and forwarding them to train-loading points? If it is the latter, it will not accomplish much more than their present arrangement for such selections.

C. N. Swanson.—We believe in a card of the character; that when Road *A* asks for a number of cars from Road *B*, the cars will be so thoroughly inspected that they will be delivered to Road *A* fit for the commodity for which they were sent over, whether it is wheat, flour, cement, or whatever it may be. When an agent calls for cars, there is a thorough inspection made for grain or flour loading, and that is the intent of this uniform inspection card.

T. H. Goodnow: If the committee has not considered that, I suggest that they do so for the reason that it is becoming more and more the practice to deliver cars on orders, already coopered with the train doors boarded up, and it is difficult for the receiving roads to make an interior inspection of the cars without providing their inspectors with ladders; and if it could be carried out and accomplish that particular effect, it would serve a good purpose.

C. N. Swanson: It should not be necessary for the receiving road to make such an inspection if the car has been thoroughly inspected and coopered, and the card placed on the car. The card on the car would indicate that the car was fit for the commodity intended.

A. Kearney: Mr. Hale of the American Railway Association suggested that it might be well to have this item returned to that Association with a definite recommendation.

D. F. Crawford (Penna.): There are only a total of 8 roads, out of all those in the United States, apparently, that are using this card, and I do not feel that the association itself is prepared to send this to the American Railway Association with its endorsement.

F. F. Gaines: I would not favor the proposition that the association is to go on record as favoring this as standard practice, by any means whatever, at this time, but we have got to the point, if you want to go any further with it, and it does seem desirable that we should go further with it, that it be recommended only as Recommended Practice. The operating end wants it, it is purely an operating proposition.

President Fuller: Mr. Crawford is correct in his position. There are very few of the members present who know very much about the subject, and they have not had much time to consider it. It seems to me that the Committee's recommendation in the last part of the report is about as far as you can consistently go, or about as far as this Convention can consistently go.

I. S. Downing: I do not think that these different classes of lading should be put up to the car inspector, for the reason that they do not know how many cars are wanted for grain, etc., except on special orders, and if this rule is adopted in big yards, it will compel the inspecting forces to inspect 5,000 or 6,000 cars and card them and classify them, and maybe they only want 50. I think the agents' men know as much about grease-spots on the floor of the cars, and such things, as our inspectors do. We have to put on special men to do this work on our road. I think as Mr. Goodnow says, this is to be an individual lading proposition, each road handling their cars and inspecting their cars. I do not think we should try to inspect cars three or four hundred miles away from the point where they are to be used, for another road.

W. E. Dunham, (C. & N. W.): I have had considerable experience in the past few years in inspecting cars for grain lading, and we do not depend even upon the mechanical divisions of our own road for inspection. We inspect the cars again, and inspect them where they are loaded, and that is the only way in which we can absolutely cut out the use of improper cars.

A. Kearney: I simply wish to say a few words in the way of explanation. This report was handed to us by the American Railway Association. A committee of that association presented a report to the executive committee of the M. C. B. Association, showing them what had been lost, or what was being lost, by reason of the poor inspection of cars, and asking the executive committee of the M. C. B. Association if they thought they could work out a code of inspection rules for such equipment. That has been the work of this committee, and now I should say we are ready to report back to the American Railway Association and hand them this recommendation for the inspection of such equipment.

T. H. Goodnow: I believe that if the report is confined to the question of inspection, a system of inspection of the cars, that will be all right, but the introduction of these cards is another matter. If, as Mr. Kearney stated, that will be left solely to the loading road, to use the cards for their own protection, they carry no significance with them, and I do not see why it is not as well for the road to handle the inspection under the system of chalking the cars or whatever other means the roads prefer to use. The big grain-loading roads in the West have to haul cars empty hundreds of miles, and you cannot depend on the inspection in big cities where the cars accumulate, to have the cars O. K. when they arrive out in Dakota, for example.

F. F. Gaines: I believe our managements, as a whole, are looking to us to do something, not so much as an interchange proposition, but in the way of a more thorough inspection of box cars to prevent damage to lading. It is not my idea that this thing is being presented for adoption

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as standard to concur with the recommendations started by the American Railway Association. We have done all we can, and now it is our province, I believe, to turn it back and see how far they want to go with it.

I. S. Downing: I do not feel like some car men, that we are entirely responsible for this equipment. Our assistant superintendent of motive power and myself made an inspection of 27 cars last week, and out of the 27 cars, we found 7 brand new cars unfit for grain loading, due to the fact that the cars had been loaded with hides and oil. The transportation department will not switch out good box cars, and take them for grain, if they need them at the nearby freight house. The American Railway Association can help the mechanical department by getting at these fellows a little and stopping that sort of thing. It costs the freight department a considerable amount of money to switch cars not fit for grain, to the rough loading station and hold the good cars for grain and a good load.

C. E. Chambers, (C. of N. J.): Mr. Downing struck the nail on the head. How many of us roads here have absolute control over the conditions at the points to which their cars go? Many times the cars are put in as fit for a certain class of freight, and the roads do not have an opportunity to inspect for that class of freight. The transportation department orders the cars where they want them, and uses them as they want them.

J. J. Tatum, (B. & O.): I believe there should be some standard method of inspecting cars for special lading. The necessity for such a method is brought about by the car supply. If you have not a sufficient number of cars of a certain class to supply for a certain shipment, you have to resort to means to supply the cars from what equipment you have then to select from. You may start your car after an inspection by an ordinary inspector at your own yard, and at an interchange point the inspector may hold out the car, and he may decide the car to be unfit for grain and flour. He may possibly lay out for rough freight a greater number of cars than the equipment in hand would justify him in doing.

A short time ago, a large number of cars were selected in Chicago for the transportation of grain. In the train which was dispatched, there were so many for grain and so many for flour and so many for rough freight. When they were delivered to the loading road, the cars which were chosen by our inspector as being fit for grain, were considered by the inspector of the loading road to be fit only for merchandise freight, and it resulted in many of these cars being cut out for the lading they were intended for. So it seems to me almost impracticable to think that one road can inspect for another road, because they are alone different lines as regards the class of cars they will use for different lading.

(Mr. Gaines' motion was then put and carried.)

CAR TRUCKS.

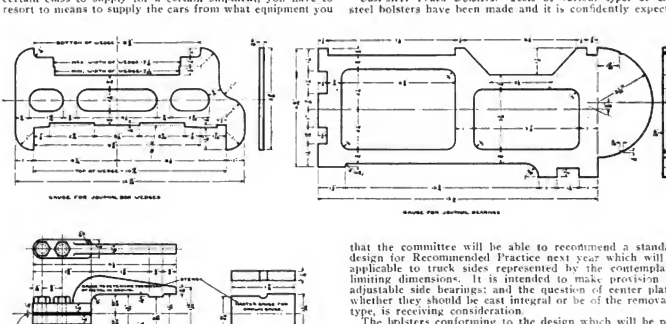
The following subjects were assigned by the executive committee to the committee on car trucks and the committee reports as follows:

DESIGN OF CAST-STEEL TRUCK SIDES AND BOLSTERS FOR FREIGHT CARS.

Cast-steel Truck Sides.—The various designs of cast-steel truck sides were considered, but as a number of them are covered by letters patent it was decided to prepare diagrams showing the limiting dimensions for truck sides for 80,000, 100,000 and 140,000 lbs. capacity cars, so as to provide for interchangeability of truck sides of the same capacities but different design, instead of proposing any definite design. The truck sides which come within these proposed limiting dimensions are to be subject to the specifications and tests contained in M. C. B. Recommended Practice adopted last year, which are being revised, and will include a proof load test for deflection without permanent set as well as limiting weights. This will provide truck sides which will be safe and interchangeable for the given capacities of cars for which they are intended and eliminates those of weaker designs.

The manufacturers have submitted drawings of the different truck sides manufactured by them, which are being tabulated with a view of arriving at the limiting dimensions. Results of tests of various truck sides made by individual railroads as well as manufacturers have been considered and tests are now being conducted by the committee, but the latter are not completed, which prevents submitting definite recommendations to the Association this year.

Cast-steel Truck Bolsters.—Tests of various types of cast-steel bolsters have been made and it is confidently expected that the committee will be able to recommend a standard design for Recommended Practice next year which will be applicable to truck sides represented by the contemplated limiting dimensions. It is intended to make provision for adjustable side bearings; and the question of center plates, whether they should be cast integral or be of the removable type, is receiving consideration.



Journal Bearing and Wedge Gages for 6 in. x 11 in. Journal.

The bolsters conforming to the design which will be proposed are to be subject to the specifications and tests contained in M. C. B. recommended practice adopted last year, which will be revised and also include a proof load test for deflection without permanent set, as well as limiting weights.

LIMITING STRAINS PER SQUARE INCH FOR ARCH BAR TRUCKS.

It is the opinion of the committee that little would be accomplished in endeavoring to harmonize the different formulæ used for figuring the limiting strains for arch bar trucks, with a view of establishing a standard along these lines. The association has adopted standard arch bars, columns and journal box bolts for 80,000 and 100,000 lbs. capacity cars. These standards are not being adhered to generally by the different railroads, changes being made in the truss dimensions to accommodate car construction and for design reasons. Different sections of arch bars are also used by some railroads on account of the standard section failing to meet the service conditions imposed. The committee is making a series of tests of the M. C. B. arch bar side frames, as well as of a number of individual designs, to determine their relative strength, and this data will be available for comparison with the tests of the cast-steel side frames when completed.

AXLE FAILURES UNDER TENDERS AND TENDENCY OF THE JOURNALS TO ROLL OUT OF THE BEARING.

George R. Henderson, Consulting Engineer of the Baldwin Locomotive Works, raises two questions concerning the standard *C* and *D* axles, with 5 in. by 9 in. and 5½ in. by 10

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in. journals, respectively, when used under tenders in connection with the operation of the quick-action E. T. brake under emergency application as follows: Axle failures. Tendency of the journal of the axle to roll out of the bearing or under the edge of the bearing.

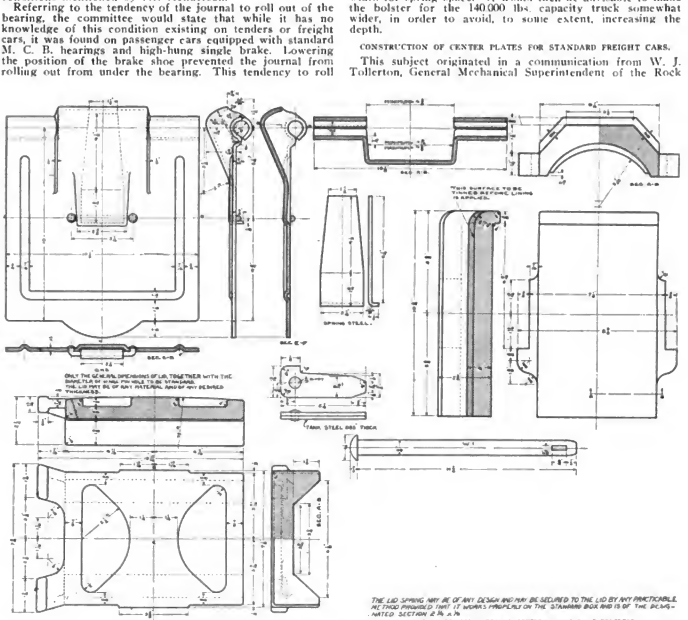
In reply to the first question, the committee would refer to the report of the Committee on Axles to the 1896 convention. The committee has not heard of any failures on these axles purchased according to specifications under the conditions mentioned by Mr. Henderson.

Referring to the tendency of the journal to roll out of the bearing, the committee would state that while it has no knowledge of this condition existing on tenders or freight cars, it was found on passenger cars equipped with standard M. C. B. hearings and high-hung single brake. Lowering the position of the brake shoe prevented the journal from rolling out from under the bearing. This tendency to roll

alloy steel springs. If alloy steel springs, which will stand about 35 per cent. more stress when solid, can be furnished, it will be possible to adopt springs with sufficient flexibility for trucks having 5½ in. by 10 in. journals without any change whatever in the space now allotted for springs. For trucks having 6 in. by 11 in. journals it would then be advisable to use five springs, of exactly the same details as the four springs used for the 5½ in. by 10 in. journals, which will require the same height and about 40 per cent. more width for spring space. It would then be advisable to make the bolster for the 140,000 lbs. capacity truck somewhat wider, in order to avoid, to some extent, increasing the depth.

CONSTRUCTION OF CENTER PLATES FOR STANDARD FREIGHT CARS.

This subject originated in a communication from W. J. Tollerton, General Mechanical Superintendent of the Rock



Journal Bearing, Wedge and Lid for 6 in. x 11 in. Journal.

out does not exist with clasp brakes. This subject was considered by the committee which conducted the Lake Shore Emergency Brake Tests, and their recommendations are recorded on page 89 of the 1910 M. C. B. Proceedings.

SPRINGS.

The committee on springs for freight car trucks at the last convention submitted a tentative design of spring for 140,000 lbs. capacity cars with arch bar trucks, recommending that the various railroad companies furnish dimensions of available space, or preferably prints of springs which have been designed or used for trucks with 6 in. by 11 in. axles. As far as has been ascertained, the Baltimore & Ohio and the Pennsylvania Railroad are the only roads who have placed such trucks in service.

The line of investigation thus far made covers the use of Island Lines, in which he suggests for investigation "The construction of center plates, for standard freight cars, bringing present practice as shown in the M. C. B. Proceedings up to date. Center plate shown is some ten years old and not suitable for steel-constructed cars."

This center plate has been generally adopted on 100,000 lbs. capacity cars, and we have not heard of any serious objections to them. This subject will be given further consideration by the committee in connection with the design of the standard truck details.

JOURNAL BOX, BEARING AND WEDGE FOR 6 IN. BY 11 IN. AXLE USED IN FREIGHT SERVICE.

D. F. Crawford, general superintendent motive power, Penna. Lines West of Pittsburgh, recommends that standards be adopted for journal box, wedge and bearings for

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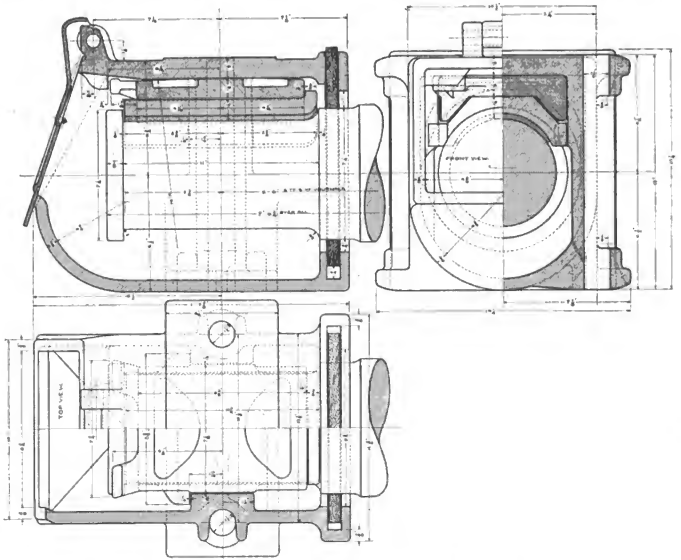
standard axle with 6 in. by 11 in. journal. The committee presented designs and recommended that they be submitted to letter ballot for adoption as Recommended Practice.

The report is signed by:—J. T. Wallis (Penna.), chairman; J. R. Gould (C. & O.); J. J. Tatum (B. & O.); E. W. Pratt (C. & N. W.); R. W. Burnett (C. P.); James Coleman (G. T.), and G. A. Hancock (St. L. & S. F.).

for the purpose of securing the greatest amount of wearing metal.

E. A. Millar, (B. & M.): In line with what the last speaker said, and in connection with the report of the Committee, I would say that one of these cars is on the line I am connected with, with a journal bearing split in two. It only traveled 15 miles after it was loaded. This was not strong enough to carry the load.



Box and Contained Parts for 6 in. x 11 in. Journal for Freight Cars.

DISCUSSION.

W. E. Dunham, (C. & N. W.): I note the exhibits A and C, that the detail of the wedge indicated is not according to the latest practice of the Association. The face has been increased, and I think this should be changed in the same way before it is submitted to letter ballot.

C. A. Schroyer (C. & N. W.): I do not entirely agree with Mr. Henderson's second question included in the report insofar as the experience of our line is concerned. We have had much trouble caused by shocks in the yard while switching. This was brought very forcibly and costly to our attention, from the fact that we used cast-iron oil boxes at one time, and under the larger carrying-capacity cars, were having the sides of the boxes knocked out constantly. I have seen the sides of five oil boxes broken out of one car at one shock; as the result of which we substituted steel, and since then have had no trouble from that cause. I am not in favor of the shape of the wedge shown, insofar as the recesses on the top of the wedge are concerned which are put in for the purpose of saving metal in the manufacture of that wedge. You can see that the line on which the wedge carries the greatest strain there is the least amount of metal. That wedge wears into the top plate of the oil box, and we should have as much metal as it is possible for us to obtain.

C. A. Schroyer: Was it the bearing or the wedge.

E. A. Millar: They both failed.

F. F. Gaines, (C. of Ga.): I move that the committee be continued for another year, as they promise additional work on the lines involved, that the last item be submitted to letter ballot, and that the committee, before sending this letter out to ballot, take into consideration the remarks made about the wedge this morning.

T. M. Ramsdell, (C. & A.): Our experience with a wedge of this design is that the bearing face at the end is not sufficiently strong to stand the underthrust of the journal; that the metal should extend clear across the face of the wedge, instead of being cut out.

R. L. Kleine: I cannot understand Mr. Millar in regard to his split of the journal-bearing. Why did it split? There are upwards of 1,000 cars running with a bearing and wedges as herein shown, and we have had no trouble whatever, and there must have been some abnormal condition in his case. However, speaking for Mr. Wallis of the committee, the Committee has taken into consideration the question brought out by this wedge, and about changing the design of this wedge to conform to the outline of the present 5½ in. x 10 in. wedge.

E. A. Millar: There was no abnormal condition. The

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journal had not run hot. It had a solid bearing and was on a 100,000 lb. car with 5½ in. x 11 in. journal.

J. J. Tatum, (B. & O.): We have had over a thousand of those, and we have never had such a failure. I believe the Penna. and the B. & O. are operating a greater number of that class of equipment, and our experience has been that the recommended practice as herein shown and suggested, has given satisfaction.

I. S. Downing: As this seems to be on coal cars that are dumped in a coal-dumping machine, we have found on investigation, that in dumping the car upside down, the waste gets under the bearings and when you run again, you get a hot box. I thought it might be possible to cast a lug on the side of the box to tend to hold that waste down on coal cars. We had the same trouble with the 80,000 and 100,000 lb. capacity car, that are put through the coal dumpers.

(Mr. Gaine's motion was put and carried).

TRAIN LIGHTING.

The committee makes the following suggestions for recommended practices:

AXLES FOR AXLE DYNAMOS.

Axles for application of axle pulleys should be in accordance with the following three designs: First, axle in accordance with M. C. B. standard, rough-turned; second, axle straight between the wheel-fit collars, rough-turned; and third, axle with straight pulley fit. In any of these designs the axle pulley as recommended in paragraph 18 of recommended practices can be applied with the proper bushing.

NOTE.—The committee feels that the question of design of axles should be left to the mechanical men of the individual railroads in question.

STANDARD DESIGN OF AXLE-DYNAMO SUSPENSION.

Axle-dynamo suspension must be designed so that with full diameter wheels and truck on straight, level track, any part of the dynamo or suspension must have a clearance not less than 6 in. above top of rail, and a clearance of at least 3½ in. between any part of the mechanism attached to the car body.

In axle-dynamo suspension the metal carrying the weight of the dynamo must not be subjected to wear.

In axle-dynamo suspension, if side arms are used, the end to be secured to the truck frame must extend under transom and be bolted to the side frame near the transom, and if carried through or over end sill, must be held securely to end sill by a hooked bolt not less than ¾ in. in diameter.

When possible, the belt should go over the end sill and under the brake beam with belt clearances of at least one inch.

A typical design covering the above recommendations is shown herewith and recommended where applicable.

NOTE.—On account of the variety of trucks and car designs, it is impossible for the committee to recommend a standard suspension which will meet all conditions.

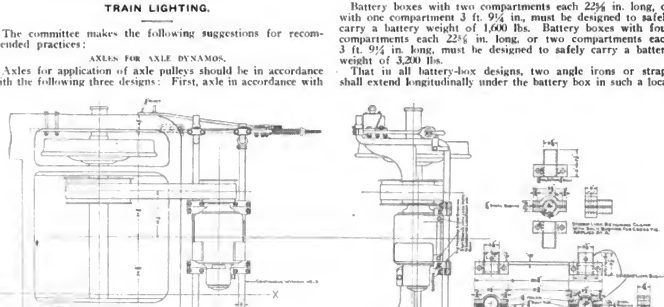
STANDARD DESIGN OF BATTERY BOX.

The inside clear dimension of battery boxes should be as follows:

Depth, front to back, 2 ft. 4 in.
Height in clear, not less than 21⅝ in.
Length of compartment for two standard double-compartment tanks or equivalent, 22⅝ in.
Length of compartment for four standard double-compartment tanks or equivalent, 3 ft. 9¼ in.

Battery boxes with two compartments each 22⅝ in. long, or with one compartment 3 ft. 9¼ in., must be designed to safely carry a battery weight of 1,600 lbs. Battery boxes with four compartments each 22⅝ in. long, or two compartments each 3 ft. 9¼ in. long, must be designed to safely carry a battery weight of 3,200 lbs.

That in all battery-box designs, two angle irons or straps shall extend longitudinally under the battery box in such a loca-



Dynamo Suspension, Link Type Belt Drive.

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In addition to the above, the Committee beg to make the following recommendations:

Under the caption of axle dynamo, the following should be added to paragraph 18:

"Diameter of axle pulleys should preferably be 17 in. or 21 in.; the diameter of generator pulley should preferably be 8 in. or 11 in."

Under the caption "Axle Dynamo," following paragraph 19, should be added the following:

"The electric connector between dynamo leads and permanent wiring on the car should be made with non-reversing self-locking receptacle and plug."

The report is signed by:—T. R. Cook (Penna.), chairman; C. A. Brandt (C. C. C. & St. L.); Ward Barnum (L. & N.); D. J. Cartwright (L. V.); E. W. Jansen (Ill. Cent.); J. H. Davis (L. & O.), and C. H. Quinn (N. & W.).

Mr. Cook presented the report and continued as follows:

In order to facilitate the handling of this report, I move that the items be referred to the Association by letter ballot by paragraphs. (The motion was carried.)

TRAIN PIPE AND CONNECTIONS FOR STEAM HEAT.

PROPOSED SPECIFICATION FOR STEAM HEAT HOSE.

The committee was continued to give consideration to this subject. It has gone into the matter very thoroughly and from previous tests, which have been reported to the Association, finds that there is so little difference between the opening in the medium-size coupler and what is known as the large coupler that it does not affect the passage of steam through the train

I. S. DOWNING,

Chairman, Committee on Train Pipe and Connections for Steam Heat.

line sufficient to warrant the large coupling. The adoption of what is known as the medium-size coupling is recommended. It also recommends a two-piece coupler, with the nipple separate, and a clamp which holds the hose on the nipple by friction.

A proposed specification for the steam-heat hose and steam-hose couplings for passenger cars is given below. Inside diameter 1½ inches as adopted as recommended practice in 1903.

1—MANUFACTURE.

Steam-heat hose must be composed of a tube of rubber, wrapped with five-ply cotton fabric and the whole covered with rubber.

2—PHYSICAL PROPERTIES AND TESTS.

The railway company's inspector will select for test one piece at random from each lot of 201 pieces. When this hose is received at the test laboratory, a section 2½ in. long will be cut from one end in order to determine the friction, tensile strength and elongation. The remaining portion will then be subjected to steam heat in the digester. After this section has been heated another section 2½ in. long will be cut from it and used to ascertain the friction, tensile strength and elongation, in order to show the change in these characteristics due to the action of heat.

Friction Test Before Steaming.—A section 1 in. long will be cut from the hose and supported in such a manner that it will turn freely on its axis. A twenty-pound weight will be suspended from the separated end of the fabric. The latter must unwind uniformly, if at all, and not faster than 6 in. in ten minutes.

Tensile Test Before Steaming.—A strip cut from the tube with a die or other suitable means to the dimensions shown in Fig. 1 will be marked at points 2 in. apart, and the width and thickness will be accurately measured. It will then be slowly

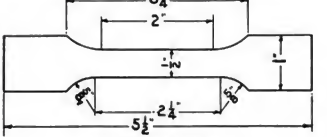


Fig. 1—Tensile Specimen.

stretched in a suitable tensile-testing machine until it breaks. The ultimate tensile strength must not be less than 600 lbs. per square inch and the elongation of the 2-in. section at the time of fracture must not be less than 6 in.

Friction Test After Steaming.—A section 1 in. long will be supported in such a manner that it will turn freely on its axis. A fifteen-pound weight will be suspended from the separated end of the fabric. The latter must unwind uniformly, if at all, and not faster than 6 in. in ten minutes.

Tensile Test After Steaming.—A strip cut from the tube with a die or other suitable means to the dimensions shown in Fig. 1 will be marked at points 2 in. apart, and the width and thickness will be accurately measured. It will then be slowly stretched in a suitable tensile-testing machine until it breaks. The ultimate tensile strength must not be less than 480 lbs. per square inch, and the elongation of the 2-in. section at the time of fracture must not be more than 8 in. or less than 4 in.

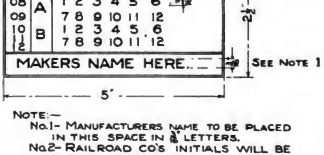
3—SIZE AND DIMENSIONS.

	Maximum, Inches.	Minimum, Inches.
Length	24¼	23¾
Inner diameter	....	....
Outer diameter	....	....
Thickness of tube	....	1/16
Thickness of cover	....	1/16

4—WORKMANSHIP.

Tube.—The tube should be composed of at least two calenders of rubber. It must be free from holes, bits of wood, bark, sand and other foreign matter, and from other imperfections. It must be so firmly joined to the fabric that it can not be pulled off without tearing it.

Fabric.—The fabric must be of duck, with the warp containing



NOTE:—
No.1- MANUFACTURERS NAME TO BE PLACED IN THIS SPACE IN ⅜ LETTERS.
No.2- RAILROAD CO'S INITIALS WILL BE FURNISHED WITH INDIVIDUAL ORDERS.
No.3- THE FIRST FIGURE IS TO BE THE YEAR WHEN HOSE IS MADE. FOLLOWING FIGURES ARE TO BE SUCCESIVE YEARS.

Fig. 2.

not less than 27 strands, 3 threads per strand, and the filler 18 strands and 4 threads per strand. It must be frictioned on both sides and have, in addition, a distinct layer of rubber on one side, readily visible between the plys when the finished hose is cut open.

Cover.—The material of the cover should be a rubber compound which has good weather-resisting qualities, as firmly

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attached to the fabric as is the tube, and to be equally free from defects. The end of the hose should be cut off true to length, but shall not be capped.

5—MARKING.

Serial Number.—Each lot of 200 hose or less must bear the manufacturer's serial number, beginning with one on the first of each year and continuing consecutively until the end of the year. Serial numbers of hose which are rejected must not be used again. With each lot of 200 hose or less, one extra piece of hose must be furnished free of cost.

Label.—Each piece of hose must have securely vulcanized to it a label of white or red rubber, as shown on Fig 2. The letters and figures in the badge plate must be 5/32 in. high and 1/32 in. in relief, except in serial number, which must be ½ in. in height and 1/32 in. in relief.

6—INSPECTION.

Rejection.—If the sample fails to pass the above tests, the lot represented by it will be rejected, and the same serial number must not be applied to any other steam hose during the same calendar year.

Inspection.—If the sample passes all the tests, all pieces

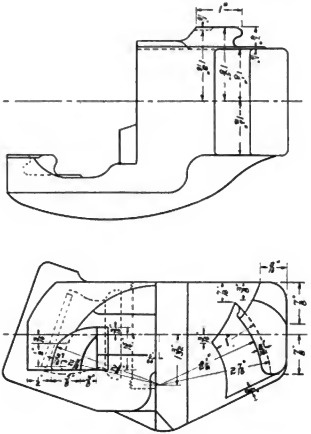

Fig. 3.

represented by it will be accepted if free from injurious mechanical defects.

Rejected hose will be returned at the expense of the manufaeturer.

You will note, paragraph 3, dimensions—the committee has not recommended inner or outer diameter. It does not feel that the adoption of the specification need be delayed on account of this and hopes the association will approve of the recommendations. If this is done, the committee has in mind the running of tests of hose made under these specifications, with inside diameter 1¼ in. with six-ply, 1⅝ in. with five-ply, 1½ in. with ends expanded five-ply.

The committee recommends that these tests be conducted by the Committee on Specifications for Air Hose and that this committee be discharged.

STEAM HOSE COUPLINGS.

1. Coupling contour to be such that coupling will interchange with the coupler as shown on Fig. 3.

2. Coupler must have a locking attachment which will securely lock the two couplers together without depending on the hose in any way.

3. The angle of the nipple to a line perpendicular to the coupling face of the coupling should not be less than 20 degrees.

4. The coupler should be of the two-piece type, having the nipple separate and, screwed into the coupler head with 1½-in. pipe thread. The nipple shall be of the type having a shoulder to engage clamp-nipple shown on Fig. 4.

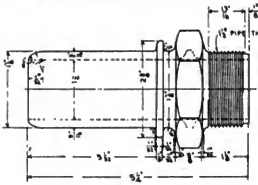

Fig. 4.

5. The clamp shall be of the two-piece type, as shown on Fig. 5.

6. The minimum diameter of hose through the gasket to be 1⅞ in.

7. Gasket shall be flat face, securely held in place in coupler head, but so designed that they can be removed and replaced without removing the hose or coupler head from the car.

The report is signed by:—I. S. Downing (L. S. & M. S.),

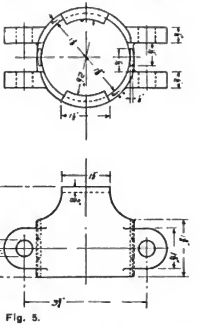

Fig. 5.

chairman; C. A. Schroyer (C. & N. W.); T. H. Russum (B. & O.); J. J. Ewing (C. & O.), and W. C. Arp (Vandalia).

DISCUSSION.

F. F. Gaines, (C. of Georgia): I think this is one of the things we need to get down to standard, especially the coupler and the specifications for steam hose. The report of the committee is thorough, and I move that the two recommendations, one for standard specification for steam hose and the other for coupler, be referred to letter ballot for recommended practice.

I. S. Downing: There is another recommendation I failed to mention—we did not give the inner or the outer dimension of the hose. We find some are using 1¼ in., others 1½ in. and others 1⅝ in. Now, either of those diameters can be used with this nipple; and we recommend that they be turned over to the air-hose committee to be followed up, and this committee discharged.

President Fuller: Is the outside diameter mentioned?

I. S. Downing: The roads using 6-ply outside diameter claim that they get away with kinking absolutely; while with the others there is a lot of kinking. We feel that this other committee on

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air hose could test out those three sizes to determine whether we should get 5-ply, 1½ in., or 6-ply, 1¾ in.

C. A. Schroyer (C. & N. W.): In connection with the steam-hose specifications I am afraid they will put us through the same course of sprouts as the air-brake hose specifications did, and if the adoption of this as a recommended practice, which will be followed by having it for a standard practice, is going to cause the rejection of the cars because they have not the same kind or brand on the hose that the specifications call for, it will put us in the position of the air-brake matter, where simply because a brand does not comply with the regulations of the association, it could not be received; and that cost the railroads of the country thousands and thousands of dollars.

L. S. Downing: As far as Mr. Schroyer is concerned, that will not affect matters until we get it into the M. C. B. rules. There is no reason why we should force roads to do this. It is a guide for roads not having chemists and engineers' tests for such matters; and then it is well for them to have the M. C. B. back of them.

C. A. Schroyer: The Committee is not recommending any given inside diameter of hose. Now, the Northwestern Railroad, in the use of air-brake hose, always purchased 1¼ in inside diameter for freight car use, with the expanded end sufficiently expanded to meet the requirements of the nipples used by us. After that was changed and we bought an air-brake hose 1½ in. or 1⅝ in. straight through, which the manufacturers claim would not cost us any more money than the 1¼ in. hose with expanded end. We have found we have paid ¾ of a cent to a cent and a half more because of that increased inside diameter of the hose.

F. F. Gaines: I think Mr. Schroyer is unduly worried about this thing. We are not going beyond recommended practice.

(Mr. Gaines' motion was put and carried.)

TANK CARS.

Since the 1912 report, the tank car committee has approved, as meeting the requirements of the Master Car Builders' specifications for "Special" tank cars:

Design and specification for lagged tank car for the transportation of liquefied chlorine gas, submitted by the Goldschmidt Detinning Company, New York City.

Design and specification for lagged tank car for the transportation of liquefied petroleum gas, submitted by the Pennsylvania Tank Car Company, Pittsburgh, Pa.

The committee also approved a design of east-steel vent with frangible lead disk, for sulphuric acid tank cars, submitted by the Crescent Tank Line, New York City.

The committee also considered the question of the handling in tank cars of bisulphide of carbon, which is highly inflammable, and gives off vapors under tension. As, however, the vapor tension came within the requirements for "Ordinary" tank cars, and as the chief inspector of the Bureau of Explosives saw no objection to the handling of this product in ordinary cars, the committee advised the Taylor Chemical Company, Penn Yan, N. Y., that there was nothing in the rules governing the transportation of materials in tank cars to prevent the handling of bisulphide of carbon in tank cars which meet the requirements of the M. C. B. specification for "Ordinary" tank cars.

The committee has still pending:

Design for tank car for carrying lead gasoline submitted by the German-American Car Company, which has not been approved by the committee, pending revision of the drawings.

Also, question as to the use of existing tank cars for the transportation of ammonia solutions. In the case of this product it develops that the vapor tension at 100 degs. F. may be as high as 22 lbs. per sq. in., and that the variation in the bursting pressure of lead disks nominally intended to rupture at 25 lbs. is that such a disk might rupture at 22 lbs. Consequently, after consultation with the chief inspector of the Bureau of Explosives, it has been decided that the lead disk should be made for a nominal bursting pressure of 30 lbs. This pressure would not in any way injure the tank, whereas the rupture of the disk would permit the loss of the most valuable constituent of the solution, viz., the ammonia gas. In view of the information that the life of tanks carrying ammonia liquors is much shorter than that of petroleum-carrying cars, the committee thinks it wise, for the present, to require retests at intervals of not over five years. These changes have been covered in the revision of the Tank Car Specifications.

As regards the tests of tanks and safety valves now provided for by the tank car specifications, the committee feels that some improvement should be made on the present practice, by requiring that a certified record of the tests shall be available in some one office. Heretofore the rule has been that the railroad on whose line a car is at home shall exercise supervision. The importance of these tests will be very great in the event of law suits following damage, and your committee believes that the office of the chief inspector of the Bureau of Explosives would be the proper place for the filing of these certificates. Considering the fact that the Interstate Commerce Commission requires that tank cars shall conform to the rules of the Master Car Builders' Association, it is highly probable that a ruling will be made by the commission, fixing the procedure to be followed in reporting the tests of both cars and valves.

Nothing has transpired during the past year to call for any radical changes in the tank car specifications. The changes which the committee recommends are principally with a view to removing ambiguities.

The report is signed by:—A. W. Gibbs, (Penna.), chairman; C. E. Chambers, (C. of N. J.); S. K. Diekerson, (L. S. & M. S.); J. W. Fogg, (B. & O.); E. J. Searles, (B. & O.); Wm. Schlafge, (Erie); Thos. Beaghen, Jr., (Union Tank Line), and C. A. Shoemaker, (Ger.-Am. Car Lines).

DISCUSSION.

Mr. Hartley, of the Summit Solvay Company, was given the privilege of the floor.

Mr. Hartley: There is one thing we would hesitate to follow in the tank car specifications and that is the recommendation which you have put in simply as a preference, as to how you shall anchor a tank on the underframe. We continued to hold our tank in place with head blocks instead of anchoring the tank to the underframe with saddle riveted to the underframe. Our belief is that in the tanks as we ship those products, that very often the rivets in the saddles anchoring the tank would simply be tight under the heads and not fill the holes.

After the rows of nuts had been eaten away under the head of the rivet, we would have a very annoying leak which is a very expensive one to stop. It was suggested that the end sills were being distorted by the movement of the loaded tank. We tried to overcome that by getting 55 lb. channels in our centre sills, and we are greatly increasing the sectional area of the central sills over the requirements, and also have the head block reinforced and have two heavy steel castings.

We test all our tanks every 3 years instead of every 5 years. We test some of our tanks every trip before they are loaded, purely as a matter of operating policy. We think it is better to do so in some cases. I understand that the requirements in the case of tanks to be built from now on is that they shall stand a bursting pressure of 240 lb., and be subject to a test pressure of 100 lb. We believe if a factor of safety was introduced, there would be no evading the design or the strengthening of that tank.

It is possible that the tanks could be made safe to sustain the bursting pressure of 240 lbs. by butt strapping and the use of a high tensile strength material, and the use of lighter plates, which however, would not make as good a tank to stand corrosion. The lighter shell plate would undoubtedly corrode somewhat more quickly, and perhaps the tank would not be good for 5 year service. However, in the majority of cases we believe the test once every 5 years ought to be sufficient for the larger number of tank car users, but a factor of safety introduced into your requirements would actually insist that the tanks should be made of certain materials, and perhaps even the thickness of the materials should be specified, that would carry with it automatically its high bursting pressure.

(The recommendations were referred to letter ballot and the executive committee was instructed to take the recommendation in regard to the filing of the tank car tests, up with the Bureau of Explosives.)

SPECIFICATIONS FOR FREIGHT CAR TRUCK SIDES AND BOLSTERS.

In the committee's first report, presented at the 1912 convention, it proposed for truck sides and bolsters specifications concerning the manufacture, chemical properties, physical properties, and inspection of truck sides and bolsters. By subsequent action these specifications have been added to the recommended practice of the Association. In its first report the committee also proposed tentative specifications for tests of truck sides and bolsters. It recommended that if the committee were continued, funds be provided for making tests, in order to develop information

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which could form the basis for final specifications for testing truck sides and bolsters. The executive committee of the Association has not found it feasible to provide funds for this work during the past year and the committee has, therefore, been unable to make progress along the lines originally laid down. In the expectation that during the coming year funds may be made available to carry on this work, we recommend that the committee be continued.

E. C. SCHMIDT.

Chairman, Committee on Specifications for Tests of Steel Truck Sides and Bolsters for Cars of 80,000, 100,000, 150,000 Pounds Capacity.

The report is signed by:—Edward C. Schmidt (Univ. of Ill.), chairman; J. S. Sheafe (Ill. Cent.), and C. D. Young (Penna.).

(The report was referred to the executive committee and the committee instructed to work jointly with the committee on freight car trucks.)

RETIREMENT OF 20- AND 25-TON CARS FROM INTERCHANGE SERVICE.

The question of the use of cars of 40,000 lbs. and 50,000 lbs. capacity in interchange is one that is being considered very seriously in different parts of the country, and it has been suggested that it be taken up and discussed at the convention. The suggestion is made that the subject be given a thorough airing at the convention, and if thought advisable, to take the matter up with a view to ascertaining whether it is practicable at this time to withdraw from interchange service all cars of 40,000 lbs. and 50,000 lbs capacity, and restrict their use to the owning line.

Signed—Jos. W. Taylor, Secretary.

President Fuller: This is a subject, gentlemen, that I believe warrants more than passing notice. We all know, especially in the mountain countries, that the light capacity cars are getting in our heavy tonnage trains and it is believed by a good many that a large number of these cars should be confined to their home lines, and not used for any interchange work. We will in the West notice particularly that a large number of cars loaded to the coast and which have to go over the mountains, by the Eastern roads, are very old, light-capacity cars and it is necessary for us to either transfer the load or take the chances of hauling these light cars. From the point of safety, if nothing else, as well as economy, we believe that every effort should be made to keep the light capacity cars, 40,000 and 50,000 lbs., at home where they belong.

F. W. Brazier, (N. Y. C. Lines): I believe we should set a date in the very near future that cars of 50,000 lbs. capacity and under will not be accepted in interchange. I realize in the past year there has been a great shortage of cars. However, the light capacity cars that are in service to-day are not strong enough to be handled in trains with heavy equipment. The draft attachments and construction of the cars are such that they are constantly being sent to the shops for repairs. I have recently received a letter from one of the large trunk lines calling attention to the number of foreign cars repaired and his records show that 50 per cent. of the total number of cars receiving repairs were foreign cars. I find on our own system that our percentage of foreign cars repaired runs very much higher than this, in fact, our percentage of foreign cars is about 60 per cent. Another important point is many railroads to-day are not making proper repairs to their equipment and are maintaining certain parts of cars that are expensive, if not obsolete they are repaired one day then go on the repair track again in a few days doing the same work over and over again. It is all very well to save a few dollars on the first cost, but is it a wise policy to build cars that will not stand two years service without being practically rebuilt and the money saved on the first cost is spent ten times over in maintaining them. I refer particularly to cars built of steel construction with the view of keeping the light weights down to the lowest possible point, the result is, there are in this country some steel cars and steel underframe cars that are really weaker than the old standard wooden cars.

I want to refer to matters that were brought up last year, that is the condition of box car doors on freight equipment and other parts of cars that are constantly needing repairs, and when they do receive repairs, the parts that fail are simply perpetuated, no aim taken to improve the defective parts, the results are they only make a short mileage before they go to the repair tracks for the same defects caused by not improving the parts that fail.

We had quite a number of accidents caused by light arch bars and arch bar bolts not properly fastened giving way, and it might interest this convention to know that during 30 days in the months of February and March on the Western District alone, we used a little over a ton of nuts a day and these were applied to trucks on loaded cars received in and around Buffalo to make them safe to run over our lines. It has been advocated and recommended for years that on all forms of trucks that depend on bolts to hold them together, that attention should and must be paid to keep the nuts in proper place. You are aware that this is an owner's defect. I firmly believe that all arch bar type of trucks should have proper nuts put on the bolts and a spring cotter or a spring key put into every bolt to keep the nut in place, and if the spring cotter is properly applied, there will be no danger then of the arch bars spreading.

I desire to emphasize again the importance when getting up designs of cars and trucks of paying more attention to the cost of maintenance and overcome the weak features in construction that are so apparent on railroad equipment throughout the country. The question again comes in of the first cost. Were cars designed with the thought of keeping them off the repair tracks instead of saving the first cost, when they are built, it would be money well invested. More care should be taken to watch the defects spoken of here in this paper and others too numerous to mention that would in the end save hundreds of thousands of dollars throughout the year in the cost and maintenance of freight equipment and help reduce periodical car shortage in that the cars will be carrying freight instead of awaiting and undergoing repairs.

I therefore make the following motion:

After January 1, 1915, cars of 50,000 capacity and under, will not be accepted in interchange unless such cars are equipped with steel underframe and all metal trucks.

C. F. Giles (L. & N.): We have 958 refrigerator cars, 40 ft. in length, 50,000 lb. capacity. These cars have metal-body bolsters and all metal trucks. They are comparatively new. They are used in the banana and fruit trade, and we feel there should be an exception made in connection with refrigerator cars in which fruit is handled.

J. J. Hennessey (C. M. & St. P.): It seems to me the way this question has been put before the convention, it is hardly the correct proposition, the question of barring cars on account of light capacity. I can show a great many figures on any class of cars you want to put up, that are not light capacity of the car which should count. There are any number of 60,000 lb. cars built, and in service, with the old wooden bolsters and the short draft timbers. Then you got away from the old wooden bolster, and put in the steel wheel bolster, but you did not increase the length of your draft timbers, you did not increase the number of your bolts. There are many of the 40,000 and 50,000 lb. capacity cars which have long draft riggings, continuous side sills, the side sills running the full length of the car. That is in my opinion, is a better car in interchange than a car with a poor set of draft timbers. How many stock cars are there of 40,000 or 50,000 lb. capacity? How will you load them beyond the capacity while they are in the service they are fit for? I think, if we do anything at all, we had better confine ourselves to the draft timber construction, the character of the draft timber, and the draft springs. I do not think it would be wise for this association, and I do not think the association is in a position to say that we will not use a certain capacity car. Every road, under rule 2, has a right

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to reject any car they do not consider safe to run over their lines, and I do not believe we can go any further, gentlemen.

D. R. MacBain (L. S. & M. S.): I want to endorse every word that Mr. Brazier has said. The idea of this movement is to bring the whole standard of equipment up after a certain time, so that it will be better than it is at the present time. There are a great many railroads in the country that are spending large amounts of money to bring their equipment up to a point where it will stand modern operation and modern handling in long trains, and hump yard service, but there are, on the other hand, a considerable number of roads which do not have the long trains and do not have the hump yard service, which are not doing this. Possibly, too, this small equipment in the hands of such railroads is suitable for the district in which they are operated, but when it comes to the matter of interchanging freight cars on railroads like the New York Central lines it becomes a serious proposition.

The New York Central lines never operate more than 50 per cent. of their own equipment on their own rails. The other 50 per cent., or a little less, is foreign equipment, hence the chances for failure due to light construction of draft gear, etc., is very great. A short time ago I obtained a report of all draft gear and draft bar failures that occurred from April 15 to June 1. Briefly stating the matter, by totals, there were 47.6 per cent., outside of the New York Central Line's cars, operated on the Lake Shore and Michigan Southern Railroad, and out of that 47.6 per cent. there were 73.8 per cent. of the drawbar failures which occurred on the foreign equipment. That is why, gentlemen, we are trying to bring about a better standard. Now in connection with this whole thing, I want to state that the New York Central Lines have adopted a policy in the maintenance and repairs of their cars which is designed to bring the equipment to the highest possible plane of efficiency, a standard which we believe will be suitable for all the conditions of modern service. I want to endorse strongly what Mr. Brazier said regardless of any arguments to the contrary.

F. F. Gaines (C. of Ga.): I not only want to endorse what Mr. Brazier and Mr. MacBain said, but I want to comment on what Mr. Hennessey said: Our experience is that the low capacity cars are not in line with the other cars, and we found it so much so that our operating department put an order into effect whereby if we get a car in interchange less than 60,000 lb. capacity, we consider it more economical to transfer the load rather than to handle the light capacity car.

R. E. Smith (A. C. L.): I inquire as a matter of information, whether this Association has the authority to pass the resolution which has been offered? It seems to me that the owners of railroad properties in this country ought to have the first say in this matter. It seems to me that this matter being, to a very considerable extent a transportation matter, that the movement for the retirement of low capacity cars ought to start from some other source than this Association.

As far as the line with which I am connected is concerned, we unfortunately have a number of low capacity cars, but they were designed and built for a class of commodity that cannot be loaded in high capacity cars, not even 60,000 lb. or even 50,000 lb. cars. I am speaking now of perishable fruit of which we handle a very large amount. In the case of these 40,000 lb. capacity cars, we are very materially improving their sub-structures and the draft arrangement, and we are bringing these 40,000 lb. capacity wooden cars up to the same degree of strength and improved design as we practically have in the case of our 60,000 lb. wooden cars, which were built a few years ago. We have gone to the extent of putting in 6 in. arch bar sills and 1¼ in. branch bolts and improved the draft gear.

C. A. Schroyer (C. & N. W.): I question very seriously as to whether this association has the authority to say that on a certain day we will not accept certain cars of certain capacity in interchange. It might be well enough for us to recommend to our superior officers a rule of that kind, which they can indicate, would be put in force on a certain day. The 40,000 and 50,000 lb. cars are going out of service very rapidly. There are no more of them being built, and those which are in operation today were built of such class of timber as cannot be produced today. Many of these cars are built with ten to twelve ft. draft timbers, the draft timber extending between the upper and lower plate of the body bolster, and as a draft apparatus, aside from the element of the coiled spring now in there, there is no better apparatus which was ever put into a car. I would prefer that 12 ft. draft timber with the coiled springs than I would many of the heavy modern built steel cars, with coiled spring draft apparatus in them. We would have less trouble. We have about 10,000 cars of 50,000 lbs. capacity. You can put on just as poor side doors on a 100,000 capacity car as was ever put on a 40,000 lb. capacity car. The whole proposition applies more generally to the general upkeep of the car.

D. F. Crawford (Penna.): I agree with both sides of the argument. For some time past I have been following up what we call "truck accidents." The conditions on the Pennsylvania Lines, West, are quite similar to those on the Lake Shore in that approximately 50 per cent. of our traffic is handled in foreign cars. Since 1904 I have had a monthly report of truck accidents. I regret to say that 80 per cent. of the truck accidents occur on foreign cars brought to our lines. I feel that this association is the proper association to bring this subject up, but not the proper association to decide it. I would move that a committee of this association obtain from each of the members the situation as to each of their cars, and ascertain if it will not be possible to make a recommendation to the American Railway Association which will permit, that for the benefit of the traffic conditions of the country, we may set aside the older cars which are giving every one of us trouble that are moving them.

I. S. Downing (L. S. & M. S.): I want to agree with Mr. Hennessey as to what he says about some of the heavier cars. I think that the 50,000 lb. capacity cars and under, are not being properly maintained and should be taken out of service. There are cars heavier than these, with short draft timbers, which are not as good as some of the lighter capacity cars, as far as draft timbers are concerned. I think we should legislate to take these short-draft timber cars out of service in the near future.

M. K. Barnum (Ill. Cent.): I second Mr. Crawford's motion. I do not think there is anyone in this room who will contend that the 40,000 lb. or 50,000 lb. capacity car is sufficiently profitable to maintain and operate, or that we are justified in keeping up these cars beyond their normal life, as many have been kept in service up to the present time. Some of these cars are 25 years old. They are going into the heavier modern trains with better equipment and jeopardizing the better equipment, and I venture to say that not a day passes that some one of these cars does not double up and damage many thousands of dollars worth of modern cars besides the track, lading and other railroad property.

The road with which I am connected has had a very serious time with this class of equipment. About 54 per cent. of the cars in service on the road have been foreign cars during the last six or eight months, and a very large percentage of bad order cars have been taken out of that number, even though we have given them preference in making repairs. In the case with Mr. Giles mentions, that of the refrigerator cars, of course the refrigerator cars would be excepted from any action taken. In my opinion, one of the principal causes of the increasing cost of freight car repairs is the larger and unwarranted amount of money spent in maintaining the old light capacity cars.

H. J. Small (So. Pac.): These small capacity cars are passed on out to the coast, and there is nothing to do with a great many of them but to dump them in the Pacific Ocean, and that is what we feel like doing with a large number of them. We have considered that the 40,000 lb. capacity car is obsolete. We have placed the value of a 40,000 lb. capacity car at $100. If it costs more than that to repair it, we break it up. We fixed up an arrangement among ourselves to keep the cars on our own rails, and I think we have succeeded to a very great extent. We ought to adopt the idea contained in this circular letter. We are great sufferers on account of this. These cars come out to us 3,000 miles over the mountain grades with Mallet locomotives hauling them and by the time they get to San Francisco or Los Angeles, it is a pretty difficult proposition to repair them so that they can go back east, which we are obligated to do, or to pay for the cars.

J. J. Tatum (B. & O.): I believe our company would advocate the recommendation made by Mr. Brazier. It has been said that it would not be within the power of this organization to legislate the 40,000 lb. and 50,000 lb. capacity cars out of the interchange of cars. As I understand Mr. Brazier's recommendation, that is not its object. He has suggested that the cars would be accepted if equipped with steel underframes and all metal trucks. If that is the case, I think the Association has just as much right to render such a decision in regard to applying steel underframes and legislating the use of wooden 40,000 lb. an 50,000 lb. capacity cars out of interchange, as they have the right to say that they will not after a certain date, accept cars not equipped with the American Continuous draft gear.

C. A. Schroyer: No one with any of these cars is advocat-

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ing their rejection from interchange, and those opposing it are the only ones who own lots of these cars. It is not for you to stand in judgment on these cars, or on the roads that have them; or to ask why they cannot destroy them and get others. I hope the chief representatives of this association will canvass among their officers as to what their wishes are in regard to this matter; and when we come here next year, removed by their wishes, then we are in position to say that after a certain day we will not accept a certain car of that kind, but we cannot do it until we are so reinforced.

M. K. Barnum: The effect of this movement has been to check the interchange of these cars, and consign them to the scrap heap unless you wish to continue them in service. But I do believe that the time has come when some more definite action toward returning these light capacity cars should be taken. Therefore, I second Mr. Crawford's amendment to Mr. Brazier's motion.

R. L. Kleine. The reason the roads that handle the heavy equipment today do not have the 40,000 and 50,000 lb. capacity cars in service was that they were compelled to take them out of service, and are still doing it; and therefore it is an injustice to place on these roads in interchange, these 40,000 and 50,000 lb. capacity cars, which are liable to result in accidents. Furthermore, on the door question, the situation is so serious that irrespective of the interchange rules, it is almost necessary to put a prohibition on that account. We all have got to put our shoulder to the wheel and do something more to put the car door in safe condition for transportation.

Samuel Lynn, (P. & L. E.): Our road doesn't have 40,000 and 50,000 lb. capacity cars. We did have thousands of them, but we have got rid of them; and every car up to 60,000 lb. capacity, that requires $100 or $150 repairs, must be torn down. There is another thing in connection with delegating a car to the scrap pile—a number of industries are refusing to load 40,000 and 50,000 lb. capacity cars.

F. W. Brazier: Some of the roads furnishing your roads with 100,000 lb. cars, and you send your 10,000 lb. ones to us. I touched on the condition of car doors and trucks and general repairs and many car men in here are glad that I said it, as they have managers and officers who will not give them the means or the facilities to repair the cars. And the sooner it goes up to the management, the better for us.

D. F. Crawford: My idea in making the motion was that we will be as far along with a good investigation of this subject as to put in our resolutions today, and that after January 1, 1915, something should happen. It would not benefit the immediate conditions more than to have a thorough knowledge of the condition when it is presented to the convention next year.

D. R. MacBain: The man with the modern equipment is getting 45 cents a day from the man maintaining the old little things; and it is not fair on the face of it, that the railroads who have spent the money should be penalized all the time. That is aside from any traffic or operating conditions.

(Mr. Crawford's motion was put and carried).

ABUSE OF THE REPAIR CARD.

The following is the discussion on this subject which was presented at the close of yesterday's session. (See *Railway Age Gazette* June 17, page 1416).

D. F. Crawford: Now, in the abuse of the repair card, it has been intimated that many of us are dishonest in making out bills. I wanted to see how dishonest we were. I therefore obtained for one year the number of car days the Pennsylvania Railroad pooled cars, all lines East and West of Pittsburg, were on foreign roads, and the number of days foreign cars were on our roads, and divided the car days into the amount of money we paid and received respectively. I found that for Pennsylvania cars on foreign roads, it was 5.5 cents a day; and in the case of foreign cars on the Pennsylvania road, twelve cents a day. Gentlemen, I do not think we are dishonest.

My idea is that there undoubtedly have been improper bills for repairs, but in our worrying about the abuse of the repair card, I am afraid we are straining at a gnat and swallowing a camel. Un one line, the General Superintendent of Motive Power, who kindly looked the information up for me, advised me that our cars on other lines cost us 2.6 cents a day, and other cars on our lines cost 15.8 cents a day. In other words, you can cut that bill in the middle and multiply the other by two and still have 50 per cent discrepancy.

Now, it instead much time on the abuse of the repair card, and we to each other and trying to find these minute cases billed improperly, let us repair the cars. I took the annual report of the two roads in question for those figures, 2.6 and 15.8, and I found they cost the owner $90 per car per year; and I am advised that one-half the equipment is wooden underframe and one-half steel underframe, whereas the Pennsylvania Railroad is paying over $60 per year per car, with an equipment of nearly 90 per cent. of steel cars, and 90 per cent. of steel underframes, and less than 10 per cent. wooden cars.

Gentlemen, if we will repair our cars and keep them in service, we will not worry about the repair cards. As Mr. Brazier said: Start with a good car and keep the good car up. We are interested in 2,400,000 live cars, built to handle the traffic in this country. But I was interested yesterday in the amount of time we spent in measuring up foreign cars which died while away from home—in other words, the depreciation rate.

First I would say, build good cars—look at all the annual reports of all the railroads and compare the cost of all the railroads are spending to maintain their cars. It gives a very clear intimation of what you are paying for. Our cars are on the lines of 26 roads, and the same twenty roads have cars on our line, and with the expectation of comparing cost of repairs to cars, with the bills they make against us, as well as those that we make against them; and I think you will find a clear relation between the cost per mile in the annual report of each railroad against whom you make the bills.

R. D. Smith (A. T. & S. F.): The debit balance against us for nine months of the present year was something like $255,000 on cars repaired. That is, bills we paid to foreign lines for repairs of cars exceeded the repairs, charges paid us by foreign lines for repairs of cars by $255,000. That will admit that was quite a serious situation, and when I was called upon to explain—and I could not explain it—and I cannot explain it today—but I made an honest effort to get some facts. I want to say that 20 per cent. of the cars that pass over our railroad for light, medium and heavier traffic, amount to 50 per cent. of all cars we repair, and I am not prepared to accept the insinuation Mr. Crawford made that we do not maintain our cars. That $88 may refer to the character of our equipment and the character of our service. I think it is a question that needs some light.

I found in my investigation, that our men were not thoroughly posted. I believe part of the explanation of the $88 difference is due to the fact that we have failed to put in all the bills we should have put in. But it does strike me as peculiar that we should be the only line that should make such replies. Many gentlemen said they were in the same box—that the debit was against them. I am simply after light on this subject.

D. F. Crawford: The charge of dishonesty in the freight car repair bills was made in the convention of 1909; it was referred to by F. A. Delano in the report made to you yesterday. Mr. Smith's letter gave me an opportunity, and I started me on an investigation which I wished to make. Mr. Smith's entire force is welcome on the entire Pennsylvania Line west of Pittsburgh, at any time.

Several gentlemen have stated that 20 per cent. of the cars repaired on their lines are foreign cars. I had a census taken and that showed that on our Southwestern System that a little more than 50 per cent. were foreign cars; but on our Northern system about 35 per cent., and on our Central System almost 50 per cent. On the Lake Shore, 50 per cent. were on foreign cars. Now, there are horse cars somewhere. So I took the figures of the Pennsylvania cars away, and all the roads of the Pennsylvania, and I was interested to find that we practically have Mr. Smith's figures, taking all of his cars away and all his cars home. Mr. Smith's figures, as I recollect, were 6 and 12 cents, but who got the 12 and who got the 6? My whole idea is to guard this situation, we must look for a larger thing than errors. I do not know but there are 10, 12 and 13 per cent., but I think they will not run much over 10.

I will take the cost line Mr. Smith referred to, and if we divide his by two and multiply ours by two, there would still be a discrepancy of 50 per cent. that would exist. You will find that by inspection of our accounts or methods. If anyone was in doubt as to car bills, we wish they would ascertain the car days at home and the car day abroad. The cost of cars day, and then take issue with each other, as we all want to maintain the Mast Car Builder Rules of Interchange which have been based on inherent honesty.

E. W. Pratt, (C. & N. W.): This method, it seems to me, is about as vague as to say how much coal. We try to to keep as many of our cars at home as we can, and as few on the road as possible; and we are repairing as few foreign cars as possible, compared with our own. We can see why your bill would be higher on the Pennsylvania Railroad and the B. & O., the Santa Fe or other high grade railroads. We

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have divisions that have three or four times the draft values. Our percentage of doubt heading is almost nothing. When such cars as ours go over the Pennsylvania hills with heavy engines on them, why the defects of course develop.

F. F. Gaines: I found the situation was that a large number of our inspectors at interchange points were putting in as few interchange repair cards as possible, partly from weakness and partly from laziness. Although our bills against us are considerably greater than our bills against foreign roads, and we expect them to be, partly on account of the territory. Still we have made a decided increase by checking up our car inspectors and educating them; and at the same time laying down the law that we did not want anything that was not our own.

President Fuller: Did you notice any difference between "Since November 1st" and "Prior to November 1st"?

F. F. Gaines: Yes, sir, we did.

I. S. Downing (L. S. & M. S.): I want to raise a question in regard to different roads, in saying there is such a percentage of foreign cars as compared with their own cars. I think your own cars get much heavier repairs than the foreign cars. Taking them as a unit, your foreign cars go ahead.

CAPACITY MARKING OF FREIGHT CARS.

The committee sent out to the members a circular of inquiry to which 35 replies, representing 924 votes were received. A careful analysis of these replies is as follows:

Sixteen lines, representing 322 votes, reported owning or knowing of weak cars or cars that would prove structurally weak if loaded to full actual capacity. These cars are for the most part wooden cars in coal trade, which would not permit the maximum capacity stenciling. Fourteen lines, representing 349 votes, do not own or know of any cars that are structurally weak. Five roads did not vote directly on this question.

In answer to the question as to whether the railroad owns or operates any cars the body or trucks of which are strong enough under the present stenciled capacity, but which would not be strong enough under the proposed light-weight and maximum-weight stenciling, the majority of the roads voted in the affirmative. Out of the 924 votes, 662 report owning certain cars that are not strong enough and to which it would not be advisable to apply the maximum capacity plan of stenciling. While there does not seem to be any doubt, as a rule, regarding the structural strength of the modern car, and its ability to carry the increased load permitted by the maximum capacity plan of stenciling, 23 roads report certain types of structurally weak cars, such as flat, gondola, and wooden underframe cars, which would develop higher stresses under the maximum loading than would be proper or permissible.

The third question was "Whether there can be any objection in applying the rule of light-weight and maximum-weight stenciling so far as it is applicable, consistent with strength of body or trucks which are not structurally weak, thereby restricting the stenciling of cars where the body or trucks may be structurally weak to the present light-weight nominal capacity.

Twenty-seven lines of the 35 who voted, or 75 per cent, of the total cars represented by the votes, are in favor of stenciling the maximum-weight capacity on cars whose strength will permit it. Two companies did not vote on this question, and the other 6 are opposed to it on the grounds of the confusion to shippers, etc. While the majority of the votes cast are in favor of limiting the proposed stenciling to cars that are strong enough, the question has naturally arisen as to what cars are strong enough, and how this strength should be calculated—that is, by the individual car owner or by a standard adopted by the association.

The fourth question was "Whether or not it would be more advisable to apply the rule of light-weight and maximum-weight stenciling to steel and steel-underframe cars exclusively, and moreover to such cars of this class as have a factor of safety sufficient to carry the maximum load; also, in the opinion of the members, what the minimum factor of safety should be for maximum loading stenciling."

In line with the limited views expressed as to factors of safety, the committee felt that the light-weight and maximum-load stenciling should be confined to cars of steel or having steel-underframes that have a factor of safety of 3 or better in the body structure, when figured for the maximum load, and with respect to trucks under such cars, the rule should be applied to all trucks having arch bars of M. C. B. dimensions or better, and to all trucks having cast-steel side frames, and to the various forms of special trucks such as pedestal type trucks of the box and other varieties, where the strength of factor of safety is equal to or greater than the equivalent M. C. B. arch bar.

On new cars the committee feels that the rule should be applied in its entirety, owing to the fact that practically all new cars are steel or steel-underframe construction, and will in all probability be built to meet the proposed requirements of 24-in. minimum cross-sectional area of center sills recently proposed by the committee on car construction to take care of buffing shocks, which imposes a construction which we feel will result in a high factor of safety on underframes from a load standpoint. With relation to trucks under new cars, the rule should be applied only when such trucks meet M. C. B. requirements or better as to arch-bar construction, or have steel side frames, or have pedestal type trucks where the factor of safety is equal to or greater than the equivalent M. C. B. arch bar.

The committee endorse the recommendation of a member that the subject of stenciling the light-weight and maximum load be referred to the American Railway Association in order to ascertain whether there are operating or traffic conditions with which the proposed method of stenciling would interfere.

The report is signed by: C. E. Fuller, (U. P.), chairman; M. K. Barnum, A. W. Gibbs, (Penna.); F. H. Clark, (B. & O.), and D. R. MacBain, (L. S. & M. S.).

DISCUSSION.

D. R. MacBain (L. S. & M. S.): As a member of the Committee on the Marking of freight cars, we want to call attention to trouble in billing freight loaded in private line cars, due to the fact that the private line companies do not follow the M. C. B. practice of stenciling the right weight on the car. As a result, the loading in refrigerating cars is in a sense estimated and corrected by weighing the car after it is unloaded; but then the ice is included.

Another point is that these companies do not all follow the I. C. C. order to publish the necessary detailed data regarding their cars in the Railway Equipment Register, which publication has been designated for the purpose. The minimum car load rating is based on the inside length of cars, and without such data available in this publication, it is hard to properly bill out. Auditors want to know if the association can require all car owners to stencil light weight on cars and also recognize the order of the Commission in publishing data in the Register.

M. K. Barnum (Ill. Cent.): I move that this subject be referred to Special Letter Ballot to ascertain the views of all the members of the association, and then referred to the American Railway Association for their information and further instruction (The motion was carried

LETTERING CARS.

At the meeting of the executive committee in the office of the secretary, August 13 and 14, 1912, the present committee on lettering of cars was continued another year, and to this committee was referred a copy of the proceedings of the American Association of Railroad Superintendents' meeting, held September 9, 1910, in which the subject of car lettering was considered. Subsequent to this, correspondence was carried on between D. F. Crawford and J. A. Sommerville, then president of the American Association of Railroad Superintendents, at Kansas City, regarding the lettering of cars. This correspondence resulted in the appointment of Charles Burlingame, superintendent of the Wiggins Ferry Company, St. Louis, Mo., to represent the members of the Association of Superintendents and-meet the committee of this association and consider the matter further. After some subsequent correspondence between Mr. Crawford and Mr. Burlingame, a subcommittee was appointed to investigate the matter and to meet with the Superintendents' Association of St. Louis and ascertain just what further changes and additions were desired. Mr. Burlingame appointed M. Mares, general superintendent of the St. Louis, Troy & Eastern R. R., to represent the Superintendents' Association, while the following subcommittee was appointed to represent this association: W. L. Wilt, Penna. Lines, chairman; C. B. Young, C. B. & Q.; O. C. Cromwell, B. & O.; and Ray M. Brown, New York Central Lines.

The subcommittee met with the Superintendents' Association of St. Louis in February last, with the view of ascertaining what their wishes were, and found that all they request was that seperate letters be placed on each side of the car, near the door hasp, for seal record purposes, so that such records could be taken by letters instead of using the words north and south or east and west with reference to sides of cars, as at present.

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They claimed that on account of cars going across the ferry at St. Louis and the switching in congested districts, they are turned on Y's destroying their seal records. This they feel is necessary on account of the large amount of pilfering going on in the St. Louis district. These letters were to be placed on the cars with respect to the A and B ends, using the letters R and L, or any other letters, to signify the side.

The subcommittee does not recommend the application of the additional lettering, but on account of the fact that this marking is entirely for the benefit of the operating department, it is suggested that a special letter ballot be taken to ascertain the views of all members of the association.

The report is signed by: D. F. Crawford, (Penna. Lines), chairman; F. H. Clark, (B. & O.); F. A. Torrey, (C. B. & Q.); and D. R. MacBain, (L. S. & M. S.).

DISCUSSION.

D. R. MacBain: I move the recommendation of the committee be acted upon, and that the question be submitted to letter ballot. (The motion was carried.)

D. F. Crawford, (Penna.): In connection with the report of the Committee on Standards, yesterday, the question of the Car Body Marking, there is this to be said: The standard of the Association requiring specified lettering, is as follows:

"That for other car body markings on sides and ends, such as capacity, couplers, brake-beams, class of car, date built, outside and inside dimensions and markings inside of car, two or three-inch letters and figures be used with the following exceptions," then he presents certain exceptions.

Now I would like to offer to the Association a recommendation that we be permitted to use on cars having steel outside frames, badge plates with smaller letters, in regard to figures relating to coupler, brake-beams, class of car, date built, outside and inside dimensions and markings inside of the car, with one in. letters; and it makes a much better appearing car than the standard requirement. And have it run over the vertical oblique outside structure. I would like to move that that subject be referred to the proper committee. (The motion was carried.)

RETIRING PRESIDENT'S BADGE PRESENTED TO PRESIDENT ALLEN.

The executive Committee of the Railway Supply Manufacturers' Association yesterday presented the retiring president's badge to Samuel G. Allen. The presentation remarks were made by E. H. Walker, who said:

"Mr. Samuel G. Allen, you have been president of the Railway Supply Manufacturers' Association for the past year. This organization, composed as it is, of many men of many minds, of interest that at times clash, of corporations rich in established business and of those rich only in hope, of concerns with their thousands of men and of individuals for the first time submitting to a hoped for market a new device, requires for its chief executive a man skilled in diplomacy, full of tact, strong in emergency, unqualifiedly fair, calm in judgment, unswayed by clamor, with infinite patience and with that rare quality that inspires confidence in his leadership.

"These be strong specifications, but you have qualified in every essential, and the Association is to be especially congratulated that its affairs have had your able, earnest and effective guidance during this year.

"We have had many exhibitions in connection with these conventions, but for conception in design, completeness in detail and smoothness of operation this exhibition has eclipsed them all. It is written that by your works men shall know you. By your work, this year the members of this association know you better, and the better we know you, the greater is our admiration and the deeper is our regard for you.

"The payment for the faithful performance of public duty is the commendation of the public, and so this association, through its Executive Committee, with its grateful appreciation of your services, presents to you this past president's badge, that all men may know that you have been faithful to trust, efficient in office and that the highest honor at the disposal of this association has been conferred upon you."

THE "CRECO" BABY.

The magnitude of the exhibits that have appeared at Atlantic City for so many years have naturally developed interests peculiar to them. In connection with the erection of the booths and their care, many things have happened, and perhaps one of the most amusing is the story of the "Creco Baby."

In 1906, the first year the M. C. B. and M. M. conventions went to Atlantic City, Mr. Timothy Stanley Higgs, colored, was first employed by the Chicago Railway Equipment Company in the installation of its exhibit. Stanley was afterwards uniformed, and so was the first uniformed attendant in connection with the convention exhibits. "Stanley" has since become very well known, if not famous, and has always displayed a remarkable devotion to "Creco" interests. In fact, he is faithful to such an extent that care is really necessary to prevent his destroying competitors. Overhearing a discussion about advertising one day Stanley suggested that an excellent and novel way to advertise the "Creco" brake beam would be for one of the beams to be

The Creco Baby.

dropped overboard from the steel pier, and for him to dive after it, Stanley explaining that his talents as a swimmer were such that they should be used to this advantage. In 1909, the Chicago Railway Equipment Company had some special beams brass plated. These "gold" brake beams profoundly impressed Stanley, and he labored very ponderously over the problem of using them. One could hear his mental machinery creak and groan under the strain, and he finally evolved the idea of giving a so-called "Creco Cake Walk." He explained in detail how he would have four colored couples, the best dancers in Atlantic City, and that after going through the evolutions in the ball room, he, as a great climax to the cake walk, would suddenly clasp his hand to his brow, leave his lady and disappear. In a few moments he was to reappear, triumphantly carrying above his head one of the "gold" brake beams, after which the remaining cake walkers were to fall on their knees in worship of the same. This, Stanley suggested, would not only advertise the beam, but would be "snttinly powful fine and new."

In many ways Stanley has always proved that he thinks at all times very intensely and solemnly of "Creco" welfare, and when he recently named his first and only child "Creco

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Leilia Higgs" he certainly manifested a beautiful loyalty, that has never been surpassed. We take pleasure in illustrating herewith a photograph of the "Creco Baby."

STEEL FRAME AUTOMOBILE CAR.

The Pennsylvania Railroad has recently adapted its new type of steel freight car frame to an automobile ear and is now having several thousand built by the Pressed Steel Car Company. This car is shown in the illustration and has single sheathing, pressed steel underframe, body frame and roof, while the side and end doors are of steel plates. The center sills of pressed steel are of the fish-belly type, 20 in. deep at the center, and 11 in. deep at the bolsters and are reinforeed at the bottom with a 4 in. x 4 in. x $\frac{9}{16}$ in. angle extending between the rear draft lugs and on the top with a 24 in. x $\frac{5}{8}$ in. cover plate running the full length of the car. The side sills are 6 in. channels extending between bolsters and 6 in. x 4 in. x $\frac{5}{16}$ in. angles from the bolsters to the end sills.

There are two crossbearers, each composed of four pressed steel diaphragms and one cast steel center sill brace securely riveted to the center and side sills and connected by top and bottom cover plates. In addition to the crossbearers there are six diaphragms on each side connecting the center and side sills of the door. Switchmen for local crews should be prohibited and six pressed steel braces between the center sills. The body bolster consists of two pressed steel "U" shaped members extending from the center sills to the side sills, with a cast steel, combined center brace and rear draft lug between the center sills. The end sills are pressed steel, connected to the side sills by malleable iron push pocket castings and reinforced at the coupler opening with cast steel combined striking plates and front draft lugs. The corners of the car are further braced by pressed steel diagonal braces, extending from the body bolster and center sills to the side and end sills.

The side and end plates are composed of 6 in. x 4 in. x $\frac{5}{16}$ in. angles, the side and end posts and braces of pressed steel and the side door posts of bulb angles. The sides are tied together at the top by ten pressed steel carlines, to which the roof sheets are riveted. The roof sheets, in addition to being welded together, are reinforced at the splices by inside and outside butt strips.

These cars have one solid end, and one door end for use in the shipping of automobiles. The end doors are made of steel, are hinged to the corner posts and the opening extends from the floor to the roof. The side and end sheathing is $1\frac{1}{4}$ in. thick and is bolted to the posts and braces. The floor boards are $2\frac{5}{8}$ in. thick. The side doors are wide and are made of steel in two parts, one sliding towards each end of the car. The side steps, ladders, grab-irons, etc., are in accordance with the United States Safety Appliance standards.

The trucks are of the Pennsylvania Railroad standard arch bar type with $5\frac{1}{2}$ in. x 10 in. journals. The cars are of 100,000 lbs. capacity and have the following general dimensions:

Length inside	40 ft. 5 in.
Width inside	8 ft. 10 in.
Height inside	9 ft. 1 in.
Height at eaves	12 ft. 10 in.
Width at eaves	9 ft. 2 in.
Length overall	42 ft. 0 in.
Width overall (at door tracks)	9 ft. 11 in.
Height, rail to top of running board	13 ft. 4⅝ in.
Height, rail to top of brake mast	14 ft. 1⅝ in.
Height, rail to top of floor	3 ft. 7½ in.
Height of side door openings	8 ft. 3 in.
Width of side door openings	12 ft. 0 in.
Height of end door openings	9 ft. 0 in.
Width of end door openings	8 ft. 6 in.
Weight of car body	32,500 lbs.
Weight of trucks	16,600 lbs.
Total weight	49,100 lbs.

CIVIL SERVICE EXAMINATIONS FOR ENGINEERS FOR RAILWAY VALUATION.

Secretary McGinty, of the Interstate Commerce Commission, received yesterday circulars of the United States Civil Service Commission announcing open competitive examinations for a number of important positions for mechanical, civil and electrical engineers of railway experience for service with the Interstate Commerce Commission, mainly in connection with its work of making a physical valuation of the railways, from the register of eligibles, resulting from these examinations. Certification will be made to fill vacancies as they may occur in the several positions in the commission, under the act providing for the valuation of the property of common carriers, and vacancies as they may occur in other branches of the service in positions requiring similar qualifications, unless it is found to be in the interest of the service to fill any vacancy by reinstatement, transfer or promotion.

The positions for which the examinations are announced include senior mechanical engineer, mechanical engineer, senior inspector of car equipment, inspector of car equipment, senior inspector of motive power, inspector of motive power, senior structural engineer, structural engineer, senior civil engineer, civil engineer, senior electrical engineer, electrical engineer, senior railway signal engineer, railway signal engineer, senior architect and architect. For the senior positions applicants will not be required to appear at any place for examination, but will

Pennsylvania Class X-24 Steel Frame Automobile Car.

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be rated upon the evidence adduced as to their general and technical education and training, and their practical experience and fitness.

As a result of the examination for senior mechanical engineer two grades of eligibles will be established, the salaries in the first grade ranging from $3,000 to $4,800 per annum, and in the second grade from $1,800 to $2,700, and expenses. It is desired to secure eligibles having a thorough technical training and several years' practical experience in connection with the design, construction, operation, and maintenance of railway machinery, motive power, and equipment, and having a thorough acquaintance with the methods of appraisal and cost-estimating of railway machinery and equipment.

Applicants for positions under grade 1 must show that they are graduates in mechanical engineering from a reputable technical school and that they have had at least five years' actual responsible practical experience in mechanical engineering work subsequent to graduation; or, if not graduates, that they have had not less than ten years' actual responsible practical experience in the above line of work. Applicants for grade 2 must have had three years' such experience subsequent to graduation; or, if not graduates, not less than eight years' such experience. For grade 1 applicants must be between 30 and 60 years of age and for grade 2 between 25 and 50.

For the position of mechanical engineer the salaries range from $1,080 to $1,500. Three years' practical experience in mechanical engineering will be required for admission to this examination. Graduation in mechanical engineering from a technical school of recognized standing will be accepted in lieu of two years of these three. Applicants must have reached their twenty-third year, but not their fortieth birthday, on the date of the examination.

For senior inspectors of car equipment the salaries range from $1,800 to $3,600. It is desired to secure eligibles having several years' practical experience in car construction or repair shops and in cost-estimating of car construction and repairs. Applicants must show that they have had at least five years' experience as master mechanic, master car builder, general car foreman, or in similar service, and that they have within two years next preceding the date of their application been in active service in such capacity.

For inspectors of car equipment the salaries range from $1,200 to $1,500. Three years' experience in the employ of a railway in the department of equipment or with a company manufacturing railway car equipment is required for admission to this examination. Graduation in mechanical engineering from a technical school of recognized standing will be accepted in lieu of two years of these three.

For senior inspector of motive power the salaries range from $1,800 to $3,600. It is desired to secure eligibles having several years' practical experience in locomotive construction and repair shops, in locomotive operation, and in cost estimating of locomotive construction and repairs. Applicants must show that they have had at least five years' experience as master mechanic, road foreman of engines, roundhouse foreman, locomotive shop foreman or engineman, and that they have, within two years next preceding the date of their application, been in active service in any such capacity or in the capacity of inspector of locomotive equipment under the government of the United States.

For inspector of motive power the salaries are from $1,200 to $1,500. Not less than three years' experience in the motive power department of a railroad or with locomotive works is required for admission to this examination. Graduation in mechanical engineering from a technical school of recognized standing will be accepted in lieu of two years of these three.

Appointments to the positions named will be principally for duty in the field, but some appointments will be made for duty in Washington.

Persons who desire to take the examinations should apply for Form 2039 to the United States Civil Service Commission, Washington, D. C., or to one of several other officers named in the circulars, before July 21.

Conventionalities.

You bet it was hot!

Those who were regretting last week that they did not bring their overcoats were regretting yesterday that they brought any coats at all.

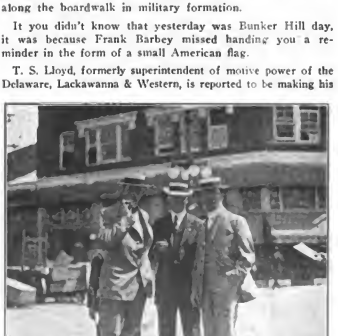
The Enrollment Committee, headed by Chairman Yardley,

J. T. Carroll, Assistant General Superintendent Motive Power, B. & O., Little Miss Carroll and her aunt, Miss McGuinn.

certainly made a fine showing yesterday noon as it marched along the boardwalk in military formation.

It you didn't know that yesterday was Bunker Hill day, it was because Frank Barbey missed handing you a reminder in the form of a small American flag.

T. S. Lloyd, formerly superintendent of motive power of the Delaware, Lackawanna & Western, is reported to be making his



Left to Right: C. A. Brant, Mechanical Engineer, C. C. C. & St. L.; M. H. Haig, Mechanical Engineer, A. T. & S. F.; A. R Ayers, Mechanical Engineer, N. Y. C. Lines West.

home at Richmond, Va. He is not attending the conventions this year.

R. D. Smith, superintendent of motive power of the Boston & Albany, came on the pier early yesterday morning with a small

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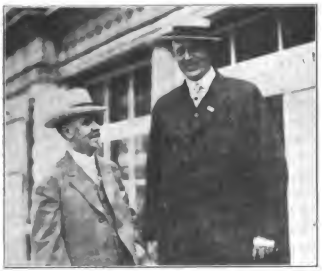
flag in his buttonhole and reminded us of the fact that Boston was having a holiday in celebrating "Bunker Hill" day.

William St. John, of the Safety Car Heating & Lighting Company, is following his old time custom of celebrating his birth at these conventions. He is just 73 years old today; but he looks not one day older than he did ten years ago.

For the third time in their short lives the four-year-old twins of A. E. Ostrander, of the American Car & Foundry Company, are attending the convention. Mr. Ostrander brought his family down Saturday and expects to remain in Atlantic City through the week.



H. Hammett and Bill Steel, the Short and the Long of the Convention.

Charles W. Waughop, for many years chief joint interchange inspector at St. Louis and East St. Louis, died within the past year and is missed from the conventions this year by his wide circle of friends. He had attended the M. C. B. conventions for 20 years or more.

W. L. Robinson, Superintendent of Fuel Consumption, Baltimore & Ohio

C. T. Rommel, special inspector in the motive power department of the Baltimore & Ohio, spent a couple of days at the conventions last week. Among other things in which he has been specially interested during the year has been an extensive series of safety valve tests.

Wm. Elmer, superintendent of motor power of the Pennsylvania at Buffalo, who is attending the M. C. B. convention, was elected first vice-president of the Central

H. E. Blackburn, Apprentice Instructor, Erie Railroad, Dunmore, Pa.

Railway Club at its last annual meeting. H. C. Manchester of the Lackawanna is the second vice-president.

W. M. O'Brien, master mechanic Kanawa & Michigan, is attending his first convention and has Mrs. O'Brien with him. He has been with the road he is representing for 27 years and received his promotion to his present position within the past year.

Left to right—J. E. Keegan, S. M. P., G. R. & I.; John Connolly, S. M. P., D. S. S. & A.

They are using power on his division which is handling upwards of 100 cars per tram.

George T. Wilson, formerly purchasing agent of the Delaware, Lackawanna & Western, and who retired because of ill health, is now stopping at the Water Gap House, Water Gap, Pa. C. L. Bundy, general foreman of the car department of the Lackawanna at Kingsland, N. J., who is attending the conventions, saw him last Sunday and says he is in fine shape.

Warren J. Lynch, third vice-president of the American Steel Foundries, is another supply man at the convention

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who was formerly in the railroad service, but his railway work has been in a different department from most of those who desert the transportation business for that of making and selling supplies. Most of his experience has been in the line of selling tickets and he was for several years passenger traffic manager of the New York Central Lines West.

E. C. Hall, general manager of the East Broad Top Railroad & Coal Company, was in Atlantic City on Sunday and looked over the exhibits on the pier with his master mechanic, J. F. Prendergast. The new narrow gage Mikados which were recently put in service are hauling 650 tons over a 2.6 per cent. grade and each one of them is replacing two of the older locomotives.

Samuel Lynn, master car builder of the Pittsburg & Lake Erie, stopped in at the editorial offices yesterday morning and threatened to bring suit against us for libel. In speaking in the *Daily* of June 17, of the number of steel cars which were given heavy repairs at McKee's Rocks, we said that they were being turned out at the rate of four per month. This should have been four per day.

C. H. Carman, who was recently promoted from the position of general foreman of the Missouri Pacific at Kansas City to general foreman in charge of the Sedalia, Mo.,

C. E. Chambers, Superintendent of Motive Power, C. of N. J. with F. D. Waller, Flower Resilient Packing Co., at his Right.

shops, is attending the conventions for the first time since 1907 and 1908 when he came as supervisor of air brakes of the C. & E. I. He went to the Missouri Pacific when the Kansas City shops were first opened.

H. Osborne, of the Canadian Pacific, came down to attend the M. C. B. convention. Within the past year he has been promoted to the position of assistant superintendent of motive power, Eastern Lines, and was succeeded as shop superintendent by G. I. Evans. Mr. Osborne still makes his headquarters at the Angus shops and finds it possible to get out into the shop more or less frequently, thus keeping in touch with the work which he has been interested in developing and extending for many years.

When M. J. McCarthy, superintendent of motive power of the Baltimore & Ohio Southwestern, left the Big Four, the employees presented him with a very fine automobile. Mr. McCarthy had to leave this with his family at Indianapolis while he was getting settled on the new job and when he finally moved the family to Cincinnati and had an opportunity to use the car he found that his 13-year-old son had become so proficient in driving it that he has not attempted to interfere and has not not yet learned to drive the car himself.

There was an enjoyable birthday party at the Traymore Saturday evening and although there were 40 candles burning on the cake, the "richin," A. R. Wilson, Detroit, declared to his friends present that the number of candles testified falsely the number of years he had lived. However, the evening was pleasantly passed by those present. Among his guests being Mr. and Mrs. P. P. Mirtz, Mr. and Mrs. W. D. Thompson, Mr. and Mrs. A. M. Rudel, Mr.

Left to right—J. Milliken, S. M. P., Philadelphia, Baltimore & Washington, and Alex. Kearney, Asst. S. M. P., Norfolk & Western.

and Mrs. Wing, D. Hawkesworth and Mr. and Mrs. Carter Blatchford.

George Gibbs, chief engineer of electric traction of the Long Island Railroad, is attending the conventions again, after having missed them last year. At the time of last year's conventions he was in Europe. Mr. Gibbs has seldom failed to be present at the meetings during the last quarter century. As is well known he was in charge of

Left to Right.—J. F. De Voy, Assistant Superintendent of Motive Power, C. M. & St. P., and James E. Keegan, Superintendent of Motive Power, G. R. & I.

some of the most important work in connection with the construction of the Pennsylvania terminal in New York, and in recent years he has devoted most of his time to work more or less closely related to electrification being done by the Pennsylvania Railroad system.

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MASTER CAR BUILDERS' REGISTRATION.

Alexander, J. R., General Road Foreman, Penna., Iroquois.
Beaghen, Thos., Master Car Builder, Union Tank Line, Shelburne.
Davis, M. J., Asst. Engr. M. P., Penna., Chalfonte.
Felton, Henry E., President, Union Tank Line, Shelburne.
Geisking, Charles, General Foreman, Penna., Seaside.
Gibbs, Geo., Chief Engineer, Penna. Tunnel & Terminal, Chelsea.
Gorrell, W. T., Master Car Builder, Philadelphia & Reading Ry., Monticello.
Kaderly, W. F., Supt. M. P., Ga. So. & Fla. Ry., Chalfonte.
Phipps, J. W., M. P. Inspt., B. & O., Ilesworth.
Porcher, S., Asst. to Pur. Agent, Penna.
Rhett, E. M., Electrical Engineer, Central of Georgia, Marlborough-Blenheim.
Sasser, E. C., M. M., Southern, Arlington.
Spence, A. N., Traveling Insp. Equip., So. Ry., Arlington.
Trapnell, F. W., Chief Interchange Inspt., All Lines, Chalfonte.
Yeager, Thos., M. M., Illinois Southern, Monticello.

MASTER MECHANICS' REGISTRATION.

Borcea, E., Pine Line, Roumanian Govt., Strand.
Cross, C. W., Supt. Transp., N. Y. C., Dennis.
Kaderly, W. F., Supt. M. P., Ga. So. & Fla. Ry., Chalfonte.
Kapp, W. F., Supt. M. P., R. F. & P., Marlborough-Blenheim.
Moriarty, G. A., M. M., N. Y. N. H. & H. R., Dunlop.
Rhett, E. M., Electrical Engineer, Central of Georgia, Marlborough-Blenheim.
Sasser, E. C., M. M., Southern, Arlington.
Wiesecked, G. F., M. M., W. M. R. R., Continental.
Yeager, Thomas, M. M., Illinois Southern, Monticello.

M. C. B. GUESTS.

Badenhausen, Fred. Wm., Accountant, So. Pac. in Mexico., Marlborough-Blenheim.
Banan, P. H., Machinist, B. & O., Lyric.
Barnes, W. C., Asst. Con. Eng., So. Pacific.
Beyer, Ed. S., Purser Steamships, Ward Line, Chalfonte.
Bisler, H. C., Asst. Supt., Penna., Seaside.
Bolin, W. O., G. C. For., B. & O., Lexington.
Borcea, E., Insp. of Service, Roumanian Govt., Marlborough-Blenheim
Brooks, N. S., Erecting Foreman, B. & O., Francis.
Burgoyne, C. J., Genl. Foreman, P. R. R., Elwood.
Burnham, W. D., Gen'l For. M. P. Dept., B. & O., Ariel.
Butts, G. W., Asst. M. M., P. R. R., Galen Hall.
Carman, C. H., Genl. Foreman, N. & P., Edison.
Carson, H. E., Secy. Mr. Baker, C. N. O. & T. P., Marlborough-Blenheim.
Cook, C. A., Fr. Painter, P. R. R.
Coulter, A. F., General Car Foreman, Union R. R., Channel.
Cruikshanks, E. D., J. C. P., The Virginian, Ohio Inn.
Davis, R. L., M. P. Insp., Penna.
Dwyer, J. B., Asst. Engr., Penna., Haddon Hall.
Dobson, J. D., Secy. to Gen. Supt. M. P., B. & O., Bouvier.
Farner, J. P., Asst. Gen'l Foreman, C. C. C. & St. L., Lexington
Fitz, F. M., Asst. Engr., P. R. R., Seaside.
Fritsch, J. A., Shop For., Penna., Lexington.
Gee, N. E., Draftsman Mech. Eng. Office, P. R. R.
Gerber, W. F., Gen. St. K., Southern, Shelburne.
Gibboney, E. S., Car Foreman, H. & B. T. M., Greater Pittsburgh
Gillis, A., Asst. For. M. P. Dept., B. & O., Wittle.
Glynn, D. M., M. M. Eng. Dept., N. Y. C., Haddon Hall.
Graham, H. F., Foreman Electric Dept., Penna., Warwick.
Grantier, L. V., M. P. Insp., B. & O. R. R., Carnix.
Green, C. H., Chief Inspr., Rock Island R. R., Traymore.
Hampton, K., Chief Joint Inspector, B. & O. R. R., Larchmont.
Haughey, J. B., Foreman, Penna., Ripley.
Hauser, Percy, Draftsman, Penna. R. R., Dunlop.
Hendry, J. A., Traymore.
Henthorn, J. T., Residence Inspector, B. & O. R. R., Brighton.
Hines, J. P., General Foreman, B. & O., Monticello.
Hinkens, E. A., General Foreman, B. & O., Marlborough-Blenheim
Hukill, H. C., Pur. Agent, P. R. R. Lines West, Traymore.
Hukill, W. S., Mech. Draughtsman, Penna., Haddon Hall.
Isaacs, T. C., Asst. For., B. & O., Boyce.
Issaeff, Anatole, Mech. Engr., Marlborough-Blenheim.
Jay, Thos. C., Chief Clerk & Mech. Engr., D., L. & W. R. R., Dennis.
Kelley, J. P., Cons. Air Brake Eng., N. Y. C., Chalfonte.
Kelly, Walter T., Mech. Engr., Pere Marquette, Haddon Hall.
Koch, Geo. B., Asst. Gen'l Foreman, Penna., Traymore.
Krouse, E. G., General Foreman Car Dept., Penna.
Lang, Charles, Jr., Traymore.
Layman, A. R., Inspt. R. R. & Warehouse, Clarendon.
Leonard, W. W., Inspt. M. P. Dept., B. & O., Pacific
Line, E. L., Inspt. M. P. Dept., Penna.
Loosen, John R., Supt. Motor & Ref. Eq., Wells Fargo & Co. Express, Rudolf.
Maddox, Paul, Car Foreman, C. & O., Chalfonte.
Major, Thos., Foreman Penna. R. R., Shelburne.
McGuire, J. J., Gen. For., B. & O., Lexington.
McGyrt, C. W., Gen. Eng. House For., D., L. & W., Lexington.
McMonamin, C. G., Motive Power Insp., Penna. R. R., Strand.
Merster, C. L., Mech. Eng., Atlantic Coast Line, Dennis.
Merz, C. B., Chief Clerk, Chgo., Terre Haute & Southeastern, Schlitz.
Murphy, P. P., Examiner, Penna., Islesworth.
Norris, J. C., For. Car Shops, Cumberland Valley, Monticello.
Osborne, Harry O., M. M., C. R. I. & P., Haddon Hall.
Otis, Chas. H., Chief Clerk Ry. Mail Service, Chelsea.
Petersen, W., Shop Engr., Canadian Pacific, Haddon Hall.
Peiffer, C. J., M. P. Ins., Penna., Lexington.
Porter, C. D., Asst. M. M., Penna., Chalfonte.
Prentice, Wade H., M. C. B. Clerk, P. C. C. & St. L., Star Cottage, 6 S. Ohio Ave.
Price, James H., M. P. Clerk, P., R. & W., Morton.
Rafter, Edw. L., Insp. Phila. Terminal Div., Penna. R. R., Chalfonte.
Ramage, J. C., Supt. Tests, Southern, Chalfonte
Ransbury, F. S., Air Brake Instructor, Penna., Iroquois.
Reece, Algernon, Haddon Hall.
Reilly, Thos. E., Special Agt., Penna., Chelsea.
Renner, C. W., Asst. Gen. Foreman, Penna., Chalfonte.
Rhine, Geo. B., Engine House Fireman, Penna., Biscayne.
Robins, J. B., Foreman Boiler Maker, C. R. R. of N. J., Eddystone.
Rose, C. H., Insp. Test Dept., P. R. R., Wheeling.
Rowland, W. I., Asst. Road Foreman of Engines, B. & O., Lexington.
Rusling, W. J., M. M., Penna., Chalfonte.
Russell, G. W., Gen. Equip. Insp., N. Y., P. & N. R. R., Raymond.
Russell, J. C., Retired Rd. Fore. Engines, P. R. R., Raymond.
Scheifele, John, Jr., Asst. Road Foreman of Engs., Phila. & Reading, Ariel.
Sensenbach, C. A., G. For., P. R. R., Milton.
Sharrow, G. C., Gen. Foreman & Car Inspt., Phila. & Reading, Riesley.
Simon, Lewis F., Purchasing Agents Office, Chelsea.
Sindall, G. E., M., M. C. B. Clerk Office Supt. M. B., Penna. R. R., Westminster
Singleton, C. W., Foreman Car Shops, West Jersey & Seashore, Radnor.
Skilling, J. K., Inspt. of Accts., B. & O., Sterling.
Spence, A. N., Traveling Equip. Inspt., Southern, Arlington.
Staley, P. C., G. F., Penna., Chalfonte.
Stanton, E., Chief Joint Car Inspt., N. & P. Belt Line, 171 Pacific Ave.
Stembrunn, J. J., Foreman Machinist, Penna. R. R., New Ocean Hall
Stewart, H. A., Shop Supt., Armour Car Lines, Marlborough-Blenheim.
Stoll, W. J., Inspector, Wabash, Pennhurst.
Suhrie, N. H., Traveling Engineer, Penna.
Swahn, J. J., Asst. Road For. of Eng., Penna., Elberon.
Terhune, I. H., Foreman, P. R. R., Edison.
Tobin, J. J., Foreman Freight Car Repairs, Penna. R. R.
Toomey, T. H., Foreman Erecting Shop, Penna. R. R., Wittle.
Trace, A. A., Chief M. C. B. Insp., Erie R. R., Monticello.
Wallen, J. D., For. Car Repairs, Penna., Boston.
Warnig, F. M., Foreman Phy. Lab., Penna.
Waterfall, Arthur T., Traffic Commissioner, Marlborough-Blenheim.
White, J. W., M. Tinner, Penna., Lexington.
Wightman, D. A., Dennis.
Williams, David T., Mech. Engr., P. & R.
Wood, Henry, Vice-Pres., Midland R. R., Chalfonte.
Wright, Wm., Consult. Eng., Brighton.
Yarwood, John G., Foreman, L. T.

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SPEED CHANGE MECHANISM OF BULLARD VERTICAL TURRET LATHE.

The maintenance of shop equipment has long been a serious item in railway, as well as in other shops, and while replacement and repair charges have been high and are constantly growing greater there is a side to the question which seldom receives consideration; that is the delay in work schedules and the increased cost of shifting the work from the machine which has fallen down under the stress of modern feeds and speeds.

An investigation of a series of breakdowns indicated that there were two prinicple causes for the delay and expense. The first in importance was the failure of gears, which indicated that the material was at fault. The second most frequent explanation of a tie-up was that sufficient oil had not been supplied to the bearings, either through the carelessness of the operator or because the oil-way had become clogged and oil could not reach the bearing.

After a long series of experiments the Bullard Machine

Lubrication of Speed Change Mechanism Used on Bullard Vertical Turret Lathe.

Tool Company adopted for its gearing material a crucible chrome nickle steel which, with proper heat treatment, shows a physical test of 270,000 lbs. tensile, 245,000 lbs. elastic limit, 11.5 per cent. elongation and 40 per cent. contraction together with an exceptional wearing surface of 70 scleroscope test. A sample of this material, bent double while cold, is exhibited at its space and shows absolutely no fracture or break or apparent strain in the ontside surface of the bend.

As an illustration of the continuous flow system of lubrication adopted by it after the investigation referred to above it also has on exhibit a testing stand which shows the copious supply of oil which literally floods the bearing and gears in the vertical turret lathe.

From the return sump in the base of the machine the oil is pumped to the filtering and distributing reservoir and from there flows by gravity through the various leads to the bearings and gear boxes. Seven quarts of clean oil per minute is passed through the machine and as the volume is so great there can be no destruction by distillation, the bearings having no opportunity to become even warm under the heaviest service.

Some two hundred and fifty machines of this type are in operation throughout the country and in not a single case has there been any expense for maintenance of gears or bearings.

FASTNUT WASHERS AND AUTOMATIC WRENCHES.

One of the most popular exhibits this year is that of the Fastnut, Ltd., London, England, represented by Walter H. Cook. Mr. Cook came to the United States to obtain patents on his automatic wrenches and is taking advantage of the convention to demonstrate their utility. He is exhibiting a "Fastnut" washer, a "Fastfit" wrench and a "Fastnut" spanner.

The "Fastnut" washer in use on over 40 foreign railroads will hold nuts under any vibration, the action being as follows: Drop the washer on the bolt in place of the ordinary washer and screw down the nut. The action of screwing down the nut flattens the teeth and automatically fixes the washer to the bolt, the springs engaging with the sides of the nut and holding it.

The "Fastfit" wrench is operated with a fixed and sliding jaw with teeth. The action of closing the sliding jaw fixes the wrench tight to the nut, allows it to hold automatically and ratchets on it. This wrench takes from ⅜ in. nut up to ⅞ in., automatically adjusting itself.

The "Fastnut" spanner is similar in appearance to the ordinary engineer's drop forge spanner, except that it has a movable head at each end. It is operated with a spring which is guaranteed to wear for two years. This spanner takes four different size nuts at each end.

ELECTRIC TRUCKS.

Self propelled trucks are proving most valuable in some cases, in railroad shops and passenger car yards, as well as in freight terminals and passenger stations. As is shown in the illustration, these trucks are capable of handling very heavy loads and are practically unlimited in their radius of action. They will transport heavy castings to various parts of a building or shop where crane service would not be possible, as well

Electric Truck in a Passenger Car Yard.

as between different shops. In the latter case they have a decided advantage over industrial tracks in view of the fact that they can receive or deliver material at practically any desired point.

Trucks of this kind, as manufactured by the Elwell-Parker Electric Company, Cleveland, Ohio, are on exhibition. On several designs the steering apparatus is arranged to operate all four of the wheels, which permits the truck to turn very sharp corners and to work its way in between machines where a

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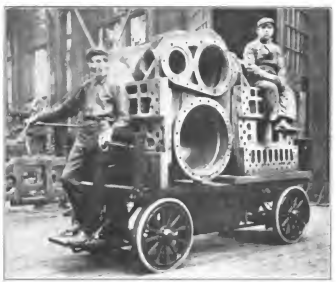
hand operated truck could not be used. Several designs with very low bodies which permit the convenient manual loading of heavy material are shown, as well as those with an elevated platform, suitable for smaller parts or for use in connection with a crane for cylinders and similar large parts.

The source of power is a compact type of storage battery located in a convenient position where it will not interfere with the operation or loading of the truck and also where it can be easily removed if necessary. This drives a small series-wound water and dust proof motor which is geared to a countershaft. The countershaft in turn is geared through universal pinions to the driving wheels. Both of these sets of gearing are arranged to give a reduction in speed so that the motor will operate at an economical speed while driving the truck at a slow rate. The operator stands on a platform at the front of the vehicle and controls its direction by a horizontal steering lever and its speed by a controller lever on the opposite side. The controller allows three speeds forward or reverse and there is an automatic switch combined with both the controller and the operator's platform which will open the main switch and return the controller to the "off position" whenever the operator steps from the platform. At the same time, twin brakes enclosed in the countershaft column will automatically



Self Propelled Truck in a Railroad Shop.

stop the truck. These come in action whenever the operator's platform is allowed to lift by the operator stepping or being thrown from it.

These trucks of various designs have a weight from 1750 lbs. to 3150 lbs. depending on the size of the truck and the type of storage battery employed. They operate at a speed of from 5 miles to 6 miles per hour when loaded and from 7 miles to 8 miles per hour when empty. In most cases a capacity of 4,000 lbs is provided.

PINTSCH GAS LIGHT WITH ELECTRIC IGNITION.

Occupants of sleeping car staterooms which are lighted by gas are apt to complain of the necessity of calling the porter to turn on and extinguish the lights in the compartment, and this objection has been cited against the use of gas lamps in staterooms. The electric light has overcome this objection, but on transcontinental trains, where a long stretch of open country prevents adequate maintenance of equipment, electric light has disadvantages that may outweigh the advantage of convenience in lighting.

The Canadian Pacific has equipped several of its transcontinental trains with an improved type of Pintsch mantle lamp that gives the occupant of the stateroom full control of the lamps in the room without any necessity of calling the porter. In these lamps ignition is obtained by an electric spark, and a combination gas cock and electric switch is located in each stateroom so that to light the lamp it is only necessary to turn the handle of the switch. The lamps in the body of the car are also Pintsch mantle lamps, and are operated by an electric spark. The porter does not have to go through the car with a torch or taper and light each lamp individually, but lights all the lamps from a conveniently located point by simply turning on the gas at

Canadian Pacific Sleeping Car Equipped with Pintsch Gas Light and Electrical Ignition.

the main cock and pushing the buttons, which are similar to those used on electric lamps. Electric berth lamps are employed in these sleeping cars and are operated from 1 k. w. Safety generator. This system has been developed by the Safety Car Heating & Lighting Company, New York

WATER COOLER FOR POSTAL CARS.

Among the fittings in the steel postal car which is being exhibited on Mississippi Avenue by the American Car & Foundry Company, is a galvanized iron water cooler having separate compartments for ice and water, and a drain for each compartment. The water compartment can be easily removed from the ice compartment by unscrewing the faucet and drain cock, and the ice compartment is provided with an overflow, having the opening located about one-third of the way below the top, so that the water from the melting ice is retained to assist in cooling the drinking water. If it is desired to drain off the water from the melted ice, it can be accomplished by opening the valve in the bottom of the ice compartment. Both the inner and outer walls of the latter are thoroughly insulated with granulated cork.

This cooler is made in two sizes, one for full postal cars, having a capacity of 8.9 gal., and the other for compartment cars, having 4.45 gal. capacity. It is manufactured by the American Car & Foundry Company, New York, and meets the requirements of the postoffice department

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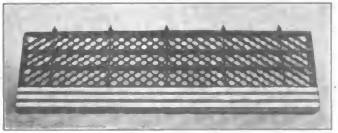
SAFETY DEVICES.

A new non-slipping safety car step is being made by the American Mason Safety Tread Company, Boston, Mass., which embodies features of the Stanwood step and the Mason safety tread. The step hangers and toe guards are of pressed steel, while the tread proper is made up as shown in the illustration. The front portion consists of a 3 in. strip of Mason safety tread and the rear portion of ⅞ in. x 19 in. gage high carbon Stanwood crimp steel. This makes a stiff and rigid step, and while essentially a safety tread



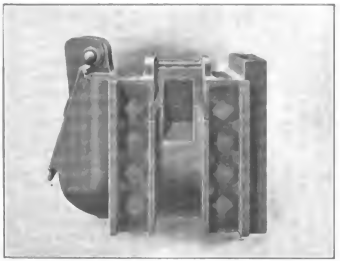
Combination Stanwood Step and Mason Safety Tread.

it also has the advantages of a foot scraper, thus keeping the dirt from being carried into the cars.

Another safety device made by this company is the Mason non-slipping safety ladder shoe. These shoes are applied to the bottom of the ladder rails, and the base, which comes in contact with the floor, consists of a carborundum surface of a hard, gritty nature. The method of attaching permits the base of the shoe to lie flat on the floor, no matter at what angle the ladder is placed. These shoes are furnished in either cast iron or aluminum.

PEDESTAL JOURNAL BOX WITH STEEL INSERTS.

After two years service, McCord & Company, Chicago, state that their pedestal type journal box fitted with continuous steel inserts in the pedestal wearing faces, has proved to have great durability and wear-resisting qualities. The steel



McCord Journal Box with Steel Inserts in the Pedestal Face.

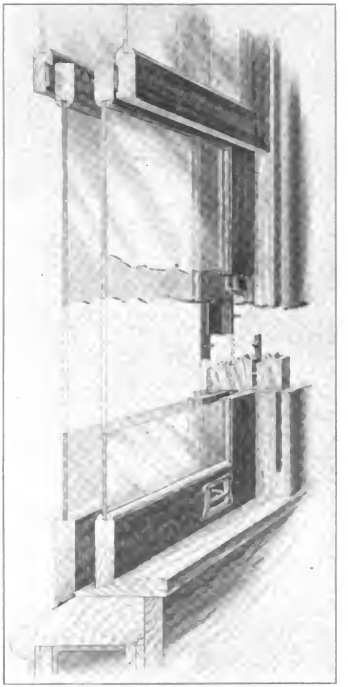
inserts are so constructed and set in place that it is claimed there is no danger of their becoming loose. This box also possesses the advantages of malleable iron over grey iron and insures an accurate fit in the pedestal. It is arranged for use with the McCord journal box lid if desired.

PRESSED STEEL FREIGHT CAR END.

The W. T. Van Dorn Company, Chicago, Ill., is exhibiting a two-piece pressed steel freight car end at the track exhibit. These new ends have the concentric corrugations similar to the single-end type except they are not made in the form of a circle. The two sheets are riveted together along the horizontal center line of the end of the car. Designs are also shown for corrugated end doors for automobile cars. Both designs have the strengthening features of the concentric corrugated sheets.

WEATHER-PROOF WINDOW.

During the past few years a great deal of attention has been given by various manufactures to the development of a weather- and dust-proof car window. The Acme Supply Company, Chicago, which has previously placed several designs of windows



Latest Design of Acme Weatherproof Window.

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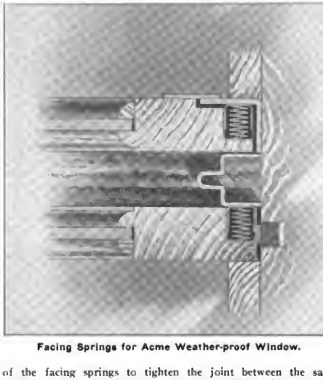
on the market, has just introduced a type in which the post battens of the window frame form a lip which extends into the rabbeted space in the sash stile. Facing springs are applied to the sash, forcing the window away from the lip, which draws the brass sash strips to a tight joint against the post battens. This joint is set away from the corner so that it is claimed the wind cannot force its way in, but the wind pressure assists the action



Facing Springs for Acme Weather-proof Window.

of the facing springs to tighten the joint between the sash strip and the batten lip. The top of the window is sealed by a plush strip and the bottom by a weather strip of double-lip rubber, held by a brass holder. This gives double weather-proofing at the bottom and also tends to stiffen the sash and prevent its bending in the center.

BOX CAR DOORS.

In the exhibit of the Camel Company of Chicago are several new designs of box car doors. One is for ordinary cars and has a hanger arranged for use with a combination Z-bar track at the top. As the rollers run between the two horizontal flanges there is no sticking of the door when being opened or closed and the track also provides a weather shed over the top of the door and the upper horizontal flange provides a weather shed over the hanger. This door is also equipped with interlocking weather and burglar-proof strips and has a deep flanged bottom Z-bar.

A door which gives a 10 ft. opening, intended for automobile cars is also on exhibition. This is double, one part being 4 ft. in width and the other 6 ft. The 4 foot door is equipped with a movable post which has an automatic locking arrangement at the top and is substantially fastened at the bottom when the door is in a closed position. This post wedges between the side plate of the car and the sill and gives the necessary support to the upper portion of the car.

Another door exhibited is designed for cars with a steel superstructure with wooden sheathing on the inside. In this case a T-iron door track is riveted to the Z-bar side plate on the car and double rollered hangers are arranged to operate on this track. The double rollers prevent the lifting of the door, making it easy of operation. The Z-bar at the top edge of the door works in conjunction with the T-iron track.

FLEXIBLE METALLIC HOSE.

Among the new exhibitors at this convention is the Goodyear Tire and Rubber Company, Akron, O., which has recently decided to manufacture all classes of mechanical rubber goods. One of the most interesting new features shown is a flexible metallic hose designed for air, pneumatic tool, steam, water, wash-out and all conditions where high service duty is required. The armoring consists of compound wires made of high carbon wire effectively galvanized, which completely protects the inner hose. The inner hose is made of high tensile strength and quality material adaptable for the particular service desired. The unique feature of this hose is its great flexibility. The question of expansion, contraction, elongation and twisting or writhing is thoroughly controlled. The armor is designed to withstand severe crushing strains and has been given the trade name of Kantkink.

STEAM HOSE COUPLER.

An improved form of hose coupler is being shown at the conventions by the Consolidated Car Heating Company, Albany, N. Y. The angle of the hose nipple is such as to prevent the hose from kinking, and at the same time the lines of the cams are so formed that when two couplers are connected, a perfect joint is secured without depending on the stiffness or kinking of the hose to hold the coupler heads in place. A guide is provided which acts as a hinge when coupling, and by its use the vertical travel is reduced to a minimum, thereby saving the kinking of the hose. The gasket and gasket holder are of a one-piece form, and are combined in such a manner as to give full protection to the gasket and at the same time to facilitate the changing of gaskets. The locking device of this coupler is automatic and is arranged to work whether the connecting coupler is of the same or a different form.

STERILIZING WATER COOLERS.

The United States Government now requires that the water coolers used in passenger cars be disinfected by sterilizing with steam every seven days. This requires, in yards where a large number of cars are handled, the laying of a great deal of pipe, with frequent branches leading out to hose connections through which the steam is conveyed to the coolers, the whole requiring a large expenditure. In order to provide a simple means for performing this work, the West Disinfecting Company, New York, has developed a portable steam generator, which can readily be moved from car to car by one man. It consists of a blow stove or burner using kerosene oil and mounted on a frame below a small boiler, which generates steam at from three to five pounds pressure per square inch. The steam is taken from the top of the boiler through a copper pipe, on the same principle as the dry pipe in a locomotive boiler, and is led directly through the flame of the burner in order to superheat it and provide against undue condensation; it then passes through a valve to a hose in the hands of the operator. A bracket and clamp are provided on the frame to hold the coolers and by using a longer hose the coolers which are only accessible through the car roof are easily reached.

WASTE SOAKING TANKS.

Among the new appliances being exhibited by S. F. Bowser & Company, Fort Wayne, Ind., is a specially designed tank for soaking waste in oil without wasting any of the surplus oil. This tank is built of heavy galvanized steel and consists of three compartments, one for storing oil, one for soaking the dry waste and the third for storing the drained oil after the waste has been soaked.

Dry waste is put in the compartment designed for this purpose and is then covered with oil pumped from the storage compartment by a Bowser hand pump. When the waste

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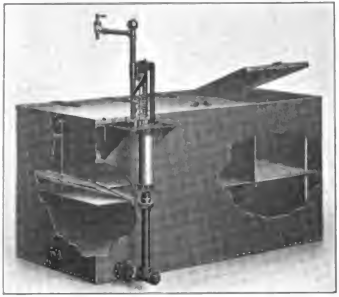
has soaked a sufficient length of time, a valve is opened and the extra oil is allowed to drain back into the third compartment. The oil has to pass through two screens, one of ¼ in. mesh and the other of 3/16 in. mesh. These prevent any lint, dirt, etc., being carried along with the oil. They can be readily removed for cleaning. The waste screening compartment has a special galvanized wire screen on the bottom so that any waste thrown in will quickly drain out; this is in case it is desired to use a little waste while the rest is soaking.

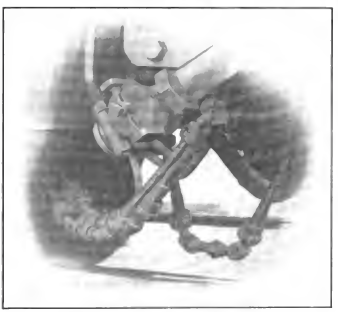
This tank has a 3½ in. clean out opening and the partition may be left out between the two upper compartments if desired and the whole upper compartment can be made oil tight. The storage compartment for oil will hold approximately 230 gal. and the dry waste compartment will hold 200 lbs. of waste. The oil soaked waste compartment will hold 100 lbs. of waste.



Waste Soaking Tank.

FLEXIBLE METALLIC CONNECTORS.

The flexible metallic connection which is shown in the illustration is intended for conveying steam, air, oil or water under any pressure common in railway practice, and is made by the Greenlaw Manufacturing Company, Boston, Mass. It is claimed for this connector that the only repairs necessary in normal use are the occasional renewal of the gasket, and as this does not contain rubber it is not affected by the action of heat or oil. The connectors are made in sizes ranging from ¾ in. upward and are used for pipe connections between locomotive and tender and between cars, and particularly in electric lighting systems where steam has to be supplied to the generating unit. Between the locomotive and tender a union is used, making it possible to disconnect the two joints without unnecessary delay when cutting off the tender. These connectors are also much used in engine houses for blowing off locomotives, etc., and for the heating of passenger cars in terminal yards.



Greenlaw Flexible Metallic Joint.

BRASS GATE VALVE.

Jenkins Brothers, New York, are exhibiting a brass gate valve which is similar to their inside screw type with the exception that a yoke and traveling spindle are substituted for the usual bonnet and inside screw; in many cases the outside screw type is more suitable than the inside. The threads on the spindle being exposed are easily lubricated, which increases their durability, particularly when the valve is used in dry or superheated steam. The traveling spindle, which raises or lowers through a stationary hand wheel as the valve is opened or closed, turns an indicator by means of which the position of the wedge or gate is readily ascertained. The valve has a solid double-faced metal wedge or gate, and the wedge is guided by ribs cast on the inside of the body which fit in corresponding channels in the wedge, thereby preventing the latter from dragging across the seat. There is a difference in thickness between the ribs on the two sides of the body, and as each channel in the wedge fits its corresponding rib it is impossible to reverse the wedge in the valve.

Brass Gate Valve.

UNIVERSAL WINDOW WEATHER STRIPPING.

The McCord Manufacturing Company reports some very interesting service given by wooden sash, equipped with its universal weather stripping on steel cars. During the recent floods in Ohio several cars were in a railroad shop for revarnishing, and all windows except those equipped with these fixtures were removed. The cars stood under water for about five days, and were found with mud about 6 in. deep on the floor and 1½ in. deep on the window sills. As the locks had been removed from these window sash, they were blocked open for about 3 or 4 in. On entering the car after the flood had subsided it was found that the windows could be raised by one hand even though the wood work was considerably warped. This is explained by the comparatively large lateral play between the sash and the window post. That these windows were air and dirt proof was shown by an air test a short time before the flood. An air pressure of 90 lbs. was applied at the joints without affecting a lighted match on the inside of the window. The reason these sash were not removed

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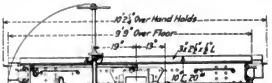
when the car was being varnished is because they are provided with a brass wearing strip, called a cinder deflector, which bears on the outside metal stop, and does not wear into the wooden sash.

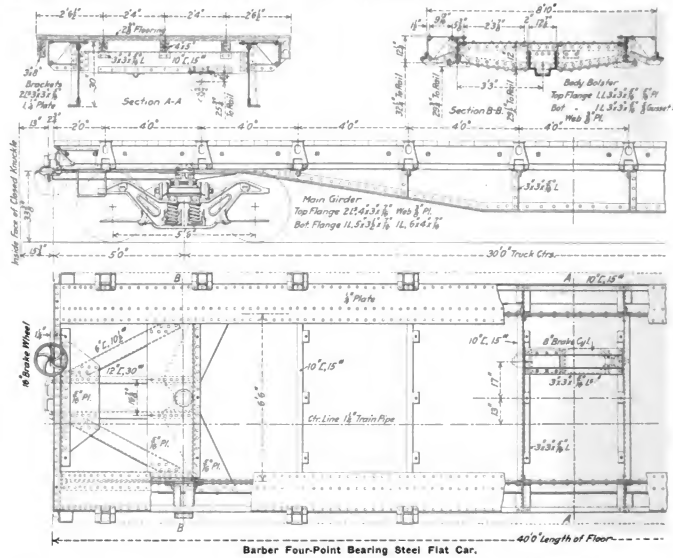
FOUR-POINT BEARING FLAT CAR.

A new design of the Barber four-point bearing flat car is being exhibited by the Standard Car Truck Company, Chicago, on the Philadelphia & Reading tracks near the pier. The car, as shown in the illustration, is especially designed for the Barber double action truck, and so that the load is delivered directly through the sills to the four bearings which are directly over the center line of the journals and half way between the journals of each truck. The radial travel is taken care of by special anti-friction devices, and the lateral motion is of the well known Barber type. There are two main drop girder sills which form a box section with the auxiliary side sill, all substantially connected with cross bearers. The end construction is a specially strong unit made up of end sill, body bolster, tie plates, braces and



End View of Barber Four-Point Bearing Steel Flat Car.

plate provides for and takes care of the switching shocks. It is, of course, understood that there is no vertical load on this center pivot. The roller caps are of malleable iron and are secured to the under side of the bolster. The radial roller seats are cast steel secured on upper side of the bolster. The radial roller cap is also of steel. The



Barber Four-Point Bearing Steel Flat Car.

draft sills. The stake pockets are flush, being made of cast steel and secured to the main sills through the cover plate of the box section.

The truck side frames are of cast steel I-beam drop girder type. The truck springs are arranged in pairs, each side supported on a seat cast solid with the truck frames. The truck bolsters are rolled I-beams with the web of the beam placed horizontal. The center pivot in place of center three parts of the radial device are so arranged that they are interlocked into one member with freedom to move with the curving of the truck or car body.

The car on exhibition represents the latest design, and contains many improvements over that shown last year. It has been in service for about one year, and has carried a load of 165,000 lbs., although its rated capacity is 100,000 lbs. The car weighs 36,500 lbs.

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ACME DIAPHRAGM ATTACHMENT.

Acme Diaphragm Attachment.

The Acme Supply Company, Chicago, is exhibiting its latest method of attaching the end diaphragm to a car. This attachment consists of three pieces of 1 in. x ⅜ in. x ⅜ in. rolled angles, two for the legs and one for the arch or top. The diaphragm is first riveted or stapled to the attachment, which in turn is fastened to the car with nine slotted lag screws provided with spring cotters such as is shown in the illustration. Two of these screws are located in each leg and five across the top. With the old method of attaching diaphragms to the car, it is impossible to release the diaphragm at the lower end of the legs without removing a large number of screws. Damage is done to the diaphragm in many instances when the men in the yards do not take the time to do this when repairing buffer springs; they sometimes put a jack screw back of the buffer plate and screw out so far that it tears the diaphragm and renders it useless. By removing four of the spring corners, in the new diaphragm, two in each leg, the diaphragm may be swung out to any required angle, the five screws in the top piece being sufficient to sustain the weight of the diaphragm.

HIGH CAPACITY TRUCK.

A new type of heavy capacity truck, designed for 70-ton freight cars, is being exhibited by the Bettendorf Company, Bettendorf, Iowa. It has been so designed that the height of the center plate and side frames has not exceeded that of the truck of less capacity, although the strength of the structure has been increased throughout. The main feature of the truck lies in the manner of applying the load on the side frames which is at points near the journal boxes, rather than at the center of the side frame. This reduces the stresses in the frames and permits the introduction of larger ends on the bolster, and at the same time provides for the application of longer springs than could otherwise be employed.

The manner of guiding the bolster is accomplished by providing slots in the ends of the bolster, both forward and behind the columns, through which the carrier bars pass and rest on the trunnions on the spring caps, thereby forming the support for the bolster and locking the side frames securely in position as well as dispensing with the ordinary spring plank. In designing this truck, care has been taken to produce one having the necessary flexibility, ease of dismantling for changing wheels, as well as having ample strength with a reduction in the number of parts. The truck illustrated has 6 in. x 11 in. journals; a 5 ft. 6 in. wheel base; a clearance of 5⅝ in. above the rail; an over-all height of side frame of 30¾ in.; springs 11 in. high and a bolster 12 in. deep at the ends.

COMPRESSION WRENCH.

An interesting type of wrench is being shown by the Lutz-Webster Engineering Company, Incorporated, Philadelphia. This is intended for use on pipe, studs, bolts, etc., and it is claimed gives a positive hold that will not slip even on a polished rod. While the grip is sufficiently firm to prevent the wrench slipping, it is also claimed by the maker that the wrench will not injure the surface in any way, and that it can be used directly on the thread of a pipe or stud and on brass or nickel plated pipe without causing any injury. Its construction and method of operation are clearly shown in the photograph. This company also makes a friction ratchet which can be set up without the handle in position, thereby eliminating the overbalancing effect. It is possible to operate this ratchet with a movement at the handle of as little as ½ in. which will be recognized as an advantage when working in a limited space.

Lutz Compression Wrench.

Bettendorf Truck for 70-Ton Freight Cars.

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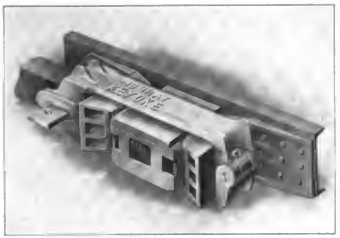
KEYOKE DRAFT GEAR ATTACHMENT.

The Murray cast steel Keyoke, which is on exhibition in Booth 321, is, it is claimed, the only keyed draft gear attachment by which the pull is transmitted from the yoke direct to the coupler lugs instead of being taken on the key. This avoids elongation of the slots in the sills, yokes and couplers, and the wear on the keys. In addition to the yoke shown in the illustration, this company is also exhibiting a cast steel yoke which does not require a coupler key or rivets but locks below



Cast Steel Keyoke and Assembled Draft Gear.

the coupler; this device incorporates the feature of taking the pull on the coupler lugs. The manufacturer states that in a recent test it was demonstrated that these yokes will stand a pull of 474,000 lbs. before breaking, and in an M. C. B. coupler jerk test seven couplers were destroyed before the yoke was fractured. This device is manufactured by the Keyoke Railway Equipment Company, Chicago, Ill.

EXTENSION CAR STEP.

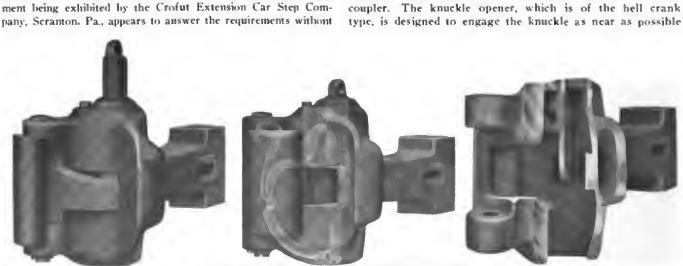
While there have been many attempts to design an extension car step which can be lowered and take the place of the usual stool, when passengers are alighting, and be raised up under the bottom permanent step while the train is in motion, the arrangement being exhibited by the Crofut Extension Car Step Company, Scranton, Pa., appears to answer the requirements without introducing the objections that have appeared in many of the earlier designs. It consists of a full width step carried by two heavy round bars which extend along the inside of the step timbers under the other steps, each having a sliding support in two brackets. Between the ends of each of these rods and the top bracket is a coiled spring around the rod which holds the step in the raised position. A connection at the center of the step to an arm on a cross shaft near the top forces it down when the lever at the side is drawn out. Notches in this lever hold the step down against the compression of the springs. Releasing the lever allows it to again assume the raised position. A connection is made to the trap door so that the step is automatically released when the trap is closed.

STREET LOCOMOTIVE STOKERS.

The reason of the general interest in mechanical stokers is easily understood when the illustrations in a pamphlet being distributed by the Locomotive Stoker Company, New York, are examined. These show seven different classes of locomotives that are now being successfully operated by Street Stokers, and an inspection of the list of dimensions given on the facing pages makes it clear that they are beyond the range for proper hand-firing. Three of them are of the Mallet type weighing from 540,000 lbs. to 405,000 lbs., and four are Mikados weighing from 330,000 lbs. to 273,500 lbs. The Street Stoker shown in operation on the pier includes a number of improvements over the design exhibited last year. These, however, are mostly of a minor nature and the principle of operation has not been changed in any way.

LION FREIGHT COUPLER.

To meet the exacting demands of modern freight service, the Monarch Steel Castings Company, Detroit, Mich., has placed on the market a new coupler known as the Lion. It is being shown in this company's exhibit, and a number of advantages are claimed for it. The construction is such that without additional parts the coupler may be operated either as a top or bottom lift, and all the working parts are protected by a housing on the bottom of the coupler head, which furnishes an additional wall connecting the face of the coupler to the shank. The strength of the shank is also increased by a rib located between the side walls and connecting the top and bottom walls, as well as extending into the head 1½ in. beyond the coupler horn. The lock is made in a solid piece, and has a bearing of 6 in. on both the knuckle tail and the wall on the guard arm side of the coupler. The knuckle opener, which is of the bell crank type, is designed to engage the knuckle as near as possible to its trunnion and thereby decrease the power necessary to start the knuckle open; the opener also follows the knuckle during the full opening. The lock-set is so designed that it is claimed the lock cannot be jarred off and allowed to drop. The construction of the coupler is clearly shown in the illustration.



Lion Coupler; Monarch Steel Castings Company.

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Railway Age Gazette

DAILY EDITION

Copyright, 1913, by the Simmons-Boardman Publishing Co.

Vol. 54. NEW YORK—JUNE 19, 1913—ATLANTIC CITY No. 24I.

PUBLISHED EACH FRIDAY, WEEKLY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE that of this issue more than 9,200 copies were printed; that of those more than 9,000 copies, 7,048 were mailed to regular paid subscribers, 200 were provided for counter and news companies' sales; and 1,700 were printed for distribution at Atlantic City and for use as sample copies.

THE arch bar truck for freight cars was for many years practically standard. Numerous designs intended to replace it were developed from time to time, but the arch bar type retained its position as a favorite, and has given excellent service under both freight cars and locomotive tenders. With the increase in the weight and capacity of freight cars, however, the problems of maintaining these trucks have increased enormously; not the least of these is the cracking of the arch bars, and the construction of this type of truck makes repairs in a case of this kind slow and expensive. Broken column bolts are another source of annoyance and expense, and the difficulty of keeping the various bolts supplied with nuts is well illustrated by the fact that recently on the western district of the New York Central a ton of nuts was used for this purpose in one day. In view of these conditions and the proportion which car maintenance repair bills have assumed, the general adoption of a type of truck which will give better service under heavy equipment than the arch bar type would seem worthy of the most careful consideration. There are several satisfactory designs of the cast steel frame truck now in use, and it is probable that it is in this direction the railroads will have to turn to find relief.

THE convention started out yesterday morning with something that might be construed into a semblance of an indignation meeting. It was on the subject of damage inflicted on cars in their passage through car dumping machines. The matter has been one causing constant annoyance and trouble for a number of years, and representatives of the railroads have made suggestions before this for minimizing the damage. Cars have been strengthened along the upper edge so as to withstand the crimping effect of the clamps, and the method of blocking has been criticised and suggestions made for bettering it. In some cases agreements have been made that certain improvements in the machine should be made. It was agreed that the work should be done, but nothing was changed. It is a matter regarding which the roads on which the machines are located are especially interested, because the majority of cars handled are home cars; but every road in the country that has a car liable to go through the machine is interested. Evidently some of the car owners are getting to be very much in earnest, and as Mr. Crawford suggested, they want the weight of the influence of the association behind them in the form of a definite recommendation to enable them to bring an effective pressure on machine owners and builders to compel them to so adjust and build their machines that the injuries shall cease to be inflicted.

HAVE we taken "into consideration also the question of reducing the cost of maintenance and operation of equipment?" This question was asked by President Fuller in his address Monday morning. The capacity of cars has been increased so rapidly during recent years and the stress to which they have been subjected because of the use of more powerful locomotives and the more general introduction of hump yards has increased so much that the designer in trying to keep up with the other demands has perhaps lost sight of the question of the cost of maintenance and operation; in many cases the management has cut out important features which have been recommended by the designers in order to save a few dollars on the first cost of the equipment. The result of this short-sighted policy is evident on many roads in the high cost of maintenance. As the claims for damaged freight have grown to excessive proportions and more attention has been given to the possibility of reducing maintenance costs it has become evident that it is often good policy to spend more money in building the cars right in the first place. Attention was greatly diverted to the desirability of doing this by the series of articles on "Defective Box Cars and Damaged Freight," which was published in the *Railway Age Gazette* during the early part of 1912. The committee report on Overhead Inspection of Box Cars at the 1912 convention also emphasized this, and the report of the same committee this year will undoubtedly direct still further attention to it. Meanwhile the car designers have been giving more attention to studying the performance of different designs in order to develop more practical construction and the railway managements have been disposed to pay more to get the right kind of cars, realizing that it is economy to do this because of the resulting better service, reduced maintenance costs and greater safety to the public and employees. This is real economy, if rightly done, but as suggested by President Fuller, the railways should be sure that such additional expenditures as are made will justify themselves fully.

THERE is a question in the minds of some of the members of the M. C. B. Association as to just what was intended by the action which was taken on the section of the report of the committee on Brake Shoe and Brake Equipment relating to a standard brake beam. Last year the committee recommended the adoption of a standard No. 2 brake beam, but this recommendation was rejected when it was referred to letter ballot. In bringing the matter before the convention this year the committee made a slight change in the No. 2 beam recommended last year, and referred it to the association with this suggestion: "The committee would also recommend the beam as shown on M. C. B. Association Sheet 17-B for consideration and trial by members of the association, with a view of adopting such a beam as recommended practice for No. 2 M. C. B. brake beam." Without doubt the committee's intention was not to submit the question to letter ballot, but rather to have the different members experiment with the beam with the idea of adopting it as standard practice at some future time. Mr. Kleine moves that the recommendation be submitted to letter ballot, but A. W. Gibbs directed attention to the fact that the brake head shown on sheet 17-B was covered by two patents which were held by one company. C. D.

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Young therefore made an amendment to Mr. Kleine's motion to the effect that the patent situation be disposed of by the executive committee before the matter is referred to letter ballot. The motion thus amended was carried. As the matter now stands the question will, it would seem, be referred to letter ballot if the executive committee can adjust the patent situation, although, judging from the wording of the committee's report it was not its intention to have it take quite this course.

PRESIDENT Fuller's experience meeting was a happy thought to fill in a few minutes made available by the run ahead of schedule yesterday morning. To those who listened to the men who eased their minds, if not their consciences, it seemed as though such an experience meeting might well be made a permanent feature of the convention. It happened to come just after the report on car construction had been read and discussed, so it is but natural that the major portion of the comments were directed towards faulty cars, but if so much could be brought out in so short a time bearing on this one topic, there must be a tremendous reserve of material stored away that might well be brought to light. Doors and end construction were the principal points of attack, and the former may well be taken as an item of crucial anxiety. It is a matter common to hear expressions of anxiety at the possibility of danger to passing trains caused by loose doors, and as for end construction, we have been talking about it for decades and now it really seems that something will be done. And such talks as these cannot fail to stiffen the recommendations of committees and encourage the association to take a stronger and more definite stand than it has sometimes done in the past in regard to seemingly minor affairs.

THE discussion on the subject of car construction seemed strongly to indicate the necessity of a standing committee on that subject, and the motion of Mr. Crawford for the appointment of such a committee was enthusiastically carried. While the committee presented a very interesting and instructive report, there were many questions asked by the members that were not touched upon. With a standing committee these questions could be carefully studied and a report be made for the benefit of all the members of the association. A standing committee is especially apropos at this time since the American Railway Association is looking forward to, and asking the various railroads for, a standard box car. Again, the work of this committee would be of special value toward the developing of standard designs and the passing on of special designs which would eliminate many of the difficulties experienced in the interchange of cars. It would be the duty of the committee to prevent such 60,000 lb. capacity cars, as were mentioned in the discussion on the retirement of the 40,000 and 50,000 lbs. capacity cars, from being constructed and in general would be of vast importance not only to the mechanical department, but to the transportation department as well. With the adoption of the new and heavier couplers there must be some change in the end construction of cars. The various parts must be carefully designed to back up the work the coupler is supposed to do, and this standing committee is just the one to advise and recommend what should be done. With the backing of the association for stronger and more substantially designed cars the committee is in a position to do the railroads of this country a very valuable service. The committee, however, cannot be expected to do its work successfully without the assistance of all the members of the association, and if the way in which the report was discussed is any indication, this assistance will be forthcoming.

AIR BRAKE HOSE.

AN average life of ten months for air brake hose manufactured under the present M. C. B. specifications, which the investigation of the committee showed to be the condition now existing, is a conclusive argument in favor of a revision. The committee has evidently given the subject most careful study and submitted, at yesterday's session, a proposed specification which would seem to insure a materially better product. A good air brake hose is a matter of more importance than the cost of replacing it after a short life and the fact that the new hose will cost considerably more than at present should not enter into consideration. Train delays due to a leaking train pipe, the occasional wreck due to a bursted hose and the cost of frequently keeping two of the largest air pumps running at full speed all the time are worth avoiding even if the longer life of the hose itself does not offset the increased cost.

Permission to use a machine made tube is given in the new specifications, which will be submitted to letter ballot for adoption as a standard. As a matter of fact a large percentage of the present hose has a machine made tube, although the specification calls for three, hand made calenders. It is praetically impossible for an inspector to determine the presence of the three calenders unless one is of a different color, as is required in the specifications of a few railroads. The objection to the machine made tube is not that it is machine made, but that; when made of poor material, it shows a serious porosity. The new specification attempts to insure a high quality of material by means of new tests and in that case it is felt that advantage should be taken of the lower cost of the machine made product.

A tensile strength requirement and a more rigid stretching test are the principle means offered for insuring a good quality of rubber. Experience covering several years will tell if they do it. At present they seem to be the most available means. At a later date there is a slight possibility that a chemical analysis will be perfected which can be used to make the quality more uniform and positive. The tensile test now proposed requires that with a speed of the machine of 20 in. a minute the inner tube must have a strength between 800 lb. and 1200 lb. per sq. in after an elongation from 2 in. to 10 in. The cover material must have a strength between 700 lb. and 1100 lb per sq. in. under the same conditions. The stretching test required at present is from 2 in. to 8 in., released, remarked, again stretched from 2 in. to 8 in. and held 10 minutes. A permanent set of ¼ in is allowed after it has been released for 10 minutes. In the proposed specification, both stretches shall be from 2 in. to 10 in. and the set immediately after releasing the second time is not to exceed ¼ in. and the set 10 minutes later is not to exceed ⅝ in.

Other new features of the proposed specifications are the introduction of a porosity test and the more severe hydrostatic and bursting tests. The new porosity test is made by putting the test hose under 140 lb. air pressure for 5 minutes and then splitting the cover with a knife and submerging the hose in water. Any escape of air of sufficient volume to indicate leakage through the inner tube will condemn the lot of 200. The new hydrostatic test is 200 lb. instead of 100 as at present and the bursting test has been increased from 400 lb. to 500 lb., both for 10 minutes.

More definite instructions are also given in connection with the quality of the wrapping and its application. The weight and width remain the same but the warp is required to have 25 threads, of a strength of 12 lb. each, to the inch and the filler 18 threads of 9 lb. strength. The edges are required to lap ½ in. No change is suggested in the friction test, but less than four ply hose will not be accepted.

In connection with the new hose specification, the committee made no sugestion about the proper way of mounting. This is fully as important as insuring a good hose and instructions are sadly needed by some railroads. Good hose spoiled before it is put in service is not as sale as poorer hose properly handled and applied.

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Closing Session—Unloading Machines, Air Hose, Revision of Specifications, Car Construction; Election of Officers.

President Fuller called the meeting to order at 9:30 A. M., June 18.

Secretary Taylor read a proposal to elect C. A. Seley, an associate member, and under the rules of the association this will lie over until the next meeting.

DAMAGE TO FREIGHT EQUIPMENT BY UNLOADING MACHINES.

The committee finds that considerable damage has been done not only by the Pennsylvania and Lake Shore & Michigan Southern, as reported last year by the Baltimore & Ohio, Wheeling & Lake Erie, Hocking Valley, Toledo & Ohio Central, and others.

There are two types of car dumpers in use; one in which the track or platen on which the car rests is moved transversely, bringing the side of the car against the side of the cradle, and referred to as the movable-platen type; the other is that in which the track is built solid with the cradle, and the cradle side is moved in against the car side by means of hydraulic cylinders, and is referred to as the solid-floor type.

MOVABLE-PLATEN TYPE.

The supporting track on the platen has its center coincident with that of the supply track leading to the machine, when cradle is at its bottom or normal position, as in Fig. 1, this being controlled by cams underneath the platen. When cradle is raised the cams become disengaged and chains which are attached to platen, and which pass through hollow clamps and extension clamps to counterweights, move the platen transversely, bringing car against side of cradle. As the cradle continues to rise the hook clamps, which move by their own weight in guides, bear on the top of car and hold car to platen by

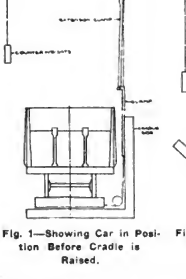


Fig. 1—Showing Car in Position Before Cradle is Raised.

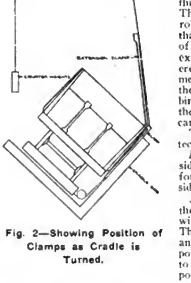


Fig. 2—Showing Position of Clamps as Cradle is Turned.

the combined weight of the clamps. When the cradle rotates to dump the car the extension clamps are brought over the top of car as shown in Fig. 2.

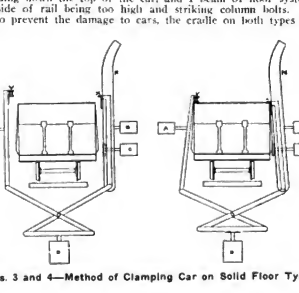
SOLID-FLOOR TYPE.

Diagrams of cradle and method of clamping car is shown in Figs. 3 and 4. It must be understood that the sequence of clamp operations can be varied, as the movement of hydraulic pistons is controlled by independent valves. When car is placed on supporting track the pistons *A*, *B*, *C* and *D* are all in release position. The cradle side is first moved in against top of car by piston *B*, bringing clamp *X* over car side and outside. Clamp *Y* is brought over car side by piston *A*. Both clamps are next brought down on top of car by piston *D*. Buffer is then brought out against car by piston *C*, thus making all clamps in operation, as in Fig. 4, and cradle is then rotated about center *N*.

With machines of movable-platen type the damage occurs when the cradle of the car dumper is rotated, due to their not having proper bearing against the side of the cradle, the side of car coming in contact with the clamp housings or side of cradle, and damaging or destroying the side ladders, handholds, roping staples or door-operating mechanism, and by the absence of extension clamps.

With machines of the solid-floor type the damage is done by hydraulic-operated clamps in the sides of the car and bending down the top of the car, and I beam of floor system outside of rail being too high and striking column bolts.

To prevent the damage to cars, the cradle on both types of



Figs. 3 and 4—Method of Clamping Car on Solid Floor Type.

dumpers should be faced with timber, preferably 10 inches thick, on specified areas and with openings between the timbers. The timbers are provided for the car to rest against when rolled on its side, and the openings are to permit of contents that have fallen into cradle being dumped on the next turn of the cradle. The blocking is so arranged as to protect the extending appliances by providing for them in areas not covered with blocking. On the machines of solid-floor type the method of moving cradle side will have to be changed so that the side pressure on car will not be greater than the combined weight of the heaviest car and its contents, and so that the vertical clamping will not exert a pressure on top of the car greater than that now used on the movable-platen type.

The principal features to be considered in providing the protection for both types of machines are, therefore.

First: Provide as much bearing as possible on the cradle side of the car and at the same time insure ample clearance for safety appliances and other attachments projecting beyond side stakes of the car.

Second: Allow for sufficient variation for spotting cars in the cradle, so that time will not be lost in placing the cars, with a resulting decrease in the capacity of the car dumper. The protection should be so placed that when a car is stopped anywhere within two feet the blocking will be ample to support the car on its side. A greater allowance than two feet is to be preferred when it can be provided without making a supporting area so small that the car will be damaged.

Third: Provide blocking so that the bearing face can be quickly renewed, so that it may be maintained in proper condition at all times by applying it when the machine is idle, to avoid the necessity of shutting down the dumper to apply the blocking.

Fourth: Provide a guide plate at the in-bound end of cradle for entering cars with spread sides.

Fifth: Machine to be provided with not less than four vertical clamps, and each of these to be equipped with an extension clamp.

Sixth: Grade of yard track leading into cradle to be of 100 ft. radius, to prevent damage to carry irons when cars are moved into machines coupled.

Seventh: Timber lining to be cut at an angle at lower ends to permit the contents spilled into the cradle to get out on the

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next turn of the cradle. Features to be considered in addition to the above, but only on solid-floor type machines, are:

Eighth: No side pressure to be used which will force the car against the lining in the cradle with a pressure greater than the combined weight of the car and contents.

Ninth: Vertical clamps to be operated by gravity so that the pressure on top of the car will not exceed that now used in movable-platen type machines.

Tenth: Top of I beam in floor system and just outside rail to be made the same height as rail.

The committee finds that to provide a lining or blocking for gondola and hopper cars owned by all railroads, could only result in insufficient support for a great many cars. It is therefore necessary for each railroad to make a study of the cars handled by machines on its lines and apply blocking according to the foregoing principles, and the typical example shown in Fig. 3. The modifications for the solid-floor type alone, as given in the eighth, ninth and tenth items, will have to be provided for by the machine designers.

Fig. 5 is a typical blocking used by the Pennsylvania and Lake Shore & Michigan Southern on machines of the movable-platen type, and the committee calls attention to the additional clearance necessary in the Sandusky car dumper to prevent damage to the side wheel operated cars of the Norfolk & Western. If it were not necessary to provide this clearance in this particular machine, a greater bearing could be given cars by cutting the blocking along the line *F G H* instead of *C D E*, along *V K L* instead of *U I J*, and along *M N* instead of *O P*. Furthermore, the recessed portion below the line *Q R* is for existing vertical handholds, and the surface can be brought out full with the balance of the blocking down to the line *S T* after July 1, 1916, when vertical handholds are no longer permissible, for all horizontal handholds will then pass below the line *S T*. Fig. 6 shows manner of applying guide for entering car with bulged sides and method of securing blocking to cradle. In securing blocking the 6-in. timber next to the cradle side is secured by ¾-in. bolts passing through wrought washers, recessed into the timber and through the cradle side. The bearing face, 4 in. thick, is secured by ¾-in. bolts in the same manner through the permament timber. The same blocking should be applied to the solid-floor type machines after the designers have modified the cradle side and clamps as per the ninth and tenth items.

Attention is also called to the following, and the necessity of each railroad giving the proper consideration in connection with car dumpers operated by it and by plants along its line:

Composite drawings of all cars to be handled by machines should be prepared and drawings for the blocking furnished to the contractor when the machine is purchased, in order that he may provide the necessary blocking, means of securing it, and reinforcement back of the cradle to support the weight of the car when on its side. When designing new cars, some thought should be given to their use on car-dumping machines. The providing of protection in acordance with this report should be taken up with plants operating car dumpers along the line of railroad, as much damage is done at steel and other manufacturing plants. When applying this blocking to existing machines, the back of the cradle wall or side should be reinforced to prevent bulging and making the blocking useless. Extension clamps through which chains pass must be used at all times to prevent damage to the car sides by chains. Face plates must not be used on the face of timbers, as cars will slip on metal-plated blocking.

This report has been made covering car-dumping machines. There are other machines and appliances used in loading and unloading cars which require additional study. Regarding recommendations for a suitable wrench for opening hopper-bottom cars, and a uniform size of shafts under these cars, the committee finds that in order to fully cover this subject it is

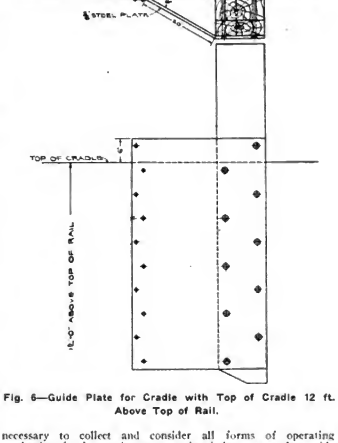

Fig. 6—Guide Plate for Cradle with Top of Cradle 12 ft. Above Top of Rail.

necessary to collect and consider all forms of operating mechanism for hopper-bottom cars, but it has not yet been able to get this information, and would therefore ask for further time.

The report is signed by:—P. F. Smith, Jr., (Penna. Lines) chairman; J. J. Tatum, (B. & O.); E. A. Westcott, (Erie); I. S. Downing, (L. S. & M. S.); J. J. Birch, (N. & W.), and C. S. Morse, (W. & L. E.).

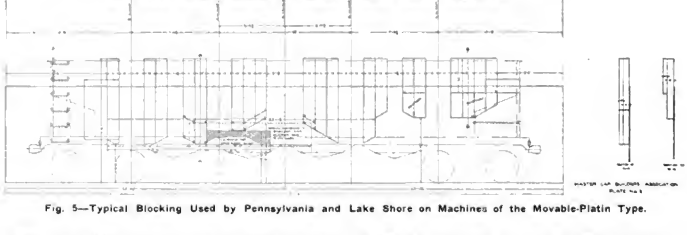

Fig. 5—Typical Blocking Used by Pennsylvania and Lake Shore on Machines of the Movable-Platin Type.

Discussion.

D. F. Crawford (Penna. Lines): This subject is very important to several of the roads that handle coal and ore between Pittsburgh and the lakes. Recently an examination of some of the machines was made by some of our people, and we find that the blocking has not been put in in accordance with the recommendations of the committee, representing those roads which gave this subject particular atten-

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tion before this committee was appointed. It is most important that this subject receive the attention of the roads on which these machines are located, and also that the roads jointly take the matter up with the various manufacturers who have machines of this kind. A large number of cars is being very seriously damaged. I have had some reports sent to me since I have been here, of a number of cars belonging to our lines, the Lake Shore and the B. & O., and the other lines that run into this territory. I think this committee should be continued to not only make definite recommendations on this machine, but others that can do damage to these cars. These machines will damage the best and latest cars we have. In one case a new car was put in and clamped, and the side was deflected two and one half inches. I have some photographs of the hopper cars of the Pennsylvania, the Lake Shore and the B & O., and the sides are bulged; and undoubtedly it was due to the clamping of this machine. I hope the Committee will make definite recommendations, and have your people devise a machine that will stop injury to the latest and best cars we own.

J. J. Tatum (B. & O.): The committee was very much surprised to find the conditions existing on the various machines which they inspected. Cars were being unnecessarily damaged and it seems that it was due principally to lack of careful watching and considering what was necessary to be done to the machine to prevent damage. The clamping action of the machine is very considerable. There is one machine which has a hydraulic buffer on the side. That machine crushes in the sides of the car and causes them to be thrown out of alignment, and the result is that the girder effect, the principle on which the car is built up for strength, is rendered practically worthless. An I-beam put along the floor of the platform of the machine comes close to the side of the track. All of us have had column bolts sheared off and we found that when the car was approaching the machine, the grade was not properly adjusted and the result was that the column bolts were sheared off. The grade was not adjusted to suit the spacing in the couplings, and when the machine would approach the car, it would bind the knuckle and break the carrier iron. There are a number of items about the machines which must be given consideration by each railroad to prevent damage to the cars.

Samuel Lynn (P. & L. E.): I am a member of the local committee which proposed some of these machines on our line. One of the troubles we have had is the shearing off of the carrier iron. I think, though, that is a condition that we have corrected to a large extent with the mill people.

D. F. Crawford: Are these diagrams in shape to be submitted to the association for adoption as recommended practice, so that we can put the weight of the association behind our arguments with the various people who own these machines, both individuals and railroads?

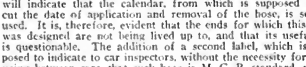
J. J. Tatum.—The recommendation of the committee is in such shape, and it would be proper to make such a suggestion.

D. F. Crawford.—I move that the recommendations of this committee be properly prepared to be submitted to letter ballot as recommended practice of the association. Remember that the cars of every railroad company which go through the machine, suffer just the same.

The motion was carried.

AIR BRAKE HOSE SPECIFICATION.

One of the items discussed by the committee was that of labels for air hose. The inspection of any pile of scrap hose will indicate that the calendar, from which is supposed to be cut the date of application and removal of the hose, is seldom used. It is, therefore, evident that the ends for which this label was designed are not being lived up to, and that its usefulness is questionable. The addition of a second label, which is supposed to indicate to car inspectors, without the necessity for their going between cars, that such hose is M. C. B. standard, means considerable extra and unnecessary expense. In the opinion of the committee, both the present labels should be discontinued, and in place of them the following design is recommended:



This label should be applied around the hose within 6 inches of one end. In mounting the air hose, the coupling is applied to the end near which this label is located, so that the drawbar will not obscure it when an inspector is on the right forward or left back side of a car. As this label contains all necessary information, and as the life of a hose can be exactly known from the date of manufacture shown, it is recommended that this question receive the most careful consideration of each member voting.

Following is the specification which the committee feels will accomplish a large improvement of air-brake hose.

PROPOSED REVISION OF SPECIFICATION FOR AIR-BRAKE AND SIGNAL HOSE.

Adopted as Recommended Practice in 1901. Advanced to Standard in 1903. Revised 1905. In 1911, detail specifications of label were placed under the heading "Label for Air-brake Hose."

I. MANUFACTURE.

1. All air-brake hose shall be soft and pliable, and not less than four-ply. It shall be made of rubber and cotton fabric, each the best of its kind for the purpose. No rubber substitutes or short-fiber cotton to be used.

II. PHYSICAL PROPERTIES AND TESTS.

Hose will be subjected to the following tests:

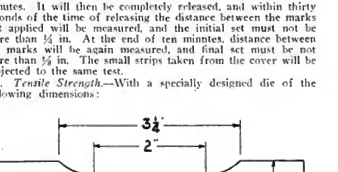
2. *Porosity Test.*—A hose will be selected at random and filled with air at 140 pounds pressure for five minutes. At the end of this time the rubber cover will be split with a knife and the hose submerged under water. This test is to determine the porosity of the inner tube. The escape of air must be distinct enough so that the porosity will not be confused with the escape of air which is confined within the structure of the hose. This test determines whether or not the lot of two hundred is accepted or rejected.

3. *Bursting Test.*—The hose selected for test will have a section 5 in. long cut from one end, and the remaining 17 in. will then be subjected to a hydraulic pressure of 200 lbs. per square inch, under which pressure it shall not expand more than ¼ in. in circumference nor develop any small leaks or defects. This section must then stand a hydraulic pressure of 500 lbs. per square inch for ten minutes without bursting.

4. *Friction Test.*—A section 1 inch long will be taken from the 5-in. section previously cut off and the quality determined by suspending a 20-pound weight to the separated end, the force being applied radially and the amount of unwinding shall not exceed 8 in. in ten minutes.

5. *Stretching Test.*—Another section 1 in. long will be cut from the remainder of the 5-in. piece, and the rubber tube or lining will be separated from the ply and cut at the lap. Marks 2 in. apart will be placed on the section, and then the section will be quickly stretched until the marks are 10 in. apart and immediately released. The section will then be re-marked as at first and stretched to 10 in. and will remain so stretched 10 minutes. It will then be completely released, and within thirty seconds of the time of releasing the distance between the marks last applied will be measured, and the initial set must not be more than ½ in. At the end of ten minutes, distance between the marks will be again measured, and final set must be not more than ½ in. The small strips taken from the cover will be subjected to the same test.

6. *Tensile Strength.*—With a specially designed die of the following dimensions:



Tensile Specimen.

Test pieces will be cut from the tube and cover and pulled in a tensile machine with a test speed of 20 in. per minute. After an elongation of at least 10 in., the inner tube must have a tensile strength of between 800 and 1,200 lbs. per square inch, and the cover 700 to 1,100 lbs. per square inch.

7. *Sampling.*—For each lot of two hundred one extra hose shall be furnished free of cost.

8. III. SIZE AND DIMENSIONS.

Length—	Air-brake Hose, Inches.	Air-Signal Hose, Inches.
Maximum	22½	22½
Minimum	22	22

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III. SIZE AND DIMENSIONS—Continued.

	Air-brake Hose, Inches.	Air-Signal Hose, Inches.
Outside diameter—		
Maximum	2 1/8	1 3/8
Minimum	2	1 1/8
Inside diameter—		
Maximum	1 5/16	1 1/16
Minimum	1 3/16	1 1/16
Thickness of cap vulcanized on—		
Maximum	3/8	3/8
Minimum	1/4	1/4

9. Hose shall be smooth and regular in size throughout its entire length.

IV. WORKMANSHIP.

10. *Tube.*—The tube shall be made either by hand or machine. It shall be free from holes and imperfections, and in joining must be so firmly united to the cotton fabric that it can not be separated without breaking or splitting the tube. The tube shall be of such a composition and so cured as to successfully meet the requirements of the tests given in Section 6 and 7, the tubes to be not less than 9/32 in. thick at any point.

11. *Wrapping.*—The canvas or woven fabric used as a wrapping for the hose is to be made of long-fiber cotton, loosely woven, from 38 to 40 inches in width, and to weigh not less than 20 to 22 ounces per yard, respectively, this to be determined by the following number of threads to the inch:

Warp .....25 threads per inch.
Filler .....18 threads per inch.

Tensile strength of single threads:

Warp .....not under 12 pounds.
Filler .....not under 9 pounds.

The wrapping shall be frictioned on both sides, and shall have in addition a distinct cover or layer of gum between each ply of wrappings. The canvas wrapping shall be applied on the bias and edges lapped at least ½ in. Woven or braided covering should be loose in texture, so that the rubber on either side will be firmly united.

12. *Cover.*—The cover shall be of the same quality of gum as the tube and shall not be less than 1/16 in. thick.

V. MARKING.

13. *Serial Number.*—Each lot of two hundred or less must bear the manufacturer's serial number, commencing at "1" on the first of the year and continuing consecutively until the end of the year.

14. *Label.*—Each length of hose shall have vulcanized on it the label for air-brake hose of red or white rubber as shown under the specifications for "Label for Air-brake Hose."

VI. INSPECTION.

15. *Rejection.*—If the test hose fails to meet the required test, the lot from which it was taken may be rejected without further examination and returned to the manufacturer.

16. *Inspection.*—Inspection shall be made at destination. If the test hose is satisfactory, the entire lot will be examined and those complying with the specifications will be accepted.

17. *Freight Charges.*—Rejected material will be returned to the manufacturer, who shall pay freight charges both ways.

TABLE SHOWING DIFFERENCES BETWEEN PRESENT STANDARD AND PROPOSED SPECIFICATIONS.

	Present M. C. B.	Proposed.
1. Number of ply..	Not less than two nor more than four.	Not less than four.
2. Porosity test....	Not required.	See Paragraph 2.
3. Hydrostatic test..	100 pounds pressure, with not more than ¼ in. expansion of diameter.	200 pounds pressure with not more than increase of ⅛ in. in circumference.
4. Bursting test.....	400 pounds pressure (water) for ten minutes without bursting.	500 pounds pressure (water) for ten minutes without bursting.
5. Friction test.....	20 pounds to unwind not more than 8 in. in ten minutes.	Same requirement.
6. Stretching test...	Tube and Cover 2 in. marks to stretch to 8 in., released, remarked and new 2 in. stretched to 8 in. Held for ten minutes, released, and ten minutes afterward to have a permanent set of not over ¼ in. Strip not to break.	Same test, except that 2 in. marks must stretch to 10 in. Finally, initial set must be not over ¼ in. and the final set (after resting ten minutes) not over ⅜ in.
7. Tensile strength..	No requirement.	Speed of machine 20 in. per minute. After elongation of 2 in. to 12 in. the inner tube must have a tensile strength between 800 and 1,200 pounds per sq. in. and the cover between 700 and 1,100 pounds per sq. in.
8. Sizes; Outside diameter. Inside diameter... Thickness of cap.	Present M. C. B. Length 21 3/8 to 22 1/4 in. Not over 2 1/8 in. in. to 1 1/16 in. Swelled ends, 1/8 to ⅜ in.	Proposed. 22 to 22 1/4 in. 2 1/8 to 2 3/16 in. Same. Same diam. throughout, 1-32 to 3-32 in.
9. Tube	Hand-made of three calenders of rubber, thickness 1/8 in. min.	Hand or machine-made. Same.
10. Wrapping	Loosely woven cotton, 38 in. wide, wt. 20 oz. per yd.; 40 in. wide, wt. 22 oz. per yd.	Same, also cotton to have specified number of threads to inch in warp and filler, and of a required tensile strength for each thread.
	No requirement as to new ing edges or to lap the same.	Edges of fabric to overlap ½ in.
11. Cover	Same quality as inner tube.	Same.
12. Inspection		Inspection to be made at destination.

The report is signed by:—M. K. Barnum, chairman; T. H. Goodnow (C. & N. W.); I. S. Downing (L. S. & M. S.); C. D. Young (P. R. R.); A. J. Cota (C. B. & Q.), and J. R. Onderdonk (B. & O.).

M. K. Barnum, in presenting the report, said: The committee has held a number of meetings and has invited the manufacturers to present their views, in the first place in writing, and later on in conference with the committee, which we have simply given you the net result of our work and have not encumbered our report with details which can be obtained from the secretary if anyone wishes them. The report should be divided into parts and acted upon under two heads, one covering the proposed new label and the other the specifications.

You will remember that the Train Brake and Signal Equipment committee had a report on the hose label, and the action on that report was deferred until the report of this committee. I would suggest that separate action be taken on the air hose label, and that afterwards the specifications be acted upon by the convention by themselves.

DISCUSSION.

M. K. Barnum (Ill. Cent.): We have here a sample piece of hose with the proposed new label, which might be passed around.

T. H. Goodnow (C. & N. W.): If the action of the association is favorable to the proposed label here, I would suggest that with the approval of the executive committee, the Secretary be instructed to send out at once a circular notifying the companies of this label, as this will not be distributed until the proceedings are, so that the purchasing departments will be advised, and can eliminate the present two labels.

Secretary Taylor: The result of the letter ballot will show whether it is adopted or not. Still, if it is desirable, I can send out a special letter on this subject.

F. F. Gaines. (C. of Ga.); I would like to know when this new badge will be adopted, and whether we will be penalized if it is not adopted on time.

M. K. Barnum: I do not recall just what action was taken on that, but the arbitration committee discussed it and intended to allow until October 1, 1915, before making the new badge a requirement for the hose, so that gives everybody a chance to use up the old hose.

C. A. Schroyer (C. & N. W.): I see a joker in this, and do not know whether it was intended so by the committee or not. You have not forgotten the troubles with the present label, and the thousands of hose thrown out for the slight variation. Now, there is a higher grade of rubber to be used in this hose, and if this label carries, which I hope it will, the question is whether we are to sit in this convention hall and vote whether all hose after a certain date without this label is not M. C. B. hose. It is not M. C. B. because it has not as high a stretching quality. There is a copyright in it. There is nothing to be said as to whether the manufacturer is to charge anything for that; but it was intimated to me that there would be an advance in the price of this hose as they had to use this copyright. I am heartily in favor of this new brand, but I hope we will not have to go through the same thing that we have had for the last few years with our present brand. This new brand will mean an advance of three or four cents.

M. K. Barnum.—If there is any joker in the report, the committee has not discovered it. As far as the use of the copyright of badge is concerned, it was to protect the association against unauthorized persons using it. There will be no charge for its use; the copyright will belong to the association.

C. A. Schroyer.—Will the manufacturer get the right to use it; how will he get it?

M. K. Barnum.—By the order which he receives for hose from people who have a right to use it.

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C. A. Schroyer.—Will there be a penalty if the method of manufacture is not followed?

D. F. Crawford.—In view of the conversation which has taken place on this subject of the label, I would suggest that the secretary send out a special ballot covering this one item alone, and send it out as quickly as he can. The result is to be announced immediately after the thirty days time in which to vote. If sent out next week, we would have this ballot from the association considerably in advance of the regular letter ballot which does not come until September or October.

C. A. Schroyer.—That refers to the label only?

D. F. Crawford.—Yes.

The motion was seconded and carried.

President Fuller: We will now take up the second part of the report.

F. F. Gaines: Inasmuch as the committee has asked to be continued for another year, and they are not ready at this time to fully outline the specifications, I move that they be continued and suggest that in the meantime as many as can shall buy hose under this proposed specification and try it out so that we may see what results we get as far as possible.

M. K. Barnum: It has been the idea of the committee that their specification as drawn up here should be ready for adoption in place of the 1905 specifications now in use. It is a generally accepted fact that the 1905 specifications are not giving a satisfactory hose. The committee found that the average life of the hose purchased under these specifications was about ten months and would recommend that the new specifications be adopted in place of the 1905 specifications, or at least be presented to letter ballot for adoption in place of them.

F. F. Gaines: I would be very glad to withdraw my original motion on that explanation. However, it is a fact, as I understand from the committee, that they have further refinements on this specification in view, and I thought that we did not want a new specification this year and then perhaps another new one next year.

C. A. Schroyer: We are requiring a hose that is parallel on its inside diameter, and as the result, it is costing us six or seven cents a hose more than if it was made 1-¼ in. inside diameter, with expanding ends. There is no benefit obtained in any respect in the use of a hose that is made parallel. There is not a fraction of a cent increased cost in making it 1-¼ in. diameter with an expanded end, and I do not think there is any need for the members of this association to pay an increased price for this hose simply because it has an increased diameter over what is required.

M. K. Barnum.—We have assurances from the manufacturers that it will not increase the cost of the hose to have it straight, and there seems to be some advantage in having it straight in the mounting and service.

C. A. Schroyer.—The manufacturers tell me that it is not reasonable to expect that they will make a hose 3-16 in. larger than the hose made heretofore and, make it at the same price as the smaller hose. It takes that much more material to do the work, and it is the material and labor in making the hose that costs the money. If any of you can show me a reason why the larger hose should be furnished at the same price as the smaller one would be, unless it is a matter of saving in labor, which it is not, then I would be willing to take into consideration that claim of the manufacturers that no additional charge would be made; otherwise, I cannot see it.

J. R. Onderdonk (R. & O.): The present M. C. B. specifications for air brake hose call for the same diameter as the proposed specifications, so that I do not see that the 1-¼ in. has anything to do with this specification over the present standard. If we expand the 1¼ in. hose at the present time, this specification makes no increase in price.

C. D. Young (Penna. Lines): I believe that the present standard of the association is a straight hose. It was agreed in the committee that we should continue that as a standard. I think there is a difference in the fabrication of hose, whether made with expanded ends or not. In practice, when the former M. C. B. standard hose had the expanded end, it was the custom of some manufacturers to vulcanize the hose after the expansion and then to wrap it so doing, it was practically impossible to wrap the canvas smoothly over the two diameters, one diameter at the swelled end, and the normal diameter over the balance of the length of the hose. It was also found difficult to wrap one piece of cloth over the hose; the cloth puckers at the point where the diameter changes.

Examination of a large number of pieces of hose will develop the fact that we practically have no protection at the point of curvature between the two diameters, and from a construction and manufacturing standpoint there is quite a decided advantage in being able to wrap a straight tube rather than one of two diameters. I think the committee's recommendation to continue the present standard of straight hose is entirely satisfactory. I am quite sure, from what the manufacturers told us in confidence, that they feel the same way. If anybody is at this time buying the expanded end hose, they are buying hose which is not standard under the present M. C. B. practice, as I understand it.

In reply to Mr. Gaines, I would explain that the investigation which the committee is making is along the line of adding additional requirements to our specifications and practices, making some slight modifications in the requirements. We are also providing, in case the association wants it, lettered air-brake hose. The tests are directed largely to accumulating data with a view of getting a life test on hose in order to determine how fast it deteriorates, and the rate of deterioration from the time it is new until it is worn out. These experiments are being carried on in the laboratories of several railroads which are represented on the committee, as well as on the cars. It will take some three or four years (if the hose lasts that long, as the manufacturers tell us it will) for us to get the results of the investigation, which is rather elaborate and will take a good deal of work. I think it would be a great mistake, if the Association desires better air brake hose, to postpone sending this specification to letter ballot.

D. F. Crawford: I move that the recommendations of the committee on specifications for Air Brake Hose be referred to letter ballot for adoption as the standard of this association, in place of the one they now have.

C. A. Schroyer: I would like to have the courtesy of the floor extended to any manufacturers of air-brake hose who may be here and who will kindly advise us what difference there may be in the cost of the larger hose and the hose with the expanded end. Let us have it direct from them.

President Fuller: The expanded end is not in the question.

M. K. Barnum: I would move, if there are representatives of the manufacturers of air-brake hose here, that the courtesy of the floor be extended to them to give such information and present such remarks as they desire. The motion was seconded and carried. No representative of the air-brake hose manufacturers responded.

Mr. Crawford's motion was then put to vote and carried.

President Fuller: The committee on Air Brake Hose Specifications have a supplemental report which they wish to present.

M. K. Barnum: This report covers the air-hose gaskets which we thought would be so closely allied to the hose that it would be well to cover that also; and as the suggested specifications are short, I will read them: "Dimensions of gaskets: The dimensions of the gaskets must agree with those adopted by the M. C. B. Convention of 1909, and all gaskets shipped must be uniform in size and section."

Material desired: Gaskets ordered under this specification should be made of such a compound that they will be tough, and yet have enough elasticity to comply with the requirements for strength and elongation. They should sustain an ultimate load of 100 lbs., and show an elongation of original internal diameter of 350 per cent. when tested as described below.

Testing: When the samples for test are received, they will be examined for size and workmanship. The gaskets will be tested in tension in a manner similar to that of the tensile test of a single link of a chain. The half-links used to pull on the gasket will each be provided with a 180-deg. fillet of the same diameter as the original inner diameter of the gasket—that is, the two semi-circular fillets of the pulling links will just fill the inside of the gasket.

Rejection Limits: If any of the sample gaskets representing a lot should fail under a load of less than 90 lbs., or if the elongation is less than 250 per cent., the entire lot represented by the sample will be rejected. If the tensile strength of any sample tested is more than 125 lbs., the lot will be rejected, unless the elongation obtained from such samples is more than 350 per cent. If the dimensions vary more than 1-64 in. in any way from those adopted as standards, the entire lot will be rejected."

I suggest that in taking action on the recommendations of the committee in this supplemental report, it be sent to letter ballot with the other, and voted on separately; that would be three items to be voted on by special letter ballot.

F. F. Gaines: I presume that in case a letter ballot is favorable, the gasket will be included with the other two items. You would not have a separate specification for the gasket?

Secretary Taylor: I understand Mr. Barnum's motion to be that the special letter ballot shall include specifications for the label and the gasket. There will be three separate questions on which to vote.

F. F. Gaines: But suppose the three are adopted by letter ballot, is the separate specification for hoist gaskets to be joined with the others?

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M. K. Barnum: It will be a separate specification and can be used separately or with the other.

F. F. Gaines: I would like to suggest that the committee, before they finally determine whether it is to be submitted as a separate question for letter ballot vote, whether we can have it made so that you can use them separately, or must they be together?

Secretary Taylor: It will be separated in the Standards, Mr. Gaines.

The motion was seconded and carried.

REVISION OF FORM OF PRESENT SPECIFICATIONS.

The committee has reviewed the existing M. C. B. specifications with a view of harmonizing the form without any change in substance, and, in order to accomplish this, an outline of instructions was prepared to guide the committee in its work. The subject matter of the outline was largely obtained from the existing standard of the committee on style of the American Society for Testing Materials.

After reworking the specifications, they were submitted to the various chairmen interested in the subjects for approval, which was obtained. The committee therefore recommends the following:

That the instructions covering the form of specifications be adopted by the association for future committees in preparing specifications.

That the specifications for iron axles be discontinued from the standards of the association, as material of this kind is no longer purchased in any quantity.

It was found in reworking the specifications that there are certain items in the rejection limits which could, to advantage, be corrected, and the committee recommends that a committee be appointed to review these specifications in order to bring them up to present-day practice. This refers especially to specifications covering steel axles.

Specifications do not exist for the following classes of material which are largely used by the members of the association, and we would recommend that consideration be given to the drafting of specifications covering this material for the use of the members:

Structural steel for passenger and freight cars.
Steel plate for passenger and freight cars.
Carbon-steel forgings for passenger and freight cars.
Rivet steel for passenger and freight cars.
Blooms and billets for forgings for passenger and freight cars.
Steel castings for passenger and freight cars.
Malleable castings for passenger and freight cars.
Medium steel bars for passenger and freight cars, for miscellaneous parts such as bolts, handholds, step treads, etc.
Pedved merchant bar iron for passenger and freight cars.
Journal-box brasses for passenger and freight cars.
Insulating properties of refrig.rator cars.
Hard-drawn copper wire.
Medium-hard-drawn copper wire.
Soft and annealed copper wire.
Pipe for freight equipment cars
Pipe for passenger and freight cars.
Galvanized sheets for passenger and freight cars.
Chain for passenger and freight cars.
Spring steel for passenger and freight cars.
Journal-box packing for passenger and freight cars.
Heat treated knuckle pivot pins.

The work of this committee convinces it that there is a large amount of work which can be done by such a committee as this in assisting various committees on material in formulating their specifications, and recommend that this committee be continued, either as a standing committee or a special committee, but, if it is made a standing committee would recommend that the secretary of the association be made the permanent chairman.

The report is signed by:—C. D. Young (Penna.), chairman; J. W. Taylor, secretary, and J. S. Sheafe (Ill. Cent.).

DISCUSSION.

D. F. Crawford: My understanding is that the report does not change the substance, but the form only; and I therefore move that the report be received and approved, and that the secretary be instructed in printing our specifications, to embody the suggestions of this committee.

The motion was seconded.

C. E. Giles (L. & N.): It would be dangerous to eliminate the specifications for iron axles. We may not use many iron axles but we are manufacturing them in an axle forge ourselves to some extent, and if we eliminate those specifications we are likely to get into trouble by reason of some broken axle coming up in connection with a lawsuit. If we condemn the iron axle we will put ammunition into the hands of someone else. On the first page of this report, it says: "That the specifications for iron axles be discontinued from the standards of the association, as material of this kind is no longer purchased in any quantity."

President Fuller: Mr. Crawford's motion was to confine the results of this report to changes in accordance with the provision of this report, and not to eliminate any standards.

D. F. Crawford: Yes, as I understand it, to eliminate a standard it would have to go to letter ballot.

Secretary Taylor: Yes.

D. F. Crawford: I would like to add to my motion that the other subject requiring such consideration be referred to the executive committee.

The motion was carried.

CAR CONSTRUCTION.

MINIMUM CENTER SILL STRENGTH, TO RESIST END STRAINS, FOR STEEL AND STEEL UNDERFRAME CARS.

Part of a letter from D. F. Crawford, general superintendent motive power, Pennsylvania Lines West, outlines the reasons for this investigation as follows:

"Prior to the 1911 M. C. B. code, all steel underframe and all steel cars were subjected to the same combinations and the same delivering lines' defects as wooden underframe, composite underframe and all wooden cars. The consequences were that, in interchange, defect cards were being requested for damage which in no event would be repaired. In order to correct this situation Rule 43 was introduced. The interpretation of this rule is, in effect, that a steel underframe car or an all-steel car will not be damaged in fair usage; consequently, the combinations should not apply, and the handling company was made responsible for all damage which necessitated repair, except such damage as might occur through corrosion and weakening of the parts.

"I have been advised that, in some of the new all-steel and steel underframe equipment constructed recently, the center sill section has been reduced to such an extent that the steel and steel underframe cars are no stronger, if as strong, as the wooden cars, and under Rule 43 the owner will receive the same protection as he would if the car had been of proper strength."

The subject has been divided in two parts:

(a) Center sills for existing cars.

(b) Center sills for new cars.

The only precedent we have is that of wooden cars. The experience with steel and steel underframe cars extends over a period of about fifteen years. This experience covers a large number of car types, showing great variations in end strain resisting qualities.

It was agreed that the relative values of steel and wood used in car construction for direct tension or compression should be based on the elastic limits of these materials, and that the committee use a ratio of four for the elastic limit of steel to that of oak or yellow pine.

Compared with a wooden car having two 4-in. by 8-in. center sills, an equivalent steel car must have an effective center sill area of not less than 16 square inches between the points where end strain takes effect. The strains in car underframes due to lading do not add greatly to the stresses from end shocks. As a rule, a loaded car is less liable to damage from end strains than an empty car, for which reason it will not be necessary to introduce load strains, but base the minimum area and end-resisting strength on end strains only.

Modern steel cars have the center line of draft at varying distances below (seldom above) the horizontal neutral axis of the center sills, and draft stops riveted to the center sills. The distance between the neutral axis of any member of the car and the center line of strain acts as a lever arm, through which bending effect is added to direct tension or compression. Strains which do not act in line with the neutral axis of car members will be designated "Eccentric Strains." The ratio of stress to strain is $\frac{I}{A} + \frac{X}{SM}$, in which

A represents the area, in square inches.

X represents the lever arm, in inches.

SM represents section modulus of the section.

Center sills not properly tied together at rear draft stops, located at some distance from the bolster, are subject to eccentric strains, which have a tendency to deflect them outward or away from the center line of car between the draft stops and bolster.

Compression strains acting on the car through the draft gear or car ends, as the case may be, create strut action in the members of the car framing. Long struts are liable to buckle under compression, for which reason it is customary to set limits for ratio of length to radius of gyration of struts, in order to restrict the excess stress caused by this buckling tendency. The members, or parts of members, of a car framing which require consideration are generally flanges of channels or I-beams, and plates. Their cross sections are rectangular, or sufficiently close

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to rectangular to be so considered in order to avoid theoretical computations.

The committee recommends the adoption of a ratio of 70 for length to radius of gyration, which corresponds closely with a ratio of 20 for length to depth "d" of a rectangular section. This depth must be measured in the direction in which buckling may take place.

To fulfill the restrictions just given, the length of a member should not be greater than 20 d., or the member must be securely anchored at intervals not exceeding 20 d.

The anchorage of center sills may be accomplished in various ways, the more common methods being by means of cover plates, or diagonal braces. The value of such braces increases the value of the center sills. Cover plates add direct value, and diagonal braces add partial value, depending on their angularity. Braces at right angles to the center sills add no value to the center sill area, unless specifically designed as horizontal girders of sufficient strength to transfer all of the end strains from the draft to the side framing, in which case the side framing must perform the functions of center sills, and must be subject to the same rules. The value of braces at point of minimum strength may be added to the center sill area, taking effect in the horizontal plane in which such value lies.

RECOMMENDATIONS.

Existing Steel or Steel Underframe Cars, which have less strength than that specified below, should be classified with wooden cars, and subject to the same rules for combination defects:

Area of center sills not less than 16 square inches.

Ratio of stress to end strain not more than 0.09.

The length of center or draft sill members, or part of member between braces, to be not more than 20 d. where "d" is the depth of the member, measured in the direction in which buckling might take place.

For new cars to be built after 1913 a greater strength should be required. Transportation requirements have increased greatly in the past ten years. Heavy freight locomotives, including Mallet road engines, greater efforts to pass cars through yards quickly, and rougher handling of cars, have increased the strains to cars, due to end shock, at least 50 per cent. Manufacturers of couplers, draft gears, draft attachments, etc., are all busy increasing the strength of their specialties, and are generally aiming to obtain double the original strength.

For new cars the area of center sills should not be less than 24 square inches.

Ratio of stress to end strain, not more than 0.06.

The length of center or draft sill members, or part of member between braces, to be not more than 20 d. where "d" is the depth of the member, measured in the direction in which buckling might take place.

BOX CAR END DESIGN AND STRENGTH.

F. F. Gaines suggested to the M. C. B. Association that designs of end framing of box cars, to prevent damage to car by shifting load, be submitted.

An investigation of box car repairs leads to a realization of the ever-increasing damage to box car ends and consequent expense of repairs. Wooden ends without metal reinforcement no longer meet transportation requirements; therefore, metal ends and metal reinforcements have been applied, tested and found much superior to wooden ends. Metal ends can be used either with or without wood lining. When using metal ends without wood lining, the inside surface of the plate must have no projections, such as bolt or rivet heads. Colonel B. W. Dunn, under date of March 21, 1913, advised as follows: "Paragraph 1662 (f), I. C. C. Regulations, prescribes that in a freight car to carry dangerous explosives, special care must be taken 'to have no projecting nails or bolts or exposed pieces of metal which may work loose or produce holes in packages of explosives during transit.' It is hoped, therefore, that you will be able to arrange the design so that the rivet heads will not project. If there is to be no interior wooden lining, and projection of the rivets can not be avoided, it would seem that the federal regulations would require a special wooden lining to be placed in the end of a car of this kind at least as high as the lading

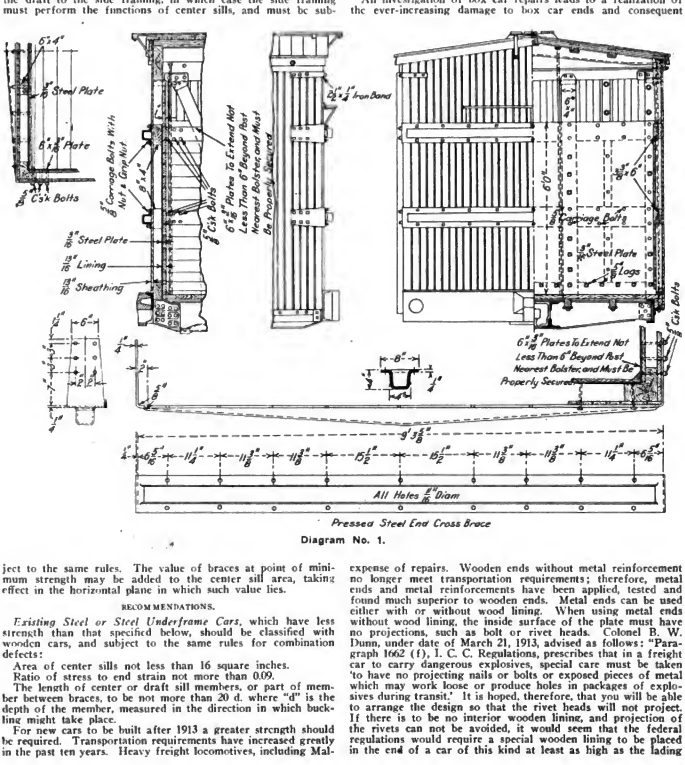

Diagram No. 1.

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of explosive packages. I do not interpret the federal regulations to forbid the presence of flat metal surfaces, such as this reinforcing plate would be, if the rivet heads did not project."

RECOMMENDATIONS.

(a) Wooden cars with standard M. C. B. lining should have the ends reinforced with metal construction in accord with Diagram 1, or its equivalent.

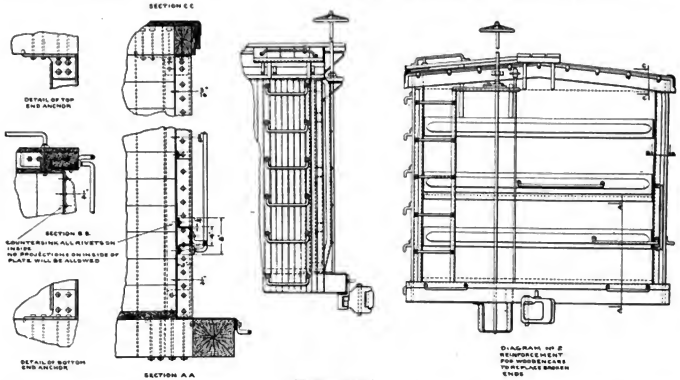

Diagram No. 2.

(b) Steel underframe cars with end lining 1½ in. thick and over should be equipped with outside braces, shown on Diagram 1, but the inside plate may be omitted.

(c) Each end must be attached to the longitudinal car members, either directly or through other members, by fastenings sufficient in strength to develop the full strength of the end.

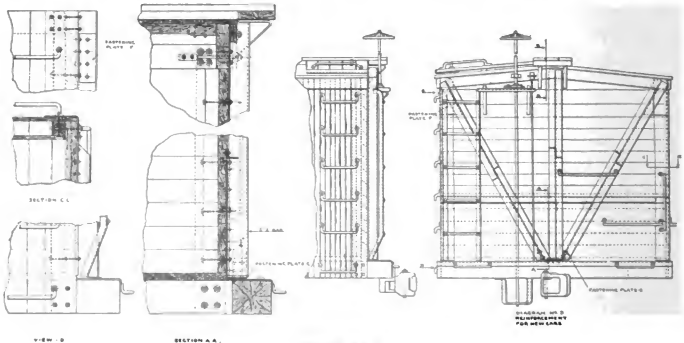

Diagram No. 3.

NOTE.—In applying outside braces, due regard must be given to compliance with United States Safety Appliance Rules for coupler and end ladder clearances.

(c) Cars with wood superstructure, requiring complete renewal of ends, should have steel ends applied, in accord with Diagram 2, or its equivalent.

(d) New cars should be equipped with ends of the type shown on Diagrams 3 and 4. The section modulus of the posts and braces, 2 feet above floor line, not including corner posts or flat end plate, should not be less than 15.

NOTE.—The Murphy or Van Dorn steel ends can be used instead of those shown on Diagrams 1, 2, 3 and 4.

(f) The construction shown in the diagrams are equally applicable to outside end sill cars as well as to inside end sill cars by modifying the attachment at bottom to suit the design of the end sill.

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Seal Records of Box Car End Doors.

The following from Geo. A. Hancock, general superintendent motive power of the St. Louis & San Francisco originated this investigation:

"Much difficulty is experienced in having yard clerks obtain accurate seal records of end doors, on account of the inconvenient location and risk of personal injury. Claims are now being paid on account of no end door seal record, and cars are being pilfered by theft through the end doors, which can be entered with the least chance for detection. Is an end door in a standard box car essential? If so, could it not be placed near the side of car where seals could be read from the side ladder?

"It brought out the discussion that an end door is desirable for loading certain classes of lumber, and that in a shipment of lumber there sometimes are specially designed pieces that are too long to go into the side door, and that have to go in at the end door, so the agents have referred the matter to this office with request that we advise: (1) If it is essential to have end doors in box cars; (2) if end doors are necessary, if they can not be located where the seals can be read with less danger of personal injury than at present; (3) if some standard location can not be adopted so that all will be alike; (4) if the vertical height of the end door could not be made the inside of the car, thus avoiding the necessity of taking seal records.

(c) Seal appliances now in use, and not accessible from the ground or from end ladders, should be revised to be so accessible to promote the safety of employees.

The report is signed by:—W. F. Kiesel, Jr. (P. R. R.) chairman); C. A. Seley; A. R. Ayers (N. Y. C. Lines); S. G. Thomson (P. & R.), and C. E. Fuller (U. P.).

DISCUSSION.

R. E. Smith (Atlantic Coast Line): Has the committee in their recommendations overlooked a very common class of cars, used largely and primarily for perishable fruit and vegetables? These cars are necessarily equipped with end doors for ventilation of the lading, both top and bottom; they are provided with means for closing the solid door and also for applying seals when the end door is closed. It is important at one stage of the journey that the end door be opened to provide ventilation, and another stage, particularly in the case of citrus fruits moving from Florida to northern points, that the doors be closed and made as nearly frost-proof as possible with that class of car; from the standpoint of the southern lines I do not see how we could accept this recommendation. It would not be pos-

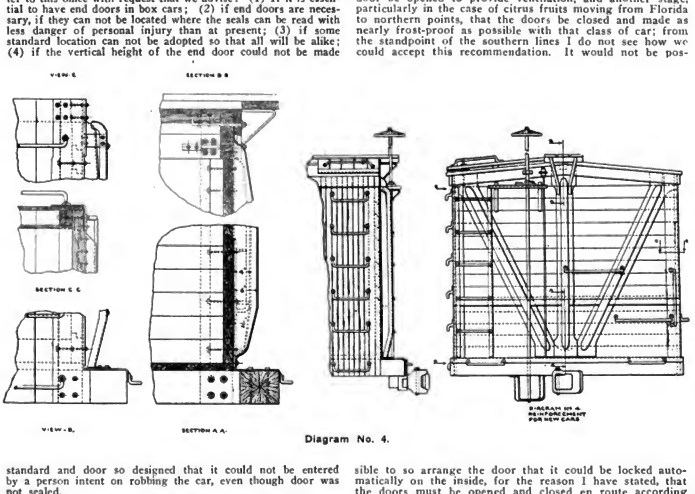

Diagram No. 4.

standard and door so designed that it could not be entered by a person intent on robbing the car, even though door was not sealed.

"As we are not putting end doors in our modern box cars, but as they are being placed in cars built by other companies, I believe that this is a matter that should be handled by the Committee on Standards and Recommended Practices, in connection with reports they made in 1912 on the height of seals on side doors."

Both kinds of cars, those with and those without end doors, used for the purpose of loading lumber, have been common in years past, but each year fewer new cars with end doors are built, because the end doors are valuable only on roads handling long lumber directly from the lumber regions as an important feature of traffic. Roads which formerly equipped all box cars with end doors have eliminated them from new cars, and are permanently fastening them in place on some of their old cars, leaving the end doors operative only on short box cars. This indicates that with the advent of the 40-foot box car the end doors will gradually become obsolete.

RECOMMENDATIONS.

(a) End doors used for loading lumber in box cars are essential only on roads having long lumber loading in box cars as an essential feature of traffic.

(b) End doors must be so constructed that when closed they lock automatically, by means of a lock accessible only from

sible to so arrange the door that it could be locked automatically on the inside, for the reason I have stated, that the doors must be opened and closed en route according to the severity of the weather.

I ask if when the committee made this recommendation, they had in mind exactly what they say: "End doors used for loading lumber in box cars are essential only on roads having long lumber loaded in box cars as an essential feature of traffic," or whether they refer to all box cars with end doors.

W. F. Kiesel, Jr. (Penna.): The committee had in mind only the small doors used in the ends of cars in which lumber is loaded. It is the common practice, to put ventilators in the ends of cars in such a manner that no one can enter the car. There may be some old cars, with which we are not acquainted, in which the ventilators are of such construction that you can enter the car from the end door, but all of the recent cars built have the end doors put in solidly, so that they cannot be removed.

R. E. Smith: I will support what Mr. Kiesel has said in respect to modern cars. Certainly this end door construction in cars of modern type is of a very substantial nature, and the car cannot be entered or pilfered through means of the end door; and the older cars, of which we have still a considerable number, cannot normally be entered for the purposes of pilfering. But people who load these cars with long lumber have been ingenious enough to butt out the ventilating appliances

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with their lumber and have failed to replace them. A thief who is properly equipped, can take out the end ventilators to get into the car, so that Mr. Kiesel is entirely right about that feature. The modern car cannot be entered for the purpose of pilfering. The pilfering of vegetable cars takes place principally from the side ventilator door and not the end ventilator door.

R. W. Burnett, (C. P.): The recommendations of this report are so far-reaching they should receive careful consideration. The company that I represent strongly objects to being forced to a standard which would mean a heavy increase in cost and weight, which experience has proved unnecessary. It is manifestly unnecessary to put back fifteen years, to make comparisons with wooden cars, considering that we have had 15 years' experience with steel cars. The comparison between steel and wooden cars is based upon the compressive strength of wood. The fact is that wooden sills fail from splitting or bending and from bending only when not properly supported, and practically never from compressive strength alone.

We have record of cars with 15 in. centre sills with an area of less than 20 in. being undamaged in accidents, while adjoining cars with centre sills of over 30 in. have collapsed at the bolster, due to the fact that the 15 in. sill was supported and the heavier sill was not supported.

There are many cars with 12 in. centre sills which have given excellent service for many years, from the fact that the sills have been supported. I think it is a mistake to use one formula for all class of cars. Within recent years we have had experience with steel superstructure cars which have shown the advantage of supporting the ends of the sills, and which has enabled us to use a much lighter centre sill, with practically no failure; where other cars with the heavier centre sills have failed, owing to the centre sills not being supported at the ends.

Experience with 20,000 cars with 15 in. centre sills, with a cross-sectional area of 19.8 in., has shown no failures except in demolishing wrecks. These cars at the end of five years were practically in the same condition as when built, while a wooden centre sill car rapidly deteriorates from the day it is put into use, due to the bolt holes wearing oblong, bolts bending, and the sills splitting. I mention the wooden centre sills again to show the necessity of comparing steel with steel, and not steel with wood.

Why not establish a minimum from facts obtained from experience with carefully designed cars where cars with 15 in. center sills have run in large numbers in the heaviest service all over the continent and in which carefully kept records for a long time show no failures of the centre sills.

With regard to recommendations (a) and (b). I feel that this association cannot give consideration to the contention that a car built last year be considered as a steel car, while a car which may be built next year of the same or superior construction would be classed as a wooden car. My understanding of this part of the committee's work is that it was to establish the difference between fair and unfair usage. If a minimum centre sill area is to be established, it should be based on the strength of the car, and not on the age. I would recommend as a substitute for recommendations (a) and (b), that in the future all cars constructed should have a minimum area of centre sills of 18 in. between bolsters and 20 in. between bolsters and end sills, when properly tied and supported, and a corresponding formula used when necessary to take care of eccentric loading; and after October 1, 1914, all cars with centre sills of less than these dimensions should be considered as wooden cars, regardless of when they were built.

F. F. Gaines: I cannot agree with Mr. Burnett in his remarks on the centre sill section. I have had some experience with cars with these light centre sills, and the experience has been especially disastrous. I do not think there is any question that in the building of steel cars in days gone by we have used too light material and that there was not sufficient strength in the car to take care of the buffing shocks. In my opinion, it is time that this association went on record as favoring good substantial car construction, and I would therefore move that recommendation (b), relative to new equipment, be submitted to letter ballot for adoption as recommended practice, and also that recommendations (a), (b), (c), (d), (e) and (f), under end construction, be separately submitted to letter ballot for adoption as recommended practice.

The end construction of box cars is something that has been neglected in the past to a very considerable extent, and I know from looking over our repair tracks that not only our own cars, but other cars which were built six, eight and ten years ago, are entirely inadequate to take care of the shifting loads. We are reinforcing our cars. I do think, therefore, that this association should put itself on record as favoring something more substantial than wooden construction in the ends of box cars.

L. C. Ord (C. P.): Mr. Gaines' remarks failed to take into consideration one point, which is not simply a question of the strength of the centre sills. If you take the old wooden flat car with wooden sills, and compare its strength with that of the box car, you know there is a very big difference as to the load which these sills will take. In other words, if you have a steel frame box car in which the strength of the car is in the superstructure as well as in the centre sills, why ignore the strength that is in the superstructure, which is preventing the end sill from dropping? Aside from any theoretical consideration of this subject, let us remember, after all is said, that the centre sills usually fail from the ends dropping. If your construction is such that the end sills will not go down, the area of 25 sq. in. that is called for is not necessary. It is manifestly unfair to make a specification which will call for a flat car, or a car with a steel underframe and light superstructure, requiring the same strength of centre sill as a steel superstructure house car in which the end sills are supported.

As to the service that they have given, prior to coming down here, we made a careful investigation and we have found that during the time our steel frame box cars have been in service, having carefully checked our records, we find that there is no case where we have been able to find a bill on owners' defects for the failure of these sills. They have been in service on practically every road on the continent, and therefore they get pretty well all the extremes of service.

We have had several wrecks, notably two in which some coal cars of our own construction, with 30 in. area sills, and almost double the depth of the oldest steel frame box cars, failed at the bolster due to the sills having gone down, whereas the box cars which were next to these coal cars came out of the wreck without the centre sills being damaged.

President Fuller in his opening address, spoke of the importance of not putting into the association records anything which would require additional or heavy expense, unless it was thoroughly warranted. The 25 in. sectional area for centre sills will be required if under the formula. They put that limiting figure on cars without the supporting superstructure, and if you refer to the report of the committee it says:

"The side framing must perform the functions of centre sills, and must be subject to the same rules." Yet by establishing that minimum area of 24 in., it means the requirements must be in excess of that. The area of centre sills should be of sufficient strength, but not be required to take care of the eccentric loading; and they cannot do that without requiring as heavy an area as was required for the minimum; while the 24 in. is approximately as steady as for cars with supported ends.

F. F. Gaines: That is a supported car like a box car, and those cars have light channel centre sills and do not come up to the specifications mentioned here. We have any number of those cars coming in every week. They are simply what might be called yard damages, where the centre sills are buckled, or other slight damage, and we have to cut them loose and straighten them out. I am thoroughly in accord with the remarks that we are building centre sills too light. This is not making it obligatory, or standard, but simply favoring good car construction that will stay out on the road and not always be in the shop.

J. J. Tatum (B. & O.): President Fuller, in his address, brought economy forward very forcibly, and I submit it is the duty of this association to support his recommendation. Let us build a substantial car that will not find its way to the shop as frequently as the car of the past has done. We have had wood sill cars fail, and we have had steel sill cars fail because we have not constructed them substantially. The report made by the committee on Car Construction is an able one, worthy of adoption by this association and I hope the organization as a body will support the motion as made and the letter read by the President.

J. J. Hennessey (C. M. & St. P.): Does that wipe out the whole report, or can we refer back to the end of it? I think there are some vital points not discussed at all.

J. J. Hennessey (C. M. & St. P.): I would rather have the sill construction go. There is another class of cars not referred to at all—automobile cars. There are a great many cars where it would be impossible to seal the end doors. Some have double doors; when used as an automobile car they open out and an inside door which can convert the car into a grain car is closed. The recommendation on the end door is too broad and inconsistent, and could not be carried out in many lightly-built cars.

C. A. Schroyer (C. & N. W.): I am of the opinion that if this association does not appoint a special committee on Car Construction, to which committee railroads may refer their drawings of car construction, and from whom they could receive suggestions what to do relative to these matters, that it will not be many years before the U. S. Govern-

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ment will do for us in the matter of car construction what he has done in the way of safety appliances. Trainmen without mechanical knowledge have told us what should be done in the matter of safety appliances and that is what will be done on car construction.

We have had a great deal of trouble with sills, light in weight, small in size, and of such shape that there was no lateral strength in them; and in the ordinary emergency application of brakes, they have collapsed on the road. That is not good construction, and insofar as the doors are concerned on the ends of cars, there can be no general rule laid down to meet these conditions. I think that with a standing committee we could reconcile many of the weaknesses that now exist in our construction.

W. F. Kiesel, Jr.: All the box car ends I am acquainted with have inside locks. Do you know of any other, Mr. Hennessey?

J. J. Hennessey: Yes.

W. F. Kiesel: There is no reason why inside locks could not be supplied. It is the best way to close the door and to keep it in shape; therefore it seems the same rule for small end cars could apply to large end ones for automobile cars.

J. J. Hennessey: Where would you seal so it could be read from the outside?

W. F. Kiesel: With the bar you could not open it from the outside; only from the inside.

D. F. Crawford: I would like to endorse all that has been said as a necessity for the railroads of this country providing good cars, and to make a motion that the report of the committee with their recommendations be referred to letter ballot as the recommended practice of this association.

The motion was seconded.

L. C. Ord: The association does not need to specify an area of centre sill as covered by this committee. The only thing is that in the one particular case of the car with the steel superstructure, some consideration should be made of that additional strength. The fact is that the formula which Mr. Kiesel has given is thoroughly satisfactory, if the exception of the sill area recommended is ignored and if the outside end eccentric loading is negligible. It seems to be the understanding of the committee on Car Construction, that not only may the area of centre sill braces be considered on the proper basis, but that where the end sill is of sufficient strength, the value of the support of the sides may be considered as supporting the centre sills and may properly be considered in establishing the minimum centre sill area required. Mr. Burnett's motion was that this should be considered. It does not matter in what form it is considered as long as the case is given sufficient consideration to be sure that it is right. I mean that the recommendation as to standard is not consistent throughout. The area is necessary under all conditions if the cars except where the end of the sill is supported.

W. F. Kiesel: The value of such braces increases the value of the centre sill; and that is supposed to be added as available for centre sill area. Then in the type of car you spoke of, if you have proper bracing between the sides and the centre sill, you are at liberty to add the minimum value of the braces to your centre sill area in considering the construction; but in a box car that is empty other questions arise. If the box car is loaded, you get a decided area, but in the empty car you have no better conditions than in the flat car.

The motion was carried.

The report of the committee on Correspondence and Resolutions was read in abstract by Secretary Taylor as follows:

"The committee on Correspondence and resolutions made its report expressing its appreciation and thanks to President Fuller for his address and for the splendid manner in which he had conducted the affairs of the association during the convention; and to the officers of the association generally for duties well done in handling the many details in connection with the convention; to the various committees that have considered and reported on the various subjects assigned to them; to the committee on arrangements for its effective services in making such complete plans for the meeting; to the railways for courtesies extended; to the hotel men of Atlantic City for their hospitality; to the Railway Supply Manufacturers' Association for their complete exhibition of railway appliances; to the technical press generally and to the *Railway Age Gazette* especially, for the daily report of the convention."

DISCUSSION (CONTINUED).

O. C. Cromwell (B. & O.): I think there are some other subjects which should be referred to the committee on Car Construction. In connection with the application of certain draft gears, where there is an insufficient distance from the bolster to the end of the car, there should be a minimum distance, because we find that certain draft gear works close into a bolster, and you cannot get good construction. That point should be given some consideration, and a minimum distance allowed, or in other words, the bolster placed a certain distance from the end sill so as to give sufficient space in which to apply the gear, which requires the maximum distance of space.

Then there is another consideration: Going into a heavy coupler, we want to provide sufficient means of attachment without conveying the stresses to the underframings.

The end sills should be so arranged as to provide for the proper application of the angle cover. They are not in the same location on many cars; and that should be considered. In connection with the coupler proposition, you must give attention to the support of the carrying-iron. There is a great deal of expense involved at the present time in renewing carrying-irons, or equivalent support for the couplers. That matter should be assigned by the executive committee to some committee of the association. The difference in forms is resulting in the spreading of the end sills and the castings surrounding them.

D. F. Crawford: As perhaps many of you are aware, the American Railway Association has before it the consideration of the construction of a standard box car, and it has expressed in some circulars which it has sent to some railways, the hope that we may reach some day a standard box car. In view of this and the discussion which has gone on before, I would like to move that the committee on Car Construction be transferred from a special committee to a standing committee.

The motion was carried.

O. C. Cromwell: Let us give careful consideration to the question of the strength of the end of open cars in connection with our consideration of the box car. We have all kinds of designs, and many of them are not very effective; that is a matter which should have some consideration.

F. F. Gaines: Mr. Brazier made a remark which was apropos regarding the subject of car doors. Regarding those photographs which were passed around, you fasten the hasp from the door with the bolt, and the first time the car gets a good bump it takes the whole door with it. There are ways to get around it, and we would like to hear more about this car door business.

A. R. MacBain (L. S. & M. S.): This meeting of this association is one of the best that has ever been held. We have gone on record as being in favor of better things. In going through all the big yards of the country, we see not only old cars, but new ones that are fitted with devices unsuited for present-day operation; and while I listened attentively and did not make any comment, I am fully in accord with the recommendations of the car committee, because it tends to better construction which is something that we need. I recently visited a big yard on the New York Central with Mr. Vanstang and others, and we were impressed with the condition of the ends of cars—many cars had ends bulged out. We tried to see how many were of the old design and how many of the new design, and in the case of certain class of loading, the same results were had with the new cars as with the old. They were all wooden, indicating that wooden ends, such as we used in the past, are unfit unless you are satisfied to have your car come in for a new end every time it carries a certain kind of freight.

What is true of the end of the car is true of the other parts. The doors are ridiculous. We have made a strenuous effort to bring our door conditions up to a better plane in the last three years, and have succeeded to a very satisfactory degree.

C. A. Schroyer: We are largely a lumber road, and haul a great deal of dressed lumber; there is no commodity we handle that is more destructive on the ends of cars than is dressed lumber, and I note with a great deal of satisfaction the new improved ends for box cars that recently came on the market. I have considered the matter of strengthening car ends, and recently I find that we are depending entirely on the corner post which I interpret as secured to the side of the car, as well as the two end posts, to resist the thrust and prevent the shifting of freight on the inside. In our later designs we strengthened the corner posts and secured them to the side of the car, and substituted 2¼ in. lumber to be used up to the height of 4 ft. We are doing that for the reason that we want the inside lining to assist in resisting the stress.

In some tests we made, we have found the timber used was not of sufficient strength. Then we used a thicker timber and under a load of 800 lbs it showed a defection of 1¾ in. With the thicker stuff we gain that much in the strength of the end provided the end is secured properly to the side. We then put 2¼ in. plank under the testing machine, and we found that we could get about 1,200 lbs. with the same amount of deflection; and because of this increased strength, we are using the increased thickness of board to obtain increased strength in the ends of the cars. I regret we cannot get closer together on these matters, but the conditions

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under which we operate have much to do with the designing of cars.

I regret as far as our association is concerned, that we do not have a larger representation on our road. We should have more general foremen and general inspectors here. They know more about the interchange of cars in one minute than we know in a month, and they would be good men to have here, insofar as our interchange work is concerned.

G. F. Giles: We all realize we have had a great deal of trouble with defective doors and door fastenings, and the ends of box cars, but those are not the sources of all our troubles. We have had more troubles and more wrecks caused by defective arch-bars than anything connected with our equipment, and it is very surprising to me to find that some of the best railroads in this country are still using arch-bar trucks in their new equipment.

One year ago we tried to inspect them by means of a handmirror so that the inside could be inspected as readily as the outside. We have found thousands of defective arch-bars. It has resulted in saving a great deal of expense and I am satisfied it prevented many accidents.

J. J. Tatum: It has been said that we expect a better convention next year. I see no reason why we should not have it. We have a committee now on car trucks, we have another committee on couplers, we have another on ear construction; and it has been suggested that we take up other important matters. It has also been suggested that something be taken up as to improved ends of cars. That is being taken care of. Just recently in one of our yards, it developed that 65 per cent. of the cars unfit for grain, had wooden ends. Many of them had steel underframes, showing that the designer considered what was needed in the underframe; but failed to consider what was needed in the superstructure.

There is one subject which has not been brought out, which I think should be. A large number of cars are sent out over a line after being received in bad order due to heated journals. It not only represents the expense of replacing the sponging, but it requires renewal of axles due to cut journals. It delays freight traffic on the road and it delays passenger traffic.

The M. C. B. Rules require that the matter of tension of sponging should be given very careful attention—as good as they give their own lines—but it does not speeify what the owner of the car should give us. Over 40 per cent. of the cars cut out on the M. C. B. lines are cut out because of hot journals. Cars are delivered with such short time between the time of leaving and receiving, that there is not the necessary time left to withdraw the sponging from the boxes and renew it; therefore, the owning line must help, as well as the operating line.

F. W. Brazier (N. Y. C.): The Coupler committee in its report said that the thanks of the association are due to the manufacturers. We feel that we should take some special action and extend a vote of thanks for their cooperation, and the work they have done in connection with the Coupler committee. I move a vote of thanks be tendered to manufacturers who have worked in connection with the Coupler committee, for the kind which they have given in bringing about the results so far as we have gone.

The motion was seconded and carried.

F. W. Brazier: The New York Central has practically adopted the all-steel ends. We have made some very severe tests with box cars loaded with wheels, and tried to destroy the cars, and I am glad to say that with our standard wooden end which costs us within $15 of the all-steel end, we practically destroyed the cars; while in the case of those equipped with the steel end, we simply had to take off a little section, and repair it and put it back on the track. We are lining these cars, as we believe it stops sweating in case of rain. We have about a thousand of these cars now running.

D. F. Crawford: The statement just made by Mr. Tatum and the one made by Mr. Schroyer and the discussion yesterday, seems to bring out that there is no such thing as a foreign car. We all have so many foreign cars on our lines that we must consider them as home cars, and we must all try to lubricate them and keep them in shape with running repairs, and keep up our own cars, also, so that we can expedite the traffic of the country. There is a great shortage of coal cars, and the old local conditions that made us design particular cars like these, have disappeared or are disappearing. I see a great deal of hope from the committee on Car Construction taking up the problems raised in this discussion.

A. Sternberg: This association should get up a standard door and fixtures for box cars. It would tend to stop the pilfering from cars.

F. W. Brazier: The trouble is we do not follow our own standards. That is why we have the Federal Standards. We had a committee on doors. It would cost fifty cents a car more, however, to put on three hangers in place of two, as recommended by the association and so people didn't do it. I want to second the remarks of Mr. Schroyer to the effect that if we do not get busy, the government will get busy. They have been here at our meetings looking for practical man for certain positions. We must unite on some standard. If the railroads had been united in the matter of safety appliances, matters would not have been handled by the government as they were. You will remember that we were then 85 against 15 per cent. If the committee recommends, as I said, three hangers for a door, the superintendent of motive power or some one else connected with him says, put on two, and save fifty cents on each one. I say, get some standard and stick to it.

J. J. Hennessey: The most hopeful thing I heard expressed at this convention was expressed by Mr. Crawford when he stated that the American Railway Association was drifting toward a standard box car. If the American Association may adopt a standard box car, and the association fives up to those dimensions and recommendations, I think it could then build a car that all the railroads of the country could build and maintain at less cost than at the present time.

J. J. Tatum: I am very much interested in this heated Journal proposition. I do not know whether or not the association has any standard method for treating for a sponge. That matter should be considered carefully, and a method might be proposed for use as a guide for the companies.

F. W. Brazier: We have with us J. W. Marden, who has been in the car department fifty years, has been retired and pensioned. He is a past president of this association. We will be glad to hear from him.

J. W. Marden: I feel quite complimented at the action which you have taken, and I wish to assure you of my appreciation. The only thing that I can say further is that quite a number of years ago I could do the talking and Mr. Brazier had to listen, but today and for a number of years past, Mr. Brazier has done all the talking and I have been listening. I thank you very much for the opportunity of speaking.

ELECTION OF OFFICERS.

The following officers were elected: President, M. K. Barnum; first vice-president, D. F. Crawford; second vice-president, D. R. MacBain; third vice-president, R. W. Burnet; treasurer, John S. Lentz; executive committee, C. E. Fuller, T. M. Ramsdell, G. F. Giles; committee on nominations, F. W. Brazier, F. H. Clark, A. W. Gibbs, C. E. Fuller and F. F. Gaines.

President Fuller: Before turning over the gavel to my worthy successor, I want to express my appreciation of the work of this convention. I have been coming to these conventions for a good many years, and as has been remarked frequently at this convention, the interest to be growing more and more in favor and more attention is being paid to their work.

We have a duty to perform, but I am sorry to say that I feel that we have not performed that duty in the full extent that we should have done. The managers of the railroads look to us to recommend what should be done in ear construction. I am sure that a great many of us believe, and it was so stated on the floor here, indirectly, that the General Managers Association ought to be consulted. We do consult with the General Managers' Association, and our own managers, but it is our function to recommend and to try to bring about conditions that will meet with the requirements of the American railroads; and I suggest in place of being backward and hesitating to recommend standard parts of cars, or anything else that is to our mind for the good of the railroads and the good of the car departments, that we should boldly recommend them. We will make mistakes; if we did not make mistakes we would not do anything, but let us make some mistakes, if necessary, and make them with a view of advancing. The questions of car construction and specifications for car construction are before you. They are a part of your work, and I think this association should take the initiative and give the railroads the benefit of our experience.

I thank you for your kindness and co-operation, and the assistance that I have received. I now have pleasure in turning the gavel over to my worthy successor, Mr. Barnum, and in doing so I want to add one thing, that I hope you will give him full support, and if you give him the same support you have given me, and give him ten per cent. or twenty per cent. more support, you will have next year the best convention you have ever had.

President-Elect Barnum: I believe it is generally conceded that the Master Car Builders' Association represents the largest

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vested interests in the United States, and that means in the world; and it is also generally conceded that it is the most influential body in directing the principles which are of most importance to the railroads of this country.

With that preface, I will simply say that I appreciate fully the very great honor that has been conferred upon me in my election to the presidency of this association, and I assure you that I will give the duties of the office my very best efforts. I thank you.

Secretary Taylor: Mr. President, Mr. Scott H. Blewett told me this morning he would like to say a word to this convention. I would like to ask that the privileges of the floor be extended to Mr. Blewett, representing the Railway Supply Manufacturers' Association.

Scott H. Blewett: I trust that my being with you as frequently as I have been in the past few days does not make me a joke, because I assure you that I appreciate the courtesy that you have extended to the Railway Supply Manufacturers' Association, of which I am a member, and to myself personally, in asking me to be with you at other times and at this time.

Mr. Fuller, there have been but few, if any other occurrences in the history of the Master Car Builders' Association and Master Mechanics' Association, like the present, that one man has been honored by being the president of both associations; I think it has never before occurred. I may be mistaken. It is no small evidence of the rare esteem and confidence that the members of these associations have in you. This badge will remind you in the future of this esteem and of this confidence. There are things which words cannot tell. Man's love for man is spoken by deeds. It was man's love for man, and his tender sympathy for man, which indited the telegram last year that informed you of your election to the presidency of this association.

Ex-President Fuller: I regret that I cannot express in words my appreciation of the honor of having held the chair as president of this association, and of being the possessor of this badge. This association is one of the most important in the transportation world, and any man may esteem it an honor to be elected to fill the position of president.

D. F. Crawford: I promised your predecessor, Mr. President, I was not going to say any more. I ask the privilege of you to say a word more. I think this association should acknowledge by a suitable vote of thanks, the splendid service which Mr. Fuller has rendered as president. I have been with Mr. Fuller on the executive committee now for several years, and no one knows more fully than I do, how much he has had the interests of the association at heart. I therefore move that we extend to Mr. Fuller a rising vote of thanks for his highly esteemed services.

The motion was put to a vote and carried, and the meeting then adjourned.

TWO OLD FRIENDS.

Two of the convention visitors who are often seen together are E. B. Leigh, president of the Chicago Railway Equipment Company, and E. L. Adreon, president of the American Brake Shoe & Foundry Company. Messrs. Leigh and Adreon have been friends almost all their lives. They were boys together, both having grown up in St. Louis; and for years they were associated in business. In 1887 Mr. Adreon succeeded Mr. Leigh as president of the American Brake Company. At the same time Mr. Adreon became a director of the National Hollow Brake Beam Company, of which Mr. Leigh became president. This concern was the predecessor of the Chicago Railway Equipment Company. It will be seen that the business relations between the two have extended over a period of over a quarter of a century.

NEW HAVEN ELECTRIC SWITCHING SERVICE.

The New York, New Haven & Hartford now has a heavy freight and switching service operated by electric locomotives, in addition to the passenger service, and it is believed that this is the first instance where a large installation of electric locomotives has been made exclusively for switching service. There are sixteen 80-ton Baldwin-Westinghouse electric switching locomotives used at different points on the system and in the Oak Point and Westchester freight yards. The first electric switching locomotive of this installation displaced two steam switchers that were working on twelve-hour shifts, this being possible because the length of efficient service of electric switchers is not controlled by fire and boiler conditions. By September 1, it is expected that the electrification of the New Haven will be complete between New York City and New Haven.

RAILWAY SUPPLY MANUFACTURERS' COMMITTEE CHAIRMEN.

At a meeting of the executive committee of the Railway Supply Manufacturers' Association, held during the noon hour yesterday, J. D. Conway was re-elected secretary-treasurer.

The following committee chairmen were also elected to serve for the coming year: Finance committee, Geo. N. Riley; exhibit committee, O. F. Ostby; entertainment committee, J. F. Seburch; enrollment committee, Harold A. Brown; transportation committee, Geo. H. Porter; badge committee, C. B. Yardley, Jr.; hotel committee, Geo. L. Morton; by-laws committee, F. M. Nellis.

ATLANTIC CITY DAYS ARE O'ER.

Atlantic City days are o'er,
The time of all the year,
When we are gladdest to go home
Yet glad that we were here.

Not for a year will the M. M.'s,
Nor yet the M. C. B.'s,
Glide gently along in roller chairs,
Famed by the ocean's breeze.

For one year more they'll stay at home,
Nor stick around at night;
Cafés, supplymen, on the left,
Wife, daughter, dance, on right.

For twelve months more they can't discuss—
Not for another year;
But next June sure will see them back
On the Boardwalk and the Pier.

DEATH OF F. O. KETCHAM.

F. O. Ketcham died of heart failure at 12.30 Wednesday morning after a few hours' illness. He had complained of indigestion for several days but thought it would pass away and gave it little attention. About 9 o'clock in the evening he was found unconscious on the walk near one of the hotels. He was taken to his room and became conscious again but sank rapidly to the end. Mr. Ketcham was 68 years of age, and this is the twenty-eighth consecutive meeting of these associations he had attended. He had been with the firm of E. L. Post & Company for many years. He began his business career in the oil trade, and was the associate of H. H. Rogers and others of that great group of men. His son arrived from Brooklyn, N. Y., early on Wednesday.

CAR DOOR STARTERS.—A new device in the form of a car door starter is being exhibited by the Camel Company, Chicago. It will prevent the use of crow bars or similar instruments for releasing a door from the closed position and operates without damage to either the door or the car.

CANTON-HANKOW RAILWAY, CHINA.—The Canton-Hankow Railway is opened to Lienkiangkou, a point seventy-five miles from Canton. At present owing to the lack of funds a fifteen-mile section between Lienkiangkou and Yingteh, the construction of which was started in May, last year, had been completed at the end of last month. This will be opened to traffic as soon as the iron bridge over the Wengyuanho river extending for the length of 750 ft. is completed.

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NEW VICE-PRESIDENT OF THE M. C. B. ASSOCIATION.

At the election of officers of the M. C. B. Association yesterday two of the vice-presidents were advanced and R. W. Burnett, general master car builder of the Canadian Pacific, was chosen as the new vice-president. Mr. Burnett was born at Farmer City, Ill., in 1868 and in 1890 entered the service of the Union Pacific in the car department at Denver, Colo. In 1892 he was connected with the Pennsylvania Railroad at Chicago as a car inspector, and from August, 1892, to July, 1899, was with the Lake Shore & Michigan Southern at Chicago as a foreman and general foreman of the car department at Englewood. The early part of 1900 he spent as general foreman of the car department of the Long Island, going in the latter part of the year to the Central of New Jersey at Elizabethport, N. J., as general foreman of the car department. He remained with that road about five years, and in 1904 went with the Erie, and

R. W. BURNETT,
Newly-Elected Third Vice-President, M. C. B. Association.

was connected with it in the capacities of assistant master car builder and master car builder, with headquarters at Meadville, Pa., until January, 1907. He left the service of the Erie to go with the Canadian Pacific as assistant master car builder, and in 1909, when W. E. Fowler retired, was promoted to general master car builder of the Canadian Pacific.

The importance of his present position is evident when we consider that in addition to being in charge of the car repair and maintenance facilities of this large system, he has charge of the building of new equipment at the Angus shops. This amounted last year to about 300 passenger cars, a large number of which were sleepers, diners and first-class passenger cars, and over 4,000 freight cars. About 4,000 men are employed in the car shops at Angus.

Meilen Chamberlain Mason Hatch, Superintendent Fuel Service of the Lackawanna.

H. J. Small, General Supt. Motive Power, Southern Pacific.

A. M. Darlow, S. M. P., Buffalo & Susquehanna.

A HANKOW TRAMWAY.—The *Ta Han Pao* reports that a tramway car company has been organized at Hankow and that orders have already been sent to Shanghai for the purchase of material.

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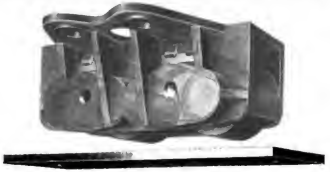
ROLLER SIDE BEARINGS.

The Joliet side bearing is so constructed that when a car is passing around an ordinary curve the rollers of the bearing run between high carbon steel plates, while on very sharp curves the rollers run free from the upper plate and



Joliet Double Roll Unlimited Travel Side Bearings.

the load is carried on large trunnions. These bearings are made in three different types to suit service requirements, and it is claimed that trouble from "slid flat" rollers and the pounding of side bearings is overcome by their use. The coned roller type are provided with a wear plate that

Joliet Single Roll Unlimited Travel Side Bearings.

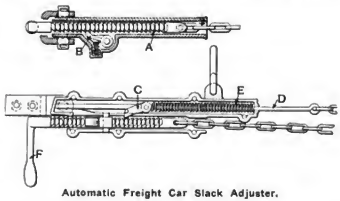
distributes the load equally to the roller at all times. They are manufactured by the Joliet Railway Supply Company, Chicago.

FREIGHT CAR SLACK ADJUSTER.

Among the slack adjusters that are exhibited on the Pier is an inexpensive design for use on freight cars. It is known as the dead lever adjuster. A chain fastens the upper end of the dead lever of the truck to a rack ratcher *A* that is held in place by the dog, *B*. The take-up is effected by means of the dog *C* that is carried on a rod that is attached to the live lever of the truck by means of a chain or rod.

The operation is as follows: When the brakes are applied a certain determined amount of motion of the rod *D* is provided for before the dog *C* drops into the teeth of the ratchet *A*. Then if the brake cylinder travel exceeds this amount the dog drags over the teeth until the end of the stroke. Meanwhile the dog *B* has held the ratchet in place and the stress of the upper end of the dead lever is carried on it. When the brakes are released the spring *E* pushes the rod *D* back into place and the dog *C* carries the ratchet *A* with it by the amount that it moved before engaging in the teeth. As the ratchet is carried back it moves over the dog *B* which finally engages it and holds it in its new and proper position. The arrangement is such that any excess of brake cylinder travel is taken up at the first application either by hand or air.

When it is desired to slacken the connections for the application of brake shoes or for any other purpose the ratchet is moved through a quarter turn by the handle *F*. This shows both dogs on to a smooth part of the ratchet bar, which is round, and it can be pushed ahead until everything is slack. Then, when the shoes are applied the handle drops back into



Automatic Freight Car Slack Adjuster.

place by gravity and the dogs are again in mesh. A pull on the rod readjusts the brakes and everything is ready for work. In case the repairman should fail to adjust the ratchet after applying the shoes the first application of the brakes does it and that one application is all that is lost.

SINGLE-PHASE MOTOR.

The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has placed on the market a new single-phase motor, made in capacities of from two to ten horsepower and suitable for constant speed application. This motor is of the repulsion-starting type and runs, when up to speed, as an induction motor. For most applications it can be connected directly to the line but where very low starting current is desired, a starting rheostat can be used. The frame combines strength and radiating capacity with minimum weight and over-all dimensions. The laminations are riveted together under pressure and pressed steel and plates are riveted to the unit thus formed; the foot, or base, is of pressed steel plate securely riveted to the end plates. The bearings are large and the rotor coils are form-wound and arranged to provide good ventilation. The commutator is of the radial type with undercut mica segments and the shaft can be pressed out of the rotor without disturbing the windings or the commutator. The motor will operate on either 110 or 220-volt circuits.

AIR AND ELECTRIC DRILLS.

The Independent Pneumatic Tool Company, Chicago, is showing several new tools at the convention this year, among which are the Thor roller bearing piston air drills. These are not only equipped with roller bearings on each end of the crank shaft, which reduces friction, but also have one-piece connecting rods, Corliss valves, telescopic screw feed and removable crank chamber plates. The sizes T and U Thor turbine air drills for telltale holes in staybolts and other light drilling, are also exhibited, as well as a two-piece long stroke riveting and a single valve chipping, calking and flue beading hammer. The Thor electric drills, which have recently been placed on the market, are also shown. These machines are equipped with roller bearings and a specially designed electric motor suitable for operating on alternating and direct current, or a universal motor for operating on either direct or alternating current.

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PINLESS LID JOURNAL BOX.

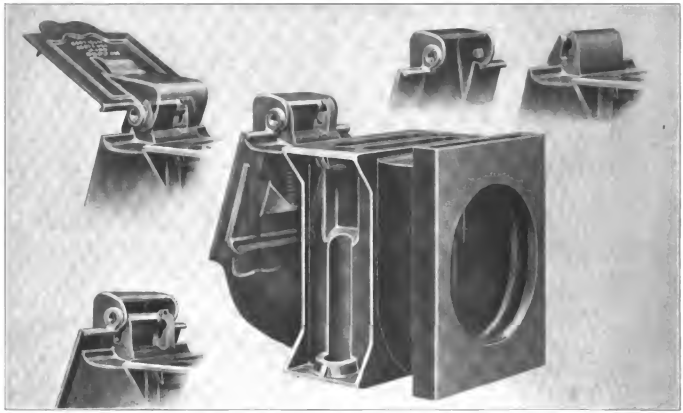
A change has been made in the McCord pinless lid journal box, by cutting a slot in the top of the hinge lug, which is covered by the hood of the lid when closed. The trunnions are made with a flattened side and are cast integral with the lid on the inside of the hood; the slot in the hinge lug of the box is just wide enough to admit a trunnion with a flat side, in line with the side of the slot. The flat side of the trunnion is so located as to necessitate the sliding upward of the lid close to the face of the box and compressing the spring to within 1/16 in. of the solid position before the lid can be removed. This cannot be done by hand, but requires a special tool which insures against loss of lids. The lid is carried on the upper and lower lips of the box and the trunnions have no bearing on the hinge lug, but perform service only when the lid is being opened or is in an open position. These boxes have been in use for three years and are manufactured by McCord & Co., Chicago.

OIL BURNERS.

Trouble is often experienced with oil or kerosene burners used for heating damaged car parts because there is a cold area in the centre of the flame which requires the burner to be held so far away from the sheet or frame that much of the heating value is lost. A burner that is being shown in operation at the end of the pier by the Mahr Fuel Oil Burner Company, Minneapolis, Minn., is designed to overcome this fault. This burner has two chambers. The oil and air are ignited in the first chamber and the flame emerges through a choke to the second chamber. On passing through this it draws in free air through an auxiliary air intake, completing the combustion and giving a steady solid flame that will heat the whole area even when in very close contact with a plate.

SECURING SAFETY VALVES DURING TESTS.

The Coale Muffler & Safety Valve Company is exhibiting in the booth of the Nathan Manufacturing Company a device for securing safety valves when making hydrostatic boiler tests. This is in the form of a tool designed to be quickly applied or removed from the safety valve, thus avoiding the expense and delay occasioned by the removal of the safety valve and capping the opening; this and another common practice of screwing the spring bolt down are exceeding objectionable methods. This tool has been developed by H. C. McCarty and is made in a substantial form, with drop forged steel parts and a steel stem extending through the spring bolt and pressing on the lower spring button. It is threaded at its upper end, which makes it applicable to all sizes of valves. Steel jaws engage the spring



McCord Pinless Lid Journal Box Showing Method of Applying the Lid.

bolt on the under side of the head, the jaws being held firmly in place by a lock washer.

THERMOSTATIC CAR HEATING CONTROL.

Relying on the judgment of a trainman, who is constantly in and out of a car, for the control of the heating system is often as unsatisfactory as to follow the ideas of individual passengers. The maintaining of a suitable temperature without variation is the ideal condition which is impossible with many of the present car heating applications. The Gold Car Heating and Lighting Company has recently perfected an automatic control which is operated by a thermostat. This is on exhibition together with a number of other recent improvements in car heating and ventilating equipment.

The thermostatic car temperature regulating system consists of a thermostatic temperature regulator, actuating, by hydraulic transmission a control valve placed between the inlet valve and the radiating pipes of the car. The regulator consists of a temperature-sensitive main diaphragm filled with a volatile liquid, with a positive action on a temperature difference of 5 per cent.

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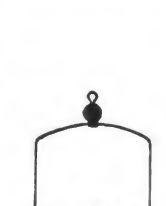
By means of a simple lever arrangement the movement of this diaphragm operates a subsidiary diaphragm (forming the transmitter of a hydraulic system) by exerting pressure on the liquid with which this diaphragm is filled, transmitting it through a pipe to a diaphragm in the control valve which is normally held open. The diaphragm of the control valve is adapted to receive the pulsations in hydraulic pressure coming from the thermostatic temperature regulator. An increase of pressure against the plate of the control valve tends to close the valve against the tension of the spring. Thus the rise of temperature of the air surrounding the regulator will operate to close the valve, and when this temperature falls the consequent lowering of the hydraulic pressure in the diaphragm of the control valve will allow this valve to open, thereby again admitting steam to the radiating pipes.

QUARTZ LAMP.

The Cooper Hewitt Electric Company, Hoboken, N. J., has placed on the market a quartz lamp which is based on the same principle as the Cooper Hewitt lamp. Both lamps use the vapor of mercury as the radiant or luminous body, but in the older type of lamp a long tube of lead glass is employed, while in the quartz lamp a short tube of pure fused quartz or silica is used. Like the Cooper Hewitt lamp, the quartz lamp produces a bluish-green light and is adapted for the illumination of machine shops, drafting rooms, rolling mills, etc., as well as for outdoor use. There is, however, a difference in the light produced in that the quartz lamp gives a larger proportion of yellow and some orange rays. The lamp consists of two elements, the quartz burner and the auxiliary. The burner consists of a quartz tube containing a small amount of mercury, and aluminum supports and a white enameled reflector. The auxiliary consists of a simple apparatus for automatically starting the mercury arc by tipping the burner and of the series inductance and resistance coils necessary for operating the lamp. The mechanism is enclosed in a ventilated canopy of sheet copper, which is readily removed, and the burner is suspended in the lower part of the auxiliary and enclosed in a glass globe. These lamps are made in two sizes, the 110-volt and the 220-volt and have a candlepower of 1000 to 2500.

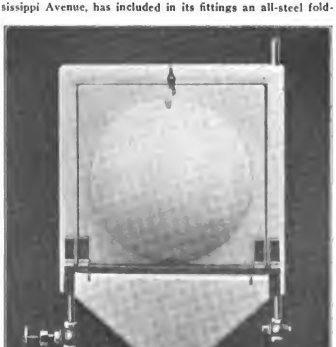
Cooper-Hewitt Quartz Lamp.



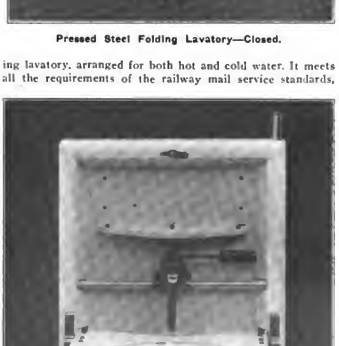
Auxiliary for Cooper-Hewitt Quartz Lamp.

FOLDING LAVATORY.

The steel postal car, which is in the track exhibit on Mississippi Avenue, has included in its fittings an all-steel folding lavatory, arranged for both hot and cold water. It meets all the requirements of the railway mail service standards.



Pressed Steel Folding Lavatory—Closed.



Pressed Steel Folding Lavatory—Open.

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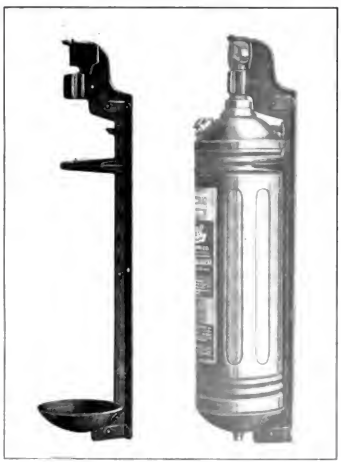
and projects only 6 in. from the back of the frame to the outside of the bowl when in the closed position. Being enameled throughout it is quite sanitary. A graduated valve, located in the center of the wash stand frame and connected for both steam and cold water, serves as a mixing chamber from which can be obtained either cold or warm water, the temperature being varied by means of this valve. The port or opening for the steam is small enough to make it impossible to allow enough steam to be mixed with the water to produce a heat that would be liable to scald the operator. The basin itself is provided with a drain at the back of the bowl, so located that when raised to the closed position the bowl automatically drains into the waste pipe connection at the base of the lavatory. The hinge rod is provided with a spring in order to cushion the bowl when swung down into the open position. A perforated soap dish is secured to the frame, and is so located that when the bowl is in the closed position it will, with all the other parts of the mechanism, be covered by the bowl itself. The lavatory is manufactured by the American Car Foundry Company, New York.

PYRENE FIRE EXTINGUISHER BRACKET.

It has been found that in a great many cases where employees use the Pyrene extinguisher, through carelessness the handle is left unlocked after use. The Pyrene Manufacturing Company, New York, in addition to the Pyrene extinguisher, has on exhibition a new type of bracket which



Pyrene Fire Extinguisher and Bracket.

will prevent this. It is so constructed that the extinguisher cannot be placed in it unless the handle is locked, thus preventing evaporation and leaking of the liquid. This bracket is specially designed to withstand the jarring of passenger cars.

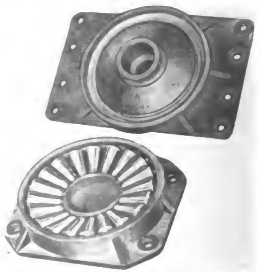
VESTIBULE CURTAIN SHIELD.

The illustrations show the new Rex vestibule curtain shield which is being exhibited by the Curtain Supply Company, Chicago. The shield is made of heavy gage material and only requires one latch at the top to hold it closed. Brass washers are placed between each hinge and a brass hinge pin is used to prevent rusting. Both curtain brackets are fastened to the casing, the upper bracket being adjustable and held in position by a thumb screw. This arrangement is considered a decided improvement over the old method of adjusting the length of the roller. The adjustable roller, however, can be used in this shield. The shield is so designed that, when opened, the curtain may easily be removed and both edges of the shield are rolled back so as to make a smooth surface for the curtain to pass over. This latter feature also provides an extra large opening for the curtain to pass through. Another improvement in the curtain is in the Rex automatic release handle. The latch has been redesigned to make a more neat arrangement and is simpler in its construction. It is arranged to trip with either a chain or tape, the curtain exhibited being provided with the tape. The device is strong, has but few parts and is adapted to either wood or steel cars.

Vestibule Curtain Shield.

TRUCK CENTERING CENTER PLATE.

The center plate shown in the illustration will, it is claimed, center a truck after rounding curves and assist in returning it to the proper position on the straight track. It is provided with coned rollers which are pitched centrally and operate on an inclined race-way, and have trunnions to prevent their dropping out. The rollers are self-adjusting under load, and the pitching largely overcomes the outward thrust, while the larger ones, if any, work outwardly, and the smaller ones work



Improved Form of Hartman Center Plate.

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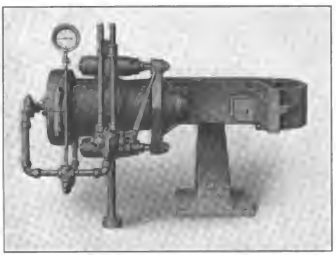
toward the center until each roller carries its share of the load. This center plate is an improved form of the Hartman center plate, and it is claimed gives three times the bearing surface of the latter. It is manufactured by the Joliet Railway Supply Company, Chicago.

COUPLER YOKE SHEAR AND RIVETER.

A new type of machine for shearing apart or riveting the yokes to the coupler shank is on exhibition at the booth of the Watson-Stillman Company, New York. Provision is made for having the ram work in either the horizontal plane, as shown



Coupler Yoke Shear and Riveter.

in the illustration, so that the parts are conveniently handled by a crane, or it can be swung to a vertical position if the coupler is to be handled by hand.

LOCKED LID JOURNAL BOX.

A type of journal box with a lid which locks in place when the box is closed, is included in the exhibit of McCord & Company, Chicago. It is shown in the illustration, and is so constructed that a lip on the lower edge of the lid engages with the box and in order to open the lid it is necessary to slide it up the face of the opening far enough to disengage this lip. The lid is made flush with the box all around so that it is impossible to obtain a purchase to slide the lid up with anything but a standard packing tool, which fits the

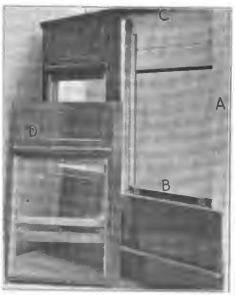
Journal Box with Locked Lid.

slot formed by the two bosses below the mouth opening. This box is made for use with any McCord or M. C. B. lid.

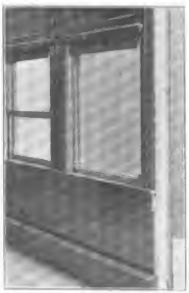
STEEL INTERIOR FINISH FOR PASSENGER EQUIPMENT.

When all-steel passenger cars began to come into extended use the problems of insulation, repairs and appearance were given serious consideration, but no scheme of construction was developed that satisfied all these three requirements. The result was that a good many roads hesitated about making the change from wood to steel in the interior finish although they built the framing and outside sheathing of steel.

The Hale & Kilburn Company, Philadelphia, Pa., has developed a system of interior finish, which is shown in the illustrations, for making the interiors of steel cars as comfortable and handsome as were those of the old wooden cars.



Integral Steel Finish and Car Interior Before its Application.



Interior of Car Fitted with Integral Steel Finish.

Exterior of Car Fitted with Integral Steel Finish.

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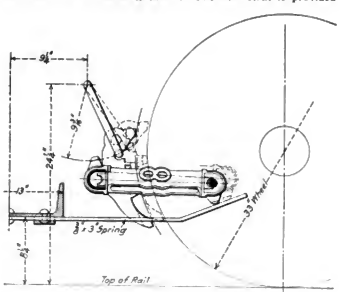
and which can be so erected that it may be taken down for repairs without destroying the material, and applied again by the most ordinary labor and without any unusual shop equipment. One of the illustrations shows a partial interior view of a passenger car to which this integral finish is being applied. It will be noted that the side post *A* is surrounded by a channel of insulation so that the post itself is enclosed in a dead air space. The window frame, panel, curtain box, sash, hardware, etc., are all assembled in a unit as shown at *B*, and this unit slips between the posts *A*, the window sill *B* and the top member of the car framing *C*. It is then fastened in place by a row of bolts across the window sill and the bolts which also support the basket rack at the top of *D*, so that machine screws and rivets are entirely eliminated. In addition to the insulating effects of the dead air space and the insulation around the window frame and post, the latter also forms a pad between the interior finish and the car framing and the check plates of the window frames themselves are broken by insulated wedges where they overlap.

All of the members are so arranged that there is no metal connection between the outside and the inside of the car, and the frames being made in one piece and all from the same jig do not depend on the framing of the car to be kept square, which should be of material assistance in keeping the windows tight at all times regardless of the shifting of the car framing. The erection of the interior finish in new cars, as can be readily seen, is much simplified, it being possible to assemble each of the units at a convenient place in the shop entirely outside of the car, leaving nothing to be done later but the bolting in place. The bolts are so located that they are easily accessible for removal and any part of the finish can be taken down and erected again without damage, which should materially reduce the cost of repairs. A large number of cars are in service on various trunk lines equipped with this finish, which is part of the exhibit of the Hale & Kilburn Company at booths 408-410.

CRECO BRAKE BEAM.

The illustration shows the application of the new Duplex strut casting to the Creco brake beams as they have been installed on the Boston & Maine. The new strut is provided

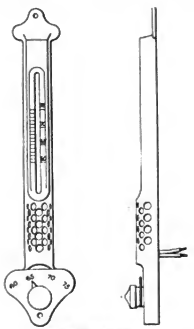


Creco Third Point Support Brake Beam with Duplex Strut Casting.

with two lever pin holes, either of which may be used. This not only increases the life of the strut casting, and thereby keeping the brake beam in service for longer periods, but allows the beam to be used either right or left hand. The sliding third point support feature is the same as has been installed by the Chicago Railway Equipment Company, Chicago, in their recent Creco brake beam installations. This combination in addition to the operating and safety advantages given by the sliding third point support has a further advantage of remaining in active service for longer periods.

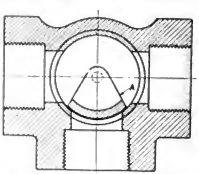
TEMPERATURE REGULATING DEVICES.

The Railway Utility Company, Chicago, is exhibiting this year an improved electric control valve and a by-pass valve for use in regulating the temperature of passenger cars. One of the illustrations shows the control thermometer and



Utility Thermometer and Electric Control Valve.

the application of the thermometer and the automatic electric control valve to the piping system. The valve is connected to the steam supply pipe of the heating system either



By-pass Valve for Use with Hot Water.

in place of or in series with the usual hand controlled valve. Two wires run from the magnetic coil in the upper part of the valve to a junction box containing a fuse box and from

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this box two wires run direct to the electric lighting system of the car from which current is available at all times. Two other wires connected the control thermometer with the fuse box. The thermometer is constructed with four platinum wires fused into the glass, one at 60, one at 65, one at 70, and one at 75 degrees. These wires are connected to a switch on the thermometer and by turning the button of this switch to whatever temperature it is desired to maintain, the platinum wire fused in at that temperature will operate the electric control valve and shut off the steam supply when the car is at the temperature desired.

The by-pass valve shown in the other illustration is controlled by the thermometer in a similar manner and is arranged so that it by-passes the circulation of water from any particular state room in sleeping cars which are heated by hot water. In the illustration the valve A is in the position that it would occupy when the temperature of the air was below that for which the thermometer was set, and the hot water can enter the state-room heating pipes.

HYDRAULIC SPEED GEAR.

Among the most interesting of the new devices that are being shown this year is a hydraulic speed gear exhibited by the Waterbury Tool Company, New Britain, Conn. While it has been in use in the United States navy and various foreign

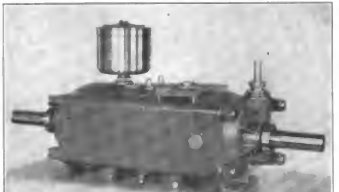

Fig. 1—Hydraulic Speed Gear Assembled.

countries for a number of years, it has only recently been introduced for commercial purposes. In its various sizes it is suitable for the transmission of power at variable speeds for any desired purpose. In the navy it is used for the operation of the turrets carrying the large 12-in. guns. On railroads, possibly its most valuable use will be in connection with direct connected motor cars where the gas engines can be driven at a constant speed and the speed of the car varied as desired. It is also suitable for use on cranes, hoists, machine tools, automobiles, etc.

Among the unique features are the fact that the driven shaft can be at any desired angle with the driving shaft without the loss of efficiency or convenience in the gear. The range of speed control is fully universal and depends on the angle of a plate on the interior of the mechanism.

The complete transmission device is made up essentially of two parts, an oil pump designated as the A-end and an oil engine designated as the B-end. The A-end may be driven by any source of power and is supposed to run at a constant speed in one direction. By the turning of a small control shaft connected with this end the stroke of the pump pistons is varied at will to deliver oil to the engine, or B-end, at the rate necessary to give the required speed and in the direction called for. The B-end is so constructed as to furnish a constant cylinder capacity for each rotation of the shaft. The speed of the B-shaft is therefore definitely determined by the rate at which oil is supplied to the B-end by the pump. No oil is by-passed without doing its share of work in the B-cylinders. The leakage averages about 13 of one per cent. of the oil used in doing the work. All of this takes place between the high and low pressure parts of the mechanism. There is practically no leakage from the gear as a whole. The speed ration between the A- and B-shafts are, therefore, positive and are definitely determined by the angular position of the control shaft in either direction from its zero, or neutral, position.

Fig. 1 shows an external view of the gear in its most compact form. In this type the A- and B-ends are combined into one working unit; the power enters the unit by the A-shaft which rotates at a constant speed, and is taken out by the B-shaft, at the opposite end of the machine, which rotates at any required speed and in either direction. The small vertical shaft shown in the figure at the right end is the control shaft, and the direction of rotation of the B-shaft is determined by the direction the control shaft is rotated from its zero position and its speed by the angle through which the control shaft has been rotated.

On top of the B-end is an oil expansion box communicating with the oil in the machine. The whole enclosing shell of the gear is entirely filled with oil, although only a small portion of it is under pressure and active in transmitting power. The chief purpose of the expansion box is to provide for the difference of coefficient of expansion between the oil and the metal. The interior of the box is in communication with the

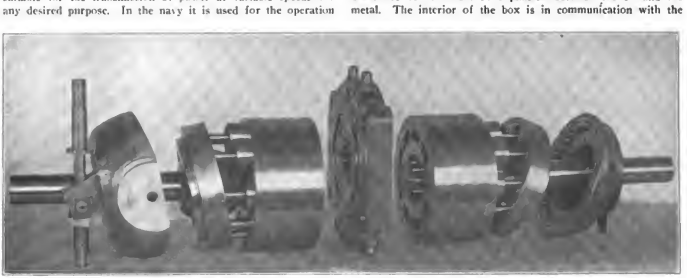

Fig. 2—Working Parts of the Hydraulic Speed Gear.

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air through a small hole in its lid; the general oil supply is therefore under only atmospheric pressure.

In Fig. 1 the two ends are united by a common valve plate located across the middle of the machine and through which the oil is circulated between the two ends. This valve plate may be made in almost any shape, permitting the placing of the two ends at any angle or in any position with reference to each other. If desired each end may be provided with a separate valve plate and located in any desired position, the oil circulation being provided for by connecting pipes.

In Fig. 2 the outer cases are removed, leaving the internal parts, the two shaft groups being separated a little from the valve plate, and the angle and tilting boxes being pulled away from the socket rings.

The valve plate stands in the middle. It is also shown alone in Fig. 3. Passing through the plate about half way between its center and periphery are two semi-annular passages. These are for the circulation of the oil between the A- and B-cylinders. When the gear is transmitting power one of these passages is under pressure while the other is in suction. These

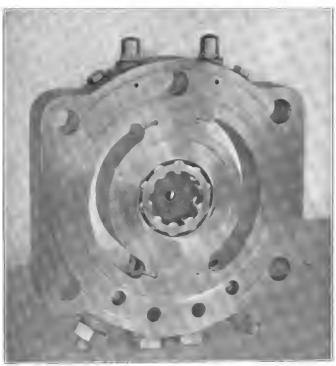

Fig. 3—Valve Plate of the Hydraulic Speed Gear.

two functions are changed according to the direction of rotation of the driven or B-shaft. Connected with the passages are three pairs of valves: at the top are two small needle air valves used only for the escape of air from the passages and cylinders while being filled with oil. At the bottom are two ball check valves used for replenishing any leakage that may take place from the high pressure oil to the low pressure. At the bottom near the replenishing valves are two safety valves to provide relief should the gear be overloaded. There is also connected with each passage near the top a plugged hole for attaching gages in case it is desired to measure the oil pressure, or the load carried. Near the top of the valve plate, and also in connection with all the valves, are holes passing through the plate giving free circulation of the oil between the two ends of the gear within the enclosing cases, or shells.

There are also bolt holes for securing the cases. In the center of the plate are roller bearings for the inner ends of the shafts.

The shaft groups of parts in the two ends are almost identical. A cylinder barrel is keyed slidably and rather freely to the inner end of each shaft. Each barrel has nine cylinders parallel with the shafts and fitted with pistons provided with ball ended connecting rods. The faces of the barrels slide in their revolution against prepared faces on the valve plate, and the cylinder ports in the barrel faces register with the semi-annular passages except as they are passing over the separating "lands" at the top and bottom of the plate. The barrels are held lightly against the faces of the valve plate by spiral springs around the shafts, which are compressed between shoulders on the shaft and counterbored recesses in the barrels. These springs are only intended to hold the barrels in position under no load. When the gear is transmitting power the barrels automatically support themselves.

The piston connecting rods are formed with a ball on each end of each rod, one ball end being secured in a piston and the other in a socket in the socket ring. The socket rings are connected by special universal joints with the shafts, so that while they revolve with the shafts, their planes of revolution may be at any angles to the shafts provided by the setting of the roller bearings on which the socket rings revolve.

The socket ring bearings must carry a very heavy thrust load and at high speed. It is therefore important to use the best possible steel for the purpose. This is made to a special analysis by two companies, one in the United States and one in England.

In the B-end of the gear the socket ring runs in what is called an angle box, which is secured in the end of the case itself through which the shaft passes. It stands at a fixed angle of 20 degrees, giving a constant reciprocation to the B-pistons. In the A-end the box is hung on trunnions and may be adjusted to any desired angle while the gear is running by turning the threaded control shaft. As the load on the trunnions of the box is practically a balanced one, the turning of the control shaft is easy.

The A-shaft, which is connected with the source of power, is supposed to run at a constant speed and in one direction. If the tilting box stands in its vertical or neutral position at right angles to the shaft the pistons are carried around with the cylinder barrel but do not reciprocate. No oil is, therefore, taken from or delivered to the passages in the valve plate. If, however, the tilting box is inclined by turning the control shaft a little, the pistons reciprocate approximately to the extent of the sine of the angle of tilting multiplied by the diameter of the circle of centers of the sockets in the socket ring. Every cylinder during one half of the shaft rotation is in communication with one of the passages in the valve plate and is then receiving oil, which it carries across the "land" and delivers into the other passage during the other half of the shaft rotation. The amount of oil transferred from one passage across to the other passage depends entirely on the displacement of the pistons. But there can be no transfer unless there is a supply to draw from and a space to deliver it into. These are provided by the cylinders of the B-end. When oil is being forced into one of the passages (already full) the pistons in the cylinders of the B-barrel in communication with this passage make room for the oil by sliding back from the valve plate; but they cannot do this without forcing their respective sockets in the socket ring farther from the valve plate. This can only be done by turning the socket ring as a whole in its inclined plane in the angle box. It must be remembered that the B-socket ring, unlike the other, is always inclined in its angle box at an angle of 20 degrees, so that the B-pistons always reciprocate to their full extent at every rotation of the B-shaft. While the pistons facing the high pressure passage of the valve plate are receding to make room for the incoming oil and so imparting rotation to the B-shaft, the pistons facing the low pressure passage are moving towards the valve plate and delivering the oil from their cylinders through the low pressure passage into the suction cylinders of the A-barrel. Since the receiving capacity of the B-cylinders is constant and the delivery capacity of the A-cylinders is varied at will by turning the control shaft, the speed of the B-shaft is corres-

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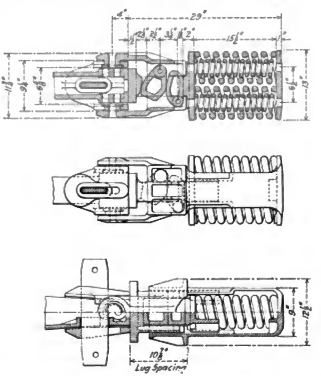
pondingly varied. It will be seen that the only oil actively employed in transmitting power is that in the oil passages of the valve plate and in the cylinders. The enclosing outside cases merely serve as a retaining reservoir and are not subject to any pressure.

The oil pressure in the cylinders and valve plate passages varies directly as the torque resistance which the B-shaft must overcome. The horse power transmitted varies directly as the product of the oil pressure and the speed of rotation of the B-shaft. The normal working oil pressure ranges usually between 300 and 500 lbs. but it may rise to 1000 or even 2000 lbs. to overcome an unusual resistance. In tests pressures as high as 4000 lbs. per square inch have been attained.

The chief advantage of this type of transmission is its great flexibility. The B-shaft may be started under a dead load of any magnitude within the strength limits of the machine, without any fear of overloading the motor or source of power; the speed may then be increased gradually and positively to its maximum without steps or abrupt gradations. Its remarkable flexibility must necessarily give wide differences of efficiency. Under the best conditions efficiencies ranging from 85 per cent. to 91 per cent. are common; under average working conditions the efficiencies vary between 80 per cent. and 85 per cent.; under small loads and low speeds of the B-shaft the efficiencies range from 80 per cent. down to 50 per cent. or less. Of course at a zero speed the horse power efficiency must be zero per cent. while the torque efficiency remains at 95 per cent., and so the horse power efficiencies have a wide range from zero per cent. to 91 per cent., while the torque efficiencies throughout the whole range remain between 90 per cent. and 96 per cent.

IMPROVED LEVER DRAFT GEAR.

The lever type draft gear manufactured by McCord & Company, Chicago, has now been on the market for about seven years. The company is this year exhibiting an improvement of this type which retains the lever principle embodied in former designs, but is equipped with a cast steel sleeve and a key connection, together with integral cast steel yokes. This gear has, in addition, two sets of springs where the older type used but one, which doubles its capacity.



McCord Draft Gear With Adjustable Center Bearing Drawbar Attachment.

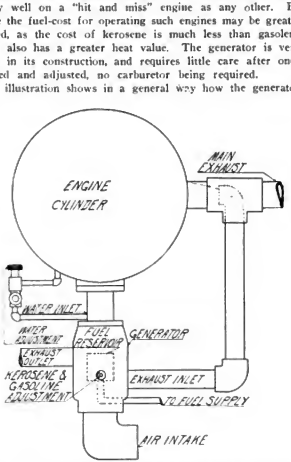
NICKELIZED CAR WHEELS.

A nickelized car wheel which was broken up after completing its full mileage in service is shown in the booth of the Nickel-Chrome Chilled Car Wheel Company. The flange of this wheel shows very little wear, and wheels of this type after making 80,500 miles in freight service on a mountainous road have withstood 175 blows in an M. C. B. drop test and 30 drop blows directly on the flange. There are now 3,000 of these wheels in use, some of them on the Pennsylvania having run for four years, and after making 90,000 miles are still in service. These wheels are in use under 50 ton capacity coal cars, refrigerator cars and in suburban electric service.

KEROSENE GAS GENERATOR

The National Oil Gas Generator Company, Chicago, has recently placed on the market a kerosene gas generator that is applicable to any gasolene engine on the market, working equally well on a "hit and miss" engine as any other. By its use the fuel-cost for operating such engines may be greatly reduced, as the cost of kerosene is much less than gasolene and it also has a greater heat value. The generator is very simple in its construction, and requires little care after once installed and adjusted, no carburetor being required.

The illustration shows in a general way how the generator is connected to a pump feed engine. The gas generator contains a fuel reservoir from which the flow of kerosene is regulated through an adjustment valve to the vaporizing pipe, the air for the mixture being drawn up through the bottom of the generator, and a certain proportion of water admitted into the mixing chamber above the generator. Part of the exhaust is diverted to a chamber surrounding the generator, heating the oil to its boiling point so that it will vaporize more freely. This makes it necessary to heat the generator with a blow torch before starting, or to start the engine on



Application of Kerosene Gas Generator to Pump Feed Engine.

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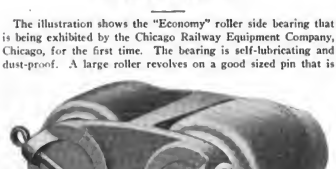
gasolene, shifting to kerosene after the generator has been sufficiently warmed up. When once adjusted, the generator is automatically regulated by the suction of the engine, working equally as well with no load as with full load.

With the correct mixture of kerosene gas, water and air, no carbonaceous or other fouling deposit will be formed in the cylinder. The use of kerosene reduces the loss due to vaporization, and is less affected by climate or altitude.

ROLLER SIDE BEARING.

The illustration shows the "Economy" roller side bearing that is being exhibited by the Chicago Railway Equipment Company, Chicago, for the first time. The bearing is self-lubricating and dust-proof. A large roller revolves on a good sized pin that is



Economy Roller Side Bearing.

held in place by a lug on one end and a split pin on the other. This gives a large bearing area and with this design an unlimited travel is obtained.

ROUMANIAN RAILWAYS JOURNAL BOX.

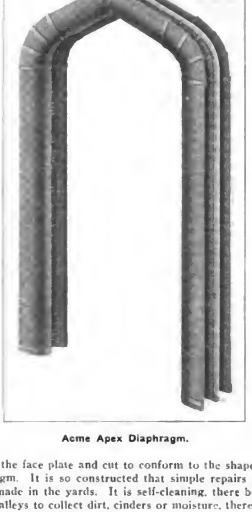
C. C. Orghidan and Dimitri Petrescu, government mechanical inspector and mechanical engineer respectively of the Roumanian state railways, are here and have an interesting model of a journal oil box that is in use on the Roumanian roads. It is on exhibition at the booth of the National Tube Company and was designed by M. G. C. Cosmovicy, engineer of material and traction of the Roumanian state railways. The object sought in the design was to provide a box that would be free from the troubles in the heating, to which the box formerly used was subject, by keeping the journal flooded with oil. It consists of a box cast in a single piece, and a rapid circulation of oil is maintained over the brass and journal. The front of the box is closed by an air tight cover and the circulation is maintained by a disc bolted to the face of the collar at the end of the axle.

The oil reservoir is located at the bottom of the box and is divided into four compartments. These compartments are not only in communication with each other but with a well at the outside of the box in which the disc mentioned turns. The connections between these compartments is such that all of the waste oil, as it flows down from the journal, must pass from the bottom of the second compartment to the third, from the top of which it flows to the fourth. This gives all sediment carried down from the journal ample opportunity to sink to the bottom of these compartments, while the clear oil passes through holes at the top of the third compartment into the fourth. Here it is caught by the revolving disc attached to the axle and carried to the top of the box where it is thrown off into a cavity, whence it flows down to the top of the brass and upon the journal, and down into the compartments again, thus completing the cycle of a complete circulation.

The dust guard at the back consists of two parts, one of which is of wood and the other of a cupped leather ring. The wooden guard is in two pieces held together by a spring which holds them firmly against the axle. At the center of the guard is a groove mating with a similar circumferential one cut in the axle and communicating with a drip passage at the bottom leading down into an oil cellar. Any oil escaping through the leather packing is caught at this groove and prevented from flowing out at the back. The result is that no oil escapes at all. The statement is made that these boxes run on an oil consumption of 1 pint of oil per 100,000 miles.

ACME APEX DIAPHRAGM.

A new style of car diaphragm is being exhibited by the Acme Supply Company, Chicago. This diaphragm, as shown in the illustration, has a pitched roof which sheds water, dirt and cinders readily. It can be used with the old face plate by using a piece of ¼ in. iron sheet attached to the upper



Acme Apex Diaphragm.

part of the face plate and cut to conform to the shape of the diaphragm. It is so constructed that simple repairs may be easily made in the yards. It is self-cleaning, there being no sharp valleys to collect dirt, cinders or moisture, thereby prolonging the life of the diaphragm.

COMBINATION PIPE FITTINGS.—Special fittings made for air brake work which have a ground joint and have been tested to 250 lbs. air pressure while under water, are being exhibited by the Crane Company, Chicago. It is claimed that by the use of these fittings it is possible to save from 20 per cent. to 30 per cent. in the number of screwed joints in the air brake equipment of a locomotive alone.

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Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$6.00
Canada	8.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 10,900 copies were printed; that of these 10,900 copies, 8,700 were mailed to regular paid subscribers and 200 were provided for counter and news companies' sales; that the total copies printed this year to date were 210,750—an average of 8,070 copies a week.

VOLUME 54. JUNE 20, 1913. NUMBER 25.

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THE cause of the rear collision on the New York, New Haven & Hartford is discussed elsewhere in this issue. There is, however, a question raised by the discussion, especially in the more sensational daily papers, of one phase of this collision which is deserving of the most serious consideration by higher railroad officers. It is one of purely public relations of the railroads. The routine on the New Haven, and probably on a good many other roads, provides for the destruction of the debris of a wreck immediately after such debris has been cleared from the track. Many of the traveling public are probably not unfamiliar with the sight of smashed freight cars being burned near the site of a recent wreck, and, in itself, of course, the fact that the remains of the wooden parlor car Skylark were burned shortly after the debris had been removed from the New Haven tracks at Stamford is of no importance one way or the other. The short-sightedness of the management in permitting the ordinary routine to be carried out in this particular case seems almost inconceivable. Every responsible railroad officer might be absolutely satisfied in his own mind that the wooden Skylark was no different in construction, design, capability of resisting shock, etc., from any other wooden parlor car built about the same time, but every intelligent, responsible railroad officer ought by this time to have learned that he cannot manage his own business in his own way regardless of the effect it may have on an easily aroused public sentiment. A man must be lacking indeed in yellow news sense who could not see the possibilities of red headlines, 2½ in. high, proclaiming "Mellen Orders the Wooden Skylark Burned." What if the New Haven management is lending every facility to the various and numerous investigations that have been begun to inquire into every detail of the fatal New Haven collision? The officers of the road are no doubt correct in declaring that the preservation of the debris of the Skylark would not have helped the scientific investigation of the circumstances surrounding the collision in the very slightest degree, but this can no more serve as an adequate excuse for what must appear as an utter blunder than would any other academic argument which omitted to take into consideration human nature.

THE letter printed elsewhere states in a quite clear manner one very common misconception as to the possibility of the government regulation of the issue of railroad securities. It is a misconception, however, which is not confined to our correspondent, but has been made manifest in various state laws and has even appeared in the writings of students of the railroad question whose views carry a good deal of weight. Our correspondent suggests that a law be passed prohibiting railways from issuing bonds except to the extent of 90 per cent. of their stock. By this he can only mean one thing, that railroads shall be prohibited from issuing bonds except to the extent of 90 per cent. of the *par value* of their stock. The Chicago, Milwaukee & Puget Sound was organized in a state which permitted the sale of bonds only to the extent of 50 per cent. of the issue of stock. When the Puget Sound, therefore, desired to issue $100,000,000 of bonds, it was compelled to first authorize and issue $200,000,000 of stock. The issue of this stock did not add one cent of equity behind the bonds, nor could any law be passed which would compel investors to buy this $200,000,000 of stock. The only possible way in which the bondholders' equity in a railroad property can be strengthened is from the voluntary purchase by investors of stock, and the only way that railroad stock can be sold is through making an attractive enough offer to investors to induce them to buy stock. The only reason why an investor should make a purchase of railroad stock is with the hope of making a profit on his investment. If we increase the profit we increase the attractiveness of stock as compared with bonds. In a way, our correspondent's letter is an unconscious appeal for higher railroad rates in so far as it is a recognition of the need of a greater margin of safety.

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THE exchange of about $38,000,000 Southern Pacific stock for the stock of the Baltimore & Ohio held by the Pennsylvania Railroad represents probably not so much the hope that either the Union Pacific or the Pennsylvania Railroad will benefit materially from any change that might be brought about in traffic conditions, as it does one of the desperate efforts which the Union Pacific directors are being forced into by the attitude of the Attorney General in regard to carrying out the orders of the Supreme Court. There never has been, in the literal sense of the word, a transcontinental railroad system in the United States. Before Mr. Harriman's death, he was a director in the Baltimore & Ohio, and unquestionably a very influential member of the board. He was also director in the New York Central, and would, presumably, if he had lived, become an influential member of that board. The transfer of a considerable block of Baltimore & Ohio stock from the Pennsylvania Railroad to the Union Pacific will not probably in practice greatly change the present traffic relations either of the Baltimore & Ohio or of the Union Pacific. From an entirely theoretical point of view, it would be hard to conceive of any move which would more thoroughly carry out the intent of the Sherman law as it was interpreted by the former administration at Washington when it brought the Harriman Lines' dissolution suit than this exchange of Southern Pacific for Baltimore & Ohio. If it were true that any considerable portion of the freight traffic originating at the eastern seaboard for movement over the Baltimore & Ohio and Pennsylvania Railroad was destined for the Pacific coast, and could be given at the will of the originating railroad to either the Union Pacific or Southern Pacific, or that any considerable traffic originating in California could in the same way be delivered to either the Pennsylvania or the Baltimore & Ohio for carriage to the Atlantic coast states, the alliance between the Pennsylvania and the Southern Pacific on one hand and the Baltimore & Ohio and the Union Pacific on the other hand would open a way for the keenest sort of competition. As a matter of fact, however, the proportion of traffic coming under this category is so inconsiderable, the free choice of routing off its own lines by the originating carrier so slight, and the give-and-take relations between eastern trunk lines and so-called transcontinentals so complicated and delicate that such potential competition is hardly likely to ever become an important factor either in the rate situation or in the routing of traffic.

ONE of the most arbitrary of all the arbitrary things done by the Post Office department during the past dozen years, in its efforts to reduce the compensation paid to the railroads, when Congress has refused to authorize reductions, was the issuance of the orders of March 2 and June 7, 1907, to include Sundays in the days counted to ascertain the average daily weight of mails carried. Those orders have now been declared by the Court of Claims unlawful, in a decision which is reported in another column and which, it is estimated, will take $20,000,000 out of the government treasury. The decision will be found interesting reading. Congress had not merely neglected to act in the matter; it had considered the question of changing the divisor from 6 to 7, and had definitely rejected the proposition. Moreover, the use of the higher divisor puts a premium on inefficiency, as it tends to induce the railroad to carry no mails on Sunday. The court says "The injustice of using 35 as a divisor for the seven-day roads is easily illustrated: Suppose there are two lines or roads the same length and carrying the same amount of mail (say 30 tons a month). One carries these mails six days a week, excluding Sundays, and the other within the full seven days. The Post Office department weighs these mails for a period embracing 30 successive working days for both these lines, which must necessarily be for five weeks, or 35 days, if it weighs the Sunday mails, in order to cover 30 successive working days for the six-day road, and thus would obtain an aggregate of 30 tons for each road. It divides this aggregate sum by 30 for the six-day road, as that was the number of successive working days the mails were weighed for that road, and obtains the correct average of 1 ton per day for that road; it divides the same aggregate by 35 for the seven-day road, as that was the number of days the mails were weighed for that road, and gets a daily average only of six-sevenths of a ton, which allows the latter road no pay whatever for carrying the Sunday mails." And for a road carrying no mails on Sunday the injustice of the seven-day division, directed by the order of June 7, 1907, is too bald to need to be stated. The Chicago & Alton, in the letter which it sent to Washington before taking its claim to court, protested also against fines for late trains, against furnishing rent free in stations, the performance of messenger service and other well known unreasonable requirements now in force; but these points are not dealt with in the decision, and on the Alton, as on the other roads, remain to be fought out in the future. The messenger service alone constitutes one glaring absurdity. A certain small road has a mail route of 10 miles, terminating at one end about 1 mile short of the post office, and, under the law and the regulations, must carry the mails that mile; and it collects pay for 11 miles. But the wages of the messenger for this eleventh mile amount to nearly double the sum that the road receives for the 11 miles!

THE STAMFORD COLLISION.

THE salient feature of the wreck which occurred at Stamford, Conn., last week is that, as regards cause, it comes within the same class as those at Bridgeport, in 1911, and at Westport, in 1912. In all three the trouble centered in the cab of the locomotive—failure to control speed. In each of the three cases there were two men in the cab, all of the six long familiar with locomotives, and thoroughly acquainted with the road. That three such notable disasters, happening within a space of 20 miles, should arouse the public, is not surprising, even if the Massachusetts and Rhode Island critics of Mr. Mellen were to be left out of the account. For the newspapers to call for drastic remedies and the theorists to demand the general adoption of automatic train stops is but natural; though it is gratifying to see that the press is somewhat more rational in its criticisms than on former occasions. Since the widespread discussions of the past year, the fact that many of the problems met by the railway manager in his quest for safety are intricate and difficult seems to be better appreciated.

As the evidence, at this writing, is not all in, a conclusion as to the responsibility for the collision would be out of place; but the main facts may be traced with little chance of error. Doherty had been a "qualified" locomotive runner for over a year, but he had actually had charge of an engine, outside of yards, only a small part of this time, and had run passenger trains less than ten days altogether. He had run a 125-ton engine only three days. He had had ten years' experience as fireman, with a good record, but whether during this time he had been well taught by his engineman, and whether he had learned all about the responsibility felt by the runner of a fast train when he is behind time and dreads to meet the criticisms of the trainmaster, are questions on which no light has been thrown, except the brief statement of the road foreman. (A young runner, on his first passenger runs, usually experiences those anxieties even if he is not behind time.) A natural conclusion would be that, being young and inexperienced, Doherty did not realize the importance of insisting, at all hazards, on prompt and adequate attention to his complaint that the air brakes were not in satisfactory condition, and of running his train with extreme caution until his brakes were made satisfactory. As we have said, this is a natural conclusion. The alternative conclusion is that he was not lacking in caution, on this particular run, but that the air brake apparatus failed in some unaccountable way after he had passed the last block station (where he slackened speed and, so far as appears, found no special trouble with the brakes). The absence of any de-

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tailed criticism of the brake apparatus, the testimony of the road foreman as to the cause of the failure to stop at Bridgeport on Tuesday, and the testimony of other runners that the brake apparatus of this engine had behaved all right, discredit this conclusion. It remains to be seen whether it will receive support from evidence yet to be brought out.

Whether the brake apparatus was or was not any less efficient at Stamford than it had been on the two days preceding, two or three lessons are already quite plain. For one, the rule that an engineman with a year's experience as spare runner, possibly all on freight trains, shall be deemed fit to run a fast passenger train, with an engine much more powerful than those to which he is accustomed, is, obviously, inadequate. It assumes that the year's experience will have been varied and will have educated the runner. In this case it was not varied. Real, not constructive, experience is the only kind that will surely fit a man for fast trains. Apparently, Doherty ought to have had the road foreman or some other competent guide with him on the big engine many more trips than he did. It is evident also that the efforts of the officers of the road to train the engineman since last year's disaster, though vigorous, were not sufficiently vigorous. Mr. Woodward said that the epidemic of carelessness (or ignorance) was as surprising to the officers of the road as to the coroner. But, surely, after six months, the division officers must have some inkling of the reasons. It may seem harsh to demand further effort from officers who say that the State and Federal commissions are taking up all their time; but, surely, in the matter of safeguarding fast trains it may well be questioned whether duties connected with close supervision of enginemen ought not to take precedence over a summons to a protracted government hearing, where lawyers ask a thousand useless questions—even at the risk of being in contempt of court!

The mind of the runner of a fast train has constantly to act in opposite directions under high pressure; on the one hand he must keep within the bounds of safety and on the other he must make time. If the power of his engine is ample and he has no trouble with fire or water, the second horn of this dilemma may be easy; but uncertainties are usually not far distant and, as we see in this case, a powerful engine is not a sure protection against anxiety. It may be that Doherty, like Wisker, the New York Central engineman whose tragic failure in New York City in 1902 made such a profound impression, is a man who can make a good record in an examination and in the work of a fireman, but who lacks the right temperament to be an express engineer. The peculiar demands to be cautious, and to be bold, alternating every few minutes, or oftener, call for a mental poise or self control that, except in rare cases, can be acquired only by experience. Except as the road foreman can testify from personal knowledge that young runners have had that experience, the superintendent's confidence must depend on a bunch of uncertain factors. Judging by the small number of road foremen on many roads, the New Haven is not the only company which has accepted constructive or presumptive experience as satisfactory.

What have the Interstate Commission's or the Connecticut Commission's investigations done for the public? As we have said, the main problem is the same now that it was in 1911; how to get the most competent and reliable enginemen. The successive accidents have been studied, and various things have been officially proposed as remedies; but on this most vital point nothing has been done. Everybody wants to know what kind of men the New Haven road employs as engine runners, and how they are disciplined. People asked the same questions two years ago, and also on the occasion of the subsequent accidents, but our costly governmental machinery has given them no answer. When an officer of the road says that there has been a lot of bad luck, an explanation is needed; for safety in travel is too important an issue to be trusted to "luck," so long as there is any possibility of finding a better course.

BULLETINS COMMENDING EMPLOYEES.

WHAT is the value of a "roll of honor" for railroad employees who do specially meritorious acts? Without attempting to answer this question with definiteness it may be said that such a list of names is prized in proportion to the rarity of the cases in which men are held to be entitled to a place in it. If the aim of the officer in charge is to record acts of "conspicuous" bravery or devotion (to use the words of some of the general managers' announcements) he must, to fully carry out the idea, be careful not to include commonplace acts. The "safety-first" movement has made rolls of honor so numerous that there is a considerable variety of treatment of the subject; and it would be a good thing if there could be a standard to which all railroad managers could conform. Occasions for acts of special bravery, as that term is usually understood, are rare; but "devotion" and "loyalty" include every-day matters concerning which it is doubtful whether they should be made the subject of special public commendation; the occasions would be too numerous. A line must be drawn somewhere; and if it must be an arbitrary line there ought to be some little discussion of the subject, so that whatever is settled on shall meet the views of the majority. That specific commendation of subordinates by a superior is a good thing, on general principles, is too obvious to need argument; the only serious questions concerning public commendations are When? To whom? What for? It would be profitable, no doubt, for nearly everybody who supervises the work of others to consider whether he ought not habitually to be more prompt, frank and generous in expressing commendation by a personal word or by a brief and informal note; but that is beyond our present purpose; the subject in hand is "rolls of honor"—commendatory notices made known all over the road.

George R. Brown, superintendent of the Fall Brook Coal Company's Railroad and the originator of "Brown's discipline" (about 1886) was a pioneer in the systematic use of commendatory written notices and letters in the railroad service, and perhaps *the* pioneer; though there were superintendents who took a "human interest" in their subordinates long before his time, and they did not always stifle their natural inclination to praise good work. With the advent of "safety first," which has stimulated men of all classes to try to correct things that are wrong, public commendation has become the fashion on roads which do not employ Brown's methods in other respects.

Brown dealt more particularly with cases where a man had manifested good judgment in an undertaking of some magnitude, and where the appropriate thing to do was to write a letter; such as the case of a conductor who did well in clearing a wreck, or one who skilfully managed a lot of trains in a difficult emergency. With the introduction of Brown's discipline on large roads his discriminating, personal management of this matter was to a large extent superseded by practices suggestive of machine methods; and such commendations as have been made public, while still rational and usually justified, seem not to have received the careful attention of officers which their importance demanded.

One possible rule, quite simple, would be to use different terms in commending a man for going beyond his duty to avert damage or disaster from what would be used for the same act in the line of duty. A station agent, sitting in his office, and averting a derailment by reporting a fallen brake beam in a passing train is to be commended; and so is a brakeman on the train who makes a similar discovery. The brakeman, however, is only doing his duty. But he is to be commended for that. There is no use in decrying the practice of praising the simple performance of duty. There will always be a few warm-hearted souls who will follow that practice, and others may as well fall in line. The only care required is to see that good judgment is exercised. It is well not to "slop over." The same man who is praised today may have to be reprimanded within a short time. But the station agent, in our supposed case, is

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on a footing different from that of the brakeman. Not the slightest fault is to be imputed to the agent if he does not watch every truck of a passing 80-car freight train. And yet it is his duty to promote safety in every reasonable way. In his office, when not engrossed in work, he may be talking to a passenger, or may be engaged in unprofitable conversation; he may be half asleep or may be gazing out of the window with an empty mind. Commendation for noticing a defective car, therefore, cannot be said to suggest to the agent the definite idea of a specific duty; but probably it will be useful as a stimulus to habitual thoughtfulness concerning the safety of trains. This, however, is well worth while, is it not?

The coldest theory is that men *must* be reprimanded for falling below par; and that, logically, commendation is appropriate only when their conduct goes above par. With a record just reaching par, nothing special is called for. In that case the pay roll provides for the only and the sufficient recompense. But, surely, this theory cannot be said to embody the highest standard. It has been followed widely, and through a long period of years; and as we are still far from perfect, no very specific fault can be found with managers or superintendents who try a policy less austere; at least not until unfavorable results are manifest because of the change.

Superintendents, trainmasters and others who have to decide on the awards to a considerable number of employees in matters like those here mentioned would do well to tell of their experiences; to report their successes and their difficulties, for the benefit of others who have to deal with the same problems. To aid in the carrying out of this suggestion we append a few notes on the honor rolls of a half dozen prominent roads. The items in these records, of which we notice only a small fraction of those for a single month, range all the way from heroism down to everyday duty; bravery, quick wit, the ordinary wit of an alert mind, unusual promptness in doing a duty, and simple faithfulness. How many classes should our roll of honor contain?

One of the things sure to be noticed, apparently, is the discovery of a fire and preventing it from doing damage. On the Illinois Central a brakeman, for this, had "favorable entry" made on his record. The *Illinois Central Magazine*, however, uses this phrase for everything, and "meritorious service" is the heading, not "roll of honor." How favorable was the mention, is not stated. On some roads a definite number of marks is announced. Whether this fire was in the brakeman's own train is not stated. On the Rock Island a brakeman was credited five marks for firing an engine when the fireman was taken sick. Another one, a few weeks later, received the five merits and also a letter of commendation. This one prevented an embarrassing delay to a red ball train.

Firemen also get credit when they fire for a sick man. One on the Illinois Central, called in an emergency of that kind, and being sent over another road to the point where the train was in distress, was stranded, by his train being indefinitely delayed; and he got off and walked, ten miles, through a snowstorm, to the point where he was needed.

On the Rock Island a passenger engineman received a letter of commendation for responding, when off duty, to a call to run a switching engine. Some *conductors* of passenger trains might be embarrassed by a call to thus go back to early days; they would feel that their technique was too rusty!

On the Missouri, Kansas & Texas a conductor, presumably freight, was given 20 days' credit for "noticing something wrong" under his train. He found a spring plank dragging. This item in the record serves as a reminder that credit may be due even if no definite defect be discovered—and even if there be doubt whether anything at all is actually dangerous. When "something wrong" is discovered about a moving train, a conductor or trainman must immediately think of Rules 105 and 106—take no risks

On the Buffalo, Rochester & Pittsburgh a conductor was commended for acting promptly on his discovery of marks on the ties after a train had passed. The despatcher was enabled to stop the train and have a fallen brakebeam attended to.

On the same road a conductor was commended for discovering a bent axle on a foreign freight car—perhaps because bent axles are not easy to discover. On the Rock Island a conductor received a "letter of appreciation" based on good work done in connection with repairing an engine. On another road a conductor and his whole crew received "favorable mention" for picking up a lot of scrap brass and rubber.

Other kinds of specially commendable service are: a switchtender assisting a brakeman, in the yard, who was in danger of losing control of his cars; an agent noticing an open door in a passing freight train, in freezing weather, and sending a message which saved the fruit in the car; an operator discovering a sliding wheel, and a bridge watchman stopping a train which had a brakebeam dragging. A car inspector reported a broken rail. On the Illinois Central a number of conductors got favorable entries by detecting improper or fraudulent use of passes; a part of their duty, but a part often shirked. A freight checker on the B. R. & P. found that a car had been robbed, followed two suspicious looking men and, having got a police officer, had them arrested; and they were tried and convicted.

As a final suggestion toward answering the questions that have been outlined we will cite the last issue of *Safety*, a "Periodical of Progress and Protection," which is issued by the New York Central Lines. It is Volume 1, Number 2, and is edited by Marcus A. Dow, secretary, New York City. Of the twenty pages of this pamphlet two are occupied by the "roll of honor." One of the two is filled with the notes on five cases (and the portrait of an operator who stopped a train in which was a broken wheel); and on the other page is a list of 24 other cases, each item giving name, occupation, town and date, and filling only one line. This condensation is to be commended. No one would wish to detract in the least from the credit due any employee, but news published 500 miles from the place where it happened inevitably suffers by the mere fact of distance. If detailed notices are the more desirable then it is a question whether they would not better be confined, in their circulation, to a single division of the road, or some small territory where they would be most appreciated. Editor Dow apparently picked out, for his first page, the five most notable cases, from the whole 29 before him; but often it would be difficult, probably, to make a fair selection. A record of exceptional things must be somewhat one-sided, because circumstances for which the individual person deserves no credit usually figure as one of the main elements in the case. A hero often has to credit his heroism partly to "luck." The propriety of publishing portraits is questionable. We do not presume to criticise definitely in the present case, for the whole matter is still in the experimental stage; but where can one draw the line in the matter of portraits?

Private, personal commendation is a practice which every superior, even the superior of a very few employees, will find profitable. Even if he make mistakes, he will soon discover how to avoid mistakes in the future; and the correcting process will be good exercise. (The word "private" as here used is not necessarily synonymous with "secret.") But as to printed notices, to be published throughout a railroad system of 5,000 to 10,000 miles, there is room for discussion.

The *Baltimore & Ohio Employees' Magazine* for May contains an extreme instance of the difficulty of doing the satisfactory thing. In the Ohio floods of last March that company lost $3,000,000 worth of property and, in addition, suffered a shrinkage of $2,000,000 in freight and passenger receipts. Vice President A. W. Thompson, commending the devotion to duty of thousands of employees, says that "it is difficult to find suitable words of comment." The best that he could do was to direct that credit be entered on the record of every employee who assisted in restoring the road to normal condition, and that "the record be made in red ink"

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DEPRECIATION IN RAILWAY VALUATION.

C. F. LOWETH, chief engineer of the Chicago, Milwaukee & St. Paul, discusses in a letter published elsewhere the editorial in our issue of May 30 on "Some Disputed Points in Railway Valuation: Depreciation." It will help to an understanding to state that the editorial Mr. Loweth refers to was not meant to deal with valuation for the purpose of purchase, but solely with valuation for rate-making. Furthermore, it was meant to be rather a statement of opposing views and practice than a discussion of the correct way to deal with depreciation in making a valuation for rate-making.

Whether one will believe that a deduction for depreciation should be made in valuation for rate-making will depend largely on his theory as to the way railway rates and profits should be regulated. The theory now most generally accepted is that ordinarily a railway company is entitled only to a fair return on the fair value of its property, and that the main factor in fair value is the cost of reproduction of the physical property. Assuming that that principle is correct, the question to be considered here is, what deduction, if any, should be made from the cost of reproduction new because of depreciation.

Mr. Loweth apparently takes the position that, in valuation for rate-making, no such deduction should be made. Let us test this by some hypothetical cases. When the construction of a railway has just been finished, doubtless its actual cost should be accepted as its cost of reproduction new. Depreciation of its ties, rails and so on immediately sets in, and will not for some years be offset by renewals, simply because there is no sense in renewing things the depreciation of which has been so slight as not measurably to affect their serviceability. *Other things being equal*, the fact that the necessary expenditures for maintenance during the first few years are relatively small will nominally keep down operating expenses and increase net earnings. In consequence, the nominal net earnings during this period may be more than a fair return. The management may pay out the net earnings nominally in excess of a fair return in dividends. As time goes on, however, the amount of renewals that have to be made annually increases until finally a point is reached when year by year depreciation is just offset by expenditures for maintenance. Meantime, *other things being equal*, the increasing cost of maintenance has increased operating expenses and reduced net earnings, so that there are now no surplus earnings over a fair return, and only a fair return can be paid. At about this time a commission comes along to make a valuation for rate-making. The original cost of the road was $50,000 a mile. The commission ascertains that this would be its present cost of reproduction new, but holds that a deduction of $2,500 a mile should be made for depreciation because the depreciation of the ties, rails and so on since they were put in service has actually decreased the value of these parts of the road that much. The railroad protests against this deduction because if its valuation is made only $47,250 a mile, and its rates are adjusted accordingly, it will be unable to earn a fair return on the original investment of $50,000 a mile. The commission, in reply, points out that the earnings in excess of a fair return which have been paid out in dividends amount to $2,500 a mile, which just equals the amount of the depreciation; takes the position that, in effect, the stockholders have received back this much of their principal; and therefore holds that they have no right to complain if it is not included in the valuation on which they are in future to be allowed a return. Is the commission right?

Perhaps the question will be made easier to answer by changing the illustration. Suppose that during the first few years of the road's history, when the necessary renewals were small, the nominal operating expenses relatively small and the nominal net earnings in excess of a fair return, the management had recognized the fact that depreciation really was going on, even if it was not necessary yet to take it up in the maintenance expenditures, and had paid the stockholders only a fair return, investing the nominal surplus net earnings in additional ballast, the filling in of wooden trestles, and other improvements costing, all told, $2,500 a mile. When the valuation was made the management naturally would contend that these expenditures from earnings should be included in the value of property investment. Would it be right?

Railway officers will have no difficulty in answering this question in the affirmative. But if appreciation due to expenditures from earnings for some parts of the property should be considered in a valuation, why should not depreciation of some other parts of it be considered? It is a poor rule that will not work both ways. Of course, every one knows that actually a new road ordinarily falls far short of earning a "fair return."

Mr. Loweth says that "if the valuation of the property is for rate-making purposes, then no account of the depreciated condition of the property need be taken, as the owner will be obliged to continue to maintain it, and must necessarily be allowed a sufficient return over and above the interest on the investment and the cost of operating the property, to take care of all appreciation."

If the owner has been allowed to earn enough for all these purposes, and has used the earnings for them, then there is no depreciation to be allowed for in a valuation, simply because there is no depreciation in fact. If he has not earned enough for all these purposes, and his property has been managed with reasonable prudence, he is clearly entitled to be reimbursed with earnings more than sufficient for all these purposes in future. And if he has earned enough for all these purposes, but has failed to use in the maintenance of the property the funds that were needed to prevent depreciation, why, on the same principle, should not an allowance for depreciation be made in the valuation of his property?

Innumerable editorial discussions of valuation have been published in these columns during the last five or six years. In view of them it is doubtless needless to say that the *Railway Age Gazette* firmly believes there are many things that should be considered in railway valuation besides the original cost and the depreciation and maintenance of the various elements of the property. What has been said in the foregoing has been intended only to bring out clearly our reasons for thinking that depreciation of certain elements of the property is a factor to be considered. Consideration of it is made no less necessary because it may be many times more than offset by appreciation due to adaptation and solidification of road bed, to increased value of real estate, to permanent improvements made from earnings, and to the going value inherent in an old and established concern. These elements and many others ought to be considered; and there can be no doubt that if a fair valuation is made these things will be found in the cases of a great majority of roads to weigh many times heavier than any allowance that can properly be made for depreciation.

Furthermore, it is far from our intention to convey the impression that we believe the interest and dividends, or the net earnings, of individual railways should be limited to any arbitrary percentage on their valuations, even though such percentage be given the specious name of a "fair return." In the first place, it would be physically impossible to make different roads operating in the same territory, but having widely different densities of traffic and operating expenses, earn the same percentages of return on their valuations, no matter how rates were adjusted. In the second place, to restrict all to the same return would be unjust and inexpedient even if it were possible, because what would be a "fair return" for a railway that is incapably and expensively managed would be a wholly unfair return for one that is ably and economically managed. The conditions to be dealt with in regulating railway rates, securities and profits are so exceedingly complex that the difficulty of making a valuation that will give due weight to all the factors that should be considered will be very great. The difficulty of making any practical use of the valuation after it is finished will be yet greater.

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Letters to the Editor.

MR. LOWETH ON DEPRECIATION IN VALUATION.

CHICAGO, June 3, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The editorial in your issue of May 30 entitled, "Some Disputed Points in Railway Valuation: Depreciation," seems to me to come quite wide of hitting the mark.

Whether depreciation should be considered or not, depends entirely upon the purpose for which the valuation is made. If the property is to change ownership from a ready seller to a willing buyer, the valuation should take full account of depreciation. If the owner, in the case of a railroad, has for several years renewed less than the due proportion of rails and ties, or otherwise has let the property run down, he has profited to that extent, and has thereby placed a greater burden of future maintenance on the property, which the prospective purchaser should take into account. Of course, property is sometimes sold when for certain reasons either one or both of the parties to the transaction are willing to overlook depreciation.

If, however, the valuation of the property is for rate-making purposes, then no account of the depreciated condition of the property need be taken, as the owner will be obliged to continue to maintain it, and must necessarily be allowed a sufficient return over and above the interest on the investment, and the cost of operating the property, to take care of all depreciation.

It is presumed that the kind of valuation referred to in your editorial is that made by the various states, and now proposed to be made by the Federal authorities, of the railroads of the United States; and unless it is a question of the purchase of these properties, it is difficult to see what would be gained by taking into account depreciation or "condition per cent.," as it is sometimes termed, except, possibly, for the purpose of determining the fair average rate of depreciation to be allowed to the owners of the properties, in addition to the costs of operation, interest and profit.

C. F. LOWETH,
Chief Engineer, Chicago, Milwaukee & St. Paul.

THE DANGER OF HIGH FIXED CHARGES.

WASHINGTON, D. C., June 14, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The history of railway financing, culminating in the St. Louis & San Francisco misfortune, raises doubt as to the propriety of the government allowing public carriers to increase their indebtedness ad libitum. In 1900 the amount of railway funded debt outstanding, based on official sources, bore a proportion to railway capital stock of 96.56 per cent., in 1905 110.62 per cent., and in 1910 126.98 per cent. The inquisitive observer wonders whether he will live long enough to see the outcome. Obviously there may be two kinds of restriction on the ever increasing tendency to expand funded debt: (1) the natural or economic, and (2) the artificial or governmental. The first is to be most dreaded because it comes with unexpected force and is curative only; the second is to be most desired, because it establishes in advance a rule of action and is preventive rather than curative.

Doubtless the railways are in the hands of their friends, the investors, who in the main appear to prefer bond investments, hence the floating of new bond issues goes on unchecked. But bankruptcy brings railway manager, stockholder, and bondholder alike into predicament; the manager loses control, the stockholder steps down and out, and the bondholder is forced against his will to become a stockholder. Nor is the conversion of bondholdings into stockholdings a painless and inexpensive metamorphosis. Many a stockholder today was formerly a bondholder and now faces another set of bondholders. Perhaps the shipper and the employee should be allowed to get in a word edgewise as to their opinion in the matter.

The force that lies behind a debt cannot be minimized by calling it "funded" debt or "bonded" debt; the day of maturity arrives strictly on time. A reasonable amount of borrowed capital may be used with profit and advantage to all parties, but there must be a safety valve somewhere. The schoolboy asks, "Why have stockholders at all?" "If the railways can borrow in amount beyond 100 per cent. of their capital stock, why not borrow the entire necessary capital and let the bondholders operate the road?" While the question is illogical, it suggests a serious proposition, which is that every road should be prohibited by law from borrowing capital in excess of its capital stock, and also should not be granted permission by the regulating commission to issue bonds in excess of, say, 90 per cent. of its capital stock unless extraordinary necessity can be shown.

E. S. HOBBS.

PROPOSED NATIONAL VALUATION CONVENTION.

CHICAGO, April 17, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Referring to your issue of April 11, 1913, page 836, on "National Valuation Convention Urged," I beg to comment as follows:

In my opinion, a convention such as that proposed would be so large and unwieldy that no results could be accomplished. If one valuation engineer from each railroad system was included this item alone would mean 1,306 men. The American Railway Association, the American Railway Engineering Association and the Interstate Commerce Commission have thus far appointed no valuation commissions, therefore could not be represented. A large number of consulting engineers are, or have been engaged more or less upon valuation of public utilities. These latter would not be especially equipped to handle railway valuations.

If the convention were represented by members as proposed there would be upwards of 2,000 in such a conference, a multitude among which no decision upon a single point could be made unanimous.

It is a mistaken idea that railways are not equipped to properly make valuations of their properties. Among the western roads, especially in states where valuations have already been made to state commissions, this work is already well in hand and with little effort can be systematized and made uniform. The forms, methods, unit prices, depreciation, engineering interest, appreciation, adaptation, solidification and seasoning and the many other items entering into a valuation are already well established, and while it is true differences exist among the various valuations already prepared, the difference is in degree only and the principles are well established.

Any well organized engineering department of our railways is already equipped, or can be so equipped on short notice to perfect an organization to value its property.

When the Interstate Commerce Commission promulgated the classification of operating and construction expenses on railroads, Prof. Henry C. Adams, statistician of the commission, was aided in the work by a "Committee of Twenty-five," who were representatives from the accounting departments of representative railways, and this committee succeeded in establishing a classification, which has as important a bearing on the interests of the railroads as the valuation of its properties is likely ever to have, and if such an important work can be accomplished by such means, it would be more practicable if the Interstate Commerce Commission would invite the railroads to appoint as representatives at a conference about twenty-five men, composed of railroad engineers and accountants who would meet with the Interstate Commerce Commission officers and promulgate rules and establish principles covering every item entering into a railroad valuation. Real constructive work and definite results would be more readily and satisfactorily accomplished by such a body than a mass meeting of 2,000 persons, each having divergent views.

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THE SUPREME COURT'S COMMENTS ON VALUATION

In the Minnesota Rate Case the Supreme Court in the Opinion by Justice Hughes Discusses Railroad Valuation.

The following is an abstract [omissions consist principally of citations and are indicated thus * * *] of that part of the Minnesota Rate Case decision dealing with valuation:

The rate-making power is a legislative power and necessarily implies a range of legislative discretion. We do not sit as a board of revision to substitute our judgment for that of the legislature, or of the commission lawfully constituted by it, as to matters within the province of either. *San Diego Land & Town Co.* v. *Jasper*, 189 U. S. 439, 446. The case falls within a well defined category. Here we have a general schedule of rates, involving the profitableness of the intrastate operations of the carrier taken as a whole, and the inquiry is whether the state has overstepped the constitutional limit by making the rates so unreasonably low that the carriers are deprived of their property without due process of law and denied the equal protection of the laws.

The property of the railroad corporation has been devoted to a public use. There is always the obligation springing from the nature of the business in which it is engaged—which private exigency may not be permitted to ignore—that there shall not be an exorbitant charge for the service rendered. But the state has not seen fit to undertake the service itself; and the private property embarked in it is not placed at the mercy of legislative caprice. It rests secure under the constitutional protection which extends not merely to the title but to the right to receive just compensation for the service given to the public.* * *

In determining whether that right has been denied, each case must rest upon its special facts. But the general principles which are applicable in a case of this character have been set forth in the decisions.

(1). The basis of calculation is the "fair value of the property" used for the convenience of the public. * * *

(2). The ascertainment of that value is not controlled by artificial rules. It is not a matter of formulas, but there must be a reasonable judgment having its basis in a proper consideration of all relevant facts. The scope of the inquiry was thus broadly described in *Smyth* v. *Ames*. * * *

(3). Where the business of the carrier is both interstate and intrastate, the question whether a scheme of maximum rates fixed by the state for intrastate transportation affords a fair return, must be determined by considering separately the value of the property employed in the intrastate business and the compensation allowed in that business under the rates prescribed This was also ruled in the *Smyth* case (*id.* p. 541). The reason, as there stated, is that the state cannot justify unreasonably low rates for domestic transportation, considered alone, upon the ground that the carrier is earning large profits on its interstate business, and, on the other hand, the carrier cannot justify unreasonably high rates on domestic business because only in that way is it able to meet losses on its interstate business.

In the present cases, the necessity of this segregation of the domestic business in determining values and results of operation, was recognized by both parties. Voluminous testimony was taken before the Master, and numerous exhibits containing data and calculations were submitted for the purpose of showing their respective estimates of the value of the entire property of the carriers in Minnesota, the amount of income and expense in that state, their theories of apportionment between the interstate and intrastate business, and their contentions as to the net return for intrastate transportation under the state rates. The multitude of facts which are involved makes it impossible here to present a comprehensive review, even in a summary way. We must be content with a statement of the salient points and deal only with those matters which, after a careful consideration of the entire record, we regard as controlling our decision.

In each of the three cases (save in certain particulars, which we need not now mention, with respect to that of the Minneapolis & St. Louis) the method adopted by the Master was as follows:

The period taken for the purpose of testing the sufficiency of the rates was the fiscal year ending June 30, 1908. During this period, all the rates in question, freight and passenger, were actually in force, with the exception of the commodity rates prescribed by the act of April 18, 1907, which had been enjoined. The amount of the reduction in the intrastate revenue which would have been caused by the application of the commodity rates is shown.

The Master found the present value of the entire property of the carrier, used in the public service in the state of Minnesota. This valuation was as of June 30, 1908, and was made on the basis of the cost of reproduction new. The Master also made findings as to the original cost of construction, and as to the present value on the basis of cost of reproduction new, of the entire system of the carrier. The estimated value of the railroad property within the state was divided between the freight and passenger business upon the relation of the gross revenue derived from each. The part of the total value which was thus assigned to the freight business within the state was then divided between the interstate and intrastate freight business on the basis of gross revenue; and a similar division was made between the interstate and intrastate business of the property value assigned to the passenger department. In this way the Master found the value of the property used in intrastate transportation, freight and passenger, upon which he computed the net return received by the carrier.

There was no substantial dispute as to the amount of the entire revenue assignable to the state or as to its division between interstate and intrastate business, as an examination of the transactions in which the revenue was obtained permitted the making of the requisite apportionments with reasonable certainty.

The Master also ascertained the total expense incurred by the carrier within the state. This expense was first divided between freight and passenger business. Those items of cost which were directly incurred in each sort of business, and not common to both, were directly assigned; and such items were found to cover about 60 per cent. of all expenses. The remaining items, those of common expense, were divided between the freight and passenger business upon the relation, as to most of them, of revenue train-miles, and others, of revenue engine-miles.

Having thus ascertained the share of the expense within the state of the freight and passenger departments respectively, it remained to divide that share, in each case, between the interstate and intrastate business. This apportionment was made, in the case of freight expense, upon what was termed an "equated ton-mile basis"; and in the case of passenger expense upon an "equated passenger-mile basis." That is to say, the Master concluded that the cost per ton-mile of doing the intrastate freight business was at least two and one-half times the cost per ton-mile of the interstate freight business, and hence he divided the total freight expense according to the relation of the interstate and intrastate ton-miles after the latter had been increased two and one-half times. In the case of the passenger expense, he concluded that the cost per passenger-mile in the intrastate business was at least 15 per cent. greater than that in the interstate business, and the total passenger expense was divided upon the relation of passenger-miles after increasing the intrastate passenger-miles 15 per cent. By the use of equalizing factors, the same result was obtained upon what was called an "equated revenue basis."

The net profits of the interstate and intrastate businesses, respectively, passenger and freight, were then found by deducting the apportioned share of expense from the apportioned share

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of revenue, and the rate per cent. of the net profit upon the property value assigned to each sort of business was computed. The Master concluded that the returns from intrastate transportatiou were unreasonably low and hence that the rates in question were confiscatory.

The validity of the result depends upon the estimates of the value of the property within the state and the apportionments both of value and of expense between the interstate and intrastate operations.

It will be convenient to take up the three cases separately: Northern Pacific Railway Company.

The par value, April 30, 1908, of the stock of this company was found to be $215.539,634.99, and of the bonds $190,256,577.66; total, $405,796,392.65. (Included in this statement of capital stock is the sum of $60,539,634.99 received to April 30, 1908, upon subscriptions to new capital stock ($95,000,000) authorized by stockholders' resolution January 7, 1907.)

These securities and their value in the market rest upon the entire property of the company. They include assets of considerable value (for example, the stock of the Northwestern Improvement Company owning extensive coal lands) which, however, do uot form part of what may be called the operating property of the company or that devoted to the public service, upon which the fair return is to be calculated (15 I. C. C. 376, 397, 407). Referring to the market value of the securities, the Master said: "Assets and property not devoted to public service have not been valued, and as they are a large element in stock valuation it follows that value of bonds and stocks is wholly unreliable and cannot be used in these cases as an element in determining the value of operating property or as a basis for rate-making." In this view the Master was undoubtedly right.

Much evidence was produced before the Master for the purpose of showing the actual cost of construction and equipment of the entire railroad system from the beginning down to April 30, 1908. This, the Master states, could be shown only by the corporate books and records; and in the early history of the original company these are somewhat obscure and uncertain and, by reasou of lapse of time, could not be verified by other proof. The total investment cost of the railroad system of the Northern Pacific thus shown, was $369,252,755. This included certain items which the Master held not to be properly allowable as a part of the cost, and after their deduction the cost was found to be $312,243,555. Of this investment cost, it appears from the evidence submitted by the company's controller that the sum of $128,184,985.82 was expended for construction and equipment, and for improvements and betterments, during the period from September 1, 1896, to April 30, 1908. The Master found that the Minnesota track mileage is substantially 21 per cent. of the track mileage of the whole system and that if the cost were apportioued accordingly, the amonnt assignable to the state of the entire cost of construction and equipment, as stated, would be $65,571,462.

The Master, however, and the court below in confirming his findings, held that rates were not to be predicated upon the original investment.

Taking, as the basis, the cost of reproduction new, the Master found that the value of the entire railroad system or operating property of this company to be $452,666,489. The value of that portion of the system which was in the state of Minnesota was separately found, on the same basis, to be $90,204,545. It was upon this estimate of the value of the property in the State, as apportioned betweeu the interstate and intrastate business, that the Master computed the rate of return.

The total net profits of the company for the fiscal year ending June 30, 1908, from its Minnesota business (interstate and intrastate) was found to be $5,431,514.56. This was equal to 6.021 per cent. on the entire estimated value of the property. This showing of the results of the entire business at once directs attention to the importance of the methods adopted in making apportionments, but before considering these. the question is presented as to the soundness of the underlying estimate of value. May it be accepted as a basis for a finding that the rates are confiscatory?

Values. The items entering into the valuation are 40 in uumber.

The first item is:

"Lands for right-of-way, yards and terminals—$21,024,562."

This is for the bare land, without structures or improvements of any sort, as the entire cost of reproduction in building the road and erecting all the existing structures is covered in other items. The Master states that the amount thus allowed for land is made up as follows:

Terminal properties, St. Paul appraisement of Read, Watson & Taylor, as modified by railroad company	$7,645,100.24
Add 5 per cent. for the cost of acquisition and consequential damages	382,255.01
Property acquired after appraisement	328,725.69
Minneapolis appraisement of Elwood, Barney and Ridgeway, as modified by railway company	4,027,616.17
Add 5 per cent. for acquisition and consequential damages	201,380.80
Property acquired after appraisement	227,737.26
Duluth, appraisement of Stryker, Mendenhall and Little	3,602,443.43
Add 25 per cent. for railway value, cost of acquisition and consequential damages	900,610.85
Total value of terminals	$17,315,869.45
Lands outside of terminals	3,708,693.45
Grand total	$21,024,562.90

The appellants insist that no more than $9,498,099.27 should have been allowed.

It is contended that the valuation was made upon a wrong theory; that it is a speculative estimate of "cost of reproduction"; that it is largely in excess of the market value of adjacent or similarly situated property; that it does not represent the present value, in any true sense, but constitutes a conjecture as to the amount which the railway company would have to pay to acquire its right-of-way, yards and terminals, on an assumption, itself inadmissible, that, while the railroad did not exist, all other conditions, with respect to the agricultural and industrial development of the State, and the location, population and activities of towns, villages and cities, were as they now are.

We may first consider the basis for the finding with respect to the "lands outside terminals," that is, the right-of-way and station grounds, etc., outside the three cities.

(a) *Lands outside terminals.* The complainants' witness was Mr. Cooper, the land commissioner of the company, who has charge of the land grants for its entire system, of its right-of-way and land purchases, and has had a wide experience in connection with land values along the lines of the railway. In the latter part of 1906, the state notified the company to report the value of its properties, requiring a statement in one column of the "market value" and in another column, of the "value for railway purposes." Mr. Cooper was instructed to prepare the valuation for this report. From the information he received in special inquiries, and his own knowledge, and following what he understood to be the instructions from the state, he set down under the heading of "market value," not the market value in the proper sense of that term, but what in his judgment it would cost the railroad company to acquire the land. This included an excess which he estimated the company would have to pay over the market value of contiguous and similar property if it were called upon to undertake such a reproduction of its right-of-way. It did not, however, embrace an allowance for payments which might have to be made for improvements that possibly might be found upon the property in such case. or for the consequential or severance damages which might possibly have to be met, or for the expense of acquisition. These supposed additional outlays he undertook to estimate. For this purpose he increased the "market value" as stated (in the case of agricultural lands generally multiplying it by three) and thus reached the amount set down as the "value for railway purposes." * * *

The "market value" of the lands (outside of the three cities), thus fixed and reported to the state was $2,008,491.50, and the increased amount estimated, in the manner stated, which was reported as the "value for railway purposes" was $4,944,924.60.

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The latter amount was submitted by the complainants in this case as the value of the lands. The Master thought that the complainants' witness used too large a multiplier and allowed 75 per cent. of the amount thus claimed, or $3,708,693.45, stating that this was determined upon as the "fair reproduction value of the property." This allowance, it will be observed, was about $1,700,000 in excess of Mr. Cooper's estimate of "market value" as that term was used in making the report.

(b) *Terminal properties.* This term is used to designate the lands for the right-of-way, yards and terminals in St. Paul, Minneapolis and Duluth. The total original cost of these lands to the company (according to its statement based on the best information obtainable) including purchases to April 30, 1908, was $4,527,228.76. The Master allowed as their value, apart from the improvements made by the company which, as we have said, were embraced in the other items of reproduction cost, the sum of $17,315,869.45.

In preparing the valuation for the report to the state, Mr. Cooper employed real estate men in each of the cities to make an appraisement. He instructed them, as he testifies, "to make a conservative report of the cost of reproducing the properties owned by the company in each of their respective cities." They divided the property into districts and reported their estimate of units of value, as, for example, by the square foot. Mr. Cooper took these reports, discussed their valuations with the appraisers and aided by his own knowledge, formed an independent judgment, in no case increasing and in some instances (with respect to certain St. Paul and Minneapolis property) reducing the appraisers' values. He then set forth under the heading "market value" in the report to the state, as described in the testimony we have quoted, his estimate of what it would cost the company to purchase these lands, exclusive of improvements that might be upon them, severance and consequential damages and expenses incident to acquisition. The amounts he thus fixed were as follows: For the property in St. Paul, $7,645,100.24; in Minneapolis, $4,027,616.17; in Duluth, $3,555,-593.93. In the case of the St. Paul and Minneapolis properties the amounts are precisely those adopted by the Master in his findings and to this he adds 5 per cent. to cover cost of acquisition and consequential damages. The Master was of the opinion that the appraisers of these properties were "fully impressed with their value for railroad purposes" and that their appraisement as verified by them before him and modified by the railway company "is a generous valuation and should be accepted as full railroad value of the terminal properties," and it was so accepted with the addition above stated. With respect to the Duluth property, where the appraisement appears to have rested upon the ordinary values of real estate, the Master sets forth as the appraised value, $3,602,443.43, to which he adds 25 per cent. or $900,610.85 "for railway value, cost of acquisition and consequential damages."

In reviewing the findings, the court below reached the conclusion that "the Master in effect found that the cost of reproduction and the present value of the lands for the terminals in the three great cities, including therein all cost of acquisition, consequential damages, and value for railroad use which he allowed, was only about 30 per cent. more than the normal value of the lands in sales between private parties. He found the value of the lands outside the terminals to be only twice their normal value."

From our examination of the evidence we are unable to conclude that the excess stated may be thus limited. What is termed the normal value does not satisfactorily appear. It further will be observed that the amount thus allowed in Item 1 for lands, yards and terminals, both in and out of the three cities ($21,024,562), was included in the total on which 4½ per cent. was allowed in Item 30 for "Engineering, superintendence, legal expenses," and again was included in the total on which 5 per cent. was allowed in Item 37 for "Contingencies," and, in addition, was included in the total on which 10 per cent. was allowed in Item 39 for "Interest during construction."

These are the results of the endeavor to apply the cost-of-reproduction method in determining the value of the right-of-way. It is at once apparent that, so far as the estimate rests upon a supposed compulsory feature of the acquisition, it cannot be sustained. It is said that the company would be compelled to pay more than what is the normal market value of property in transactions between private parties; that it would lack the freedom they enjoy, and, in view of its needs, it would have to give a higher price. It is also said that this price would be in excess of the present market value of contiguous or similarly situated property. It might well be asked, who shall describe the conditions that would exist, or the exigencies of the hypothetical owners of the property, on the assumption that the railroad were removed? But, aside from this, it is impossible to assume, in making a judicial finding of what it would cost to acquire the property, that the company would be compelled to pay more than its fair market value. It is equipped with the governmental power of eminent domain. In view of its public purpose, it has been granted this privilege in order to prevent advantage being taken of its necessities. It would be free to stand upon its legal rights and it cannot be supposed that they would be disregarded.

It is urged that, in this view, the company would be bound to pay the "railway value" of the property. But, supposing the railroad to be obliterated and the lands to be held by others, the owner of each parcel would be entitled to receive on its condemnation, its *fair market value* for all its available uses and purposes. * * * There is no evidence before us from which the amount which would properly be allowable in such condemnation proceedings can be ascertained.

Moreover, it is manifest that an attempt to estimate what would be the actual cost of acquiring the right-of-way, if the railroad were not there, is to indulge in mere speculation. The railroad has long been established; to it have been linked the activities of agriculture, industry and trade. Communities have long been dependent upon its service, and their growth and development have been conditioned upon the facilities it has provided. The uses of property in the communities which it serves are to a large degree determined by it. The values of property along its line largely depend upon its existence. It is an integral part of the communal life. The assumption of its non-existence, and at the same time that the values that rest upon it remain unchanged, is impossible and cannot be entertained. The conditions of ownership of the property and the amounts which would have to be paid in acquiring the right-of-way, supposing the railroad to be removed, are wholly beyond reach of any process of rational determination. The cost-of-reproduction method is of service in ascertaining the present value of the plant, when it is reasonably applied and when the cost of reproducing the property may be ascertained with a proper degree of certainty. But it does not justify the acceptance of results which depend upon mere conjecture. It is fundamental that the judicial power to declare legislative action invalid upon constitutional grounds is to be exercised only in clear cases. The constitutional invalidity must be manifest, and if it rests upon disputed questions of fact, the invalidating facts must be proved. And this is true of asserted value as of other facts.

The evidence in these cases demonstrates that the appraisements of the St. Paul and Minneapolis properties which were accepted by the Master were in substance appraisals of what was considered to be the peculiar value of the railroad right-of-way. Efforts to express the results in the terms of a theory of cost of reproduction fail, as naturally they must, to alter or obscure the essential character of the work undertaken and performed. Presented with an impossible hypothesis, and endeavoring to conform to it, the appraisers—men of ability and experience—were manifestly seeking to give their best judgment as to what the railroad right-of-way was worth. And doubtless it was believed that it might cost even more to acquire the property, if one attempted to buy into the cities as they now exist and all the difficulties that might be imagined as incident

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to such a "reproduction" were considered. The railroad right-of-way was conceived to be a property *sui generis*, "a large body of land in a continuous ownership," representing one of the "highest uses" of property and possessing an exceptional value. The estimates before us, as approved by the Master, with his increase of 25 per cent, in the case of the Duluth property, must be taken to be estimates of the "railway value" of the land; and whether or not this is conceived of as paid to other owners upon a hypothetical reacquisition of the property is not controlling when we come to the substantial question to be decided.

That question is whether, in determining the fair present value of the property of the railroad company as a basis of its charges to the public, it is entitled to a valuation of its right-of-way not only in excess of the amount invested in it, but also in excess of the market value of contiguous and similarly situated property. For the purpose of making rates, is its land devoted to the public use to be treated (irrespective of improvements) not only as increasing in value by reason of the activities and general prosperity of the community, but as constantly outstripping in this increase, all neighboring lands of like character, devoted to other uses? If rates laid by competent authority, state or national, are otherwise just and reasonable, are they to be held to be unconstitutional and void because they do not permit a return upon an inerement so calculated?

It is clear that in ascertaining the present value we are not limited to the consideration of the amount of the actual investment. If that has been reckless or improvident, losses may be sustained which the community does not underwrite. As the company may not be protected in its actual investment, if the value of its property be plainly less, so the making of a just return for the use of the property involves the recognition of its fair value if it be more than its cost. The property is held in private ownership and it is that property, and not the original cost of it, of which the owner may not be deprived without due process of law. But still it is property employed in a public calling, subject to governmental regulation and while under the guise of such regulation it may not be confiscated, it is equally true that there is attached to its use the condition that charges to the public shall not be unreasonable. And where the inquiry is as to the fair value of the property, in order to determine the reasonableness of the return allowed by the rate-making power, it is not admissible to attribute to the property owned by the carriers a speculative increment of value, over the amount invested in it and beyond the value of similar property owned by others, solely by reason of the fact that it is used in the public service. That would be to disregard the essential conditions of the public use, and to make the public use destructive of the public right.

The increase sought for "railway value" in these cases is an increment over all outlays of the carrier and over the values of similar land in the vicinity. It is an increment which cannot be referred to any known criterion, but must rest on a mere expression of judgment which finds no proper test or standard in the transactions of the business world. It is an increment which in the last analysis must rest on an estimate of the value of the railroad use as compared with other business uses; it involves an appreciation of the returns from rates (when rates themselves are in dispute) and a sweeping generalization embracing substantially all the activities of the community. For an allowance of this character there is no warrant.

Assuming that the company is entitled to a reasonable share in the general prosperity of the communities which it serves, and thus to attribute to its property an increase in value, still the increase so allowed, apart from any improvements it may make, cannot properly extend beyond the fair average of the normal market value of land in the vicinity having a similar character. Otherwise we enter the realm of mere conjecture. We therefore hold that it was error to base the estimates of value of the right-of-way, yards and terminals upon the so-called "railway value" of the property. The company would certainly have no ground of complaint if it were allowed a value for these lands equal to the fair average market value of similar land in the vicinity, without additions by the use of multipliers, or otherwise, to cover hypothetical outlays. The allowances made below for a conjectural cost of acquisition and consequential damages must be disapproved; and, in this view, we also think it was error to add to the amount taken as the present value of the lands the further sums, calculated on that value, which were embraced in the items of "engineering, superintendence, legal expenses," "contingencies" and "interest during construction."

By reason of the nature of the estimates, and the points to which the testimony was addressed, the amount of the fair value of the company's land cannot be satisfactorily determined from the evidence, but it sufficiently appears for the reasons we have stated that the amounts found were largely excessive.

Finding this defect in the proof, it is not necessary to consider the objections which relate to the sources from which the property was derived or its mode of acquisition, or those which are urged to the inclusion of certain lands which it is said were not actually used as a part of the plant; and we express no opinion upon the merits of these contentions.

The property other than land, as the detailed statement shows, embraced all items of construction, including road-bed, bridges, tunnels, etc., structures of every sort, and all applianees and equipment. The cost of reproduction new was ascertained by reference to the prices for such work and property. In view of the range of the questions we have been called upon to consider, we shall not extend this opinion for the purpose of reviewing this estimate, or of passing upon exeeptions to various items in it, as their disposition would not affect the result.

The Master allowed the cost of reproduction new without deduction for depreciation. It was not denied that there was depreciation in fact. As the Master said, "everything on and above the road-bed depreciates from wear and weather stress. The life of a tie is from eight to ten years only. Structures become antiquated, inadequate and more or less dilapidated. Ballast requires renewal, tools and machinery wear out, cars, locomotives and equipment, as time goes on, are worn out or disearded for newer types." But it was found that this depreciation was more than offset by appreciation; that "the road-bed was constantly increasing in value"; that it "becomes solidified, embankments and slopes or excavations become settled and stable and so the better resist the effects of rains and frost"; that it "becomes adjusted to surface drainage, and the adjustment is made permanent by concrete structures and rip-rap"; and that in other ways, a road-bed long in use "is far more valuable than one newly constructed." It was said that "a large part of the depreciation is taken eare of by constant repairs, renewals, additions and replacements, a sufficient sum being annually set aside and devoted to this purpose, so that this, with the application of road-bed and adaptation to the needs of the country and of the public served, together with working capital . . . fully offsets all depreciation and renders the physical properties of the road not less valuable than their cost of reproduction new." And in a further statement upon the point, the "knowledge derived from experience" and "readiness to serve" were mentioned as additional offsets.

We cannot approve this disposition of the matter of depreciation. It appears that the Master allowed, in the cost of reproduction, the sum of $1,613,612 for adaptation and solidification of road-bed, this being included in the item of grading and being the estimate of the engineer of the state commission of the proper amount to be allowed. It is also to be noted that the depreciation in question is not that which has been overcome by repairs and replacements, but is the actual existing depreciation in the plant as compared with the new one. It would seem to be inevitable that in many parts of the plant there should be such depreciation, as for example in old structures and equipment remaining on hand. And when an estimate of value is made on the basis of reproduction new, the extent of

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existing depreciation should be shown and deducted. This apparently was done in the statement submitted by this company to the Interstate Commerce Commission in the Spokane Rate case in connection with an estimate of the cost of reproduction of the entire system as of March, 1907. (See 15 I. C. C. 395, 396.) In the present case, it appears that the engineer of the state commission estimated the depreciation in the property at between eight and nine million dollars. If there are items entering into the estimate of cost which should be eredited with appreciation, this also should appear, so that instead of a broad comparison there should be specific findings showing the items which enter into the account of physical valuation on both sides.

It must be remembered that we are concerned with a charge of confiscation of property by the denial of a fair return for its use; and to determine the truth of the charge there is sought to be ascertained the present value of the property. The realization of the benefits of property must always depend in large degree on the ability and sagacity of those who employ it, but the appraisement is of an instrument of public service, as property, not of the skill of the users. And when particular physical items are estimated as worth so much new, if in fact they be depreciated, this amount should be found and allowed for. If this is not done, the physical valuation is manifestly incomplete. And it must be regarded as incomplete in this case.

Apportionment of Values. As the rate of net return from the entire Minnesota business (interstate and intrastate) during the test year was 6.021 per cent. on a valuation of $90,204,545, and would be greater if computed upon a less value, we are brought to the question whether the methods of apportionment adopted are so clearly appropriate and accurate as to require a finding of confiseation of property used in the intrastate business.

The apportionment of the value of the property, as found, between the interstate and intrastate business was made upon the basis of the gross revenue derived from each. This is a simple method, easily applied, and for that reason has been repeatedly used. It has not, however, been approved by this court and its correctness is now challenged. Doubtless, there may be cases where the facts would show confiscation so convincingly in any event, after full allowance for possible errors in computation, as to make negligible questions arising from the use of particular methods. But this case is not of that character.

In support of this method, it is said that a division of the value of the property according to gross earnings is a division according to the "value of the use," and therefore proper. But it would seem to be clear that the value of the use is not shown by *gross* earnings. The gross earnings may be consumed by expenses, leaving little or no profit. If, for example, the intrastate rates were so far reduced as to leave no net profits, and the only profitable business was the interstate business, it certainly could not be said that the value of the use was measured by the gross revenue.

It is not asserted that the relation of expense to revenue is the same in both businesses; on the contrary, it is insisted that it is widely different. The Master found that the revenue per ton-mile in the intrastate business, as compared with the revenue per ton-mile in the interstate business, was as 1.4387 to 1.0000. And, on his assumption as to the extra cost of doing the intrastate business, he reached the conclusion that the cost per ton-mile in proportion to the revenue per ton-mile in the intrastate business, as compared with the interstate business, was as 1.7377 to 1.0000. It is contended, according to the computations, that only a little over 10 per cent. of the entire net revenue of the test year ($5,431,514.66) was made in the intrastate business, and that 90 per cent. thereof was made in the interstate business; but approximately 21 per cent. of the total value of the property was assigned to the intrastate business.

If the property is to be divided according to the value of the use, it is plain that the gross-earnings method is not an accurate measure of that value. . . .

The value of the use, as measured by return, cannot be made the criterion when the return itself is in question. If the return, as formerly allowed, be taken as the basis, then the validity of the state's reduction would have to be tested by the very rates which the state denounced as exorbitant. And, if the return as permitted under the new rates be taken, then the state's action itself reduces the amount of value upon which the fairness of the return is to be computed.

When rates are in controversy, it would seem to be necessary to find a basis for a division of the total value of the property independently of revenue, and this must be found in the use that is made of the property. That is, there should be assigned to each business that proportion of the total value of the property which will correspond to the extent of its employment in that business. It is said that this is extremely difficult; in particular, because of the necessity for making a division between the passenger and freight business and the obvious lack of correspondence between ton-miles and passenger-miles. It does not appear, however, that these are the only units available for such a division; and it would seem that, after assigning to the passenger and freight departments respectively, the property exclusively used in each, comparable use-units might be found which would afford the basis for a reasonable division with respect to property used in common. It is suggested that other methods of calculation would be equally unfavorable to the state rates, but this we cannot assume.

It is sufficient to say that the method here adopted is not of a character to justify the court in basing upon it a finding that the rates are confiscatory.

RAILWAY SIGNAL ASSOCIATION.

The June meeting of this association was held in New York City beginning June 11 and 12, with President B. H. Mann in the chair. Mr. Mann mentioned the work being carried on in connection with committees of other associations and heartily recommended the joint committee work. Mr. Anthony spoke of the work being done in connection with the superintendents of telegraph regarding the joint use of pole lines. Mention was also made of the necessity of making early hotel reservations for the annual convention at Nashville. Mr. Rosenberg will issue a circular in regard to this matter.

In the entertainment which was furnished by the Signal Appliance Association Wednesday afternoon—a boat trip around the city, landing at Coney Island for dinner—moving pictures were taken as the members and guests boarded the steamer.

The first business was the report of Committee No. 2, submitted by C. J. Kelloway, chairman. A long discussion followed on R. S. A. drawing No. 1260, mechanical single switch layout with one facing point lock and one detector bar. W. H. Elliot suggested that the plans be discussed as information but not as standards, stating that there was an unnecessary duplication of parts. Mr. Rudd suggested that a note be added stating that certain parts shown have not yet been standardized. Mr. Mock suggested that the committee observe page 212 of the *Journal* of the Association for June, as a guide in showing dimensions. A disagreement arose concerning the duties of Committees 2 and 6, and it was suggested that the committee submit new plans at the Nashville Convention, accepting the suggestions offered. This was put to vote and carried. The other drawings submitted by this committee were then discussed, suggestions being made for guidance of the committee.

The report of Committee No. 3 was submitted by R. C. Johnson. The specifications for the installation of a vitrified clay conduit system were read and slight changes made in the wording. C. F. Denney moved that the specifications for construction be compiled separately from those for material. This motion was carried. It was then voted that the specifications as corrected be accepted for presentation at the annual convention. The recommendation shown on page 138 will be presented to the annual convention as printed.

The report of Committee No. 4 was presented by A. R. Fugina

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in the absence of Messrs. Adams and Phinney. In Section 5 of the specifications for relays the word "water" was substituted for "moisture." The suggestion was made that the specifications for lifting armature, neutral type D. C. interlocking relays be corrected to conform to the present methods of manufacture and that representatives of the supply houses be consulted in preparing these specifications for the annual convention. This suggestion was accepted by the committee. The report of Sub-committee No. 12, of Committee No. 4, was presented by Mr. Fugina. T. S. Stevens said that paragraph b, of part 2, of the specifications for vibrating crossing alarms, was unnecessary; but after it was shown that four roads needed this clause the paragraph was accepted as a part of the specifications. Mr. McCready, of the Union Switch & Signal Company, suggested that the committee look into the working resistance of crossing bells. This was put in the form of a motion and carried. Mr. McCready moved that, "Normal Working Voltage" be inserted under part 16, and this was carried. Mr. Elliot moved that the word "Alarm" be stricken from the title. This motion was carried. Mr. Stevens moved that paragraphs b and c of part 2 be reconsidered, on account of the practices of the various roads. This motion was carried and the committee was then excused.

The report of Committee No. 5 was presented by T. S. Stevens. C. C. Anthony suggested that where the word "operator" appeats the word "signalman" be substituted. Mr. Rudd suggested that part 2-b of the paragraph on Controlled Manual Block be reconsidered and be changed so as to provide for a broken train. These suggestions were accepted by the committee. Mr. Stevens then explained that the drawings shown were so arranged that the cost of any combination might be easily estimated. Mr. Denney suggested that a note to that effect be added to parts m. b. 1 and m. b. 2. Mr. Elliot suggested showing a bill of material and Mr. Morrison recommended the insertion of a note stating that R. S. A. Standards be used where possible. In part m. b. 1, paragraph d, and m. b. 2, paragraph c, the word "Arranged" was substituted for "Complete." The word "Written" was removed from paragraphs d and f of part m. b. 1, and paragraph c of m. b. 2.

The report of Committee No. 6 was presented by J. C. Mock. Drawings 1008, 1009, 1085, 1090 and 1063, were accepted. In drawing 1084 the dimension of 1¼ in. was inserted to show the thickness of web, in accordance with a suggestion by Mr. McCready. Drawing 1095 was accepted with the proviso that the committee arrange for a removable cap. Mr. Stevens moved that a multiple unit bolt lock be designed, and Mr. Anthony moved that an adjustable unit bolt lock be designed. These motions were carried and the committee instructed to so proceed. The color of blades was discussed and the committee instructed to send circular letters to get information as to whether a combination of red and white or yellow and black is preferred. The committee reported that designs for lamp brackets and for bridges are being considered.

The report of Committee No. 8 was presented by H. S. Balliet. Regarding paragraph 602 on page 161 the committee accepted a suggestion that the part referring to contracts read "front and back contacts shall carry four amperes and break 10 amperes." In paragraph 545 the words "Core type" were taken out. The specifications for A. C. and D. C. Core Type Impedance Bonds were accepted. The other specifications presented by this committee were read and accepted, Mr. Balliet recommending that they be carefully studied before the annual convention.

The report of Committee No. 9 was presented by Mr. Elliott as information. He stated that about one-half of the users of the R. S. A. formula for insulation found it satisfactory. There was a short discussion by Messrs. Rudd, Stevens, Wilson and Martin, and the committee was excused.

The report of Committee No. 10 was presented by R. B. Elsworth. The report of the committee was accepted after a long discussion on paragraphs a. and c. of part 5. It was finally carried that the word "Pure" be inserted before "Lead" in the title.

J. E. Saunders was highly complimented on the presentation of his papers, and particularly by Messrs. Morrison, Waldron, Stevens and McCready. Mr. Leisenring suggested the addition of a note stating that the papers applied chiefly to steam roads practice. This suggestion was accepted. The discussion and a notice of the papers will appear in the *Journal* of the Association for September.

HEATING SMALL STATIONS.

By D. E. Lamon.*

After carrying coal and keeping fires going in a set of three stoves in my station for ten years I have come to the conclusion that from about every possible point of view, the use of stoves for heating the ordinary station of two waiting rooms and an office is a failure.

If a small basement were made under the building just large enough for a furnace, a coal bin, and an ash heap, with a coal chute from the platform and a window in the rear for getting the ashes out, the plan would prove decidedly better. If a furnace, made upon the plan of the present stove, solid and substantial but cheap, were to be installed, the first cost would not be a great deal more than the cost of the three stoves with their pipes and chimneys, and this difference would be quickly made up in the fuel saved.

Not so much coal would be burned; not so much time required to keep the fire going; less fire risk from one chimney than from two; no ashes on the floor, and less smoke and soot on the walls. The rooms would have a more up to date appearance, space in the office and waiting rooms would be saved, and the comfort of passengers and efficiency of the service would be increased.

Three separate fires for the three rooms are too many. They burn too much coal, and in many cases employees will not keep them up properly. If the fire in the office is going all right and they are comfortable, they do not worry about the waiting rooms. I have noticed this at many offices, more especially at night when the agent is not on duty to see how things are attended to. Many times, too, during the daytime, when the agent or man on duty is very busy he unintentionally overlooks the fact that the fire in the waiting room is getting low until it is out; and usually about that time someone leaves the outside door open and the room becomes cold in a very short time, giving just cause for complaint. If the fire that kept the office warm also warmed the waiting rooms he would not forget it.

The station stove is an old offender in the way of throwing out dirt. It is almost impossible to avoid having more or less ashes and coal dust on the floors. It is also out of the question to keep stoves properly blacked, as the polish will burn off in two or three days; and at their best they are not an ornament. The introduction of the furnace would do away with all of this dirt, and would give passengers the impression that the road was trying to keep up to date.

This plan could not be used at a station situated on ground so low that the basement would be flooded during rainy weather but I believe that the majority of stations are built at places where flooding could be avoided.

* Agent of the Chicago & North Western, Three Lakes, Wis.

SUNDAY TRAINS IN SCOTLAND.—An influential deputation of Scottish religious bodies waited upon the Caledonian Railway board of directors to press home the public outcry against the Sunday railway service which is to be inaugurated immediately. Sir Charles Renshaw, refusing the prayer of the petition, said the Scottish railways had not by any means moved rapidly in the direction of developing Sunday traveling. The public demanded it, and, as Glasgow cars had long since given these facilities and citizens had not objected, there was no reason why railways should not share in the traffic.

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SUPERHEATING AND FEED WATER HEATING.*

Theoretical Discussion of These Features in Various Combinations Checked by Results on Egyptian State Railways.

By F. H. Trevithick and P. J. Cowan.

The tendency in recent years to increase trainloads and average speeds has, in the main, resulted in larger locomotives. By putting proportionately more weight into the boiler, the evaporative capacity has been increased, and, since boiler capacity limits the tractive effort at anything above low speeds, this has been quite a logical development. The same provision, at equal loads, results in increased economy, since the rate of firing is brought down to a point where the boiler efficiency is greater.

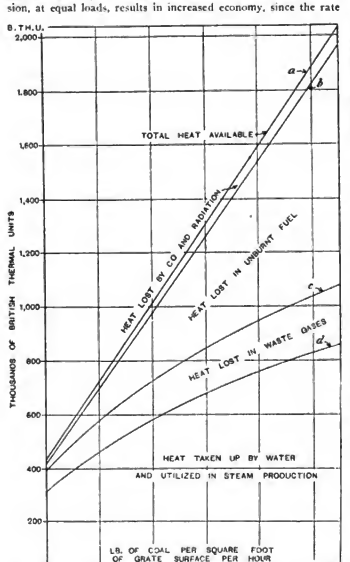

Fig. 1—Heat Utilized and Lost at Different Rates of Firing, Based on the St. Louis Tests (Series 200).

Fig. 1 shows the nature of the losses of heat in steam production in the form of a diagram of heat available, taking 14,500 B. t. u. as a typical calorific value for the coal. The line *a* represents the total heat available in the fuel at any rate of firing per square foot of grate area per hour. This diagram is merely typical. A comparison of numerous published results shows that it may fairly be taken to be so.

In locomotive operation, engine output, steam output, rate of firing, draft, smokebox temperature and other factors are interdependent. Engine output for a large part of the range of working is limited by boiler output, which is dependent upon the rate of firing. This, in its turn, depends on draft,

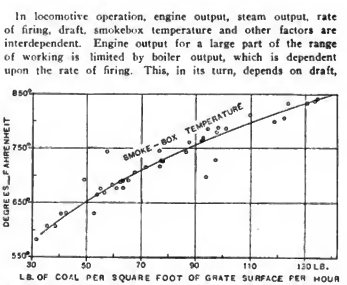

Fig. 2—Relation of Smokebox Temperature to Rate of Firing.†

which, other conditions being unaltered, is a function of the steam exhausted. The vacuum in front of the diaphragm in American engines is often twice as intense as that behind it.

The net loss of heat in the waste gases is dependent upon their quantity and specific heat and the smokebox temperature. In quantity the waste gases increase with the rate of firing, though the amount of gas per pound of fuel burned tends to diminish. The manner in which smokebox temperatures increase with the rate of firing is shown in Fig. 2. The St. Louis tests on modern large boilered engines show lower temperatures than the Purdue tests represented in Fig. 2. The specific heat of the waste gases increases with smokebox temperatures. As a net result of the combination of these three factors, the proportion of the loss in the waste gases to the heat available in the coal gradually falls, but in amount increases with the rate of firing

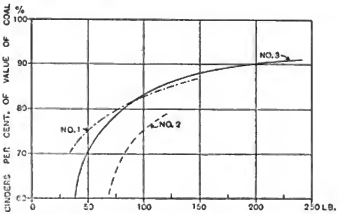

Fig. 3—Relation of Calorific Value of Cinders Passing Through the Boiler Tubes to Rate of Firing.‡

*Abstract of a paper presented before the Institution of Mechanical Engineers (London), March 14, 1913.

†Values are from Goss' "High Steam Pressures in Locomotive Service" (Youghiogheny coal).

‡Values for No. 1 are taken from Goss' "Superheated Steam in Locomotive Service" (Pocahontas coal); No. 2, for Youghiogheny coal; No. 3, from "Locomotive Sparks" (Brazil black coal).

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Of the loss by unburnt fuel, part, occurring at the grate, is not usually preventable, except such as arises from inexpert firing. The larger portion of this loss is involved with rate of firing has on the relative amounts of the smokebox cinders, and those passing out of the stack, but it appears probable that so long as the smokebox capacity is not taxed,

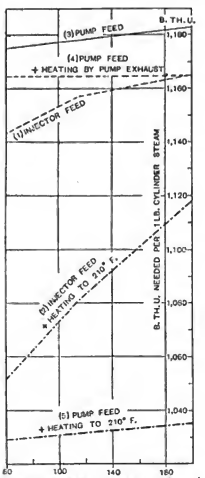

Fig. 4—Saturated Steam Boiler Output in B.t.u. Necessary with Various Conditions of Feed for Each Pound of Steam Used in the Cylinders.

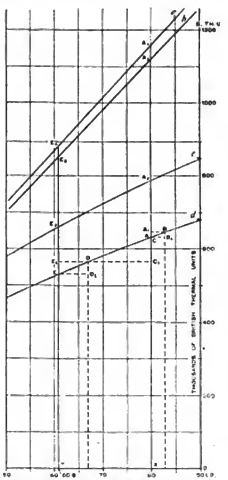

Fig. 5—Diagram Showing the Economy of Feed Heating to 270 Deg. Fahr.

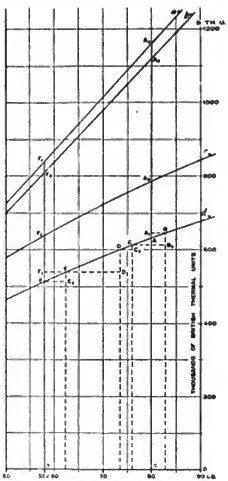

Fig. 7—Diagram Showing the Economy of Feed Heating to 210 Deg. Fahr., Combined with Superheating by Waste Gases to 85 Deg. Fahr.

engine output and draft. The greatest loss is traceable to the quality and quantity of the smokebox cinders, and of those passing out of the chimney. Both these increase with the rate of firing. It is not possible to state definitely what effect the

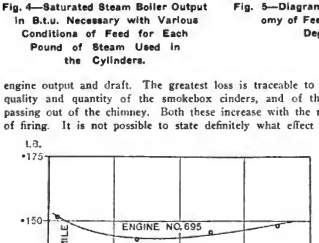

Fig. 6—Coal Consumption per Ton-Mile for Engine 711 (Feed Heating to 270 Deg. Fahr.) and Engine 695 (Non-Heater).

the smokebox cinders are greater in amount than those passing out of the chimney when the work is light, and that when the engine is forced, those emitted from the chimney exceed those retained in the smokebox.

An idea of the way in which the calorific value of these cinders increases with rate of firing is given by Fig. 3. The curves are for three different kinds of coal. Their value is thus high, being shown to be about 90 per cent. of the original value of the coal at the highest rates of working. In the St. Louis tests the highest calorific value found for smokebox cinders was 95 per cent. of the value of the original coal, and for the cinders ejected 87.6 per cent. of the coal value. The average for all tests was for smokebox cinders 80.7 per cent., and for cinders ejected through the chimney 72.5 per cent. of the original value of the coal.

The facts which show so rapid an increase in the boiler losses at the higher rates of firing emphasize the statement already made that improvement will be realized if the necessary output can by some means be secured at a reduced rate of firing. Two processes which meet this requirement are feed-water heating and steam superheating.

FEED WATER HEATING.

For feed-heating agents, providing a direct saving of otherwise waste heat, there are available the exhaust steam and the

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waste gases passing out of the chimney. If these agents are used in series, heating by the waste gases must be accomplished last. As the process may be arranged to result in temperatures being reached at which even the so-called hot water injectors will not work, its successful adoption involves a reconsideration of the feeding system generally.

The ordinary injector will not pick up water above about 120 deg. to 125 deg. F., and the feed water cannot, therefore, be effectively heated before it reaches the injector, while the admixture in that apparatus of live steam with the feed, so raises the temperature of the latter that full advantage cannot be taken of subsequent heating by either of the agents available. An injector may feed into a boiler at 180 lbs. about 11.2 lbs. of water for every pound of steam used. If the supply be at 65 deg. F. the delivery will be about 160.5 deg. F. This increase is not an economic gain. Delivery falls off as the boiler pressure rises, and the temperature of delivery is higher at the higher pressures. Subsequent feed heating is of less advantage now than it would have been when pressures were lower.

For each pound of steam used in the cylinders (1 + a fraction) must be produced in the boiler, from the temperature of the injector discharge, in order to supply both the engine and injector. The B. t. u. thus to be produced are given for various pressures in Fig. 4, by curve 1, which is based on data published by S. L. Kneass.* If, subsequent to delivery from the injector, the feed be heated by the cylinder exhaust to 210 deg. F., the boiler work is reduced, as denoted by curve 2. The work needed increases with the boiler pressure. Heat can further be transmitted from the waste gases, and an average feed temperature of 280 deg. to 290 deg F. obtained, but compensation can in no way be secured for heating during part of the process with live steam.

At modern pressures the ordinary exhaust injector shows a thermal saving over the live steam injector of some 9 per cent. The supplementary portion of the exhaust injector is handicapped by the water fed to it being already at a high temperature (about 180 deg. F.). Its steam consumption is thus high, and the final temperature of discharge is about 280 deg. F. Additional feed heating is thus impracticable, even by the waste gases. The only gain procurable with this injector is that due to the use of part of the exhaust steam; this, however, may exceed the thermal gain of 9 per cent. or so. In a more recent form of exhaust steam injector the efficiency of the exhaust steam jet has been improved, and much less supplementary live steam is needed. Though the thermal position is the same with both types, the discharge temperature is thus lower with the later pattern. The final temperature with the later type is 195 deg. F. compared with 280 deg. F. with the earlier, and further feed heating is practicable.

The pump offers advantages over the injector in connection with feed heating, since, with it, the feed temperature is not increased in the process of raising the pressure, and the temperature head is sufficient for the effective transfer of heat to the pump delivery, successively from the exhaust steam and the waste gases. On account of the sudden demands which a locomotive feed pump is called upon to meet, such an appliance should be arranged to work with water at moderately low temperatures, and the greater part of the feed heating process should be carried out between the pump and the boiler check valve.

Independent steam pumps suitable for locomotive work will deliver 100 lbs. of water for about 1.5 lbs. of steam, working at and against 180 lbs. pressure. Curve 3, Fig. 4, shows the B. t. u to be provided by the boiler for each 1 lb. of steam delivered to the cylinders, using pump supply and feed at 65 deg. F. Curve 4 shows the work required if the pump exhaust be utilized for feed heating, about the same amount being required at all pressures. The pump and injector are then on an equal footing at modern pressures. Heating, further, by the main cylinder exhaust to 210 deg. F., reduces the boiler work to the amounts shown by curve 5. This system has a considerable advantage over the injector feed combined with heating to 210 deg. F. (see curve 2), and this is maintained if the feed heating be carried still further.

*"Practice and Theory of the Injector." (Wiley.)

SUPERHEATING.

In superheating, a final benefit may be due to different causes according to the system. In one system the heat in the waste gases discharged from the boiler is utilized to raise the temperature of the steam. In another a directly fired superheater is employed, commonly incorporated for convenience in the boiler, in order that one grate may serve both.

Contrary to general experience in other branches of steam engineering, and also in conflict with testimony from many railways, it has been maintained that waste-gas superheating effects little or no benefit in locomotive work. This system combines improvements in two directions, namely, in the efficiency of steam generation and in the engine's consumption. The gain in generation has been commonly ignored or actually denied so far as locomotive work is concerned, while the engine gain has been fairly generally admitted. A true waste-gas superheater forms an adjunct to the ordinary boiler. Its installation should not disturb the heating capacity of the boiler, nor altar its efficiency. The over-all efficiency of the generator is improved, the proportion of heat available in the coal, put to use, being increased.

Directly fired superheater locomotives, using superheat from 100 deg. F. upwards, which can lay claim to no improvement in the efficiency of steam generation, but rather suffer in an adverse sense, admittedly prove satisfactory in service. There appears, therefore, to be no valid reason why the waste-gas heating system, with which superheat of about 90 deg. F. can be obtained, should not likewise give good results. The difference between the temperatures just cited is more than made up by the higher over-all efficiency of the combined waste-gas heater and boiler.

It is difficult to determine the economical position of the directly fired superheater installations of the moderate degree or high degree types, as applied in locomotive service. For the generator efficiency to be undiminished, no more heat must be lost from a superheater boiler than in the ordinary boiler. In some installations the average amount of heat absorbed through the smoke-tube superheater surface may about equal, as far as can be gathered, the average amount transmitted through the water-heating tube-surface. This may be so in the double-loop high-degree type in which high steam velocities are used, and the ends of the loops are brought fairly near the firebox. Locally, transmission is then very great and the average is high. With the single-loop types giving moderate degrees of superheat, the elements are often short and the speeds low. The transmission, at the best, is then comparatively low, and, on the average, lower than that of the water-heating tube surface. As regards efficiency of steam generation, therefore, the combination of the waste-gas superheater and boiler ranks first. Probably the ordinary boiler ranks second and the high degree smoke-tube superheater boiler third, but this does not appear yet to have been definitely determined; it is possible their relative positions are not the same at all powers. Last of all stands the moderate degree smoke-tube superheater boiler.

Though the above aspect of superheating is often treated with indifference, it is generally conceded that there is more or less saving in steam at all degrees of superheat. Even with no superheat the use of a heater may reduce the feed necessary, if the steam normally sent over is wet. Part of the economy shown on road tests undoubtedly arises from this. With any temperature above that corresponding to dry steam, there is an improvement in the engine. This has been determined in road tests, and also on testing plants. Dr. Goss and others responsible for the work at Purdue University have concluded that steam consumption falls with increasing superheat. This determination is naturally only approximate. The data issued from Purdue con-

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stitute the only records yet published, showing the effect of progressive superheat on steam consumption in locomotive service. As regards coal consumption, however, they do not fairly indicate the possibilities of moderate superheating (though it is sometimes held they do), since they do not embrace investigations with the more efficient installations of that class.

COAL CONSUMPTION.

Feed-water heating and superheating may be employed in various arrangements or combinations. For moderate feed-heating, the pump exhaust and part of the main cylinder exhaust are used. The former raises the feed temperature by 25 deg. to 30 deg. F., the latter to about 210 deg. F., or slightly more. High degrees may be attained by continuing the process with a smoke-box heater in series. Temperatures of 280 deg. to 290 deg. F. may thus be reached, with even 360 deg. F. for short supplies feeding to a boiler working at a pressure of 180 lb. The smoke-box heater may be used alternatively for moderate superheating, when a superheat of about 90 deg. F. may be secured. Thus feed-heating to 210 deg. F. and moderate waste-gas superheating may be combined. Finally, with the smoke-tube type of superheater, moderate and high degree feed-water heating may also be adopted.

High Degree Feed-Water Heating.—Unless conditions are unfavorable, feed-heating is purely a gain to the boiler. If an engine be overrated, hot feed may be accompanied by the production of somewhat drier steam. The effect of feed-heating may be studied by the aid of Fig. 5, which is part of Fig. 1 to an enlarged scale.

Taking, as typical, a rate of firing of 80 lbs. per square foot of grate area per hour, by the scale, AX, the amount of heat utilized in steam production is 632,000 B. t. u. This is equivalent to the evaporation of 591 lbs. of water from and at 160.5 deg. F., the temperature of discharge of the injector with supply at 65 deg. F., and boiler pressure at 180 lbs. Dividing this in the proportion of 11.2 to 1, gives 542.57 lbs. as the steam taken by the engine, and 48.44 lbs. as that used in working the injector. For a pump-fed engine (with supply at 65 deg. F.) to develop the same power, the same number of pounds of steam must be furnished to the cylinders. This requires 542.57 (1197.7 — 33.07) = 631,890 B. t. u., 1197.7 representing the total heat in steam at 180 lbs. pressure, and 33.07 that in the water at 65 deg. F., both above 32 deg. F. The pump consumption will be taken as 2.2 lbs. of steam per 100 lbs. of water delivered, and therefore (542.57 × .022) lbs. = 11.94 lbs. of steam are needed for the pump, equivalent to a demand on the boiler of 13,910 B. t. u. The total number of thermal units to be generated is thus (631,890 + 13,910) = 645,800 B. t. u. This is supplied in stages, namely, by the pump exhaust heating by 25 deg. F., or to 90 deg. F.; by the main cylinder exhaust to 210 deg. F.; by the waste-gas heater to, say, 270 deg. F. (a temperature easily reached); and finally by the boiler. The total heat supplied per 1 lb. of steam is (1197.7 — 33.07) = 1164.63 B. t. u. Of this, therefore, the pump exhaust furnishes (58.0 — 33.07) = 24.93 B. t. u.; the main exhaust (177.99 — 58.0) = 119.99 B. t. u.; the waste gases supply (238.8 — 177.99) = 60.81 B. t. u.; and the boiler furnishes (1197.7 — 238.8) = 958.9 B. t. u. The total heat is supplied to the engine and pump as follows:

TABLE I.—HEAT SUPPLIED WHEN FEED-HEATING TO 270 DEG. F.

Source of Heat.	Proportion of total supplied.	B. t. u. supplied — To Engine.	To Pump.	To Engine and Pump.
Pump exhaust heater	24.93 / 1164.63	13,530	300	13,830
Main cylinder exhaust heaters	119.99 / 1164.63	65,100	1,430	66,530
Waste-gas heater	60.81 / 1164.63	32,990	730	33,720
Boiler	958.9 / 1164.63	520,270	11,450	531,720
Totals		631,890	13,190	645,800

Instead of 632,000 B. t. u. to be supplied by the boiler in the injector-fed engine, coal has now only to be burnt to furnish the reduced supply of 531,720 B. t. u. Following this out in Fig. 5, the requirements have first to be increased from A to A_1 (= 645,800 B. t. u.), on account of the substitution of the pump for the injector. This corresponds to a point B on the curve ϕ. The use of the pump-exhaust reduces the demand by 13,830 B. t. u., namely to B, and C, or slightly below the original point for the injector-fed engine. The main exhaust furnishes a further 66,530 B. t. u., and the demand is brought down to C_1 and D, and again of this 33,720 B. t. u. (DD_1) is derived from the waste gases, leaving EY (= 531,720 B. t. u.) to be provided by the boiler itself. The rate of firing which will produce this is 60.8 lbs. per square foot of grate area per hour, compared with the original 80; a saving of 24 per cent, is thus indicated for the system.

The diagram shows how this comes about, supposing smoke-box conditions to remain normal. The heat represented by DD_1 is drawn from the waste gases. This length may, therefore, be set up over E at EE_2. Then E_1E_2 represents the final loss in the waste gases compared with the original AA_2, that is, 96,000 B. t. u. instead of 156,000, or a reduction of 38.5 per cent. in this loss. The loss by unburnt fuel has been reduced from A_2A_1 (332,000 B. t. u.) to E_1F_1 (193,000 B. t. u.), a reduction of more than 41.5 per cent. The proportion of the heat utilized, to the total available, has been greatly increased. The savings by feed-heating are, in locomotive work, on a rather higher scale than in other branches of steam engineering.

Trials of this system were made on the Egyptian State Railways. Engine 711, with heaters, ran against a sister engine, 695, without heaters, on expresses between Cairo and Alexandria (130 miles), the fastest timing being 3 hours with two intermediate stops. The ton-miles accomplished were 1,939,847 by engine 711 and 1,926,054 by engine 695. The average coal per ton-mile worked out at 0.1116 lb. for 711, and 0.1450 lb. for 695—a saving of 23 per cent. for the heater engine. The results of the trials are shown in Fig. 6. The consumption of the non-heater engine increased much more rapidly with the loading than did that of the heater engine. The economy shown by the latter improves at the heavier loads.

The service data for engines in regular service confirm all trials made with this system. Table II gives such records for engines 711 and 677 and non-heater engines.

The large difference between 711 and sister non-heater engines is probably in part due to 711 being constantly used for investigation work, and being kept in first-class order. Coal was also most likely booked to it more carefully than it would otherwise have been. The figures for 711 with and without heaters are fairly comparable. Engine 677 is of another class. An all-round improvement in this case of 18 per cent. is shown for the heaters, but if the comparison be confined to periods of like climatic conditions (an important point when work in a country such as

TABLE II.—SERVICE WORKING OF FEED-HEATER AND NON-HEATER ENGINES.

	Engine 711 without heaters.	Engine 711 with heaters.	29 Sister Engines without heaters.	Engine 677 with heaters.	Engine 677 without heaters.
Average load, tare behind tender	249.6	281.6	231	280	278.4
Average lbs. of coal per mile	41	35.9	40.2	37	45.1
Average lbs. of coal per ton-mile	0.1643	0.1376	0.1749	0.1322	0.1622
Difference in favor of heaters on coal per ton-mile		0.367 lb.	0.0473 lb.		0.031 lb.
Ditto Per cent.		22	27		18

Egypt is being considered) this engine, fitted with heaters, showed an improvement of 20.5 per cent. over working without them.

Considering the modified smokebox arrangement, the result shown for the trials of 711 (an economy of 23 per cent.) is in remarkably good agreement with the saving indicated by the method of Fig. 5. If part of the exhaust steam be efficiently employed in raising the feed to temperatures approaching the maximum, its utilization in this manner is productive of more economical working than its use in the blast would be, in maintaining a higher smokebox vacuum.

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Moderate Degree Feed-Heating and Moderate Superheating by Waste Gases.—With supply at 65 deg. F. the pump-exhaust warms the feed to 90 deg. F., and part of the main cylinder exhaust subsequently carries it to about 210 deg. F. The waste-gas heater gives superheat of about 90 deg. F. on a boiler pressure of 180 lbs. per square inch. For the sake of moderation 85 deg. F. will be taken.

This degree of superheat reduces the steam consumption by about 9 per cent. Instead of the 542.57 lbs. necessary in the previous case, only 493.74 lbs., therefore, need to be supplied to this engine for the same work. Each pound contains, however, 1215.33 B. t. u. above 65 deg. F., and the total heat to be supplied for engine purposes is now (493.74 × 1215.33) = 600,060 B. t. u. The pump requires (493.74 × 0.022) = 10.86 lbs. of steam, which, taken from the dome, is saturated. This represents (10.86 × 1164.63) = 12,650 B. t. u., and the total engine and pump requirements amount to 612,710 B. t. u., supplied as in Table III.

In this case coal has only to be burnt to supply the 514,560 B. t. u. demanded of the boiler (see Fig. 7). As before, the demand is first increased from A to A_1 by the adoption of the pump. From the corresponding point B on the curve *d*, superheating reduces the total demand to B_1 and C (612,170 B. t. u.). Thence to C_1 and D (600,130 B. t. u.) the demand is lowered by the use of the pump-exhaust, and to D_1 and E (539,590 B. t. u.) by the main exhaust heaters. The superheater completes the process by relieving the boiler of duty equal to 25,030 B. t. u., and the demand is brought down in this way to E_1 and F (514,560 B. t. u.), corresponding to a coal rate of 58.1 lbs. per square foot of grate per hour, compared with the original 80 lbs., or a saving of nearly 27.4 per cent.

TABLE III.—HEAT SUPPLIED WHEN USING MODERATE FEED-HEATING AND MODERATE SUPERHEATING.

Source of Heat.	Proportion of Total.	B. t. u. supplied—To Engine.	To Pump.	To Engine and Pump.
Pump exhaust-heater	24.93	12,310		12,580
	1215.33			
	24.93		270	
	1164.63			
	119.99			
Main exhaust-heaters	1215.33	59,240		60,540
	119.99		1,300	
	1164.63			
	1019.71			
Boiler	1215.33	503,480		514,560
	1019.71		11,080	
	1164.63			
Superheater	50.7	25,030		25,030
	1215.33			
Totals		600,060	12,650	612,710

EE_1 and FF_1 represent heat taken from the waste gases in superheating, and the loss in these gases is reduced from AA_1 (156,000 B. t. u.) to F_1F_1 (102,500 B. t. u.)—a saving of 34.3 per cent. The loss by unburnt fuel is restricted to F_1F_1 (173,000 B. t. u.) in lieu of A_1A_1 (332,000 B. t. u.)—a fall of 48 per cent.

Among others, two long series of trials of this class of installation have been conducted on the Egyptian state railways. The heaviest scheduled trains between Cairo and Alexandria, having average speeds, deducting for stops, of between 42.4 and 43.3 miles per hour, with loads usually above 330 and frequently over 400 tons tare behind the tender, were worked. The heater engine 706, five sister engines without heaters, and one engine of the same class (712, as then fitted) with a high degree superheater and piston valves, were all run in one link working with three De Glehn compounds. Coal was dealt with as before described, but the records were kept for over-all service working, and not as in the trials there alluded to, for running time only. The figures in Table IV, therefore, include lighting up, and some unavoidable light mileage, the latter, however, being negligible. In all these trials the checking of the coal was officially carried out by the stores department and by representatives of the general manager. The provision of the coal in sealed sacks effectually prevented the favoring of any engine with selected coal. On these railways the stores department is always responsible for the coal until it is actually on the tenders.

Engine 706 proved the most economical of the whole link, and showed 30.8 per cent. economy over the non-heater engines, and handled throughout the heaviest trains. It showed an economy of 20 per cent. on the De Glehn compounds. The difference between the 30 per cent. economy shown in these trials and the 27.4 per cent. deduced by means of Fig. 7 may be due to several causes. The average superheat may be nearer 90 deg. F. than the 85 deg. F. taken above, or the saving indicated by the Purdue tests may not quite coincide with the actual saving, or again the difference may be due to excessive moisture in the steam produced in the ordinary engine.

Another test is interesting, though made with a lighter class of engine, fitted with a type of installation since greatly improved upon. On light trains, with three stops only, the non-heater engines took 36.7 lbs. of coal per mile and the heater engines took 28.4 lbs. For similar trains, with thirteen stops and seven slacks, the consumptions were 42.9 lbs. and 33.5 lbs. respectively, the heater engine taking 5.1 lbs. extra per mile, but the non-heater 6.2 lbs. extra. For the heavy trains the difference is increased. For trains of 337 tons tare behind the tender, the non-heater engines took 38.4 lbs.; as against 47.1 lbs., a difference of 8.7 lbs., while the heater engines took 30.6 as against only 34.4, a difference of 3.8 lbs.

TABLE IV.—TRIALS OF MODERATE FEED-HEATING COMBINED WITH MODERATE SUPERHEATING.

Engine Nos.	697, 713, 712, 720, 721.	706.	669, 674, 675.
System.	Ordinary.	Heater.	De Glehn.
Average load tare behind tender	328.0	336	333.5
Coal consumption, average lbs. per mile	47.7	33.8	42
Economy in favor of Engine No. 706	29.2%	19.8%	
Coal consumption, average lbs. per ton-mile	0.1453	0.1005	0.1261
Economy in favor of Engine No. 706	30.8%	20.25%	

High Degree Feed Heating and High Degree Superheating.—Owing to the lack of sufficient data it is not proposed to go at length into calculations regarding this combination. It is not known how far the curve *d*, Fig. 1, agrees with the performance of a combined high-degree superheater and boiler. Further, when high-degree feed heating is combined with superheating, the superheater is reduced, but to what extent is yet uncertain. Also, superheater engines are commonly fitted with piston valves, to which part of their performance should rightly be credited, instead of the improvement being wholly imputed to the superheating system.

If, however, superheating to 200 deg. F. with feed heating to 200 deg. F. be considered, using the curve *d*, Fig. 1, as the basis, the following results are shown: For this superheat 21.15 per cent. steam economy will be obtained. The original 542.57 lbs. of engine steam would therefore be reduced to 427.82 lbs. and the heat needed would be 427.82 (1.307-33.07) = 545.010 B. t. u. The pump takes saturated steam representing (427.82 × 0.022 × 1,164.63) = 10,960 B. t. u., the total being 555,970. Subdividing this among the pump heater, the main exhaust heaters, the smokebox heater, and the superheater and boiler, it is found that 457,050 B. t. u. have to be provided by the superheater and boiler. The point on the curve *d* corresponding with this represents a rate of firing of 49.1 lbs. per square foot, as against 80, or a saving of 38.64 per cent. The loss in the waste gases has been reduced 57 per cent., and that by unburnt coal 75 per cent. These large savings seem to be substantiated in practice.

A smoke tube superheater, giving 200 deg. F. superheat, may not be considered to be representative of usual practice, but the figure is chosen because of the unavoidable fall of superheat already referred to. With the lessened boiler duty the intensity of draft is reduced, and as, for a wide range, superheat varies approximately as the draft, a drop on conversion is natural.

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On the Egyptian state railways an engine, 712, giving about 200-220 deg. F. superheat before conversion, gave after the addition of the feed water heaters superheat of about 150 deg. F. Nevertheless the results proved very satisfactory.

Engine 712 was run against the heater engines 706 and 714, and, compared with them, with average tare loads behind the tender of 346.8 tons, showed a consumption of only 27.7 lbs. per mile or 0.0798 lb. per ton mile; this is an economy of 20.0 per cent. over the heater engines 706 and 714. In the 1911 trials engine 706 worked at exactly the same consumption as during this latter period, and the consumption of engine 712, fitted with the high degree feed and high superheat combination, may, in default of more direct means, be compared with that which the non-heater engines then showed. If running at an economical load, engine 712 would thus show an economy of 45 per cent. over sister non-heater engines.

Direct comparison being impossible on the heavy workings, engine 712 was transferred, for a short time, to a link of lighter trains handled by the non-heater engines. On these trains, however, engine 712 was underrated and was not working at its best. It averaged, for trains of 262 tons tare behind tender, 0.0952 lb. per ton mile, against the average for several non-heater engines of 0.1528 lb. on trains of 256.5 tons load, or an economy of 37.7 per cent.

ECONOMICAL FEATURES OF THE SYSTEMS.

The use, in all the heater systems here dealt with, of part of the cylinder exhaust for feed heating, is equivalent to an enlargement of the exhaust tip. The volume of steam driven through the orifice is diminished by over 12 per cent. Again, enclosing the blast in a comparatively small chamber, as in the later Egyptian state railways systems, increases the inducing action and results in comparatively high vacua with a larger nozzle than is used in the standard engine. In the latter a tip of 4½ in. is used above the netting, and produces in front of the tube space a vacuum of about 6 in. in normal working. With the high degree superheat system alone, as fitted to engine 712, it was necessary to reduce the tip from 4½ to 4⅛ in. to obtain a proper vacuum with the reduced quantity of steam then used. Since fitting the feed-heaters to this engine the blast pipe has been again enlarged to 4½ in., and as part of the exhaust is used for feed heating, it is now virtually one 4⅛ in. in diameter for about 15 per cent. less steam than passes through the standard tip of the ordinary engine. The size to which this 4½ in. tip actually corresponds is thus about 5 in. in diameter. With these exhaust tips a vacuum of from 6 in. to 8 in. is obtained in the small blast chamber. This is reduced by the resistance offered by the heater tubes, and there is a vacuum in the smokebox proper of from 2 in. to 3 in. compared with 6 in. or more in the ordinary engine.

The lighter draft just considered results in less loss in unburnt fuel. The Egyptian state railways' engines show, progressively, less accumulation of cinders in the smokebox with increased economy. The reason why the heater engines show greater economy over the ordinary engines when on stopping trains than when on fast non-stop expresses, is connected with the blast and heater. The smokebox heater offers some resistance to the flow of the gases, and has the effect of damping the heavy pulsations of the blast when the engine is working at or near full gear. The fire is not lifted in the same way; the loss of coal is thus reduced.

RAILWAY ACCIDENT IN MACEDONIA.—On May 23 a collision occurred at a junction of the railway between Poroi and Andjista as the result of which two engines were completely ruined. The accident is said to have been due to an error either of the Bulgarian military station master at Poroi or the station master at Andjista, and it is reported that the one who was held to be responsible has been shot by order of Colonel Ivanoff, the inspector of Bulgarian Railways. Discipline in Macedonian railway service is rather abrupt.

SIX PASSENGERS KILLED AT STAMFORD.

In a rear collision of passenger trains on the New York, New Haven & Hartford at Stamford, Conn., at 5 p. m. on Thursday, June 12, six passengers were killed and eighteen injured; and the criticisms of the management of the road which filled the newspapers last October on the occasion of derailments at Westport and other places have been renewed with increased vigor.

The trains in collision were the first and second sections of westbound express No. 53. The first section had stopped to change engines, and while standing was run into by the second section at about 20 miles an hour or faster; and the rear car of the first section, a Pullman parlor car, well filled, was ripped open for more than half its length. All of the killed were in this car. The other cars of the train were not seriously damaged. The parlor car was of wood, and criticisms of the company for not introducing steel cars more rapidly were heard on every hand.

The collision was due to failure of the engineman of the second section, Charles J. Doherty, to control the speed of the train. He and his fireman were unhurt and testified before the coroner at Stamford on the 13th. Doherty said that the air brakes, when applied, failed to reduce the speed. The train consisted of a new Pacific type locomotive, No. 1338, and 8 cars. The engine weighs about 126 tons. Doherty was a spare runner and had run this train only 3 days; and until June 10 had run passenger trains altogether only about 4 days since he was promoted, which was in March, 1912. He is 33 years old, of good character, and an abstainer from liquor; has a perfect record as fireman 10 years, and spare runner about 1½ years, all on the New Haven road.

From the testimony of Doherty before the coroner and from statements of officers of the road to the newspapers we gather the following summary:

Doherty had found on a former trip (Tuesday) that the brake apparatus on the engine apparently was not in proper condition, "the brakes did not hold"; he had entered the fact on the proper book, but nobody had taken any action about it. He had mentioned this difficulty to other runners and got the reply that all of the new engines of that type had been subject to the same complaint. The road foreman had warned him that with the new engines, on account of their weight, it was necessary to apply brakes earlier than with the smaller engines. Doherty had overrun the platform at Bridgeport on Tuesday, and later on the same day, at South Norwalk, because of danger of running over a child, he had strained his back in reversing the engine, so that on Wednesday he worked only a half day. He came on duty Thursday with plasters on his back because of the strain. The fact that he had been off, sick, for half a day was not noticed by any superior or inspector. In the Stamford emergency, after it was plain that the brakes would not stop the train soon enough, he tried to reverse, but found his strength insufficient. Some difficulty with the reversing gear appears to have existed from the time the engine was put in service.

The distant signal at Stamford is about 2,100 ft. back of the home (the home was close to the standing train) and was properly observed. At this point in the hearing Doherty's testimony is not clear; the most that can be made out is that the line of the road is straight and the grade slightly descending; that he shut off steam before reaching the distant signal and that on finding the home signal against him he could not make the brakes hold; in short that the speed was not reduced soon enough. When within a few hundred feet of the standing train Doherty sanded the rails, and motioned frantically to a couple of trainmen standing on the ground near the rear car of the train ahead, to move that train forward. Doherty's train broke apart, behind the third car, a few hundred feet before striking the standing train, and the rear portion stopped 200 ft. or 300 ft. back of the leading portion.

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Doherty said that another engineman, John Harmon, running the same train, had been suspended three days before for running past a stop signal at South Norwalk.

Doherty was held by the coroner on a charge of manslaughter in $5,000 bail on Friday, bail being furnished by his wife's brother, J. H. Dillon, of New Haven.

C. N. Woodward, general superintendent of the road, testifying before the coroner on Saturday, said that within the last six months 30 enginemen had been discharged for running past signals; this notwithstanding that there had been a campaign of education, in which the majority of enginemen took a lively interest, and in which the officers of the road had spent a great deal of time in talking with and educating the men. He could not explain the hard luck that apparently had visited the road.

C. F. Carroll, road foreman of engines, told the coroner that he had known Doherty for seven years; that he was a first-class engineer and a fine young man. Carroll himself instructed Doherty in running No. 1338. "I told him not to let her get away from him, as she was a new engine and pulled strong. He told me of being two minutes late one run, and I told him not to mind that, but to consider safety first of all. He also told me of his running by the signal at Bridgeport last Tuesday, and I told him why he did it."

"You mean he told you why, don't you?" the coroner asked.

"No, I told him why," replied Carroll. "I told him the reason was he came into the station like the devil and let her get away from him."

"Didn't he tell you the reason was that the air brakes weren't working right?" the coroner said. Carroll replied that Doherty did not say anything to him about the air.

Three enginemen who had had experience with No. 1338, including Harmon, who had been suspended on Monday, testified before the coroner. Harmon said that while he found the levers and especially the reverse lever hard to work, as might be expected, he did not attribute his running past the signal to that fact. He claimed that his air was all right, and that the trouble was that the distant signal was clear while the home was against him. All three of these enginemen testified that they had found no fault with the air.

On Saturday the New Haven road invited a number of men from other roads to come to New Haven to inspect the air brake equipment on engine 1338 and the cars of its train. These men are: P. J. Langan, chief air brake inspector of the Delaware, Lackawanna & Western; C. W. Martin, of the Pennsylvania Railroad; T. L. Burton, of the Westinghouse Company, and Charles E. Joy, chief inspector of the New Haven.

Mr. Dillon, Doherty's brother-in-law, who was the close companion of the engineer at the coroner's hearing said:

"Doherty came to me as soon as he could after the wreck. He was at my home when it was said he had disappeared. He wanted my advice. I took him in charge and shall remain in charge of him.

"I think that an engineer's story, free from the heart, has been told today for the first time. There was no advice that he misremember things or forget things. There was no previous rehearsing of his story. I saw that he came in contact with nobody until he faced the coroner, and that all suggestions that he 'come to the office,' of which five or more were made, were turned down."

The wrecked Pullman car, being worthless, was destroyed by fire at 11 p. m. on the 12th. The coroner complained of this and the officers of the road replied that there was nothing about the car which would be of any value as evidence concerning the cause of the deaths of passengers.

General Manager Bardo said that prior to March 1 last spare enginemen had been assigned to all trains, except limited trains, without special reference to their experience; but that since that date there is a rule that those men who have had less than one year's experience as runner shall not be assigned to through passenger trains.

On the 16th the coroner took testimony concerning the condition of the engine on the day when Doherty reported that the air brakes were not in good condition. It appears that the page in the book on which entries are made contains a printed list of questions relating to different parts of the engine. Doherty made notes against piston rods, water glass, and some other things, but against air brakes there was no entry; and the statement that the brakes were "no good" was made at the bottom of the page, under the head of "other work needed." Main reservoir pressure was given as 150, and the train line pressure as 110.

Doherty gives a somewhat different version of the conversation between himself and the road foreman which was referred to by the foreman at a previous hearing. According to Doherty the foreman recognized that the brakes on the new engines did not diminish speed satisfactorily.

Joseph J. Gash, the roundhouse man who attended to Doherty's report of engine 1338 on Tuesday, told the coroner that he had looked the brakes over and that they appeared to be all right; and he took no further action. He found that the piston and the air pump were all right and concluded that Doherty must have been mistaken in his statement that the brakes did not work satisfactorily.

The counsel for the road presented transcripts of a number of roundhouse records made at Springfield and New Haven which showed trips where engine 1338 had come in from passenger train runs and no complaint was made concerning the air brakes or other parts of the engine.

Engine No. 1338 weighs 251,500 lbs.; weight on drivers, 154,000 lbs.; weight of engine and tender, 384,100 lbs. The cylinders are 24 in. x 28 in.; diameter of driving wheels, 73 in.; boiler pressure, 200 lbs.; tractive effort, 37,558 lbs. The engine was built by the American Locomotive Company.

On Tuesday, June 17, eight experimental runs were made between Noroton and Stamford with the same train that caused the wreck—8 cars, 1 baggage car, a mail car, three day cars and three parlor cars, and the locomotive, the locomotive having been sufficiently repaired to be run. The air brake apparatus had not been injured and had not been changed since the day of the collision.

The grade of the road is slightly descending.

In the first trial the train was stopped from a speed of 64.5 miles an hour in 2,067 ft. In the second trial a reduction of 30 lbs. was made at once and the train was stopped from a speed of 55 miles an hour, in 1,994 ft. From a speed of 57.5 miles an hour with the emergency application of the brakes the train was stopped in 1,617 ft. The next run was made at 59.5 miles an hour, with a reduction of 15 lbs., followed by another of 15 lbs. The stop was made in 2,586 ft. In the next run the engineman, by order of the manager of the tests, attempted to duplicate the operations made by Doherty on the day of the collision, as narrated by him before the coroner. The speed at the time of the application of the brakes was 57 miles per hour. A 10 lb. reduction was made, then a 5 lb. reduction, and then full emergency application. The distance run was 2,567 ft., time 49.6 seconds, and the train ran about 350 ft. beyond the point where the collision occurred. We give these reports for what they are worth, but their value is questionable because of indefiniteness as to the exact location of the point where the brakes were applied, and also as to where they should be applied; that is to say, the accuracy of Doherty's narrative in that portion in which he tells where he applied the brake. Other tests are in progress as we go to press.

FLOOD DAMAGE IN NATAL.—It is estimated that the total cost of repairing the damage done to the railways in the province of Natal by the recent floods, and of effecting certain improvements with a view to reducing the possibility of similar damage occurring in future, would be $276,250, all of which will probably be charged to capital account.

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THE ELECTRIFICATION OF TRUNK LINE RAILROADS.

An Estimate of the Cost, of the Saving in Operating Expenses and in Upkeep That Would Show a Profit of 6.8 Per Cent.

By Charles P. Kahler,

Electrical Engineer, Oregon Short Line.

The great objection to operating many of the large steam railroads by electric power is the extremely heavy investment necessary for the electric apparatus and equipment. The ability of the steam locomotive to handle railroad traffic in a very reliable and expeditious manner is very well known.

Very little of the past work of steam railroad electrification was done on account of the financial return expected on the money so expended. The smoke trouble with steam locomotives has been one of the most important reasons for the past progress in heavy electric railroad work. Irrespective of what caused the past heavy electric railroad work, the actual operation of large electric locomotives showed that they could in some ways handle railroad traffic more advantageously than steam locomotives. The published records of the steam and electric locomotives of the New York Central, the New York, New Haven & Hartford, and the Pennsylvania, indicate that electric locomotives are probably even more reliable in operation than steam locomotives. The published records of these roads also indicate that the quantity of fuel required to generate power in a steam-electric plant for railroad operation is much less than the fuel required by steam locomotives in the same service, and the locomotive repair expense was found to be much less on electric than on steam locomotives.

Further, as the electric locomotives do not have to take fuel and water, nor have a boiler or firebox to be cleaned out, they are nearly always ready for service, and take less time to handle trains than steam locomotives, especially on long runs. The perfection of the multiple unit control has made the number of driving units which can be controlled by one man practically unlimited, and, consequently, it is possible to make the size of electric locomotives much greater than steam locomotives with the boiler limitations.

Another important point in connection with electric operation has been brought out by the great success of the interurban electric railways. The gasolene motor car and the gas-electric motor car would probably not have been developed were it not for the trolley lines taking local passenger business away from the steam railroads.

If roads were electrically operated, the weight of the freight trains could in most cases be made much heavier than possible by steam operation, on account of the characteristic of the electric locomotive to operate overload without dangerous overheating, long enough to get over the short heavy grade sections, and on this account the ruling grade of an electrically operated railroad will seldom be as great as the ruling grade of a steam operated railroad.

Only one engine crew would be required on helper districts where more than one electric helper locomotive is used, as two or more electric locomotives can be coupled together and operated as a single unit by one man, while with steam locomotives as many engine crews will be needed as there are steam locomotives used.

The locomotive is directly responsible for from 30 to 40 per cent. of the operating expenses of a steam railroad. At a speed of 16.5 miles per hour, which is only a little greater than the usual average speed of freight trains, the tractive power of a consolidated steam freight locomotive and an electric locomotive for freight service is the same. Above this speed the steam locomotive can exert a higher tractive effort than the electric locomotive, while below this speed the electric locomotive has the higher tractive effort.

The steam locomotive can exert the tractive effort of 15,000 lbs. at the higher speeds only for short intervals, on account of the inability of the boiler to continuously supply the necessary steam. On the other hand, the electric locomotive cannot continuously exert the high tractive effort at low speeds without overheating. The maximum tractive effort which can be continuously exerted by the electric locomotive with safety is 34,600 lbs. at a speed of 16 miles per hour. Below this speed the high tractive efforts can only be secured for certain periods of time. Thus, for one hour, 45,000 lbs. tractive effort can be exerted without overheating the motors, with the speed at about 14 miles per hour.

At starting, as much as 55,000 lbs. can be exerted by the electric locomotive, while the steam locomotive can, under favorable conditions, only exert a tractive effort of about 43,000 lbs. at starting. One of the causes of the higher power of the electric freight locomotive at starting is that all its weight, 220,000 lbs., is on the drive wheels, while although the steam locomotive with loaded tender weighs 185 tons, it has only 187,000 lbs. on the drive wheels. Also the coefficient of adhesion is greater for an electric locomotive than for a steam locomotive.

DESCRIPTION OF RAILROAD CONSIDERED.

Let us consider a single-track railroad constructed through a semi-arid region, similar to many parts of the West, which contains numerous irrigated and dry farm districts. The length will be taken as 467 miles, divided into three engine districts, respectively 167, 160 and 140 miles long, from the west towards the east, and will be referred to as engine district No. 1, No. 2 and No. 3, in the order named. The curvature averages about 12 deg. of central angle per mile and the ascents and descents of grade average 18 ft. per mile. The engine terminals will be referred to as No. 1, No. 2, No. 3 and No. 4, from west to east. It will be assumed that there is a helper district 9 miles in length for westbound trains on engine district No. 1 and also one of the same length on engine district No. 2 for eastbound trains, the foot of these helper grades to be located 11 miles west of and 7 miles east of terminal No. 2, and the helper locomotives of both districts to be hostled and taken care of at terminal No. 2. The limiting grades of the three engine districts are shown in Table II.

Table 1.

	Engine districts.			
	No. 1.	No. 2.	No. 3.	Total.
Miles of main track	167.5	160	140.5	468
Miles of side track	54.5	51	50.5	156
Total main and side track	222	211	191	624
Miles curved track	35	33	32	100
Degrees of central angle per mile	12	12	12	12
Maximum curvature, deg	6	4	4	6
Ascents and descents of grade per mile, ft.	14	22	18	18
Average grade, per cent.	0.14	0.21	0.17	0.17
Weight of rail per yard, lbs.	90	90	90	90

For steam equipment the through passenger trains are to be handled by Pacific type locomotives of 192 tons weight with loaded tender to handle from 5 to 14 coaches per train. The local passenger trains consist of a 110-ton locomotive with loaded tender baggage car, smoking car and day coach, all cars being of 45 tons weight. The freight trains are to be handled by consolidated locomotives of total weight with coal and water of 185 tons, and with 187,000 lbs. on the drive wheels. The local freight trains are to be handled by 130-ton locomotives.

For comparison of steam and electric operation, the above line will be considered as equipped with an 11,000-volt, single-phase, 15-cycle trolley, with 110,000-volt, 15-cycle high-tension

*Abstract of a paper presented before the American Institute of Electrical Engineers, New York, on May 20, 1913.

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line to supply power to 14 substations, the power to be received into the high tension system at terminal No. 3. The local passenger trains are to consist of two electric motor cars and one trailer, the through passenger trains to be hauled by 100-ton electric locomotives. The local freight trains are to be hauled by 85-ton locomotives, which class of locomotives will also be used in switching service. The through freight trains, both expedite and drag, are to be hauled by 110-ton locomotives.

The passenger traffic consists of six through trains per day, three each way over the entire road. On engine district No. 1 there will be four local passenger trains per day, two each way, while on engine districts Nos. 2 and 3 there will only be two local passenger trains per day.

The annual freight traffic over each engine district will be assumed as follows:

Engine districts.	Tonnage of cars and contents. No. 1.	No. 2.	No. 3.
Westbound:			
Expedite freight	800,000	700,000	800,000
Drag freight	1,700,000	1,700,000	1,600,000
Local freight	200,000	.....	160,000
Eastbound:			
Expedite freight	600,000	600,000	600,000
Drag freight	1,300,000	1,300,000	1,200,000
Local freight	100,000	.....	100,000

To determine the number of freight trains necessary to handle the above traffic, the maximum tonnage which the locomotives can haul over each engine district will have to be determined. For steam operation, this can be closely computed if the ruling and starting grades are known. Also a close approximation of the maximum tonnage by electric operation can be made if the average grades and their length are known, together with the maximum grades at starting.

However, the most accurate way of determining the maximum tonnage which can be hauled by a locomotive is to draw the velocity diagram for the limiting grade sections of the engine districts. This will also give an idea of the variety of conditions for which a locomotive of a trunk line railroad is used.

The limiting points are determined by the starting grades, the helper grades and the ruling grades. In computing the hauling capacity for steam locomotives, it is usual to make 10 miles per hour the minimum speed in order to allow for weather conditions, the personal equation of the engineer, and other variable conditions. Westbound steam freight trains of 2,040 tons get down to 10 miles per hour at about mile post 152, on the helper section, and hence the helper section limits the weights of steam freight trains. The starting capacity of the steam locomotive is also nearly reached with the same tonnage. For westbound electric trains, the starting grades limit the weight to 3,350 tons. The weight of eastbound steam freight trains is limited to 2,240 tons by the ruling grade, 0.55 per cent. The starting grades also will not permit a heavier steam train. The weight of the eastbound electric freight trains (2,470 tons) is limited by the long 21-mile grade from mile post 82 to mile post 111, which averages 0.45 per cent., the maximum grade in this distance being 0.6 per cent. It is on these long grades, where the electric locomotive operates on its continuous rating, that the steam locomotive compares most favorably with the electric locomotive. But even here the steam locomotive's hauling capacity is determined by the ruling grade, 0.55 per cent., which is very short, while the hauling capacity of the electric locomotive is determined by the average grade, 0.45 per cent.

The electric locomotive can haul from 50 per cent. to 60 per cent. greater tonnage than the steam locomotive over these engine districts.

Table 3 shows the number of freight trains per year necessary to handle the freight traffic given above.

TABLE 3—NUMBER OF FREIGHT TRAINS PER YEAR.

	Steam locomotive. West.	East.	*Total.	Electric locomotive. West.	East.	*Total.
Engine Dist, No. 1:						
Expedite trains	656	442	1,312	309	318	636
Drag trains	1,149	793	2,298	656	688	1,376
Local trains	400	400	800	400	400	800
Totals	.....	.....	4,410	.....	.....	2,812
Engine Dist. No. 2:						
Expedite trains	809	741	1,618	404	335	808
Drag trains	1,417	1,300	2,834	859	727	1,718
Totals	.....	.....	4,452	.....	.....	2,526
Engine Dist. No. 3:						
Expedite trains	428	741	1,482	225	372	744
Drag trains	711	1,200	2,400	450	747	1,494
Local trains	320	320	640	320	320	640
Totals	.....	.....	4,522	.....	.....	2,878

*As it is necessary to operate the same number of trains in both directions on account of train crews and equipment, the totals, of course, are twice the greatest number of trains required in one direction.

TABLE 2.

	Limiting grades. West. Per Cent.	Length.	East. Per Cent.	Length.	Tonnage per train including locomotive. Steam oper. West.	Steam oper. East.	Electric oper. West.	Electric oper. East.
Engine Dist. No. 1:								
Maximum grades (exc. of helper grades)	0.56	600 ft.	0.6	1,300 ft.	(Momentum Grades)		.....	.....
Ruling grades (steam)	0.52	3,800 ft.	0.55	2,300 ft.	2,350	2,240	.....	.....
Maximum average grades:								
Continuous rating (electric)	0.22	21 mi.	0.45	28 mi.	.....	.....	3,680	2,470
Maximum grades at starting	0.32	.....	0.46	.....	2,650	2,240	3,350	2,780
Helper grades (3 engines):								
Maximum (momentary rating)	2.00	1,900 ft.	....	.....	2,040*	.....	3,450*	.....
Average grade (hourly rating)	1.3	8 mi.	....	.....	.....	.....	4,140*	.....
Maximum tons per train actually hauled	....	.....	....	.....	2,040	2,240	3,350	2,470
Engine Dist. No. 2:								
Maximum grades (exc. of helper grades)	0.81	3,100 ft.	1.00	3,900 ft.	1,690	1,432	(Partly Momentum)	
Ruling grades (steam)	0.81	3,100 ft.	1.00	3,900 ft.	1,690	1,432	.....	.....
Maximum average grades:							(Partly	
Continuous rating (electric)	0.3	8 mi.	0.48	28 mi.	.....	.....	Momentum)	2,370
Momentary rating (electric)	0.81	3,100 ft.	....	.....	.....	.....	2,590	.....
Maximum grades at starting	0.29	.....	0.5	.....	2,725	2,150	3,480	2,750
Helper grades (2 engines):								
Maximum (momentary rating)	....	.....	1.72	2,300 ft.	.....	1,645*	.....	2,680*
Average grade (hourly rating)	....	.....	1.11	9 mi.	.....	.....	.....	3,200*
Maximum tons per train actually hauled	....	.....	....	.....	1,690	1,432	2,590	2,370
Engine Dist. No. 3:								
Maximum grades	0.88	1,150 ft.	1.00	2.5 mi.	.....	1,432	.....	.....
Ruling grades (steam)	0.35	2 mi.	1.00	2.5 mi.	3,000	1,432	.....	.....
Maximum average grades:								
Continuous rating (electric)	....	.....	0.55	17 mi.	.....	.....	.....	2,160
Momentary rating (electric)	0.35	2 mi.	....	.....	.....	.....	4,583	.....
Maximum grades at starting	....	.....	0.7	.....	4,300	1,795	5,500	2,290
Maximum tons per train actually hauled	....	.....	....	.....	3,000	1,432	4,583	2,160

*Without weight of helper locomotives.

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On all railroads the traffic at some seasons of the year is greater than at others. However, it is seldom that the passenger and freight busy seasons happen at the same time. The writer has been often surprised at how uniform the train mileage and ton mileage per mile of line is during the year. For the railroad considered, the maximum and average number of trains per day is taken as follows:

TABLE 4—NUMBER OF TRAINS PER DAY—(BOTH WAYS).

	Eng. dist. No. 1.		Eng. dist. No. 2.		Eng. dist. No. 3.	
	Average day.	Maximum day.	Average day.	Maximum day.	Average day.	Maximum day.
Steam trains:						
Passenger	10.0	10.0	8.0	8.0	8.0	8.0
Freight	12.1	16.0	12.2	17.0	12.4	18.0
Total	22.1	26.0	20.2	25.0	20.4	26.0
Electric trains:						
Passenger	10.0	10.0	8.0	8.0	8.0	8.0
Freight	7.7	11.0	6.9	10.0	7.9	12.0
Total	17.7	21.0	14.9	18.0	15.9	20.0

Table 5 shows the train mileage, ton mileage, and locomotive mileage necessary to handle the assumed traffic over the railroad considered. The locomotive mileage includes the mileage to and from trains and the switching locomotive mileage.

TABLE 5.

	Steam operation.	Electric operation.
Train miles:		
Local passenger trains	462,820	000
Local motor trains	000	462,820
Through passenger trains	1,022,730	1,022,730
Total passenger	1,485,550	1,485,550
Local freight trains	233,200	233,200
Through trains	1,858,670	953,344
Work trains	81,120	81,120
Total freight trains	2,172,990	1,267,664
Total all trains	3,658,540	2,753,214
Locomotive and motor car mileage:		
Motor car mileage	000	971,922
Passenger locomotives	1,559,828	1,073,867
Local freight locomotives	240,196	240,196
Through locomotives	1,914,430	981,944
Work train	107,624	107,624
Helper locomotives	225,474	102,111
Switching	397,000*	*397,000
Total freight, work, helper and switch	2,884,724	1,828,875
Total locomotive mileage	4,444,552	2,902,742
Locomotive ton mileage:		
Motor cars	000	83,307,600
Passenger locomotives	259,638,174	107,386,700
Freight locomotives	385,395,130	129,631,480
Local train locomotives	15,067,360	9,662,160
Helper locomotives	41,712,690	8,386,510
Switching locomotives	55,880,000	35,730,000
Total freight, work, helper and switch	498,055,180	183,434,150
Total all locomotives and motor cars	757,693,354	374,128,450
Ton mileage—cars and contents:		
Passenger trains	744,424,800	675,001,800
Freight trains	2,113,300,000	1,940,045,760
Work trains	40,560,000	40,560,000
Switching	158,800,000	158,800,000
Total cars and contents	3,057,084,800	2,814,407,580
Grand total ton miles	3,814,778,154	3,188,536,030

*Six miles allowed for each hour a switch engine is in service.

NUMBER OF LOCOMOTIVES REQUIRED.

An examination of the records of numerous steam railroads will disclose the fact that a steam locomotive spends a good portion of its time in the shops undergoing heavy repairs, also that a larger part of its time is spent in or near the engine houses where the boiler washing is done, the fire boxes and flues cleaned, and the light running repairs are made, etc. The records of two western steam roads show that their passenger locomotives spent respectively 21 per cent. and 17 per cent. of their time in the shops, and that the freight locomotives of the same roads were in the shop 30 per cent. and 24 per cent. of their time.

The most complete record of the actual distribution of engine service I have seen is given in Table 6, which is for a section of a railroad between 500 and 600 miles in length.

TABLE 6.

	Passenger locomotives.		Freight locomotives.	
	Per cent. of total time.	Days per year.	Per cent. of total time.	Days per year.
Time in shops	22.4	82	28.2	103
Time spare	1.4	5	2.7	10
Time in enginehouse (having running repairs done, boilers washed, fire boxes cleaned)	53.2	194	35.9	131
Time running to and from trains	1.6	6	1.1	4
Time in helper service	1.1	4	4.3	16
Time on road	20.3	74	....	....
Actually running	....	..	17.1	62
Standing on sidings, taking water, etc.	....	..	10.7	39
Totals	100	365	100	365

It will be noted that each passenger locomotive was actually on the road, running or standing on sidings, only 74 days of the year, while each freight locomotive, exclusive of those used for helper service, was actually running only 62 days of the year and standing on sidings, etc., 39 days, not considering the helper locomotives.

The number of locomotives required to handle the traffic of any railroad depends of course upon the quantity of traffic, number of trains, the arrangement of the train schedule, ratio of maximum and average traffic, etc. An estimate of the number of steam locomotives required to handle the trains over the road can be made from the train sheets, and to this number will have to be added an allowance to cover time in engine house, shops, etc., as shown above in Table 6. However, the total number of steam locomotives shown in Tables 7, 8, 9 and 10, as required for operating the railroad discussed in this paper, is the same

TABLE 7—PASSENGER SERVICE.

	Steam locomotives.			Electric locomotives.		
	Per cent. of time.	Days of year.	No. of locomotives.	Per cent. of time.	Days of year.	No. of locomotives.
In shops	22.1	81	6.2	19.2	70	2.5
Spare	1.4	5	0.4	3.1	11	0.4
In enginehouse, etc.	53.0	193	14.8	27.7	101	3.6
Running to and from trains	1.6	6	0.5	3.8	14	0.5
In helper service	1.5	5	0.4	3.1	11	0.4
On road	20.4	75	5.7	43.1	158	5.6
Totals	100	365	28	100	365	13

TABLE 8—FREIGHT SERVICE.

	Steam locomotives.			Electric locomotives.		
	Per cent. of time.	Days of year.	No. of locomotives.	Per cent. of time.	Days of year.	No. of locomotives.
In shops	28.0	102	26.9	25.1	91	10.8
Spare	2.7	10	2.6	6.0	22	2.6
In enginehouse	35.8	131	34.4	27.9	102	12.0
Running to and from trains	1.1	4	1.1	1.4	5	0.6
In helper service	4.8	17	4.6	3.5	13	1.5
Standing on sidings	10.6	39	10.1	13.7	50	5.9
Running on road	17.0	62	16.3	22.4	82	9.6
Totals	100.0	365	96.0	100.0	365	43.0

as that actually used on a western railroad where the quantity of traffic and other conditions are similar. The number of electric locomotives given was estimated from the steam figures.

TABLE 9—SWITCHING SERVICE.

	Steam locomotives.			Electric locomotives.		
	Per cent. of time.	Days of year.	No. of locomotives.	Per cent. of time.	Days of year.	No. of locomotives.
In shops	37.5	137	6	27.3	99	3
In service	62.5	228	10	72.7	266	8
Totals	100.0	365	16	100.0	365	11

TABLE 10—SUMMARY.

	Steam equipment.	Electric equipment.
Passenger service:		
Motor cars	0	14
Passenger locomotives	28	10
Freight locomotives	96	43
Switching locomotives	16	11
Total motor cars	0	14
Total locomotives	140	64

The time in the engine house, where the inspection, cleaning and light repair work is done, will manifestly be much less with electric than with steam locomotives. A steam locomotive receives a thorough inspection after each run, whereas the practice with electric locomotives is to inspect them after they have made a certain mileage, which varies from 1,200 to 2,500 miles, the

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former figure being the New York Central standard, while the latter is the practice of the Pennsylvania at New York.

The boiler washing, firebox cleaning and other things required on a steam locomotive, and which consume a large part of the time in the engine house, would not be necessary with electric locomotives and, consequently, the time spent by electric locomotives in or near the engine house would be much less than with steam locomotives. Likewise, electric locomotives would spend less time in the shops than steam locomotives, as there would be no boiler, firebox smoke stack or tender to repair.

As a check on the above figures for number of locomotives required some data will now be given of electrified steam lines in operation. Table 11 below was computed and condensed from data given in a paper by W. J. Wilgus, concerning the electric operation of the N. Y. C. & H. R., and which shows the distribution of steam and electric locomotive time out of the shop.

TABLE 11.

	Hours.		Per cent.	
	Steam locomotives.	Electric locomotives.	Steam locomotives.	Electric locomotives.
Busy	138.00	203.92	20.7	30.3
Waiting	174.10	229.19	26.2	34.2
Total	312.10	433.11	46.9	64.5
Dead	354.90	238.89	53.1	35.5
Grand total	667.00	672.00	100.0	100.0

This data, which is for all classes of locomotives, would indicate that for conditions on the New York Central the steam locomotives were having fireboxes cleaned, boilers washed, light repairs made, and other things which are done in the engine house, a little over half the time out of the shops, while the time spent by the electric locomotives in the engine house being inspected, having light repairs made, etc., was only about one-third of the time out of the shops.

ESTIMATED COST OF ELECTRIFICATION.

The following is an estimate of the money needed to electrify the 467 miles of steam railroad considered:

High tension lines (steel tower), 450 miles		$2,250,000
Trolley and feeder wire:		
3/0 grooved copper trolley, 468 mi. at $650	$304,200	
Steel trolley wire, 156 mi. at $320	49,920	
2/0 feeder wire, 468 mi. at $500	234,000	
		588,120
Overhead construction:		
Bracket arm construction, 420 mi. at $1,650	$693,000	
Span construction, 92 mi. at $2,600	239,200	
Steel bridges, 4 mi	36,000	
Section breaks	6,600	
Additional for curved track, 100 mi. at $300	30,000	
		1,004,800
Track bonding:		
624 mi. at $450		280,800
Substations:		
14 substations, 56,000 kw.a	$616,000	
3 portable stations, 6,000 kw.a. (complete)	96,000	
		712,000
Rolling stock:		
14 motor cars, $18,000	$252,000	
10 passenger locomotives, $45,000	450,000	
43 freight locomotives, $50,000	2,150,000	
11 switching locomotives, $35,000	385,000	
		3,337,000
Changing block signals and telegraph (468 mi.)		561,600
Engineering and supervision, 5 per cent		431,716
Contingencies, etc., 10 per cent		905,964
Total		$9,972,000
Credit for steam equipment:		
140 locomotives	$2,520,000	
241 coal cars	241,000	
14 passenger cars	112,000	
Give credit for, say, about 70 per cent. of new value.	$2,873,000	2,012,000
Net estimate		$7,960,000

The figures given apply to the intermountain regions of the West. As the actual construction cost was available of a high tension steel tower line parallel to a railroad, the material being distributed by work trains of the railroad, the estimate for this item given should be very close. The trolley line and substation estimates were based upon interurban construction cost of two lines in the west, a liberal allowance being made for the heavier work needed for trunk lines. No item is shown for electric shop machinery as credit for steam locomotive shop machinery will offset this expense.

COMPARATIVE COST OF MAINTENANCE AND OPERATION BY STEAM AND ELECTRIC POWER.

Having determined the amount of traffic of the railroad, and the number of trains necessary to handle the same by steam and electric locomotives, the comparative cost of operation by steam and electric power will now be given.

TABLE 12—MAINTENANCE OF WAY AND STRUCTURES.

	Steam. Per ct.	Electric. Per ct.	Steam.	Electric.
1. Ties	100	92.5	$163,800	$151,515
2. Applying ties	100	92.5	46,800	43,290
3. Rail and other track material	100	85.0	93,600	79,560
4. Applying rail and other track material	100	85.0	33,760	27,846
5. Maintenance and care of track	100	85.0	154,400	131,240
6. Maintenance and care of roadbed	100	100.0	74,880	74,880
7. Signals	100	70.0	23,400	16,380
8. Telegraph	100	120.0	11,700	14,040
9. Engine house and shops	100	50.0	23,400	11,700
10. Fuel and water stations	100	0.0	23,400	000
11. Roadway tools and supplies	100	92.5	23,400	21,645
Totals	...	....	$671,540	$572,096

TABLE 13—MAINTENANCE OF OVERHEAD STRUCTURES AND SUBSTATIONS.

	Steam operation.	Electric operation.
12. *Maintenance of trolley line:*		
Bracket construction, 420 mi., at $100	000	$42,000
Span construction, 92 mi. at $120	000	11,040
Steel bridges, 4 mi. at $60	000	240
13. Maintenance of high tension line, 450 mi. at $50	000	22,500
14. Maintenance and inspection of substations	000	7,450
15. Track bonding, 624 mi. at $20	000	12,480
Totals	000	$95,710

TABLE 14—DEPRECIATION OF OVERHEAD STRUCTURES AND SUBSTATIONS.

	Steam operation.	Electric operation.
16. *Trolley wire:*		
Copper, $304,200 at 4 per cent	000	$12,168
Steel trolley, $49,920 at 5 per cent	000	2,496
17. Feeder wire, $234,000 at 1 per cent	000	2,340
18. Poles and fixtures, $568,000 at 5 per cent	000	28,400
19. Steel bridges, $36,000 at 3 per cent	000	1,080
20. Track bonding, $281,000 at 4 per cent	000	11,240
21. High tension line, including copper, $2,250,000 at 2 per cent	000	45,000
22. Substations, $712,000 at 3 per cent	000	21,360
Totals	000	$144,084

TABLE 15—MAINTENANCE OF EQUIPMENT.

	Steam operation.	Electric operation.
23. *Passenger locomotive repairs:*		
Steam, 1,559,828 mi. at 10c	$155,983	
Electric, 1,073,867 mi. at 45/6c		848,324
24. *Freight and switching locomotive repairs:*		
Steam, 2,884,724 mi. at 14c	403,861	
Electric, 1,828,875 mi. at 6c		109,732
25. *Electric motor car repairs:*		
Electric, 971,922 mi. at 3c	000	29,158
26. *Passenger car repairs:*		
Steam, 11,661,120 mi. at 1.2c	163,935	
Electric, 12,735,580 mi. at 1.2c		152,827
27. *Freight car repairs:*		
46,590,000 car mi. at 0.6c	279,000	279,000
28. *Coal cars (company coal):*		
3,650,000 car mi. at 0.6c	23,100	000
Totals	$1,025,879	$619,041

TABLE 16—DEPRECIATION OF EQUIPMENT.

	Steam operation.	Electric operation.
29. Depreciation of locomotives (steam, 3 per cent.), (electric, 2 per cent.)	$75,600	$59,700
30. Depreciation of motor cars, 2 per cent	000	5,040
31. Depreciation passenger cars released, 3 per cent	3,360	000
32. Depreciation coal cars released, 3 per cent	7,230	000
Totals	$86,190	$64,740

The steam operating expenses given in Tables 12 to 18 are based upon actual steam railroad operation and the electric operating expenses were computed.

TABLE 17—TRANSPORTATION EXPENSES.

	Steam operation.	Electric operation.
33. *Engine and motormen on switching locomotives:*		
Electric, 70 per cent. of steam	$50,090	$35,000
34. *Engine and motormen on passenger locomotives:*		
Steam, 1,559,828 mi. at 8c	124,786	
Electric, 1,073,867 mi. at 8c		85,909
35. *Engine and motormen on freight and work locomotives:*		
Steam, 2,267,250 mi. at 11c	248,848	
Electric, 1,329,764 mi. at 11c		146,275

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	Steam operation.	Electric operation.
36. *Engine and motormen on helper locomotives:*		
Steam, 225,475 mi. at 12c.	27,056	
Electric, 76,241 mi. at 12c.		9,149
37. *Car motormen:*		
462,820 mi. at 2c.	000	9,256
38. *Conductors and brakemen in switching service...*	90,000	90,000
39. *Passenger locomotive train crews:*		
Steam, 1,485,550 mi. at 6.8c.	101,017	
Electric, 1,022,730 mi. at 6.8c.		69,546
40. *Motor car trainmen:*		
462,820 mi. at 4c.	000	18,513
41. *Freight and work train crews:*		
Steam, 2,262,250 train mi. at 13c.	294,093	
Electric, 1,328,764 train mi. at 13c.		172,739
42. *Fuel:*		
400,000 tons at $2.25	900,000	000
43. *Purchase of power:*		
90,000,000 kw-hr. at 0.75c.	000	675,000
44. *Water*	52,000	000
45. *Lubricants*	14,000	6,000
46. *Other locomotive supplies*	23,000	16,100
47. *Enginehouse expenses, locomotives:*		
Steam, 40,000 locomotives at $2.50	100,000	
Electric, 14,000 locomotives at 80c.		11,200
48. *Enginehouse expense, motor cars:*		
2,000 motor cars at 50c.	000	1,500
49. *Signal operation*	40,000	35,000
Totals	$2,064,800	$1,381,187

TABLE 18—SUMMARY—OPERATING EXPENSES.

	Steam operation.	Electric operation.
A. Maintenance of way and structures	$671,540	$572,096
B. Maintenance of overhead structures and substations	000	93,710
C. Depreciation of overhead structures and substations	000	144,084
D. Maintenance of equipment	1,025,879	619,041
E. Depreciation of equipment	86,190	64,740
F. Transportation expense	2,064,800	1,381,187
G. Taxes		31,551
Totals	$3,848,409	$2,908,409
Steam operation expenses	$3,848,409	
Electric operation expenses	2,908,409	
Annual saving effected by substitution of electric power	$940,000	

The published figures of the N. Y. C. & H. R. show that the steam locomotives cost $1,842 for repair during 335 days, while the electric locomotives cost $704 during 350 days, for the same service. The electric locomotive repair cost on the N. Y. C. & H. R. is thus only 36.5 per cent. of the steam locomotive repair costs.

The figures published by Mr. Gibbs of the Pennsylvania give the electric locomotive repair cost as 5.91 cents per locomotive mile, the New Jersey division steam locomotive repair cost as 8.83 cents per locomotive mile, and the average of steam locomotives for all divisions of the Pennsylvania as 11.9 cents per locomotive mile. The electric locomotive repair expense is thus only 67 per cent. of the steam expense on the New Jersey division and only 50 per cent. of the steam repair expense on all divisions. The annual mileage of the electric locomotives was 26,000, 28 per cent. of which was switching. The heavy grades on the electrified section of the Pennsylvania of course make the repair cost of electric locomotives considerably higher than if they were operated over a section with the grades as low as the average of the whole road, and consequently the relative cost of steam and electric locomotive repairs will be even less than shown. The electric locomotives of the P. R. R. are also much more powerful than the steam locomotives.

All things considered, it is probable that the electric locomotive repair cost will be even lower than 45 per cent. of the steam locomotive repair cost, which was estimated above for the road considered and used in making the comparative estimate of steam and electric operating expenses. For the road considered, the repair expense for steam passenger locomotives was taken at 10 cents per locomotive mile, and steam freight, helper and switching locomotives 14 cents per locomotive mile, which figures were based on the present locomotive repair costs on a western railroad where similar conditions exist. The electric locomotive repair expense will thus be 4.5 cents per locomotive mile for passenger locomotives and 6 cents per locomotive mile for freight service.

An electric locomotive will have a longer life than a steam locomotive, and thus the rate of depreciation will be less. The statement below shows the depreciation percentages used in the above tables. The steam locomotive figures were obtained from the auditing department of a western line. The electric figures were estimated, and although the modern electric locomotive has been in use only half the time allowed below for its life, I think past experience justifies the expectation of life allowed.

	Steam locomotive. Per cent.	Electric locomotive. Per cent.
First cost of locomotive	100	100
Salvage value when worn out	20	30
Total cost	80	70
Estimated life	26½ yr.	35 yr.
Annual depreciation	3%	2%

The wages of the motormen on the electric locomotives were assumed to be the same as those of the enginemen on the steam locomotive, but the motormen on the electric motor cars were taken as equal to about what would be paid for trolley car service. Although no fireman is needed on electric locomotives, two men were assumed necessary for all electric road and helper locomotives; but on switching locomotives, which have a conductor, and sometimes two or three switchmen, only a motorman was allowed. When two electric locomotives are used on a helper district to assist the road locomotive, only one crew was allowed, as the electric helper locomotives, being equipped with multiple-unit control, can be operated by one crew.

All coal used on a steam locomotive is not utilized in hauling trains, but a good deal is wasted by radiation while the locomotive is standing on sidings, imperfect combustion in the firebox, starting fire, etc., and the loss of energy is very much greater than would be the case in a steam electric plant generating power for electric operation of a railroad. The figures published by W. S. Murray in the March, 1908, Proceedings of the American Institute of Electrical Engineers, indicate that it requires about double the coal for operation of the steam locomotives of the N. Y. N. H. & H. that it does to generate power in a steam electric power plant for operation of its electric locomotives in the same service.

The quantity of electric power needed was computed from the grades, train weights, speed and other necessary data, the average power for a train of two motor cars and trailer, making stops every six or eight miles, being taken at 40 watt hours per ton mile, the passenger locomotive trains being allowed 31 watt hours per ton mile. The freight trains were allowed 25 watt hours per ton mile and the switching locomotives 45 watt hours per ton mile. As stated above, the power is to be purchased and delivered into the railroad's high tension transmission line at terminal No. 3. The rate to be paid for electric power in any locality depends upon the local conditions, the load factor, etc.

In many sections of the West, the development of numerous extremely low construction cost hydroelectric plants has made it possible to obtain power to some points at considerably lower cost than 0.75 cents per kw-hr., which was used in the above estimate. For instance, the Great Falls Power Company has made a rate of 0.536 cents per kw-hr. to the Chicago, Milwaukee & Puget Sound, and agrees to construct some of the high tension lines.

It is estimated that it only costs one-third as much to handle an electric locomotive through the engine house as it takes to handle a steam locomotive. At $2.50 per locomotive for steam operation would mean about 80 cents per locomotive for electric operation. The New York Central figures published by Mr. Willgus gives $3.37 per day for steam locomotives and 55 cents for electric locomotives, or the electric cost of engine house expenses only 16.3 per cent. of the steam.

RETURN ON INVESTMENT.

The estimated cost of the electrification of the 467-mile railroad considered above was $7,960,000. The return on this investment on account of the saving in operating expense was estimated at about $940,000 per year. The interest earned on the money used for the electrification of this road would thus be 11.8 per cent. If it is necessary to borrow the money for this purpose, and if it can be obtained at 5 per cent. interest, there would remain a profit to the railroad of 6.8 per cent. of the net cost of electrification.

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Maintenance of Way Section.

THE statistics of the Interstate Commerce Commission for the year ending June 30, 1912, show that 565 track and bridge men were killed and 645 injured by being struck by trains, in addition to 95 who were killed and 1,115 who were injured in other accidents. The number of track and bridge men employed for one killed was 579, and for one injured, 217. This record is emphasized by an accident on one of the eastern roads recently, where in a gang of foreigners recently arrived, ten were killed and a number injured by being run down by a passenger train, while running away from a blast and dodging another train. These figures show the necessity for placing special emphasis on the instruction of foremen regarding their responsibility in protecting their men from accidents. By far the larger proportion of accidents is avoidable if proper care be exercised. And the need for this care has risen greatly within the past few years owing to the largely increased number of foreigners employed in this department. The matter referred to is one that cannot be left solely to the foremen, but should be constantly brought to their attention by the higher officers.

THE extent to which the application of heavier rail and more ballast will actually reduce the cost of maintenance of branch lines with only a moderate traffic is often overestimated. The results secured are quite different from those on main lines carrying a heavy traffic, where heavy construction is essential, if maintenance charges are to be kept from becoming excessive. Very frequently in requesting an appropriation for the improvement of a branch line the local officers will make the statement that the cost of maintenance will be materially reduced. An actual comparison of the expenditures before and after improvement of the track will generally fail to show any marked reduction. Undoubtedly, less work is required to maintain a branch line track with 85 lb. rail and good ballast, than, for instance, one with 65 lb. rail with little or no ballast, but the difference usually is not sufficient to justify taking a man off a section. Rather, the result is that a better track is maintained for the same expenditure, and the track forces are given opportunity to keep up fences, buildings and other work which may have been neglected previously. Another important result not always considered is in the increased facility with which the trains are enabled to get over the road or in the increased tonnage which they are enabled to haul in the same time. While individually slight, many irregularities in line and service, as well as in greater elasticity and increased wave motion with light track construction, are cumulative in effect. Thus, rather than a decreased cost of maintenance, the result usually secured is a better track for the same money, and a better train movement or loading.

THE defects in the railway scale and weighing conditions have been brought out prominently in the recent hearing before the Interstate Commerce Commission, and a number of conditions not entirely creditable to the railways have been exposed. As a result, this subject has been given more attention by the railways themselves than ever before, and a large number of new scales has been installed, while many others will be in the near future. For this reason the action of the American Railway Association in adopting the specifications published in another column as good scale practice is timely and valuable. Up to this time there has been almost no authentic information available regarding the design of scales, and the railway official studying the question has been severely handicapped. Scales have been generally purchased upon the ratings and designs of the manufacturers, and there has been no opportunity to compare one design with another on any equitable basis, or to ascertain if any individual design met the actual service requirements. This situation has resulted from conditions for which the railways and manufacturers are jointly responsible. Because of the inability to intelligently compare different designs of scales they have been purchased very largely upon the basis of first cost. As a result, in an effort to reduce the cost of manufacture the weight of the various parts has been reduced to a minimum and the scale rating has come to mean very little. This cheapening of the design by some manufacturers has forced others to do likewise if they were to secure any business. With a general specification which the railways can use when installing new scales, and in accordance with which all the manufacturers can design on an equal basis, the present situation should be materially improved.

THE layout of a ballast pit or quarry has an important influence on its economic operation; and it is usually difficult to correct errors in the original plans after the pit has once been operated. As the cost of the ballast on board cars forms a large part of its total cost in track, the effect of this cost on maintenance expenditures is substantial. For these reasons the description of the El Paso & South Western quarry at Tecolote, N. Mex., and the figures of the cost of operation, published in this issue, are valuable. Very often ballast is purchased from outside parties on the assumption that the road cannot prepare it as cheaply as it can buy it. This may be true when washed gravel is used, and when the profits are largely secured from the by-products of sand and roofing gravel. It may also be true when, under favorable local conditions, stone is used. There are, however, many places where a road can afford to build its own quarry to good advantage. It is interesting to note that following a visit to this Tecolote quarry by representatives of another western road, the latter has authorized the installation of a crushing plant of its own and, incidentally, has brought down the contract price of its crushed stone several cents at other points. In view of the large quantities of ballast of various kinds required on the average large system a comprehensive study of the best materials to use on various lines should prove advantageous. This study should include the demands of the traffic, standards of maintenance, the kinds of material available, the sources of supply, etc. One road is now seriously considering the assignment of one man to devote his entire time to studies of this nature and to supervise the preparing and distribution of ballast at the various pits and quarries on the system.

IN common with other branches of railway service, maintenance work very generally suffers from a lack of sufficient supervision. This results largely from two causes. In the first place, the average supervisor is given charge of more forces than he can intelligently handle. Again, many men place too much dependence on correspondence and inspections made from the rear end of trains accompanied by the promiscuous use of "butterflies," and spend too little time with the various gangs on the work. While the first condition is beyond the control of the supervisor, he is responsible for the latter condition which is largely one of method. At this season of the year when repair work of all kinds is at its height, it is important that he spend as much time as possible with his gangs. As the money is actually being spent in the field it is more important that the supervisor be on the ground directing its economical expenditure than in the office explaining how it is being spent. Probably the most promising field of study for him is that of devising means of eliminating lost time. The amount of time actually wasted by the average gang is a surprisingly large percentage of the total. Although this has come to be commonly regarded as a necessary evil, it can in many cases be remedied

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to a large degree. By studying the proper distribution of men in each gang, the proper size of gangs, the ability of the different foremen to direct men, and more particularly, by training the foremen themselves to study and correct these leaks, surprising results can be gained. Without such encouragement by his superior officers the average foreman will pay little attention to this matter. Again, by maintaining thorough familiarity with conditions, a supervisor can keep his foremen keyed up where they will make their best efforts. When they learn that he can detect at once when they have made a creditable showing or have failed to do so, they are more likely to do their best. Likewise, with such supervision, inefficient or ineorrect methods can be detected and corrected so that they will be avoided in the future. In these ways the efficiency of the forces can be increased and the foremen themselves strengthened. These advantages are not fancied, but are being realized by numerous men today. One officer in charge of a portion of a main trunk line recently made a study of his expenditures for the past year as compared with five years ago, and found that although the amount of work actually done has steadily increased, he has made a saving of over $100,000 yearly in actual expenditures. He attributed this to the fact that he has aimed to spend nearly all his time with the foremen in the field assisting them to close leaks here and there. Similar results are possible on many other lines where the officer, perhaps unconsciously, has allowed himself to be tied down too closely to his desk to the detriment of the work on the line.

BOARDING CAMPS AND THE LABOR SHORTAGE.

NOT many years ago any railway man who ventured to suggest that common laborers employed on construction and maintenance work be provided with anything beyond the actual necessities, exposed himself to ridicule. This condition has changed. Many contractors have been quick to see the direct advantages of providing good quarters for their men and taking an interest in their welfare, even to the extent of providing recreation after working hours; and some railways are following their lead. The old idea still prevalent on many roads that any car not fit for anything else can be used for a bunk car, and that the boarding privilege should be let to the contractor making the company the largest percentage, is fast losing ground. Changing public sentiment, combined with the distinct labor shortage of the past few years, is prompting the giving of greater attention to these details.

The problem of sanitation is a serious one about any camp, for if it is unhealthy, the efficiency of the men will be affected. The average railway laborers' bunk car has been conspicuous for years for its lack of attention. Greater care exercised in the fitting up of these cars and in their maintenance and fumigation will eliminate much of the present complaint. Better cars are now being used on many roads, the wooden bunks are being replaced with metal and help is employed by the camp to keep the cars in proper condition.

In adopting precautionary measures against disease, contractors have again led the railways. Many contractors have had doctors, at least in their larger camps, for years, who supervise the condition of the men and camps and give aid to the sick and injured. While the average railway camp would undoubtedly not justify such an expenditure, it should be possible for one doctor to supervise a number of camps located on the same or adjoining divisions. Such precautions are especially advisable in handling contagious diseases. The prompt discovery and isolation of any laborer so afflicted will, in most cases, prevent the disease from spreading through the entire camp and eventually shutting down work entirely.

Public opinion is strongly against allowing camps where large numbers of men are herded together in unsanitary quarters to be maintained in the vicinity of towns or cities, and complaints frequently arise from this source. A number of investigations and reports on this subject have been made, particularly in eastern states, and the fact that the subject is still a live one is shown by a recent report of the Bureau of Industries and Immigration of the State of New York, in which it is stated that there are at present 2,000 unsanitary camps in that state housing 50,000 employees. If publicity continues to be given to such reports some states will soon give their boards of health authority to control conditions in construction camps. The best way the roads can control the imposition of stringent requirements by such boards is for the roads voluntarily to remedy the conditions.

Appearing even more radical than the precautions taken to safeguard health in the camps are the measures provided in some cases for recreation for the men outside of working hours. This class of welfare work has been done in other industries for several years, evidently with good results. Contractors engaged in railway and other heavy construction in remote parts of the country have also found that Y. M. C. A. branches or recreation rooms have been a valuable means of holding labor. As an instance one large contractor employing large numbers of negroes early this spring provided an electric piano and a dance floor in his camp. Upon discontinuing this a few weeks ago he noticed at once such an increased difficulty in securing labor that he has put the piano and dance floor in service again. The installation of shower baths in the recently constructed timber treating plants has proved a valuable adjunct in holding labor at these places, and at least one railroad is now considering the installation of shower baths in a construction camp. This same road is also planning to put up a recreation building at this camp where the men can read or talk outside of the cars in which they sleep, believing that the small amount of money spent for improving the condition of their living quarters and providing amusement for them while not at work will be money well spent.

While these measures undoubtedly appear unwarranted to the average men familiar with conditions of a decade or more ago, they are nevertheless attracting the serious consideration of those railway men who are beginning to feel a greater responsibility for the welfare of their laborers and who also feel that as a business proposition, money spent in providing more attractive quarters will repay a good interest on the investment as a means for holding laborers.

NEW BOOKS.

Proceedings of the Ninth Annual Meeting of the American Wood Preservers' Association. Published by the association. F. J. Angier, secretary and treasurer, Baltimore, Md. Size 6 in. x 9 in., 481 pages. Price, cloth, $3.50; paper, $2.50.

The standing which the American Wood Preservers' Association has attained by the earnest work of its officers and members in the past few years is reflected by the character of the annual proceedings which have just been issued. This book is the largest ever published by the association and in many respects is the most valuable.

It contains a full report of the convention held in Chicago, January 21-23, 1913, at which more papers were presented than at any preceding meeting and the discussions were fully up to the standard set in recent years. In addition to the report of the meeting, the list of members and the constitution and by-laws of the association, the book contains considerable statistical information of interest to railway men in general. A number of maps and tables presented show the production of lumber in the United States, the number of crossties and poles purchased, the location of treating plants in reference to the timber bearing regions and a complete list of timber treating plants in the United States, Canada and Mexico. There is also a brief resume of Forest Service investigations including brief abstracts of the most important bulletins that have been published from time to time.

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TUNNEL LINING ON THE VIRGINIAN RAILWAY.

Details of the Methods Used in Placing Concrete Linings in Eighteen Main-Line Tunnels without Interruption to Traffic.

The Virginian Railway let a contract about two years ago for the lining of 18 tunnels on the upper portion of the road. Three are now completed, work is under way on two more and the others will be undertaken at a rate which it is expected will finish this contract in about three years more. Most of these tunnels were timber lined when they were built, but some, which are located in hard material, were left unlined. A rather serious cave-in of one of these tunnels showed that the unlined ones are not as safe as could be desired, and it was therefore decided to undertake the lining of all tunnels about the safety of which there was any question. The concrete linings which are being placed are built to four standard plans, for large and small sections, and with and without reinforcement, as shown in the accompanying cross sections. Work is being done without interruption to traffic, and on account of the size of the contract the contractor and the company's engineers have together developed a system for handling the work which is proving very efficient.

Concrete Car with Two High Levels for Shoveling into Upper Portion of Forms.

Placing Concrete in Parapet Wall at Portal by Shoveling Twice.

The details of the work at the tunnel about two miles east of Princeton, W. Va., will serve to illustrate the methods used on all of these jobs. This tunnel is 1,700 ft. long, the material being comparatively soft stone, which is loose in many places and is rather wet. On account of the character of the material the reinforced concrete lining is being used, and on account of the size of the bore the large section is required. This section is 23 ft. 6 in. high from sub-grade to invert and 18 ft. 4 in. wide, the walls being vertical from the springing line down to a line 5 ft. 7 in. above sub-grade. From that line down they are battered to give a footing 3 ft. 6 in. wide for the support of the wall. The minimum thickness of the lining inside the old timber rings is 15 in., the walls being 2 ft. 3 in. thick from the face of the old lagging. An 18 in. gutter is provided inside the footing. The reinforcement in the footing consists of three ¾-in. rods laid longitudinally, which are used only in yielding material. The reinforcement in the side wall consists of vertical ¾-in. rods spaced from 2 to 3 ft. apart, as required by the character of the material. These rods are long enough to extend about 4 ft. above the springing line and are bent to form a bond with rods in the arch ring. The ring reinforcement also consists of ¾-in. rods placed in three pieces; the lower pieces coming down to the springing line overlapping the wall rods by 4 ft. and the middle rods, or key reinforcement, overlapping the upper ends of the other rods 3 ft. In addition to this reinforcement there are 19 ¾-in. rods placed horizontally, as shown in the accompanying cross section.

The concrete mixture is 1:3:6. The section used in this tunnel required 5 cu. yds. of concrete and 100 lbs. of reinforcing rods per lineal foot of tunnel. The small section unreinforced requires 4.7 cu. yds. of concrete per lineal foot, the small section reinforced, 4.4 cu. yds of concrete and 100 lbs. of steel, and the large section without reinforcement, 6.4 cu. yds. of concrete. Refuge niches 3 ft. wide are provided at intervals of 200 ft. on each side, staggered. Weep holes in the side walls just above the gutters are spaced a maximum of 50 ft. center to center, 3 in. galvanized iron pipe being used for this purpose. In particularly wet places, holes were bored through the old lagging and 4 in. drain tiles were placed over these holes to carry the water to the weep holes. Where necessary, these drains are provided at intervals as close as 10 ft. In some cases wooden boxes were substituted for the drain tiles, these boxes being 3 in. square inside and framed of 1 in. material, unfinished. The back of the portal is sloped to drain all surface water to a concrete basin built into the back of the portal wall at one extreme end, from which the water is carried through a hole in the parapet wall and down a concrete drain to the roadway ditch. The construction of this drain is clearly shown in one of the accompanying photographs.

The concrete plant for handling this work is located at the

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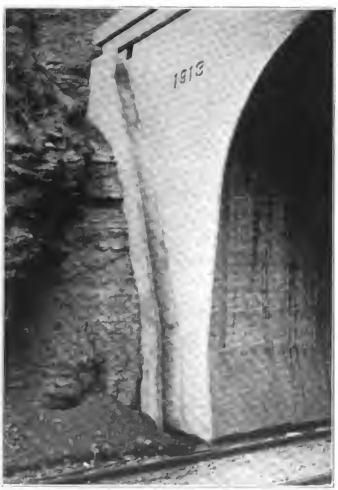
end of the east approach cut, about 300 yds. from the portal. The sand and stone for concrete are brought in in coal cars, the stone being secured from the Sinking Creek quarry about 35 miles away, and the sand from Norfolk, Va. This material is unloaded by a 65 ft. derrick and one yard clam-shell bucket into storage piles having a capacity of 250 yds. of sand and 350 yds. of stone. The cement house holds 2,000 bbls. A water tank with a capacity of 3,000 gal. supplies water by gravity to the mixer and the dinky engine which operates the concrete car in the tunnel. In order to carry on the work in cold weather, a small vertical boiler near the mixer is used to heat the mixing water and steam pipes are laid in the sand and stone storage piles to heat these materials. The water is heated whenever the temperature falls as low as 32 deg. and the sand and stone when the temperature reaches 28.

The unloading derrick which takes the material from cars is



Concrete Drain for Carrying Water from Back of Parapet Wall Down to Roadway Ditch.

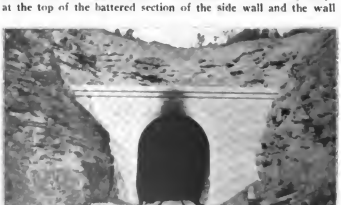
used to place the sand and stone from the storage piles into hoppers over the mixture plant. These hoppers have a capacity of 25 yds. of stone and 20 yds. of sand. From these bins the material is dropped into a steel proportioning hopper directly over the mixer. Two men are stationed on the platform above the mixer to proportion the materials, being guided by lines ruled on the inside of the steel hopper so placed as to give the exact quantities of the aggregate needed to secure a 1:3:6 mixture. Each mix is proportioned on the basis of two sacks of cement. The cement is trucked out from the storage house and loaded on a steel skip which is set up on the platform in front of the mixing hopper by a second derrick which is used to handle the concrete buckets. From this skip the men in charge of the proportioning of the material take their bags of cement. The half yard Smith mixer dumps into 1 yd. buckets, two batches being dumped into each bucket and two buckets being filled during the interval that is required for the train to run into the tunnel and place the concrete. When the train returns to the mixing plant the derrick swings these two buckets of concrete that have been loaded over the cars and they are dumped on the shoveling platforms.

To provide electric power for lights in the tunnel and in the

Concrete Mixing Plant, Material Hoppers at Top, Proportioning Platform Below, Mixer at Bottom.

camp, a generating plant is installed which has a 14 k. w. generator furnishing 112 volt d. c. current. The generator is driven by a 20 h. p. engine, belt connected, which receives steam from the 40 h. p. boiler that serves both the light plant and the pumping plant.

The forms are built of long leaf pine dressed on all four sides. By careful handling this form lumber is used four or five times. All forms are framed in place, the posts being set up and lined after which the lagging is put in as required. The waling strips at the top of the battered section of the side wall and the wall



Portal of the Tunnel Near Princeton, W. Va.

plates at the springing line are bolted back to the old timber lining, the waling strip at the top of the footing being wired. The concrete is placed in sections 48 ft. long. The footings are first laid, then the side walls are put in up to the springing line in a single operation. During the placing of these side walls the vertical reinforcing rods are held in place by nailing 2 in. by 4

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in. scantlings longitudinally along the old timber rings a little above the springing line to which the tops of the rods can be wired. The longitudinal rods in the side wall are placed as the concrete is carried up. With the exception of the key, the arch ring is also placed in sections 48 ft. long by placing three or four boards and filling over these and then placing more until the entire ring is turned with the exception of the 3 ft. key section at the top. This key section is placed in 4 ft. lengths by

Building the Portal.

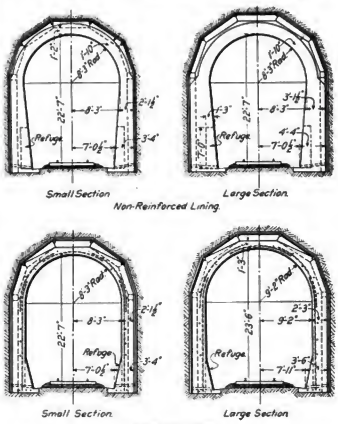
shoveling back after the closing forms have been placed. About 2 in. of mortar is placed over the forms in the key section before the concrete is put in order to insure a neat cement finish. Expansion joints are provided at the end of each 48 ft. section and adjacent sections are firmly keyed together. Forms are never removed within 72 hours after placing the concrete. The use of corrugated tin for protecting the concrete from moisture is being tried in this tunnel. This tin is placed in sheets behind the side walls and above the arch ring before any concrete is placed and before the forms are completed. The sheets are bent around the old timber posts and arch rings so as to fit the old

Train Used for Carrying Concrete from Mixing Plant to Tunnel.

timber lining closely and allow the concrete to fill the entire space. Where necessary, holes are cut through the old timber lining in order to allow the water collecting above to flow down behind these tin sheets to reach the weep holes at the bottom of the wall.

The concrete is brought into the tunnel in 2 yd. batches on a train consisting of a dinky locomotive and two cars. One of these cars is an ordinary flat car from which the concrete in the footings and lower section can be placed, and the other is a flat car on which staging has been built to provide two higher floor levels from which the concrete can be shoveled into the upper portion of the side walls and the arch ring. The shoveling platforms are covered with sheet iron. Eight laborers are used on this car to shovel concrete into the forms and four men are kept in the tunnel to spade back the concrete from the face of the forms. The sequence of operations has been very carefully worked out so that no time is lost in the operation of this train. When the lower portion of the side wall is being placed it is possible to handle 125 yds. of concrete in a ten hour shift, although the delay occasioned by the difficulty in placing the upper portions of the arch ring, and particularly the key section, cut down the general average to 50 or 60 yds. per shift. In order to eliminate delay caused by the building of forms, concreting is carried on at two points in the tunnel alternately.

As it is necessary to operate the concrete train over the main line, it is necessary to protect regular train movements very



Cross Section of Completed Tunnel Linings.

carefully. A man is placed at each end of the tunnel with telephone equipment connected to the despatching circuit, who warns the dinky of an approaching train and who gives clearance cards to all main line trains. No train is allowed to enter the tunnel without first stopping for this clearance. There are two regular passenger train movements a day, and from 5 to 12 freights. On account of the length of these freights and the slow speed at which they move and the occasional delay due to breakdowns in the tunnel, the total amount of delay from trains is a very considerable item.

This work is being handled under the supervision of H. Fernstrom, chief engineer, B. T. Elmore being division engineer in direct charge of the work in the field. The contract is being executed by W. W. Boxley & Co., Roanoke, Va.

RUSSIA'S PURCHASE OF RAILWAYS.—The Budget Committee of the Duma has agreed to the early purchase of the Moscow-Kasan Railway, and has expressed a wish that a bill for the purchase of the Lodz-Raisan-Ural Railway be drafted.

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BRIDGE MAINTENANCE.*

BY ENGINEER.

Bridge work is a perpetual and continuous job like track and all other classes of railroad work, but the kind and amount of the different varieties of the work changes with the seasons. In the winter surveys should be completed and plans made for future work, and maintenance should be kept up at the least possible expense. Light construction work should be dropped while heavy construction work on abutments, piers, and mass concrete can be pushed to advantage, especially in localities where the ice is strong enough to be of assistance in handling the work, and also where low water is necessary.

In the spring all bridges should be closely inspected and the necessary repairs ordered. Various methods for making inspections are in vogue. The general inspection may be annual or semi-annual, and be added to by periodical local inspections. When semi-annual, the fall inspection is made with a view of seeing that everything is in shape for the winter and to decide on the construction or heavy maintenance work to be considered and investigated for the next season's operations, while the spring inspection is for the purpose of planning and starting the work to be done in the immediate future.

On many roads the bridge engineer makes the general inspection of the large bridges and permanent work, while the inspection of the smaller temporary or wooden structures is left to the local officers. On at least one of the large western roads this process is reversed and the bridge engineer inspects the temporary structures yearly, leaving the permanent structures for the local officers. Possibly it would be well for bridge engineers to combine the two methods and inspect all bridges.

The maintenance and construction forces should be built up and work started as early in the spring as possible so that the beginning of summer will see the work well under way. All pile drivers, machinery and tools should be overhauled and repaired; material ordered, delivered and unloaded, and complete preparations made so that once work is started it can be pushed ahead without delay. A definite program in the delivery of material to each bridge or each job of work should be outlined and insisted on so that there need be no delays waiting for material, and it should be so arranged that gangs can fully complete each job and then go to the next job without any delay.

The summer is the season for doing the systematic work of repairing, renewing, filling or replacing with permanent structures every bridge on the line as it may need. The work is done by gangs of various sizes which may be either permanent or extra gangs as the work may demand. The pile driver is generally handled by a regular gang, although the method of having each bridge gang educated so that it can also handle the pile driver is sometimes advocated. However, as each road tries to get along with a minimum number of pile drivers so that it is desirable to keep them working at their maximum efficiency at all times, this latter method is of doubtful economy.

On account of the scarcity of foremen and of labor and the advantage of getting work done immediately with as little traveling as possible the combining of the bridge work with section work, signal work and other maintenance work is beginning to be advocated. There are many strong arguments in favor of this and should it be found successful it is likely to re-organize our entire maintenance system and methods. The past 15 years have witnessed very radical changes in the construction of permanent waterway openings due to the use of concrete and steel, and the future will be likely to add to these and thereby also change our methods of maintenance.

As temporary bridge structures are replaced by steel and concrete the amount of maintenance work is very materially decreased. Bridge gangs are replaced with carpenter gangs, painters' gangs, plumbing gangs, etc., as development of the country necessitates. The building up of towns and cities makes it necessary to do much more work around the station grounds than formerly, and the quality and kind of work varies with the nature of the public improvements. Sewers, pavements, permanent platforms, water supplies, plumbing, electric lighting, electric power and other features of latter day progress make it necessary for the railroads to employ specialists who can best handle the necessary work.

Small jobs of construction work and indeed all construction work that it is possible for them to handle should be done by the regular maintenance organization, but large construction jobs require a separate organization which should be flexible as to size and which can be moved from place to place as exigency requires.

Permanent structures in the past have been largely put in by contractors, mainly for the reason that the railroads have not had the necessary equipment for handling the work. However as they have become larger and permanent work has become more general, it is now becoming customary for the railroads to do their own masonry and steel erection work. Whether they save money in all cases by doing this is questionable, when the cost of the equipment with interest and depreciation is taken into consideration. Undoubtedly where construction work is continued from year to year requiring permanent forces, outfits and machinery, they save the contractor's profit, but in many cases the amount of work and the inexperience of the men makes the cost more to the railroad company, although this fact may not be evident on the surface of their accounts.

During the summer months all the bridge work should be pushed to completion as rapidly as possible, so that in the fall all that remains to do will be to get every bridge and opening in shape for the winter. This not only means that its strength and condition should be cared for, but that the waterways themselves, including the channels and ditches, should be clean and free from obstructions, so that there will be a free flow of water to and from the openings, that the openings may fulfill the purpose for which they were constructed.

As most of the railroads in this country were constructed in a time when timber was cheap, many pile and trestle bridges and timber culverts were built which are being replaced more or less rapidly with permanent structures. This has been accelerated of late years by the use of concrete and the consequent cheapening of the permanent openings. The life of the timber bridges has also been lengthened in many cases by the use of creosoted timber. This material is especially applicable in cases where the bridge decks have to be replaced oftener than the piles, and many years are often added to the life of the bridge by the use of a creosoted deck which may be filled in and ballasted.

When the original timber bridges were built, but little attention was paid to the size of opening required to properly carry the water, so long as it was large enough.

With permanent structures this is not a sufficient rule on account of the greater cost, and the size of openings should be proportioned to the use required of them. This makes necessary complete surveys and investigations of the bridge, its drainage area and outlet. These surveys should be made or started as early in the fall as possible, so that time may be had for considering each bridge and designing the necessary structure, culvert or pipe for the opening in order that the material may be ordered and delivered in time for the next summer's building.

In considering the amount which can profitably be spent for replacing temporary with permanent structures, the first cost of the temporary bridge should be taken together with such an amount as will, when put at interest at current rates, provide for its maintenance and periodical replacement at such times as it may wear out. A common wooden pile bridge can be replaced by a permanent reinforced concrete pile bridge on a ratio at present-day prices of about 3 to 1, while there are many cases of bridges or trestles which can be replaced by reinforced concrete culverts, boxes or pipes for even less than the cost of a

*The fifth of a series of articles on timely maintenance topics. The first appeared on page 351 of the issue of February 21, the second on page 496 of the issue of March 14, the third on page 905 of the issue of April 18, and the fourth on page 1091 of the issue of May 16.

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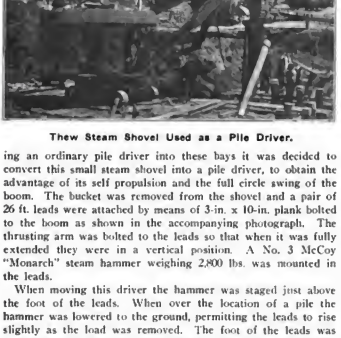
wooden structure. The use of reinforced concrete for many railroad structures is growing rapidly and merits the full investigation of every railroad engineer. Pipes, culverts, boxes, highway bridges, subways and over-crossings, arches, trestles, bridges and retaining walls are now being permanently and cheaply constructed of this material, to say nothing of buildings, tanks, coal chutes and other uses for which it is being rapidly adopted.

THEW STEAM SHOVEL USED AS A PILE DRIVER.

A No. 0 Thew steam shovel was recently used in a novel manner in constructing the foundation for a passenger subway for the New York Central station at Utica, N. Y. The shovel was originally used to make an excavation about 165 ft. long, 40 ft. wide and 10 ft. deep, with three bays on each side each about 20 ft. square. After the excavation was completed it was necessary to drive piles under the sidewalks, center piers and stair piers in these bays. In all about 250 spruce piles 13 to 16 ft. long were used.

Owing to the limited working space and the difficulty of moving an ordinary pile driver into these bays it was decided to convert this small steam shovel into a pile driver, to obtain the advantage of its self propulsion and the full circle swing of the boom. The bucket was removed from the shovel and a pair of 26 ft. leads were attached by means of 3-in. x 10-in. plank bolted to the boom as shown in the accompanying photograph. The thrusting arm was bolted to the leads so that when it was fully extended they were in a vertical position. A No. 3 McCoy "Monarch" steam hammer weighing 2,800 lbs. was mounted in the leads.



Thew Steam Shovel Used as a Pile Driver.

When moving this driver the hammer was staged just above the foot of the leads. When over the location of a pile the hammer was lowered to the ground, permitting the leads to rise slightly as the load was removed. The foot of the leads was then supported roughly on blocking, a rope was passed through the bale of the hammer and it was hoisted, carrying the pile with it, as there was no way to attach a separate pile fall. After driving a pile the foot of the leads was pulled in toward the shovel by the thrusting arm until it cleared the pile, permitting the shovel to move or revolve in the usual manner.

Although considerable trouble was experienced with soft bottom, requiring the shovel to be carried on plank throughout the work, an average of 19 to 20 piles were driven in a ten-hour day, the smallest number being 15 and the highest 27. The actual time of driving averaged from 10 to 14 min. While a heavy hammer would have been desirable for faster driving, it could not have been placed on this shovel. As it was, it was necessary to weigh down the back of the shovel by suspending about 400 lbs. of iron from the I beams beneath the boiler. When the driving was completed the leads were removed and the bucket replaced in less than three hours.

The performance of so small a steam hammer on piles of 11 and 12 in. butts is interesting. The piles were driven until a penetration of about one-half in. was secured under 40 blows. A drop hammer weighing 1,860 lbs. was used on an adjoining contract which touched the subway at one point. Hardwood piles of the same size were used here and were driven to a penetration of one-half in. under a 30 ft. fall. As the steam hammer had driven its piles from three to four ft. lower than the drop hammer it was thought desirable to try it on the piles which the drop hammer had been unable to put down deep enough. The steam hammer was therefore substituted for the drop hammer and although the piles had been driven several days before the small steam hammer was not only able to start them but secured a penetration of three ft. additional.

The alteration of this Thew shovel was devised by A. A. Parker, of Waterford, N. Y., associated with H. R. Beebe, Utica, N. Y., the contractor on the subway.

ABSTRACT OF ENGINEERING ARTICLES SINCE MAY 16, 1913.

The following articles of special interest to engineers and maintenance of way men and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since May 16, 1913:

Some Disputed Points in Railway Valuation.—A series of editorials discussing variations in the methods adopted in the different valuations made up to this time, including investment from earnings, depreciation and intangible values, appeared in the issues of May 23, page 1018; May 30, page 1164, and June 6, page 1208, respectively.

New Kansas City, Mo., Passenger Terminal.—The next to the largest terminal development now under way in this country is that at Kansas City, Mo., where a new $5,000,000 station, a belt line around the city and freight yards are now being built, requiring a total expenditure of $40,000,000. This project was described in detail and illustrated in the issue of May 23, page 1121.

The Problem of Railway Valuation.—The change in the public's attitude toward the railways and the problems connected with the making of a fair valuation were discussed by Logan G. McPherson, director of the Bureau of Railway Economics, in the issue of May 23, page 1131.

Plans for New Union Station at Chicago.—The plans for the proposed new passenger terminal for the Pennsylvania, Burlington, St. Paul and Alton at Chicago, as presented by the railways, were described in the issue of May 23, page 1147.

Canadian Pacific Coal Unloading Dock.—A new dock for the unloading of coal from lake boats onto storage piles or cars, similar in design to the more recent ore unloading plants, has recently been completed at Fort William, Ont. This dock was described May 30, page 1173.

Relocating the Chicago Railway Terminals.—The Chicago Plan Commission, appointed by the mayor to study the terminal situation, has prepared a plan providing for the location of passenger and freight terminals along Twelfth street. This plan was described and illustrated in the issue of May 30, page 1184.

Grand Trunk Grade Separation in Toronto.—The Grand Trunk is now engaged in the work of separating its grades in Toronto, Ont. This project will also involve the construction of a new union station and is divided into three sections, the first of which is now practically completed. This work was described and illustrated in the issue of June 6, page 1212.

New Extension of the Norfolk Southern.—The consolidation of a number of lines to form the Norfolk Southern has been further augmented by the extension to Charlotte, N. C., giving it a direct through line from Charlotte to Norfolk. A number of interesting construction problems were presented in this work and were described and illustrated in the issue of June 13, page 1315.

Thirty Mile Electrification on Norfolk & Western.—The Norfolk & Western has recently authorized the electrification of a 30 mile section of its main line between Bluefield, W. Va., and Vivian, to handle a very heavy coal traffic over the mountains. The general details of this work were given in the issue of June 13, page 1319.

Doubling the Load Capacity of an Old Iron Railroad Viaduct.—An interesting method of strengthening an old iron viaduct on the Pere Marquette by the addition of reinforcing trusses and center posts, was described in a paper by W. T. Curtis, presented before the Western Society of Engineers and abstracted in the issue of June 13, page 1323.

New Yards of the Chicago & Alton near Chicago.—The Chicago & Alton is now engaged in the construction of a new yard and engine facilities at Glenn, Ill., about 10 miles southwest of Chicago. A number of interesting features in the design of this yard and buildings were described and illustrated in the issue of June 13, page 1327.

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TRACK SCALE SPECIFICATIONS AND RULES.

Recommendations Adopted by the American Railway Association Provide a Standard to Which Railroads Can Work.

The following recommendations were adopted by the American Railway Association at its session in New York on May 21, with the view of setting an ultimate standard towards which railroads generally may work, but are not intended to condemn scales, methods of installation or reinstallation, etc., now in service, which come within the sensibility and tolerance prescribed in section 4 and respond to the tests as prescribed in section 12 below. These specifications and rules are also not intended to cover installations for special weighing such as twin loads, etc.

SELECTION, INSTALLATION AND LOCATION OF NEW SCALES.

1. When selecting track scales, the following should be considered:

(a) Maximum loads to be moved over scale for weighing or otherwise, considering the spacing of and the concentration of weight on axles.

(b) Length of wheel base of cars or other equipment to be weighed.

(c) Whether cars are to be weighed, spotted or in motion.

2. When track scales are to be installed, consideration should be given to:

(a) Location with respect to yard work and grade.

(b) Character of foundations.

(c) Method of installation.

(d) Drainage, lighting, heating, ventilation.

3. Having the above information, the three essentials of a track scale are:

Design, capacity and length.

4. SCALE DESIGN.

(a) Scales should be so designed that the load is suspended from (and not superimposed on) the main supporting levers, unless intermediate means are provided between the bridge supports and the bearings to absorb the oscillations and prevent the displacement of the bearings at points of contact on the knife-edges.

(b) They should be constructed in four sections with vital parts as accessible for cleaning and inspection as practicable.

(c) Practical means of adjustment should be provided to secure uniform distribution of load on the scale at points of support.

(d) Parts of the same type of scale should be of uniform dimensions and interchangeable as far as practicable. The position of each nose iron should be clearly indicated by a well-defined mark, showing its position when the lever is sealed.

(e) Scale design which contemplates the use of check rods should be checked longitudinally and transversely, preferably at the point of least resistance.

(f) Beams should be so designed as to weigh all loads on main and fractional bars without use of hanger weights. The main bar of the beam should have not more than six notches to the inch, assuming each notch to represent 1,000 pounds. Fractional bar should be graduated to 50 lb. subdivisions, with not more than four subdivisions to the inch, which would correspond to 200 lbs. per inch. A shoulder stop must be provided on all beams to prevent the poise traveling back of the zero graduation. Where the scale is not equipped with a full capacity beam, the maximum capacity must be clearly and permanently placed on the scale where it can be easily seen.

(g) Multiplication at butt of beam should not exceed 800 to 1. High multiplication in levers is undesirable.

(h) Type-registering beams should be used where spot weighing is performed.

(i) The sensibility reciprocal is the weight required to move the beam a definite amount from pointer or other indicating device of a scale. In scales provided with a beam and trig loop the sensibility reciprocal is the added weight required to be placed upon the platform to break and turn the beam from a horizontal position in the middle of the loop to a position of equilibrium at the top of the loop. This may be determined by subtracting the weight instead of adding it, or by using the sliding poise on the beam, if this is done without jarring the beam.

For railroad track scales the angular movement or play should be 2 per cent. and the sensibility should correspond to 1 per cent. angular movement of the beam.

The sensibility reciprocal of a track scale should never be greater than 100 lbs., and when the scale is new should be not greater than 50 lbs., that is, a load of 50 lbs., when applied to the scale platform, should cause the beam to move from a position in the middle of the trig loop to the top of the loop. For verification purposes when new, a scale should be capable of adjustment to within 1/2000 (one-half pound to the thousand pounds) of the capacity, and should be considered inaccurate after it cannot be maintained in adjustment to within four pounds to the thousand pounds, in excess or recess. Track scales should be kept in the closest possible adjustment.

(j) Bearings, wherever practicable, should be compensating to insure full length contact of pivots with bearings.

(k) Friction in all parts of the suspension should be reduced to a minimum by providing hardened steel contacts, and the design of scales should contemplate this important factor.

5. CAPACITY.

In determining the sustaining capacity of the scale, there is still a diversity of opinion among the best scale engineers as to the better method of procedure, and it is true that in figuring the scale levers the prime factor is to figure for deflection, which may necessitate deviating from standard engineering practices somewhat. It matters not if we assume a very small fiber stress neglecting the impact or assume a higher fibre stress and add a percentage for impact.

As a basis of calculation from an analytical point of view it seems quite natural to first assume the capacity of the scale and then proportion the amount beyond that which will apparently eliminate deflections, and we here approach what may be determined an undeveloped state in the higher art of scale building at this time.

One of the most logical ways of arriving at a conclusion would be to take the maximum weight on a pair of wheels (whether they be cars or locomotives), which at present is about 65,000 lbs., located on a transverse center line of main levers, plus the dead load divided by the number of supporting knife-edges. The above may be expressed in the shape of a formula, as follows:

w = Dead load.

a = Maximum weight on a pair of wheels.

n = Number of supporting knife-edges.

$$\text{or maximum load} = q = \frac{w}{n} + a.$$

The load "q," which is applied to both main levers of each section at the points of load support, is distributed as follows:

1. Main Levers. Maximum load "q" at point of load application.

2. End Extension Levers. A percentage of "q" based on the multiplication of the main lever.

3. Middle Extension Levers. A percentage of "q" based on the multiplication of the main lever and the reaction of the end extension lever.

4. Fifth Lever. The combined reaction from the two middle extension levers.

By taking these loads at their respective points of application,

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the moments can be determined and the size of cross-section computed according to the stresses recommended.

Levers. The design of levers, and the classes under which they appear should be governed by the use of such sections, that under the load or weight determined from the capacity, the deflections and stresses are within the limits specified.

Stress—	
Cast iron, tension	2,500 lbs. per sq. in.
Cast iron, compression	5,000 lbs. per sq. in.
Cast steel, tension	8,000 lbs. per sq. in.
Cast steel, compression	8,000 lbs. per sq. in.
Maximum deflection—	
Cast iron	0.040 in.
Cast steel	0.060 in.

Loops. All loops should be so designed that the respective strengths are equal to those of the pivots, the latter being the basis for calculation. The combined stress in tension due to flexure plus direct tension should not exceed 8,000 lbs. per sq. in.

Pivots. All knife-edges, pivots, and bearing surfaces for same should be made from a steel which possesses such properties as will insure a maximum toughness combined with the necessary degree of hardness to insure minimum wear under maximum loads. The following physical properties, based on steel with the internal strains relieved by drawing after hardening, should be as follows:

Ultimate tensile strength	200,000 lbs. per sq. in.
Elastic limit	165,000 lbs. per sq. in.
Elongation in 2 in.	5 per cent.
Reduction in area	25 per cent.
Maximum working stress	20,000 lbs. per sq. in.

Application of load and method to be followed in determining the cross-section, based on the stress specified:

In determining the bending moment, the lever-arm "L" should be defined as half the length of the bearing surface in the loop or connection, plus ¼ in., plus the difference between the dimensions of the friction faces in the loop and the friction faces on the lever, as expressed in the following formula:

Let L = Lever arm required.

I = Bearing surface in loop.

T = Distance between friction faces of loop.

W = Width of boss or sustaining member enveloping pivot.

Then:

$L = \frac{1}{2} I + (T - W) + \frac{1}{4}$ in.

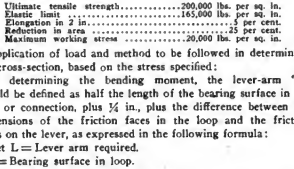

Fig. 1.

(i) The bearing per lineal inch of knife-edge should not exceed 7,000 lbs. when the hereinbefore mentioned loading is considered.

Structural steel used in connection with the installation of scales shall be properly braced, including diagonal stays, if necessary, and should conform to steel structures furnished by the American Railway Engineering Association.

6. LENGTH.

(a) The length of scales should be considered as the distance between ends of scale rail.

(b) The ends of scale rails should not project beyond the knife-edges of the end main levers.

(c) When cars are to be weighed spotted, the scale should be of sufficient length to place the entire car on the scale and preferably longer to facilitate spotting.

(d) When the cars are to be weighed in motion, cut at both ends at a speed not to exceed four miles per hour, the scale should be approximately 1/3 longer than the wheel-base of the longest cars ordinarily weighed. Humps for gravity weighing should be so constructed that cars with wheel-bases longer in comparison to scales should pass over scales at a slower rate of speed or be spotted if necessary.

7. LOCATION.

The proper location of scale depends principally on the following conditions:

(a) The volume of traffic to be weighed in comparison with that switched over the scales and not to be weighed.

(b) Whether scale is to be equipped with dead rail or relieving gear.

(c) Whether run-around track will be installed for switching with a separate track for weighing.

(d) Whether cars are to be weighed spotted or in motion.

(e) The cost of extra switching, when the scales are not located on a lead to classification track.

(f) Cost of maintenance when scale is located on lead to classification track and only a small proportion of cars are to be weighed.

(g) The necessity for quick despatch of cars that are weighed.

So much depends on local conditions affecting the different carriers that it would be difficult to give exact rules in connection with the above suggestions. It is recommended, however, that there be not less than 50 ft. of tangent track at both ends of scale rail. When only a small proportion of the cars handled are to be weighed the rails leaving the scale in the direction of weighing may be curved and the dead rail straight, or the curvature may be equalized between them.

8. GRADE.

(a) When the scales are located on a lead to classification tracks in hump yards they shall be at a sufficient elevation that cars will run by gravity as far as desired into the classification yard, considering a maximum speed of four miles per hour over the scales.

(b) When scales are not located on the hump, they should be at a sufficient elevation to provide the necessary grade on the track leaving the scale in the direction of weighing that the usual cut of cars to be weighed will run away from the scale by gravity in order to prevent impacts on the scale.

(c) The length of the hump and the grade thereon should be such that free running cars as above will pass over the scales at a speed not to exceed four miles per hour without brake application.

(d) Where it is the practice for one car rider to take several cars together into the classification track, the same grade as on the scale should be maintained for at least 100 and preferably 200 ft. beyond the scale in the direction of weighing so that cars may be stopped easily by the car rider and so that succeeding cars will not cause excessive impact when striking the car ahead which should occur not less than one car length from the scale.

9. FOUNDATIONS.

(a) Scale foundations should be constructed of concrete or cut stone. When the latter material is used it should be laid in cement mortar.

(b) Foundations should be constructed in accordance with the best engineering practice.

(c) Piers or parts of foundations supporting scale stands or the rail system should be of sufficient area that the pressure per square inch in accordance with the best engineering practice will not be exceeded and must be constructed as nearly as possible to exact elevations. Grouting is undesirable. The tops of piers or supporting walls should be finished with a layer of cement mortar in the proportion of one to one to the depth of approximately 1½ in. and after setting dressed to exact elevations.

(e) Where necessary to prevent seepage of water through foundations into the scale pit, they should be water-proofed and drained into a water-proofed cistern located outside of the scale

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pit, and equipped with either hand pump, air siphon, or steam siphon.

(f) Drainage should be provided in all cases where there is a possibility of water getting into the pit and where excessive seepage is not present and there is sufficient fall, pipe drainage should be used.

(g) The minimum period of ten days should elapse between the placing of the last concrete and the putting of the scale in service to permit proper setting of the concrete. The proper setting will be influenced by the prevailing temperature and weather conditions during that period, and this should be given due consideration.

10. INSTALLATION.

(a) Scales should be installed with dead rail or relieving apparatus.

(b) The deck or platform should be of the rigid type, so that the balance of the beam is not affected by weather conditions, etc. It should be made as nearly dirt and water proof as possible.

(c) Scales to be used for spot weighing should be constructed with scale rails level and approach rails level with scale rails for a distance of 50 ft.

(d) Scales to be used for motion weighing should be constructed with scale rails at not greater than one per cent. grade.

(e) Wedge or other means of adjustment used between bridge and scale supports to secure uniform distribution of loading should be set as low as possible when scales are installed, as future lining usually requires raising the bridge rather than lowering it. The end of the check rod on scale should be ¼ in. higher than at point of anchorage.

(f) Material such as wooden ties, placed between the bridge and scale rail, will absorb the shock and protect the vitals in case of derailment. This should not be framed until the bridge is installed in order to secure proper elevation of the scale rails and should be fastened securely to the bridge to prevent shifting.

(g) Scale should be set directly on foundations or on metal bed plates resting on foundations.

(h) Scale parts, where necessary, should be securely anchored to foundations, and it is desirable that means of slight adjustment longitudinally and transversely be provided for properly setting scale, interchanging scales in the same pit, etc., in order to secure perfect freedom of action for all parts in suspension.

(i) Scale beam supports should rest directly on scale foundation.

(j) The use of extension levers between the fifth lever and scale beam is undesirable.

(k) Scales and structural steel should be cleaned and painted with one coat of red lead paint before being installed, one coat after installation and at such other times as may be necessary.

(l) Minimum clearance for the working of scale parts through or about parts of installation not connected with scales, should not be less than ¾ in., except that when scale end approach rails are securely anchored a clearance of not less than ½ in. will be permitted.

(m) Open hearth scale rails of full length and sufficient capacity for supporting the load are desirable.

(an) An efficient transfer rail, or other connection, may be used to prevent impact of cars moving over joint between approach and scale rails, such contrivance to be so designed as not to interfere with the action of scale.

(o) Approach and scale rails should be anchored to prevent creeping and should be maintained in proper line and surface.

(p) Scale pits should be heated wherever practicable and necessary to prevent freezing and rust.

(q) Effective means should be provided for ventilating the scale pit where practicable. Openings in side walls are desirable. Means should be provided for closing such opening when there is possibility of wind pressure affecting the scale when weighing.

(r) Scale pits should be properly lighted for purposes of cleaning, inspection and testing.

(s) Scale houses should be constructed at track scales for proper housing and protection of scale beam and protection of weighmaster.

(t) The interior and exterior of scale houses should be amply and properly lighted to afford proper facilities for weighing and the prevention of mistakes in reading scale beam, car numbers and stenciled light weights. This applies more especially where cars are weighed at night.

11. MAINTENANCE AND OPERATION.

(a) All track scales should be numbered and referred to by number and location.

(b) Extensive repairs to scales, such as renewal of or sharpening of pivots, should be made in properly appointed shop.

(c) When scales are in service regularly, scale parts, substructure and foundations should be cleaned at least twice a month, and, when exposed to the elements, or otherwise located so that they are liable to become clogged with ice or dirt, should be cleaned as frequently as necessary.

(d) The application of rust preventives to bearings is desirable, but they should be so applied as not to interfere with the proper working of the scale.

(e) If ice obstructs the levers, salt should not be used to melt it; artificial heat should be used wherever practicable.

(f) Equipment should not be allowed to stand on the scales except when being weighed.

(g) Engines or other equipment not to be weighed should be passed over the dead rail, except on authority of the weighing department.

(h) Cars should not be bumped off scales by an engine or another car on the dead rail, nor be pulled across the scale coupled to another car moving over the dead rail.

(i) Engineemen should not apply sand to scale or dead rail, nor should the injector on the engine be applied when the engine is standing on or passing over the scale.

(j) The weighing beam should be balanced before the scale is used and when not in use should be locked with the beam catch.

(k) Cars should not be violently stopped on the scale by impact, by the sudden application of brakes or by throwing obstructions under the wheels. When pushing off scale cars which have been stopped for weighing or otherwise, impact must not occur at a speed greater than two miles per hour. When necessary for any reason to run cars over the scale rails, the speed must not exceed four miles per hour.

(l) The weighmaster should familiarize himself with the construction of the scale and make such inspections at such intervals as are necessary to determine if the scale is in proper working condition.

(m) Parties appointed to inspect and clean scales should be properly instructed, and it is desirable that they be present with the scale inspector when scales are tested.

12. TESTING.

(a) The standards of mass for testing scales should be derived from primary weights, verified by the National Bureau of Standards, Washington, D. C., to within what is known as their "Class B Tolerance." Such weights can be obtained either direct or through scale manufacturers. The 50 lb. secondary or working cast iron weights, which are transported from place to place and used directly in testing scales, should be rectangular, and of such design as to facilitate stacking; they should be free from pockets, blow holes, etc., which are liable to catch and hold foreign matter. No adjusting cavity or cavities in the bottom of the weights should be permitted.

These weights should be tested and adjusted in comparison with the master-weight, which has been verified to within "Class C Tolerance." The working weights shall be adjusted to within 25 gr., and maintained to within 100 gr. of their true values.*

(b) Scales in regular service shall be tested at least every three months with a test car or test weights up to at least ten per cent. of their rated capacity.

(c) Scales should be given a graduated test up to their work-

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ing capacity when installed and periodically thereafter. The necessity for the frequency of such a test depends on the design, capacity and method of installation of the scale used, the wear of scale pivots, and the amount of weighing performed.

(d) A test shall be made each week by weighing a heavily loaded freight car with as short a wheel base as is obtainable, on each end and the center of scales. When a scale is equipped with an automatic weighing attachment, the car should, in addition to the above, be weighed spotted on the trip end of the scale and in motion with the automatic attachment connected. A report of these tests should be sent to officer in charge of scales and weighing.

(e) In addition to the above a daily test should also be made on each scale equipped with an automatic attachment, by weighing a car spotted on the trip end of the scale with beam, also in motion with the automatic attachment connected. A book record of this and other tests is to be kept by weighmaster.

13. EQUIPMENT FOR TESTING.

It is desirable for verifying or sealing test weights and test cars to have, in addition to standards of mass prescribed above:

(a) An accurate even arm balance of 100 lbs. capacity in each pan, sensitive when loaded to two grains.

(b) A master scale of sufficient length and capacity for scaling test cars, sensitive to within 5 lbs. in 50,000, should be installed under cover and properly maintained and tested to insure accuracy.

(c) For the proper design of scale test cars consideration should be given to the following:

(d) All metal construction.

(e) Length of wheel base.

(f) Uniform distribution of load on axles.

(g) The elimination as far as practicable of ledges or projections likely to catch and hold dirt.

(h) The elimination of all unnecessary parts.

(i) Strength and durability so that frequent repairs will not be necessary.

(j) Surface area to be reduced as much as possible to limit wind pressure.

(k) The accessibility of all parts for inspection.

(l) The ease with which it may be barred or moved by scale inspector.

(m) Weight of car and weight of super-cargo if used.

NOTE.—There is a wide variation of practice in regard to the design of scale test cars. It is thought, however, that the majority of cars weigh from 30,000 to 60,000 lbs., and have a wheel base of from 6 ft. to 8 ft. Some have a body made up of wheel castings with space provided for a small super-cargo; others have a body of plate steel with space for super-cargo or test weights, weighing about as much as the car. Local requirements principally determine the type of construction to be followed. It is not thought, however, desirable to have test car weigh less than 30,000 lbs., nor greater than 60,000 lbs., for general testing. Heavier cars on two axles up to 80,000 lbs., are desirable for use in making graduated tests up to the capacity of the scales or the capacity of loads to be weighed.

NOTE.—The standards for testing scales in the Rupublic of Mexico must be in accordance with the metric system standards and will be verified by a federal scale inspector in accordance with the federal laws.

14. AUTOMATIC WEIGHING AND RECORDING DEVICES.

Efficient automatic weighing and recording devices may be used where desired. There has been, in the past, however, and may be at present, an impression, by some, that the automatic weigher and recorder will overcome all outside influence and give correct results regardless of scale and track conditions and the speed at which the cars are handled over the scale. This is an erroneous impression as it is absolutely necessary that the scale and the automatic device as well be in first class condition with properly maintained approach tracks and cars must be run at a slow rate of speed with particular attention to steadiness of motion if best results are to be obtained.

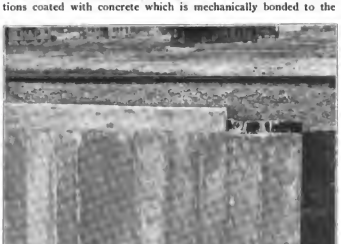
NEW BRANCH LINE FOR INDIA.—A branch line, 8.58 miles long of the 3 ft. 3 in. gage has been sanctioned from Nidamangalam, on the South Indian Railway, to Mannargudi; to be constructed on behalf of the District Board of Tanjore.

NEW FORMS OF STEEL SHEET PILING.

The use of steel sheet piling for cofferdam work has become quite general in recent years, and a number of forms of such piling have been placed on the market. The Lackawanna Steel Company, Buffalo, N. Y., manufactures sheet piling in a number of different designs for various purposes and has recently added to these designs two new ones: the arched web piling and the concrete protective piling.

The arched web design differs from the straight web type in the fact that the web is curved or arched so that the entire web lies to one side of the neural axis. The outer side of this arch is flattened to lie in the same vertical plane as the extreme edge of the interlock, this flat face furnishing a large bearing area for waling strips used for internal bracing. This type of piling is recommended where transverse or beam strength is required and for such location the section is very effective as it has a decidedly higher section modulus for a given weight of section than the straight web piling.

The protected steel piling consists of any of the standard sections coated with concrete which is mechanically bonded to the



Lackawanna Protected Steel Sheet Piling.

steel piling. These combination piles are designed for use in permanent structures in which the use of exposed steel would be objectionable on account of the rapid corrosion that would take place due to the intermittent wetting of the steel surface or from the chemical action of acids contained in the materials in contact with the piling. The piles are encased in concrete before driving; the facing being so mechanically and adhesively bonded to the pile as to permit its driving with the concrete facing attached. The lower ends of the piles for a length of 6 in. are left exposed to serve as a cutting edge and the lower end of the concrete facing is tapered to facilitate driving. The tops of the piles for a length of 6 in. are also left exposed to receive the blows of the driver. The portion of the piles below the ground surface need not be protected if they are coated with a good preservative. If it is desired, the piles thus protected can be completely driven and the upper portion can then be encased in concrete by the use of removable forms, the same bonded wires being used as in cases where they are encased before driving. A great number of combinations of steel sections can be secured in these protective piling, and if desired, two or more piles may be encased together to form solid slabs

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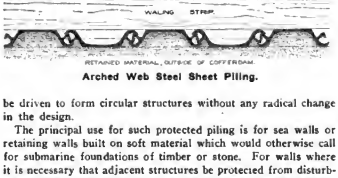
which may be driven as a single unit. When the piles are encased before driving the section is so designed that the interlocking portion of the steel bonding can act in the same manner as in the uncoated piles; the pockets in the interlock and between the faces of the concrete coating being filled with grout after the wall is driven. The mechanical bond is secured in the case of center flange piles by inserting reinforcing rods through holes drilled in these center flanges. In the straight web and arch web sections, rectangular bars are placed through rectangular holes in the web, the bars having holes near their ends for the insertion of the bonding bars. The entire thickness of the coated piles is either 9 in. or 12 in., as desired. These piles can also be made for any desired angle or bend, and can



Arched Web Steel Sheet Piling.

be driven to form circular structures without any radical change in the design.

The principal use for such protected piling is for sea walls or retaining walls built on soft material which would otherwise call for submarine foundations of timber or stone. For walls where it is necessary that adjacent structures be protected from disturbance which would be involved in the building of large foundations and where quick action is required in the construction or repair of permanent foundations requiring strong and impervious walls. An installation of these protective piles requires no subfoundation, no sub-aqueous foundation nor rip rap along the outer face to protect against the action of waves or tides. A number of suggested designs for shore revetments, dikes, bulkheads, levees, docks, sea walls and piers have been worked out by the Lackawanna Steel Company, as well as the complete details for the forms used in encasing the steel piles.

THE PRESERVATIVE TREATMENT OF RED-OAK AND HARD-MAPLE CROSSTIES.

Much has been published upon the durability of railway ties treated by various preservative processes, but there is little available information concerning ties treated by different processes and laid in one track, where the treatments can be compared. In order to gather data for such a comparison the Forest Service of the Department of Agriculture, through its Forest Products Laboratory, in co-operation with the University of Wisconsin and the Chicago, Milwaukee & St. Paul, has completed the first stage of an extensive experiment, the purpose and scope of which are given in Bulletin 126 of the Forest Service, recently issued. The ties used in the experiment were ordinary stock of the co-operating railroad, and 100 of each of the two species, red-oak and hard-maple, were treated by each of six processes, selected so as to include at least one from each general type of pressure processes in common use. Thus, there were treated for the experiment 600 red-oak and 600 hard-maple ties, and 100 untreated ties of each species were laid. The history of each tie up to the time of laying is recorded, the preservative processes described, the methods of handling and laying given in detail, and everything needful for comparison of results of future inspection carefully worked out.

In selecting a location for the test track the effort was to secure normal conditions of site and traffic. The location is on a single track road which carries a fairly heavy traffic in both directions. The track at the point where the ties are laid is gravel ballasted, well drained, straight and practically level. Nearly all the treated ties are placed on a fill, but a few included in the test were laid in a cut.

Screw spikes with flat tie-plates were used on 50 per cent. of the ties and the remaining 50 per cent., unprotected by tie-plates, were fastened by ordinary cut spikes. An extension to the original experiment included red-oak and chestnut ties treated by a commercial plant, and a few spruce ties contributed by another firm were used. In order to avoid disturbing the track in the future, new rails were laid at the time the ties were placed, and new fastenings were used throughout.

It is thought that a series of observations and inspections covering several years will yield valuable information relative to the preservation of timber and its behavior in actual use. The bulletin is illustrated with reproductions of drawings and photographs of apparatus and material, and all details as to ties are given in tabular form.

THE FOREMAN PROBLEM—HOW TO PROVIDE A SUPPLY FOR THE FUTURE.*

By L. W. Strayer,
M. of W. Department, B. & O., Pittsburgh, Pa.

The criterion of a good roadmaster is his ability to build an organization of foremen about him, to efficiently and economically conduct the maintenance on his territory. Track foremen are made and not born. They should have at least an ordinary common school education, be skilled in track work, have foresight and be capable of meeting all emergencies that arise. In order to develop foremen, we must begin with the track laborer and familiarize him with the work and standard practices of maintenance. Generally the plan of increasing wages to attract a more intelligent class of men and educating those who show a disposition for advancement, will produce results. In the rural districts, mountain divisions, on branch lines of our railways and on some trunk lines that traverse the middle western agricultural belt, there are American trackmen who can be worked into foremen. If we could develop all this talent and use it wherever we need new foremen, our problem would be much easier. Some of these men, however, are averse to handling foreign labor, others shun promotion for lack of initiative, still others have family connections or perhaps some property that holds them to a certain place and they will work at lower wages rather than be transferred to a strange community.

There should be a leading laborer or assistant foreman to each section at an increased rate of 15 or 20 cents a day, this man to act as foreman in the absence of the regular one. The most promising of these assistants can be used as assistant foremen on extra gangs during the summer months. In this way one can develop men and at the same time stimulate a rivalry for the promotions as they are bound to come. This method should be supplemented by keeping not less than four men and a foreman to each section regularly, these men to be paid an increase over the ordinary extra gang and temporary section men. Such places would be permanent ones and at a premium. The efficiency of such a class of skilled trackmen would easily cover the increased rate of pay, attract a better grade of men and eventually produce better foremen. This scheme is being successfully carried on locally in several instances.

Another phase of the problem is to educate the best of the foreign element, in and near the industrial centers, for scarcely any men of American birth can be found doing track work in a vicinity where other employment can be had. By a little timely observation and instruction, the best laborers can be picked out and made leading laborers, then assistant foremen of extra gangs for a season or two, during which time they should be encouraged to attend night schools, or instruction should be furnished by the railway company in order to teach them to read

*Received in the contest on The Section Foreman Problem, which closed March 25, 1912.

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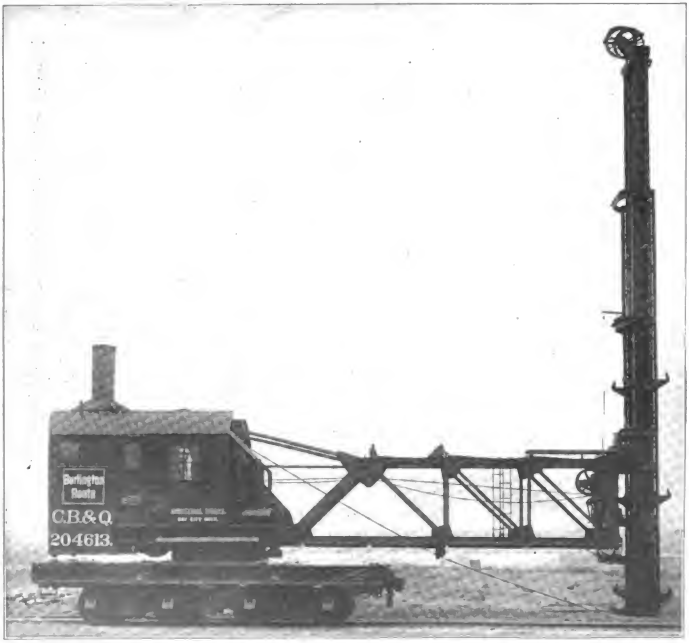
and write the English language and the rudiments of bookkeeping, so they can handle the reports required of them as section foremen. Anyone in close touch with foreigners realizes that they are quick to learn. I have found them eager to advance themselves if some one will take the time to direct and encourage their efforts. Once they become foremen, they are likely to settle down and their efforts are an asset to their employers.

In the South, where negro labor is used largely, there is practically no opportunity to recruit foremen from trackmen. The railways in the Southwest have been having success with Mexicans and some Indians during the past years, especially so as sectionmen, but for the most part they are not aggressive enough to promise much as future foremen. Japanese and some Chinese on the Pacific coast do not offer much in any grade above that of laboring men. On most all the roads foremen are of American birth, with some Italians. It is necessary therefore to develop foremen in the favorable localities and transfer them at an increase of salary sufficient to meet the conditions.

It is possible since the introduction of automatic track circuit signals, interlocking plants and other signal devices that the maintenance forces can be combined under one foreman's supervision. This is practical on territory subjected to heavy traffic, where several departments patrol the same sections to inspect and make minor repairs. In such a combination we could draw on any of the various departments for a foreman and get a broader man, at the same time eliminating the friction between departments. Such an organization has been successfully tried out locally, in a small way, so that several trunk lines are contemplating such a move where traffic is heavy. It seems very reasonable to predict that such a maintenance organization will work out and in the end be a decided improvement over the present system. If such can be made a universal success, we have our foremen problem solved.

A CONVERTIBLE LOCOMOTIVE CRANE PILE DRIVER.

A combination locomotive crane and pile driver has recently been developed by the Industrial Works, Bay City, Mich., for the use of railroads and contractors requiring a pile driver only a portion of the time. As shown in the photograph, this is not a crane with leaders suspended from the boom, but is a com-



New Convertible Locomotive Crane Pile Driver.

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plete pile driver with a built-up leader truss, a battering attachment and regular leaders. Ordinary locomotive cranes are frequently equipped with steam hammers, either with or without leaders, and good results are obtained where the service is not too severe or where it is not necessary to drive the piles on a batter. However, such a combination is not sufficiently rigid to be able to force into position and hold upright while driving, a pile that is not inclined to drive straight. It is to overcome these objections that this new driver has been designed.

The construction of this machine does not differ in any important detail from that of a regular 30-ton crane. The 24-ft. car is built entirely of steel and is equipped with standard draft rigging, complete air brake equipment and telescopic outriggers. A boiler of large steam capacity is provided to meet the demands of varying conditions of service. All of the important castings are of steel and all of the gears are either of cast steel or bronze. The operations and functions are the usual ones of a locomotive crane, making it available for use with a hook, lifting magnet, grab bucket, etc.

As a pile driver, the distinctive feature is the leader truss, which is easily substituted in the place of the regular crane boom. This truss is constructed of structural shapes and is fastened to the crane by a steel pin and tension rods. At the outer end is provided the support for the leaders and the battering attachment. The leaders are self supporting and are of all steel construction similar to those on ordinary pile drivers but correspondingly lighter. All of the operating movements are power driven, it being possible to raise or lower the leaders in a few seconds. The adjustment for battering is made by hand by means of a crank and gearing.

This machine will drive piles 29 ft. either side of the center of the track or 21 ft. ahead of the wheel base without the use of outriggers or blocking, and because of the full circle swing it will work equally well at either end of the car. The machine shown is a 30-ton crane built for the Chicago, Burlington & Quincy. Similar arrangements can also be provided on the larger size cranes, thus making them available for a greater variety of service.

DETAILED SUPERVISION ESSENTIAL TO SAFETY OF MEN.*

By G. R. Talcott,

Assistant Division Engineer, Baltimore & Ohio, Baltimore, Md.

Although it is not generally considered that the risk of personal injury is great in maintenance of way work, a large number of accidents occur which are primarily due to carelessness or ignorance, and are, therefore, preventable. General instructions covering the conduct of employees do not accomplish the desired result unless the men themselves, and especially the foremen, are impressed with the importance of protecting their men and themselves from personal injury. Instructions requiring foremen to blow a shrill whistle to notify the men of the approach of trains, and requiring the men to stand clear of all running tracks while trains are passing, have brought good results. When working around yards and terminals, constant vigilance on the part of the foreman is necessary and in addition to giving a warning signal, he should each time designate the place the men are to stand in the clear, and the men should thoroughly understand that this will be done. A foreman's qualifications in this respect should be one of the important considerations governing his selection for yard and terminal work.

The use of worn out or broken tools causes accidents which are entirely preventable. The use of such tools is not desirable from any point of view, and the men should be encouraged to report such defects to the foreman as soon as discovered. The elimination of dangerous physical conditions along the road is an important part of a general safety movement, and increases the safety of maintenance of way employees as well as of other employees and the public. While the introduction of special devices and appliances will promote safety in specific cases, the greatest good is to be accomplished by education, which can best be attained by periodical meetings of the division engineer or roadmaster, as the case may be, with the supervisors, followed by meetings of the supervisors with the foremen. These meetings need not be safety meetings primarily, but for the discussion of all matters pertaining to the work with safety as a subject to be reported on. When once an interest is aroused, numbers of small risks taken by the men will become apparent which would otherwise escape notice until an accident resulted.

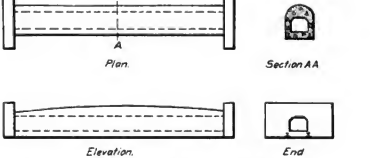
*Received in the Safety contest which closed October 25, 1912.

A SMALL MONOLITHIC CULVERT.

By C. T. Musgrave,

General Foreman, Bridges and Buildings, Oregon Short Line, Idaho Falls, Idaho.

The accompanying plan shows a type of culvert which has been built in several instances on the Montana division of the Oregon Short Line. This culvert is built monolithic, with two scrap rails in the lower corners for reinforcement. Where the inside width does not exceed 20 in. a culvert of this kind can be put in without stopping traffic, as it is not necessary to take out more than one tie, and the excavating can be done, the concrete poured and covered over, and the tie replaced in a few hours. A wooden form was used for these culverts, in which the bracing could be knocked out with a long pole, allowing the sides to collapse. The estimated cost for such a culvert 22 ft. long with end walls was $100.



Small Monolithic Concrete Box on Oregon Short Line.

Three of these culverts have now been in service over two years and are still in perfect condition. One of them was built in a swamp with the top within 2 ft. of the rail at a point where it has been difficult to maintain any kind of pipe under the pounding of trains which drove it down in the center while the frost raised the ends. This culvert replaced a timber box, the middle of which has been driven down more than a foot below the ends.

TEN STATES PRODUCE BULK OF PORTLAND CEMENT.

The production of Portland cement in 1912 in the United States was 82,438,096 barrels. This production was reported from twenty-four states, the first ten states, namely, Pennsylvania, Indiana, California, New York, Missouri, Illinois, New Jersey, Michigan, Iowa and Kansas given in the order of their importance reported 69,682,321 barrels, or about 85 per cent. of the total. These states ranged in production from 26,441,338 barrels in Pennsylvania, or over 32 per cent., to 3,225,040 barrels in Kansas, or about 4 per cent. of the total. Indiana, the second largest producing state, reported 9,924,124 barrels, or 12 per cent., and California, the third state, reported 5,974,299 barrels or over 7 per cent. of the total. These first three states reported over one-half of the total production.

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NEW TIMBER TREATING PLANT OF THE B. & O.

A Modern Installation Recently Placed in Service at Green Spring, W. Va. A Number of Original Features Introduced.

By F. J. Angier,

Superintendent of Timber Preservation, Baltimore & Ohio System, Baltimore, Md.

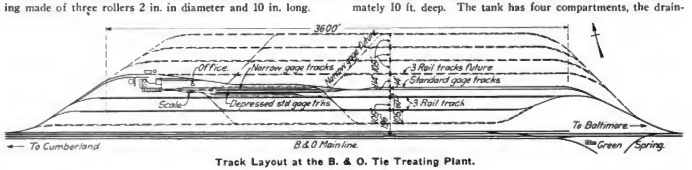
The Baltimore & Ohio has put into operation a new timber treating plant which has just been completed at Green Spring, W. Va., and which is one of the most complete and modern timber treating plants in America. It covers 60 acres and is situated close to large areas of timberland along the South Branch valley of the Potomac river. The requirements of the Baltimore & Ohio system approximate 2,500,000 ties annually for renewals, and with the new plant in operation a large proportion of these ties will be treated by the company. Other timber for railroad use will also be treated here.

The plant is equipped with two cylinders 7 ft. in diameter and 132 ft. long, made of ¾ in. steel and built for a working pressure of 175 lbs. per sq. in. Each of the retorts rests on nine concrete piers and is securely anchored to a center pier with six 1¼ in. bolts. On the remaining eight piers the retort rests on cast steel saddles, and between the saddles and an iron plate imbedded in the concrete are nests of steel rollers, each nest being made of three rollers 2 in. in diameter and 10 in. long.

The retort doors swing on steel rollers and can be opened and closed easily by one man, notwithstanding their weight of 6,400 lbs. each. The doors are steel frames with flanged steel dished heads 1 in. thick. The retorts are equipped with heating coils and also with perforated pipes. The pipes are inserted to obtain a more perfect distribution of steam when green timber is being artificially seasoned as well as for the circulating device used in the Card process.

Track Layout and Tie Yard at New B. & O. Treating Plant.

The main building of the plant is of steel frame construction with corrugated iron sides and concrete roof. The floors are of concrete and a concrete basement is provided so that should any of the preservative be spilled it can be recovered. In the basement is a concrete sump equipped with an electric device which indicates to the engineer in charge when the sump is filled. The sump is emptied by means of an ejector, the liquid passing into a settling tank about 50 ft. from the building. The settling tank is also of concrete, 20 ft. wide, 50 ft. long and approximately 10 ft. deep. The tank has four compartments, the drain-



Track Layout at the B. & O. Tie Treating Plant.

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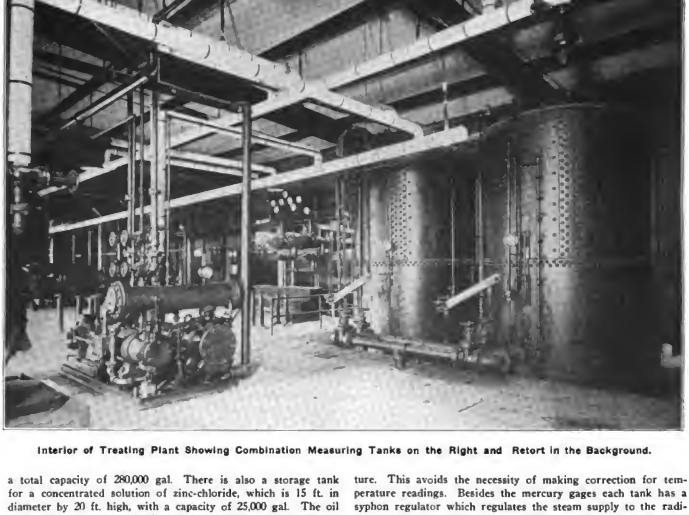
ings from the plant entering one compartment and passing through each of the others in a circuitous path to the last compartment. By this time any creosote carried from the plant falls to the bottom, because of its greater specific gravity, and enters a well in the bottom of the last compartment. Here a bilge pump, operated by electricity, picks it up and carries it to an underground tank from which it is carried into the working tanks by compressed air.

The boiler room is adjacent to the main building, being 30 ft. wide and 40 ft. long. It contains two horizontal return tubular boilers of 150 h. p. each, built for 125 lbs. per sq. in. working pressure, and space is provided for a third boiler to be installed when required. A boiler feed heater, injector and feed water pump complete the equipment in the boiler room.

The oil storage tank is 40 ft. in diameter by 30 ft. high, having a total capacity of 280,000 gal. There is also a storage tank for a concentrated solution of zinc-chloride, which is 15 ft. in diameter by 20 ft. high, with a capacity of 25,000 gal. The oil storage tank is equipped with a system of heating coils made in four sections, the combined heating surface of which is 500 sq. ft. An angle stem thermometer is placed in the side of this tank to enable the oil to be kept at a constant temperature of about 120 deg. F.

Near the storage tank is an underground unloading tank, 6 ft. in diameter by 60 ft. long, enclosed in a concrete pit, to prevent waste of the creosote if leakage occurs. The tank will withstand an air pressure of 50 lbs. per sq. in., and creosote is forced from this tank into the storage or working tanks by air also. The working tanks and pressure tanks are all located inside the building, so that they can be kept warm and the temperature of the working solution retained at 190 deg. The working tanks are each 24 ft. in diameter and 20 ft. high, with a capacity of 68,000 gal. Each tank is equipped with mercury gages, syphon regulators and dial thermometers. The location of these tanks inside the building also effects a further economy in the consumption of fuel, particularly in cold weather.

The working tanks are 24 ft. in diameter by 20 ft. high, each having a capacity of about 68,000 gal. They rest on concrete foundations 6 ft. above the floor line, being equipped with cast iron radiators for heating the solution. Each tank has three sets of radiators working independently. The combined heating surface of the radiators is 441 sq. ft. Each tank is also equipped with air coils for agitating a mixed solution of creosote and zinc chloride. Air is admitted at 100 lbs. pressure and distributed in such manner as to completely mix the solution in from two to five minutes. The tanks have mercury gages which show the true reading in tub feet and gallons, regardless of the tempera-



Interior of Treating Plant Showing Combination Measuring Tanks on the Right and Retort in the Background.

ture. This avoids the necessity of making correction for temperature readings. Besides the mercury gages each tank has a syphon regulator which regulates the steam supply to the radiators and automatically opens and closes the steam supply valve in maintaining the required temperature.

The pressure tanks are 8 ft. in diameter and 14 ft. high, made of ⅜ in. steel for a working pressure of 175 lbs. They are in reality a combination of pressure, measuring and drain tanks, and are located in such a way that they are readily filled while the treating cylinders are being filled preparatory to treating a charge of timber. Compressed air is then applied through the top of these pressure tanks and the preservative is forced through a pipe in the bottom connected with the cylinders. Pressure is maintained until the required absorption is obtained in the timber, after which the valve is closed and any preservative remaining in the tank can be returned to the working tank by means of the compressed air already in the pressure tank.

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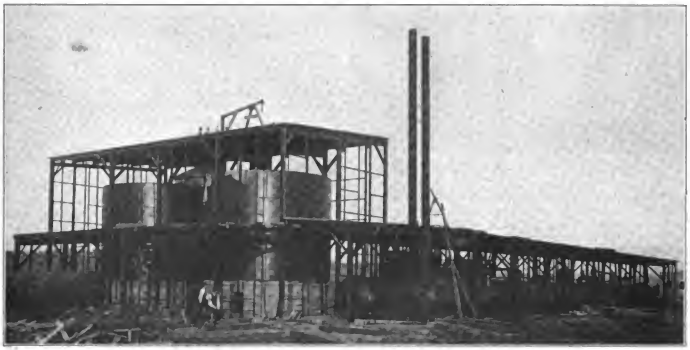
There is also a sufficient amount of compressed air in this tank to force all of the solution in the treating cylinder back to the working tank. The tanks are also used for measuring purposes, being equipped with mercury indicators which show the amount of solution, and thus inform the engineer as to the amount of solution going into the timber he is treating. They are also used as drain tanks to catch and measure the solution taken from the timber during the vacuum and draining process. The bottoms of the pressure tanks are only slightly lower than the treating cylinders, and though all of the drainings from the charge would not flow into the pressure tank by gravity, this is easily and quickly accomplished by admitting atmospheric pressure to the treating cylinder, while the pressure tank still contains a vacuum. This combination of pressure-measuring-drain tank is unique with the plant at Green Spring. It was worked out by the writer, assisted by Messrs. Card and McArdle, who were the draftsmen in getting out the pipe plans. This plant has now been in operation about two months, and these tanks have worked very successfully. It has been found that large



Main Building During Construction, Showing Cylinders and Inside Oil Tanks.

oak ties can be treated to absolute penetration by the Card process in six hours, with an injection of from 14 to 16 lbs. of solution per cu. ft. It eliminates entirely the dirty and expensive pressure pumps commonly in use in timber treating plants.

Recording gages and recording thermometers are connected to the treating cylinders. This places the superintendent in complete touch with the treatment in all of its details, the charts indicating the temperature, pressure and vacuum recorded for every moment the plant is in operation.

The plant is heated throughout by steam, the vacuum system being used, all condensation being returned to the boiler feed heater and thence to the boilers. A 50 k. w. generator furnishes the light for the plant and the yard, there being three arc lamps and about 50 incandescent lamps in the system. The electric plant also furnishes current to operate two 10 h. p. centrifugal pumps and a one h. p. bilge pump. Eight inch centrifugal pumps are used to circulate the mixture of creosote and zinc-chloride in the retorts while using the Card process. The latter is placed in the settling tank and is used to pump creosote into the underground unloading tank.

An experimental plant is situated adjacent to the main building. This plant consists of a complete physical and chemical laboratory. The experimental cylinder is 30 in. in diameter and 9½ ft. long, or large enough to hold three or four ties. There are two working or pressure tanks, underground drain tank, pressure pumps and electric centrifugal pump. The tanks are equipped with the latest gages and thermometers, and the entire plant is so designed that any process can be used and pressure can be supplied as high as 300 lbs. The chemical laboratory adjoins the physical laboratory, and creosote distillations, zinc-chloride analyses, etc., will be made.

The office building is of concrete, and is fireproof in its entire construction, as are all the other buildings in the plant. The hose and engine houses are of wood, but these are small and located some distance from the other buildings. A fire system has been installed, and a fire department will be organized among the employees, which will be similar to that at large terminals, shops and other centers on the Baltimore & Ohio. A 6-in. water main has been laid the entire length of the tie yard and there is a hydrant every 300 ft. The hose house is near the office and is equipped with a reel of 300 ft. of hose. Water pressure for fire emergency is maintained by a high 50,000-gal. water tank kept filled at all times.

At the present time the water used in the timber treating plant is being pumped from the Potomac river, but this arrangement is but temporary until a permanent joint system can be built for the timber treating plant and for supplying water to locomotives in train service. The permanent water plant calls for two pumps located at the plant in a concrete well about 100 ft. below the surface of the ground. The depression was deemed necessary on account of the lift from the river. Water will be pumped into the high storage tanks and fed by gravity throughout the plant and yard.

Practically all of the ties treated at the plant to date have been oak, the number being approximately 200,000. The standard tie in use on the Baltimore & Ohio is 7 in. x 8 in., and 8½ ft. long, containing 3⅓ cu. ft. These ties are unloaded and cribbed in piles of seven and one, and are handled by piecework. It is the intention to air-season all ties. However, if they are not received in quantities sufficient to properly air-season, the plant is designed to give a preliminary steaming and vacuum before the injection of preservatives.

All storage yard tracks have three rails, the outside pair being

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of standard gage and the inside rail fixing a 30 in. gage for the tram cars. In loading for treatment the ties are classified as hard and soft woods, and as No. 1 and No. 2. For this work the men are paid at a rate per tram instead of per tie, as in the case of unloading and cribbing for seasoning. Thus it makes no difference whether there are 30 or 40 ties on a tram, the cubical contents are practically the same and the amount paid is the same. One hundred and thirty tie cars are used to deliver the ties to and from the treating cylinders.

The cars are moved with a narrow gage locomotive, to which is

Concrete Settling Tank for Collection of Creosote.

attached a bumper car as shown in the accompanying photograph. This car is also thought to be original with this plant. It carries two drums, each carrying 150 ft. of ¾ in. wire cable. The cable from one drum passes underneath the engine out through the front bumper, and the other passes back through the back bumper. The engineer sitting in the cab can tighten the cable at any point along its length by means of cam and lever, and the switchman can pull out 10 ft., 50 ft. or 150 ft., as required. The cable is hooked to the links provided in the little tram cars, one

Power House, Sump, Retort Building and Storage Tanks.

of which can be seen in the little car just at one side and in front of the locomotive. An entire charge can be switched to any point in the yard by means of this arrangement.

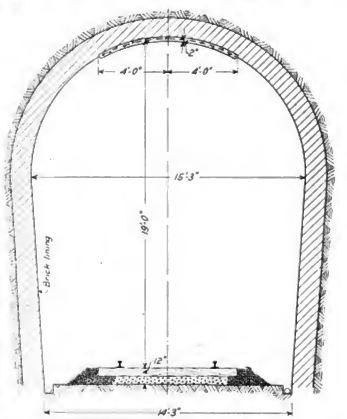
The location of the timber treating plant is believed to be admirably suited for all purposes, being in near proximity to large timber areas. Green Spring is at the junction of the main line of the Baltimore & Ohio system, with the Romney branch, which extends 16 miles to Romney, W. Va., and the Hampshire Southern Railroad, extending 38 miles farther to Petersburg, tapping a timber tract of several thousand acres, much of it being virgin timber. The outlet for all timber adjacent to the lines men-

Narrow Gage Locomotive and Bumper Car.

tioned is by way of Green Spring, so it is merely a question of stopping the timber at the plant to have it seasoned and treated.

REPAIRING A TUNNEL LINING WITH A CEMENT GUN.

The brick lining in the single-track tunnel on the Chicago, Milwaukee & St. Paul, near Tunnel City, Wis., was repaired in an unusual manner last summer. This tunnel is located on the La Crosse division, on the double-track main line between Chicago and St. Paul. This line handles a very heavy traffic, there



Cross-Section of Chicago, Milwaukee & St. Paul Tunnel Showing Concrete Protection.

being an average of 32 train movements per day at this point during the period that the work was under way. The tunnel is located on the ruling grade and all tonnage freights are operated with pushers. The fact that both engines are worked to capacity has caused unusual wear of the lining by the locomotive blasts, and the doubling back of the pusher locomotives greatly

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increases the number of movements. The old tunnel, which is 1,330 ft. long, was built in 1872, and was lined with brick, the arch having four rings. The mortar filling in the roof of the tunnel had been so damaged and the lower course of bricks so worn away as to make necessary some repair to the strip over the center line of the track to prevent the possibility of bricks falling out. The method adopted was to place a cement coat over a strip 8 ft. wide by the use of the cement gun, and the results secured have been very satisfactory.

It was the intention to place a coat of concrete which would extend 2 in. below the old face of the lining, making the total thickness from 4 to 6 in. in some places where the wear of the bricks had been most severe. The concrete never extended into the old lining for a distance greater than the thickness of one brick. Before placing the concrete, the surface was cleaned with a sand blast which was also handled by the cement gun, the water and cement, of course, being omitted for this process. The sand used both for cleaning and for the cement was the same as that used for ordinary concrete in that locality. It was dried and screened to remove pebbles and to prevent the clogging of the gun nozzle the water was also put through a wire gauze screen before going into the supply barrel. It was planned to use a ¼ in. square mesh wire reinforcement for the concrete coating, and some of this material was used at the beginning of the work. It was found, however, that this mesh was too small for the best results, and No. 4 American Steel & Wire triangular mesh reinforcement was substituted. This was cut to 8 ft. lengths and placed at right angles to the tunnel axis. From two to five coats of cement were required, depending on the thickness necessary.

In planning for this work it was thought that some form of shield would be necessary to protect the newly placed cement from locomotive blasts until it had thoroughly set. A movable shield to be supported from the roof was accordingly built and was used at the beginning of the work. It was soon found, however, that the cement placed by the gun was so hard immediately after placing that the locomotive blast had no effect upon it and the use of the shield was accordingly discontinued. Weep holes were drilled through the old brick lining near the edge of the concrete coating to allow water above the arch ring to escape and prevent its freezing there.

The air compressor plant was located at the east portal, a 2 in. air pipe being carried through the tunnel with connections at frequent intervals, to which rubber hose for operating the gun could be attached. The air was dried at the condensing plant to eliminate condensation in the pipe line. A water line was also carried through the tunnel to supply water at the gun nozzle. The plant at the portal also included a generator used for lighting the tunnel. Lighting wires were carried through the tunnel which could be tapped wherever necessary to provide illumination at the point where work was being carried on. Both the compressor and the generator were driven by gasolene engines.

The cement gun and the mixing board were carried on staging supported by two standard gage cars coupled together. A Fairbanks-Morse gasolene locomotive operating on a 2 ft. gage track having one rail in common with the main track was used to push this staging in and out of the tunnel. It was necessary to remove the entire outfit to a siding near the east portal for every train movement. For the protection of trains and also to enable the work of placing the cement to be carried on as long as possible between train movements, an operator was stationed at the east end of the tunnel and a flagman at the west end, both of whom were provided with telephones cut in on the despatcher's line. The despatcher notified the operator whenever a train entered an adjacent block and such train was held in that block until the track in the tunnel had been cleared.

The work was carried on for about two months, the progress being about 210 ft. a week. Two 10-hour shifts were used for six days in the week. The total cost, including labor and material, installation of the plant and preliminary cleaning was 23 cents per sq. ft. of protection placed.

This work was carried out under the general supervision of C. F. Loweth, chief engineer, Chicago, Milwaukee & St. Paul. L. D. Hadwen, engineer of masonry construction, was in charge of the plans for and execution of the work, and F. E. King, assistant engineer, directed the work at the tunnel.

A LOCAL SAFETY COMMITTEE.*

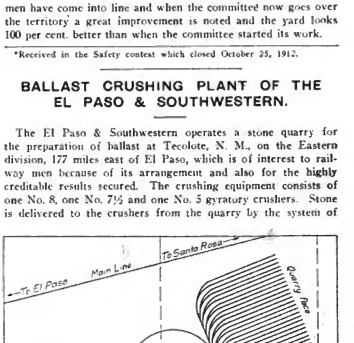
By F. Dohr,
Section Foreman, Chicago & North Western, Chicago.

About two years ago the roadmaster of the Chicago & North Western Chicago terminals appointed four of his section foremen as a safety committee in the terminal, arranging it so that none of the foremen went over his own section. The first time that these men went out on an inspection trip over the sections they were surprised at what they saw. They found safety blocking out of guard rails, switches and frogs, and found old rails, ties, draw bars, side doors and all kinds of old scrap lying around the tracks. There was also considerable old material piled so near the track that no one could walk alongside of the cars. This committee made a report to the roadmaster, who in turn reported to the central safety committee, sending a copy of his report to all his section foremen. At first some of the foremen did not like this, but the reports were continued each month and soon some sections were reported without criticism since when all the men have come into line and when the committee now goes over the territory a great improvement is noted and the yard looks 100 per cent. better than when the committee started its work.

*Received in the Safety contest which closed October 25, 1912.

BALLAST CRUSHING PLANT OF THE EL PASO & SOUTHWESTERN.

The El Paso & Southwestern operates a stone quarry for the preparation of ballast at Tecolote, N. M., on the Eastern division, 177 miles east of El Paso, which is of interest to railway men because of its arrangement and also for the highly creditable results secured. The crushing equipment consists of one No. 8, one No. 7½ and one No. 5 gyratory crushers. Stone is delivered to the crushers from the quarry by the system of



Track Layout at E. P. & S. W. Tecoloto Quarry.

tracks indicated on the accompanying plan. The primary quarry track is oval in shape, the front side of the oval passing over the top of the No. 8 and the No. 7½ crushers. The rear side of the oval lies parallel to the quarry face. This track begins to drop from the crushers on a 2½ per cent. grade which diminishes to a 1 per cent. grade on the rear side of the oval, this grade continu-

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ing around to a point on the front side of the oval adjacent to the No. 8 crusher, at which point the track rises on an incline of 1 in 3, the difference in elevation from the bottom to the top of the incline being 20 ft. On the rear side of the oval, spur tracks lead off approximately at right angles to the face of the quarry, these tracks being on a level grade and extended as the quarry face recedes. The gauge of the tracks is 3 ft.

The quarry cars are all steel cars of 3 cu. yds. capacity, dumping from both sides directly into the hopper of the crusher. They

View Looking Towards Quarry Face.

run by gravity from the crusher, around the oval to the foot of the incline. On the rear side of the oval they are intercepted by the men loading the rock and switched out to the quarry face. After being loaded they are pushed back to the oval track and resume their gravity run to the foot of the incline, where they drop into a pocket, are automatically picked up by the chain hoist of the incline and also automatically released at the top.

The rock is loaded into the cars at the quarry face by contract at 25 cents per car, from 15 to 20 cu. yds. of ballast being loaded per nine hours per man actually engaged in loading. The quarry

Crushing Plant with Cars Ascending to Crusher.

face is about 20 ft. high. Drilling is done with air, the holes being sunk to the floor of the quarry in one drilling. The rock is a very hard limestone, broken to ballast of a maximum size of 2 in. It is elevated from the crushers to bins and loaded by gravity from the latter into Rogers ballast cars, which are spotted on the track above the ballast bins and are dropped by gravity to and away from the bins as required, one switching per day only being required for this service.

During the working seasons of 1910, 1911 and 1912, comprising 365 days actual working time, 254,272 cu. yds. of ballast were produced, averaging 700 cu. yds. per day. During the first 105 working days in 1910, the average daily output was 900 cu. yds., during which time the average cost of ballast on board the cars at the crusher was $0.30314, the maximum for one month being $0.34612 and the minimum $0.24363 per cu. yd. During this time the total cost of finished ballast in the track was $0.56522, the maximum for one month being $0.61072 and the minimum $0.48214. This was with a short haul of 40.3 miles and the common labor at $1.25 per day. During the seasons of 1911 and 1912, common labor advanced to $1.50 per day and the average total haul for all time to 94.3 miles. The average cost per cu. yd. of ballast on board the cars at the crusher for the entire work was $0.40541, and the average total cost of completed ballast in the track was $0.74352. All figures herein include total cost of maintenance and operation in producing ballast and finishing it in the track, but they do not include cost of inserting new ties and gaging track. The detailed cost data for finishing the entire 254,272 cu. yds. of ballast in the track, averaging 2,500 cu yds. per mile of single track, are as follows:

	Total cost.	Cost per cu. yd.
Superintendence	$4,441.20	$0.01747
Drilling and blasting	5,934.68	0.02334
Powder	18,143.10	0.07135
Loading in quarry	34,308.12	0.13492
Haul to crusher	10,587.66	0.04164
Crushing	18,190.55	0.07154
Tools and supplies	11,490.57	0.04515
Opening track	11,244.24	0.04422
Haul to track	34,846.45	0.13704
Unloading	1,542.48	0.00606
Raising track	16,964.05	0.06672
Lining, surfacing and dressing	21,365.10	0.08402
Total cost	$189,058.20	
Cost per cu. yd.	$0.74352	
Cubic yards	254,272.00	
Average haul in miles	94.30	

A NEW SPIKE PULLER.

The spike puller illustrated in the accompanying cuts has been invented by J. E. Jones, Carneyville, Wyo., and is being used on one of the western divisions of the Chicago, Burlington & Quincy. The principal advantage of this puller over a claw bar is that it will pull a spike straight up, eliminating the friction caused by the bending of the spike and leaving the old

Spike Puller for Track Spikes.

spikes in condition to be redriven. A straight pull also causes less damage to the tie than is the case when the spike is pulled to one side, greatly enlarging the old hole. The device is easily attached to the spike and has a very short lever arm from the support on the head of the rail to the grip on the tie, allowing the spike to be pulled without exerting an excessive effort at the end of the bar. The length of the bar is about 30 in. The device complete weighs about 10¼ lb. On account of the fact that leverage is secured on the head of the rail, this device can be used to pull spikes between main rails and guard rails at frogs or crossings as easily as in other locations.

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RENEWING TWO SWING SPANS UNDER TRAFFIC.

Use of Open Timber Caissons in Building Concrete Piers for Grand Trunk Bridges at Lacolle, Que., and Portland, Me.

During the year 1912 the Grand Trunk renewed two single track swing bridges, one at Lacolle, Que., over the Richelieu river which is the northern outlet of Lake Champlain and the other at Portland, Me., over Back Cove bay, both renewals being undertaken in order to strengthen the bridges to accommodate the heavier motive power now in use. Coopers E 50 loading was used in the design.

RICHELIEU RIVER BRIDGE.

The Richelieu river bridge originally consisted of a swing span 180 ft. long, with two clear channels of 73 ft. each, with a pile

Fig. 1—Motor Boat Towing a Barge of Rock for Riprap.

trestle approach 500 ft. long on the west end and one 350 ft. long on the east end. The center and rest piers under the swing span consisted of timber cribs filled with rubble stone surrounding the supporting piles which were capped with timber grillages on which were carried concrete tops. The center pier was 26 ft. square and 33 ft. high. In renewing this pier a double wall caisson 38 ft. square over all, built up of 10 in. by 10 in. horizontal wall timbers and 12 in. by 12 in. vertical timbers, was sunk around the old pier, leaving a space between it and the old crib of 3 ft. 2 in. This caisson rested on a heavy shoe, the outside edge of which was vertical and the inside beveled at an angle of 45 deg. The shoe was made up of a longitudinal 10 in. by 14 in. oak timber beveled to form a cutting edge, and upon it two transverse sections of 12 in. by 12 in. timbers also beveled and all drift bolted together.

The caisson of the center pier and all the double wall caissons, were sunk by filling the 12 in. space between the walls with concrete. If one or more points reached a firm bearing with the caisson level before other points touched the bottom, an even bearing was secured by filling in bags of concrete placed by a diver. After the bottoms were sealed with this concrete, loose concrete was placed between the caisson and the old crib by means of a bottom dump bucket.

When the 3 ft. 2 in. wall of the center pier was filled up to approximately 3 ft. below low water level, reinforced concrete walls were carried up on this wall to the top of the old pier to support the 11 by 26 in. 166 lb. special I beams on which the swing span was carried during the completion of the pier. The reinforcement consisted of ¾ in. and 1 in. twisted rods placed as shown in the accompanying cut.

It was originally intended to complete the center pier by cleaning out all the rubble stone filling in the old crib one pocket at a time, but this was found to be impracticable owing to the slaty character of the rock foundation which made unwatering almost impossible. Instead of unwatering the pier, water was pumped into it creating a head of about 3 ft., which was utilized in forcing a 1:2 mortar through the voids in the rubble stone. This process was continued until all the voids were filled when the regular concrete was used. The mortar was deposited on the rubble by tremie. This method gave excellent results, as the concrete with the rubble stone as an aggregate resulted in a 1:3:5 proportion. The old concrete pier top was allowed to remain with the exception of the upper 18 in., which was broken up by blasting. The 108 cedar piles which supported the old pier top were also left in place, thus adding somewhat to the supporting power. The completed pier contained 1,620 yds. of concrete.

The new swing span is 250 ft. long providing two clear channels of 97 ft. each. It was erected on falsework driven under the old span. Construction work started January 1, 1912, and the new swing, the two rest piers and the outside portion of the center pier were completed March 20, 1912, in time for the opening of navigation. This work was handled during a very severe winter, some of the concrete being placed at temperatures as low as 20 deg. below zero. The center pier was protected during construction by steam pipes connected with a 30 h. p. boiler located on the old protection work. This boiler also supplied steam for the pumps.

All the protection piles and cribs of the old bridge had to be replaced, the new work consisting of six cribs built of 10 in. by 10 in. timbers loaded with rubble stone. These cribs are joined to each other and to the rest piers by floating booms. The booms consist of 12 in. by 12 in. timbers spaced 1½ in. apart by blocks, and bolted with 1½ in. bolts at intervals of 3 ft. These booms average 30 ft. long and are held in position by two 12 in. by 12 in. vertical timbers bolted to the cribs and rest piers.

The old center protection work below low water was allowed

Fig. 2—Framing Timber Caissons for Richelieu River Bridge.

to remain and after strengthening it by the addition of five new cribs, a continuous new top with a double row of walings was built. The center pier and protection work was built in 30 ft. of water.

The approaches to the new swing span consist of seven spans of 60 ft. each on the west and five spans of 60 ft. each on the east end. Deck plate girders resting on concrete piers have been used for these approaches. The three shore piers on the west end and the two shore piers on the east end were built with single wall caissons, the other seven piers being built with

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double wall caissons similar to that used for the center pier. These double wall open caissons rest on a heavy shoe as described above. The 10 in. by 10 in. wall timbers were well caulked and pumping was started generally after about two-thirds of the concrete required below the elevation of low water was placed. The intermediate piers are practically 50 ft. long and 16 ft. wide. Both the upstream and downstream ends are pointed, the angles being 45 deg. and 30 deg. respectively.

The pier noses are protected by one-half in. plates. All the piers rest on the natural bottom of hard pan and slate rock, except two piers and one abutment, on the east end, where it was found necessary to drive piling. The foundations on natural bottom were well cleaned of the loose top material by a diver.

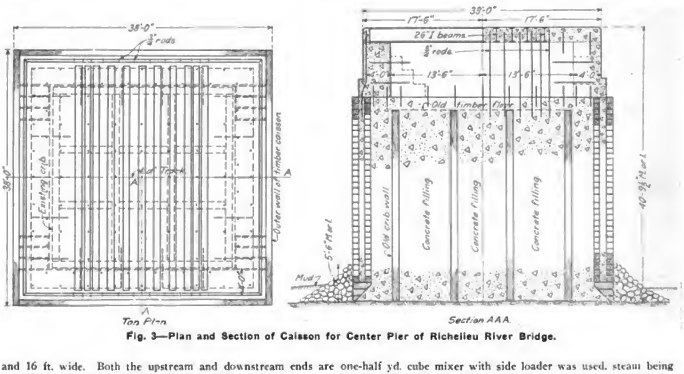

Fig. 3—Plan and Section of Caisson for Center Pier of Richelieu River Bridge.

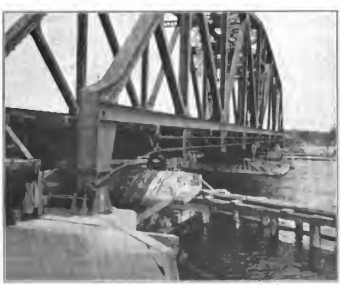

Fig. 4—New Span in Place on Completed Rest Piers, Showing Construction of Center Pier and Protection Work.

Blasting was resorted to very frequently in removing large boulders that were in the path of the cutting edges of the caissons. All the old protection work, rest piers, and piles of the old trestle approaches were removed by blasting and generally the dynamite was placed by the diver. Rip-rapping was done quite extensively and as much as 5 ft. of rubble stone was placed around the lower edge of the caissons.

The concrete plant was located on the west bank between the main line and a standard gage material siding. All sand and stone was unloaded directly from this siding at a convenient distance from the mixer, the storage piles being covered. A one-half yd. cube mixer with side loader was used, steam being furnished by a 45 h.p. horizontal boiler. Exhaust steam from this plant was turned directly through the sand and stone and served to keep these materials sufficiently warm during the severe winter. A hoist alongside the mixer handled the buckets into which the concrete was dumped, placing them on narrow gage cars which were operated on a track from the mixer out across a temporary trestle alongside the bridge for its full length. While the river was open a 30 ft. motor boat with an 18 h.p. engine capable of making 15 miles per hour was used to very good advantage in towing barges and handling material to and from the bridge site.

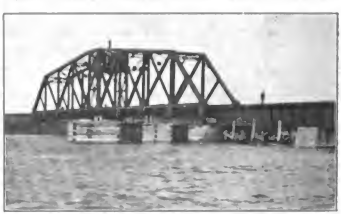

Fig. 5—New Swing Span and Approaches at Lacolle, Que.

The twelve deck plate girders weighing 28 tons each were erected in 5½ days. The old pile bents were cut off below low steel, and the old bridge floor removed by a derrick. As the grade line was raised 3½ ft., temporary timber approaches were used at both ends.

BACK COVE BAY BRIDGE AT PORTLAND.

The work at Portland consisted of renewing a single track

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bridge 225 ft. long, replacing the two rest piers and retopping the center pier. The grade line was raised 3 ft. at this bridge, requiring a new top on the old masonry center pier which proved to be in very good condition after 20 years of service. The same design of open caisson was used as that described above for the Richelieu river bridge. In this case the caissons were sunk through blue clay. One was driven to rock 42 ft. below high tide and the other to the same elevation being supported on piles driven inside the caisson as the rock at this point was 75 ft. below the old base of rail or 67 ft. below high tide. The concrete was deposited by bottom dump buckets under water and by tremie, special cars being taken to secure the best quality of work in order to withstand the action of sea water.

The piers were of concrete faced with granite masonry, thus insuring permanent results, as investigations showed that concrete suffered from frost owing to the variations in tide level. The difference between average low tide and average high tide at this point is 10 ft.

The J. S. Metcalf Co. Ltd., were the contractors for both bridges. The Dominion Steel Co fabricated and erected the Richelieu river bridge and the Pennsylvania Steel Co. had the contract for the Back Cove bridge. The work was handled under the supervision of H. R. Safford, chief engineer, and R. Armour, masonry engineer, Albert Larsen being the resident engineer in direct charge of the work.

EFFICIENCY IN BRIDGE WORK.

By L. C. LAWTON.

Division Engineer, Atchison, Topeka & Santa Fe, Newton, Kan.

It is not a paradox that some of our most successful superintendents or general foremen of bridges are making their individual gangs all-round workmen and specialists too. It is necessary that every regular bridge gang should be able to man a pile-driver, crib a bridge or build any kind of false work. One gang may do all the difficult driving, but if the gangs are assigned to certain districts, each one should be able to, and should have the opportunity to drive the bridges or false work on that division. It frequently happens that the best gang is caught away from the pile-driver during a washout and that is no time to break in a green gang and foreman, nor even for an experienced foreman to take men who are not trained. No doubt this has been impressed on many officials in the flood districts recently, especially where their permanent work has called for little use of a pile driver. In such cases the pile driver drill should be a part of their work, as the fire drill is of most shopmen.

Not only should each man be taught his place on the driver, but should be able to make a driver in short order from a hoisting engine and with swinging, or in a pinch, with no leads at all. In this way an old drop hammer would be all the extra equipment needed to carry on this work. We had an experience of this kind during the last year, when an old drop hammer was swung from the boom of a derrick car, and swinging leads made in a few hours, enabling us to drive false work for a steel bridge on a distant branch line when the regular driver was in the shop for repairs and no other could be secured. By so doing, we avoided tying up a very expensive steel gang.

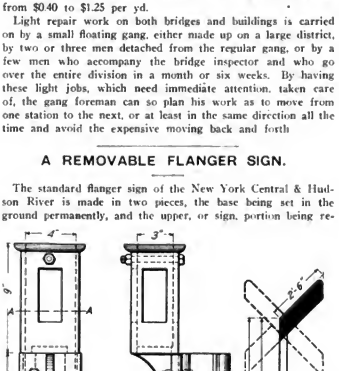
A part, at least, of each gang should also be familiar with cribbing. Every engineer knows how exasperating it is to get a gang of inexperienced men in water 4 to 6 ft. deep and with more or less current and start a crib. The chances are that they will build up without a foundation, or if one is started properly it will wash out or topple over when half completed. Few old time bridge men are left, and those of the present day are often only second rate carpenters and helpers, as the better men can get higher wages and an easier life in other work.

With reference to creating an efficient organization, I would not advocate an apprenticeship, but would suggest that all gangs have some drill in caring for bridges or track in case of flood, fire or other disaster. On the other hand each extra gang, and there should be several, should be specialists in their line. One or more, if needed, should do the building, and in this can be placed the best house carpenters that can be picked up. This will make a gang entirely unlike any other on the road and should be so. Another will be the concrete gang and, in a large part, composed of concrete laborers. Added to this will be one or more form carpenters, although it is often an advantage to use these men on light repair work in buildings when form building is not under way. After a little training, this gang can be used on rough false work at but little over the average wage for concrete work. This has been found much cheaper than contracting this class of work, as in any case, the company is responsible for the false work and usually keeps a bridge gang either on the work, or accessible to it. The concrete is often placed by our men in the time that was lost by the old method and the contract price saved. During the last few years much of the cut masonry placed when our road was built has shown signs of decay and is being replaced by monolithic concrete. The cost of false work varies in each job, but cost of labor in removing the old masonry runs from $1.50 to $2 per yd. on forms fifty to sixty cents, and of placing concrete $1.75 to $2 per cu. yd. The cost of embankment or foundation excavation varies greatly, running from $0.40 to $1.25 per yd.

Light repair work on both bridges and buildings is carried on by a small floating gang, either made up on a large district, by two or three men detached from the regular gang, or by a few men who accompany the bridge inspector and who go over the entire division in a month or six weeks. By having these light jobs, which need immediate attention, taken care of, the gang foreman can so plan his work as to move from one station to the next, or at least in the same direction all the time and avoid the expensive moving back and forth

A REMOVABLE FLANGER SIGN.

The standard flanger sign of the New York Central & Hudson River is made in two pieces, the base being set in the ground permanently, and the upper, or sign, portion being removed during the summer when there is no occasion for its use along the track. The lower portion or base extends about 4 ft. below the ground, with a socket 9 in. long extending above



A Removable Flanger Sign.

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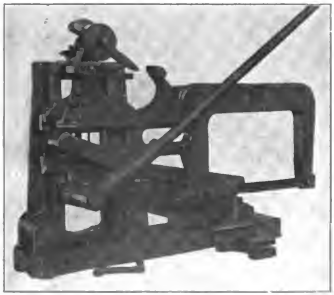
ground into which the post of the sign is inserted, the latter being held in place by one bolt. When serving solely as a flanger sign, only one wing is put on, as shown solid on the drawing. Where the sign serves also as a snow plow wing sign, the upper arm on the left is added as shown in heavy dotted lines. At points where the flanger has to be raised and the wings of the snow plow closed in at the same time, a cross is used as indicated in light dotted lines. We are indebted to C. E. Lindsay, division engineer, for this information.

THE FLESTER RAIL SAW.

With the rapidly increasing use of open hearth rails the difficulty in cutting rails quickly and accurately has been greatly increased. To meet the demand for a saw to perform this work the Flester rail saw has been devised, an important feature of which is its positive automatic feed. This automatic feed is secured by means of a ratchet, the cam of which is moved at each stroke of the handle. The rate of speed is adjustable by a slide arrangement on the cam so that it can be changed as desired. In actual performance the lowest feed is used in cutting through the top of the rail, a much higher feed through the web, and a medium feed through the base. The saw is rigidly built so that



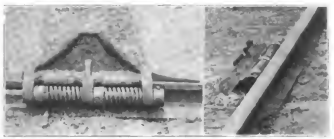
The Flester Rail Saw.

it does not vibrate in service and cuts clean. By removing a pin the saw can be adjusted to cut at any angle. By removing one bolt it can be tipped back to clear trains without disturbing the adjustment, and when thrown back in position it will strike the same cut without breaking the teeth of the blade. A ring is inserted in the top of the saw over the center of gravity through which a handle can be placed enabling two men to carry it. The machine weighs 120 lbs. A test on the New York Central showed that this machine would cut through their standard high carbon rail in 12.5 min., while girder rails on the Interborough Rapid Transit Lines in New York have been cut in 14.5 min. This saw is sold by Flint & Chester, 237 Lafayette street, New York City.

THE RINK HINGED RAIL STOP.

The accompanying photographs show a hinged rail stop which is designed especially for use on car floats, docks and terminal tracks and on tracks leading to car floats and transfer tables. This device is not intended to stop cars running at high speeds, but rather to prevent cars from starting because of impact shocks or wind. When in use, it is thrown up on the rail as shown, and if a through track is desired, the stop is easily thrown on its side.

The stop consists of three parts, a lower casting or bracket which is secured to the web of the rail by four bolts, the top casting which normally rests upon the head of the rail when in service, and a coil spring. The top casting is provided with a wedge protection and the face of the stop toward the wheel is also curved upward to offer resistance to a wheel climbing up on the stop. This casting is also provided with flanges projecting over both sides of the head of the rail to hold it in position. The coil spring opposes the longitudinal movement of the top



Rink Hinged Rail Stop in Service and Out of Service.

casting along the rail and serves to absorb the momentum and shock imparted to the device by a moving wheel. The friction between the stop and the rail is greatly increased by the weight of the wheel on the stop, and also materially assists in retarding the movement. One of these devices is placed on each rail when in use. This stop has been in service in tracks leading to the transfer table in shop yards of the Central R. R. of New Jersey at Elizabethport, N. J., for some time, and is also in use on tracks of the Lake Shore & Michigan Southern at Collinwood, Ohio. It was devised and patented by Geo. W. Rink, mechanical engineer, Central Railroad of New Jersey, Jersey City, N. J.

A PENNSYLVANIA WORK CAR.

By C. H. Thomas.

The accompanying photograph shows an old style passenger coach which the Pennsylvania has remodeled and is now using in the maintenance of way department. This car is fitted up at

A Pennsylvania Work Car.

the rear end with an office for the work train conductor. Back of this there are two rooms with seats on either side for the use of track hands and other laborers. A commissary is also located in this car.

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General News.

The anti-noise campaign in Chicago is receiving the co-operation of the railways, several of which have promised their assistance by eliminating some of the whistling of locomotives and ringing of bells which the city council committee deems unnecessary.

The twenty-first annual meeting of the Society for the Promotion of Engineering Education will be held at Minneapolis June 24, 25 and 26. Among the papers to be presented will be one on the "Revision and Standardization of English Technical Terms."

An elevated railroad is being built in California at the Oakland terminal of the Southern Pacific—the only elevated railroad west of Chicago. The elevated line will be a double track structure with ballasted floor, 12 blocks (3,844 ft.) long, and will accommodate the suburban electric passenger trains.

The "Diamond Special" Express of the Illinois Central, northbound, was stopped by robbers about 13 miles south of Springfield, Ill., on the night of June 17, and the engineman was compelled to pull the express car some distance away from the passenger cars where a stop was made and the express messenger was overpowered and the safe blown open.

Special despatches from Washington say that the bill, or one of the bills, for the construction by the government of a railroad in Alaska, is to be urged for early passage in Congress, and that President Wilson has in a general way approved the project. The bill in its present shape will put the control of this enterprise in the hands of the president, the committee having cut out the provision for a special commission. The amount of bonds authorized to be issued, as now stated in the bill, is $40,000,000.

The bill to amend the Erdman Act, providing for conciliation and arbitration in controversies between interstate railroads and their employees, which was reported in the *Railway Age Gazette* last week, page 1328, is understood to have the approval of all important interests, the railroads, the officers of the railroad brotherhoods and the National Civic Federation; and a committee representing these different interests expects to have conferences with congressional committees at Washington this week, looking to early action.

"How to Repair and Maintain the Roads" is the title of a bulletin which has been issued by the Office of Public Roads of the Department of Agriculture. It does not treat the subject of road building, but takes up the repair and care of roads after they are built. All classes of roads, from the natural earth road to the macadam roads with bituminous surfacing, have received attention. The action of automobiles on road surfaces is explained. The systems of road management in Massachusetts, New York, England and France are given, with tables of costs.

The Public Service Commission of New York, for the First District, has written a letter to Governor Sulzer asking him to urge upon the special session of the Legislature, convened this week, to make an appropriation of $1,278,025 as the State's one-quarter of the estimated cost of eliminating grade crossings on the Atlantic Avenue Division of the Long Island Railroad, between the end of the present elevated structure and the westerly end of the Jamaica improvement. The commission sets forth the number of accidents which have occurred since the commission was organized, July 1, 1907. These include 15 fatalities and a large number of serious injuries. The conditions at the most dangerous of the crossings are set forth in detail.

Railway Terminal Discussion in Chicago.

New plans for the solution of the terminal problem in Chicago continue to be presented to the committee on terminals of the city council. The latest is that of William Drummond of the architectural firm of Guenzel & Drummond, who suggests a main trunk line at Englewood to be used by all through traffic entering from the south, and a three-sided loop with connections to handle the traffic from the west and north.

Following the Pennsylvania's ultimatum last week, to the effect that unless the road's plan for a west-side terminal is approved the present inadequate facilities will be continued indefinitely, the council committee has held several meetings at which the various plans were discussed by interested parties. Architect A. J. Graham presented arguments for the Pennsylvania plan, and F. O. Butler of the J. W. Butler Paper Company—whose opinion is probably representative of that of the business men in localities embraced in the various plans—supported Mr. Graham's contentions.

On Saturday of last week Jarvis Hunt, sponsor of one of the plans, gave the committee of councilmen a long address, the burden of which is well expressed by the word "ouch." He accused Joseph Wood, one of the vice-presidents of the Pennsylvania, of saying that "he didn't give a cuss about Chicago," and later of reiterating his statement to the effect that he "cared nothing about Chicago." Mr. Hunt also accused Darius Miller, president of the Burlington, of changing front on the subject without sufficient reason. He referred to a book written by President Rea of the Pennsylvania, called "The Railways Terminating in London," in which he said the segregation of traffic was urged; disclaimed all but altruistic motives in spending his own time and money in the preparation of his terminal plan; and expressed himself otherwise in a manner which tended to show that he was considerably aggrieved because the railroads involved have not seen fit to discard the results of seven years of planning on their part and accept his proposition.

The Chicago Association of Commerce, on June 11, addressed an open letter to the mayor, the city council and the citizens of Chicago urging delay in passing the proposed smoke abatement and electrification ordinance which would demand electrification of all railroad terminals by June, 1915, and which has received the recommendation of the council committee on terminals. The association denies vigorously the accusation that it has attempted to thwart electrification or smoke abatement in the city, and says that its report, which has been in course of preparation for three years, will be ready in 1914, and will come nearer the desired solution of the problem than any haphazard action which may be taken by the council without a comprehensive investigation.

At one of last week's meetings of the Council Committee, Robert C. Sattley, valuation engineer for the Rock Island Lines, presented a scheme for a union station to include all the railways entering the city, even the Illinois Central, and to be located west of the river at a distance from the loop district not much greater than the new North Western terminal. Mr. Sattley's plan is the one that was originally presented in 1901 before the Western Society of Engineers and published in proceedings of that organization, but with revisions to bring it up to date.

Engineers Wanted for Valuation Work.

The United States Civil Service Commission, Washington, has issued its announcements of examinations to be held for filling positions in the Interstate Commerce Commission under the act providing for the valuation of the property of railroads. The examinations will be held July 23, at the usual places in different parts of the country, and the places to be filled are as follows:

Senior structural draftsman	Salary	$1,800	to $4,000
Senior mechanical engineer		1,800	to 4,800
Senior railway signal engineer		1,800	to 4,800
Senior electrical engineer		1,800	to 4,800
Senior inspector of car equipment		1,800	to 3,600
Senior civil engineer		1,800	to 4,800
Senior inspector of motive power		1,800	to 3,600
Senior architect		1,800	to 4,800
Architect		1,080	to 1,500
Inspector of motive power		1,200	to 1,500
Civil engineer		720	to 1,500
Inspector of car equipment		1,200	to 1,500
Electrical engineer		1,080	to 1,500
Railway signal engineer		1,080	to 1,500
Mechanical engineer		1,080	to 1,500
Structural engineer		1,080	to 1,500

In the case of positions for which the salaries are $1,800 or more the applicants are not required to assemble at any place for examination, but are rated according to the documentary evidence presented.

Persons desiring to enter an examination should at once apply for blank form 2039 to the United States Civil Service Commission at Washington, D. C.; or to the secretary of the Board of Examiners, at Boston, Philadelphia, Atlanta, Cincinnati, Chicago, St. Paul, Seattle, San Francisco, New York, New Orleans, Honolulu, St. Louis, or to the chairman of the Porto Rican Civil Service Commission, San Juan.

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Disastrous Fire at Oak Island, N. J.

In the burning of a trestle bridge of the Lehigh Valley across Newark Bay between Waverly and Greenville, N. J., on Sunday morning last, about 3,000 ft. of the bridge, together with the same length of the bridge of the Pennsylvania Railroad adjacent, were destroyed above the waterline, and the lines of both these roads to their freight termini at Communipaw and Greenville were put out of business for perhaps two weeks. The loss, including cars, is estimated variously at from $500,000 to $1,000,000. The fire is said to have started from sparks thrown by a locomotive, without a train, running at high speed. The floor of the trestle was of new creosoted ties and burned rapidly; and it is said that drippings of oil had made the floors of both bridges highly combustible. Both of these bridges are double track. Thirty cars of freight were either burned or fell into the bay, a freight train having been held on the trestle because of a blockade on the track ahead of it. Firemen from the nearby cities were obliged to pump water more than a mile to reach the fire, and fireboats in the channel were kept a long distance from the fire because of the low tide.

New Railroad Law in Massachusetts.

The legislature of Massachusetts has passed a law empowering the New York, New Haven & Hartford to own, operate and extend electric railways in the western part of the state—the law covering, it is said, all of the city and interurban lines west of Worcester. This law was adopted on June 12 by very large majorities in both houses after it had been vetoed by the governor. On June 12 also the governor vetoed the bill to enlarge the number of men in the Railroad Commission, to change the title of the commission, and to give it many new powers; and this law also was soon adopted over the governor's veto.

Under the new law, which is called the Washburn law, the railroad commission becomes the Public Service Commission and will have five members instead of three. It gives extensive power of regulation of railways, similar to those of the public service law of New York, and the board will have the same authority to enforce its orders reducing rates, etc. There is the usual elaborate prohibition of free passes and free service. The commission is specifically authorized to order changes in the number of men in train crews. Two sections concerning which there was much controversy and the terms of which were given by the governor as the chief reasons for his veto, sections 15 and 16, authorize railways to incur indebtedness equal to twice the amount of their capital stock, but every act of a corporation in financial matters is under the close supervision of the commission.

The Wicked Express Companies.

We are constantly hearing complaints about the high cost of living. The pessimist, who is always with us, cries out that we are taxed from the cradle to the grave; but the worst, it seems, is yet to come. The Pennsylvania State Anatomical Board, which has charge of the pleasant task of the distribution of the bodies of the unclaimed dead to medical schools, has complained to the Railroad Commission that the express companies are about to double the rates for carrying this class of freight. The only explanation of it is that the express companies, being no longer able to practice extortion on the living, propose to take it out on the dead.—*Philadelphia Inquirer.*

Tool Foremen's Convention.

The American Railway Tool Foremen's Association will hold its fourth annual convention at the Sherman Hotel, Chicago, July 22, 23 and 24. All foremen in charge of the tool department of steam and electric railway shops are eligible to membership, and all railway foremen are invited to the convention whether members or not. There will be elaborate exhibits of tools and machinery in the exhibition hall adjoining the convention room, in charge of A. H. Ackerman.

It is expected that there will be a number of higher railway officers present as speakers, and the program is as follows:

1. Reclaiming of Scrap Tool Steel; J. J. Sheehan, chairman. 2. Making of Thread Cutting Dies; A. W. Mertz, chairman. 3. Making of Forging Machine Dies; B. Hendrickson, chairman. 4. The Electric Furnace for Tempering Tool Steel; Method of Operation, Cost of Maintenance, and Results Obtained; C. A. Schaffer, chairman. 5. Superheated Tools and Their Care; H. Otto, chairman. 6. The Form of Thread and Degree of Taper for Boiler Studs and Boiler Plugs; A. M. Roberts, chairman.

American Society for Testing Materials.

This association, affiliated with the International Association for Testing Materials, will hold its sixteenth annual meeting at Atlantic City, N. J., next week, Tuesday, Wednesday, Thursday, Friday and Saturday, at the Hotel Traymore. There will be business meetings morning and afternoon, and on Tuesday and Wednesday evenings. Following are the principal subjects on which reports and papers will be presented: Standard Specifications for Coal; Standard Specifications for Rubber Products; Preservative Coatings for Structural Materials; Standard Tests for Lubricants; Tests on the Rate of Corrosion of Metals; On Heat Treatment of Iron and Steel; Heat Treatment of Hypo-Eutectoid Carbon-Steel Castings; Tests Made on Rail-Steel Concrete Reinforcement Bars; Standard Specifications for Steel; Rail Failures and Their Causes; Resistance of Steels to Wear in Relation to Their Hardness and Tensile Properties; Effect of Small Percentages of Vanadium on the Physical Properties of Steels; Standard Specifications for Wrought Iron; Standard Specifications for Cold-Drawn Steel; Tests of Welded Boiler Tubes; Mechanical Tests of Heat-Treated Spring Steel; Oxygen in Iron and Steel; Value of Ledebur Method in its Determination; Standard Specifications for Cement; Reinforced Concrete; Method and Apparatus for Determining Consistency of Concrete; Autoclave Tests for Cement; Waterproofing Materials; Tests of Reinforced Concrete Slabs Under Concentrated Loading; Test Data on an Experimental Concrete Bridge; Ceramics and Road Materials (seven reports); Standard Specifications for Copper Wire; Metallographic Study of Lead-Tin-Antimony Alloys; A Study of Bearing Metals and Methods of Testing; Conservation and Shipping Containers; Efficiency and Safety in Explosives Used in Blasting; Large Capacity Testing Machines in this Country and Europe.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Boston, Mass. Convention, May 19, 1914, St. Louis.

American Association of General Passenger and Ticket Agents.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

American Association of Freight Agents.—R. Q. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

American Association of Railroad Superintendents.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Electric Railway Manufacturers' Assoc.—H. G. McConnaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

American Railway Association.—W. F. Allen, 75 Church St., New York. Next meeting, November 19, 1913, Chicago.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

American Railway Engineering Association.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago.

American Railway Tool Foremen's Association.—A. R. Davis, Central of Georgia, Macon, Ga.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—J. Weninger, 11 Broadway, New York; 2d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

American Wood Preservers' Association.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Annual convention, October 14-24, Chicago.

Association of Railway Telegraph Superintendents.—F. W. Drew, 112 West Adams St., Chicago.

Association of Transportation and Car Accounting Officers.—G. P. Coward, 75 Church St., New York. Summer meeting, June 25-26, Charlevoix, Mich.

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ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 764, Harrisburg, Pa.; 1st Monday after Jan., March, May, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; 1st Thursday after each meeting of the U. P.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & BRIDGE PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M. R., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. D. Anderson, Penn. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOCIATION.—J. Scribner, Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 2-5, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—W. Sykes, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Peterson, 15 Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs. Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—C. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DISPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. R. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The new schedule for the new extra-fare Overland Limited of the Chicago & Northwestern and Union Pacific which went into effect, Sunday, June 8, decreases the time between Chicago and San Francisco another hour. The running time is now 63 hours and 30 minutes.

The New York State Public Service Commission, Second district, which has authority over telephone rates throughout the state, including New York City, last week issued an order reducing toll rates for long distances in New York City from 10 cents to 5 cents, to such an extent, it is said, that the reduction in the receipts of the company will amount to $750,000 a year. The telephone company had already signified its acquiescence in this order.

The Empire Express Company, a new independent organization in Texas, is the defendant in a case recently filed in the Federal District Court at Dallas, to test the legality of an exclusive contract with a railroad. The proceedings are in the nature of an application for injunction by the Missouri, Kansas & Texas against itself to restrain it from receiving express packages from the Empire Express Company and also restraining the express company from offering such packages for transportation. The defendant claims that the exclusive contract with another express company, upon which the railroad bases its application, is in violation of the laws and constitution of the state of Texas.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended from June 20 until December 20, certain advances in rates for the transportation of potatoes from points in Oklahoma to points in Colorado.

The commission has suspended from June 23 until December 23, certain advances in rates on lumber from points in Texas, Louisiana and Arkansas to destinations in Oklahoma and Missouri.

The Commerce Commission has suspended from June 18 until September 12 the operation of an item in Supplement No. 1 to Hocking Valley tariff No. 1534, containing a proposed increase in the charge for the privilege of fabrication in transit at Toledo of structural iron and steel.

Cotton Seed Rates.

Refuge Cotton Oil Company et al v. St. Louis, Iron Mountain & Southern et al. Opinion by Commissioner Meyer:

The complainant contends that the rates on cotton seed from points on the St. Louis, Iron Mountain & Southern in Arkansas and Louisiana to Vicksburg, Miss., are unreasonable as compared with rates on the same commodity to St. Louis, Mo.; Memphis, Tenn.; and Natchez, Miss., and asks that just and reasonable rates be established. The commission decided that the rates in question were unreasonable and that the remedy which the complainant seeks could be found only in the establishment of joint through rates. As the complainant did not request the establishment of such rates, no orders could be issued, but the commission recommended that certain joint through rates be established. (27 I. C. C., 117.)

Coal Rates Not Increased.

Shoal Creek Coal Company v. Toledo, St. Louis & Western et al. Opinion by the commission:

The complainant contends that the rates on bituminous coal from Panama, Ill., to points on the west bank of the Mississippi river, are unreasonable. On December 1, 1910, these rates were increased and the complaint is directed against these advances. The commission decided that the advances had not been justified and ordered that in future the same rates should be charged as those in effect prior to December 1, 1910. (27 I. C. C., 107.)

Lumber Rates from Southern Mills Sustained.

Suspension Docket No. 145. Opinion by Commissioner McChord:

Proposed increased rates on lumber in carloads from certain

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groups in southeastern territory (Florida, Georgia and Alabama) to Washington, Baltimore, and points related thereto, and to certain points in New Jersey, not found to be unreasonable or unjustly discriminatory. Order of suspension vacated. As to certain rates the protests (filed last August) were withdrawn, and the principal contention remaining was as to the reasonableness of the increased rates to Washington, Baltimore and intermediate stations. The increases were from 1 to 4 cents per 100 lbs.

The proposed tariffs, generally, establish the same rates to Washington, Baltimore, and all intermediate stations on the Baltimore & Ohio. At the present time the rates to Washington proper are higher than to stations on the line of the Baltimore & Ohio Railroad immediately beyond Washington as far as Hyattsville and Alexandria Junction, Md.; the rates to Washington are the same as to stations on the Baltimore & Ohio between Alexandria Junction and Relay; and these Washington rates are higher than the rates to stations Relay to Baltimore, inclusive. At the present time, and for some years past, the rates to stations on the Philadelphia, Baltimore & Washington between Washington and Baltimore are and have been the same as the proposed rates. From some of the points of origin here in issue and from a large part of the southern territory, the Seaboard Air Line has had in effect since September 10, 1910, rates to Baltimore & Ohio stations east of Washington, including Alexandria Junction and Hyattsville, the same as the rates here suspended.

The grounds upon which the carriers seek to show that these proposed increased rates are just and reasonable are that they were published to establish rates in line with the normal basis between the points named, the same as the rates now in force via the Seaboard Air Line and the same as now apply to stations between Washington and Baltimore on the line of the Philadelphia, Baltimore & Washington; to eliminate certain violations of the fourth section of the act at destination points; and to correct clerical errors in present tariffs. As a part of their defense the respondents show the revenues per ton per mile the proposed rates would yield, and compare these ton-mile earnings with those now received under the rates from the same general territory of origin to central freight association territory.

The protestants claim that the maintenance of the present rates to Washington and Baltimore for a long period has resulted in an adjustment of commercial conditions that should not be disturbed, and that the rates to Baltimore may well be less than to Washington in view of its location and the possibility of water competition. To this the respondents reply that the present rates to Baltimore were erroneously constructed in the first instance by using, on traffic moving through Richmond, the divisions applicable to Norfolk; that the divisions on lumber up to Norfolk accruing out of all rates to eastern points have never properly been applicable to Baltimore; and that while Baltimore is a great port it has never been called a water-competitive point, because that term in this territory is restricted to points on or served in connection with the New York, Philadelphia & Norfolk.

The unweighted average distance from 17 of the more important points of origin served by the Southern Railway to Washington is 792 and to Baltimore 806 miles. The average revenue per ton per mile on this traffic from these points, if the proposed rates be permitted, will be 6.58 mills to Washington and 5.63 mills to Baltimore. Comparing these distances and revenues with those from the same points of origin to Springfield, Ohio, the respondents show that the average short-line distance is 691 miles and the average revenue per ton per mile on the rates now in force 7.64 mills. For the Central of Georgia it was shown that from 13 representative points in the various groups served by it the average short-line distance to Baltimore is 887 miles and to Washington 847 miles. The proposed rates would yield an average ton-mile revenue of 5.55 mills to Baltimore and 5.75 mills to Washington. These distances and revenues are compared with the short-line distances to Dayton and Columbus, Ohio, and to Indianapolis and Logansport, Ind., from the same 13 points. The average distance from these points of origin to these four points of destination is 794 miles, and the average revenue per ton per mile 6.57 mills. For the Atlantic Coast Line it was shown that from 12 representative points of origin served by it to Baltimore the average distance is 849 miles and the average ton-mile revenue 5.77 mills. Apparently to Washington the average distance is 869 miles, and the average revenue under the proposed rates would be 6.05 mills.

No part of the advances here involved will accrue to the lines north of Richmond and Potomac Yards. The southern roads, on whose lines the traffic originates, proposed the rates here considered and will receive whatever additional revenue may be produced. Respondents have sustained the burden of proof, and a careful investigation of the record failing to show unreasonableness or unjust discrimination in the proposed rates it follows that the order of suspension should be vacated. (27 I. C. C., 189.)

Coke Rates Reduced.

Coke Producers' Association of the Connellsville Region v. Baltimore & Ohio et al. Opinion by Chairman Clark:

Rates on coke in carloads from the Connellsville producing region of Pennsylvania to various destinations are attacked as unreasonable *per se*, unjustly discriminatory, and unduly preferential. The commission holds:

1. That the rates to Youngstown, Canton, Cleveland and Toledo, Ohio; North Cornwall, Robesonia, Reading and Philadelphia, Pa.; Baltimore, Md.; and Newark, N. J., are unreasonable *per se*.

2. That the present relationship of rates as between the Connellsville district and the Fairmont district in West Virginia is not unduly discriminatory against Connellsville or unduly preferential to Fairmont and must be maintained.

3. That participation by defendants in through rates from West Virginia and Tennessee fields, which yield lower earnings per ton-mile than their rates from the Connellsville field, is, under the conditions of competition between carriers which defendants cannot control, neither unduly discriminatory nor unduly preferential.

In its conclusion the commission says:

"In this and in other cases herein referred to, the rates upon a vast tonnage are involved. We feel impelled to give most careful consideration to the effect which changes will have upon the carriers' revenue. Under the circumstances we would not feel warranted in requiring the serious reductions that have been sought unless it were necessary in order to remove unjust discrimination or to correct manifest unreasonableness. There is nothing here to indicate that the volume of traffic will be augmented by drastic reductions in these rates or change in the relationship as between Connellsville and Fairmont. Other carriers have heretofore maintained, to markets that could thus be reached from other districts, rates approximately equal to those from Connellsville, and there is no reason to assume that they will surrender that traffic and allow the industries served by them to die rather than to meet reduced rates from Connellsville. Manifestly, the loss of revenue which would result from drastic reductions in the rates upon the tonnage involved in these cases cannot be compensated for by increases in rates upon other traffic.

The commission orders that the defendants (16 roads) desist, on or before August 1, 1913, and for a period of two years thereafter from charging their present rates for the transportation of coke in carloads from the Connellsville region to the various destinations in Ohio, Pennsylvania, Maryland and New Jersey named below, and that they establish, on or before August 1, 1913, the following rates (in dollars per net ton): Youngstown, Ohio, $1.20; Canton, Ohio, $1.40; Cleveland, Ohio, $1.60; North Cornwall, Pa., Baltimore, Md., and Robesonia, Pa., $1.80; Reading, Pa., and Toledo, Ohio, $1.85; Philadelphia, Pa., $2.05; and Newark, N. J., $2.30. It is further ordered that they apply to the transportation of coke in carloads from the Fairmont district of West Virginia to the said destinations the same relation of rates that at present exists, which relation is found to be reasonable. (27 I. C. C., 125.)

Youngstown Sheet & Tube Company et al. v. Pittsburgh & Lake Erie. Opinion by Chairman Clark:

Complaint attacks the rate on coke from Connellsville to points in the Mahoning Valley of Ohio and the Shenango Valley of Pennsylvania as unreasonable *per se*. Reparation is sought. It is held that following the decision in the case above reported (27 I. C. C., 125) the rate of $1.35 per net ton from Connellsville district to points in the Mahoning Valley of Ohio is unreasonable to the extent that it exceeds $1.20. Transportation to points in the Shenango Valley is not within the commission's jurisdiction. In the case above noted a general readjustment of rates on coke is prescribed, and under such new adjustment reparation will not be awarded. (27 I. C. C., 165.)

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Coke Rates Sustained.

Wickwire Steel Co. et al. v. New York Central & Hudson River et al. Opinion by Commissioner Meyer:

The present rates for transportation of coke from the Connellsville fields in Pennsylvania to Buffalo, N. Y., not found unreasonable; complaint dismissed. (27 I. C. C., 168.)

Wisconsin Steel Company v. Pittsburgh & Lake Erie, et al; same v. Pennsylvania Railroad et al; Inland Steel Company v. Pittsburgh & Lake Erie et al. Opinion by Chairman Clark:

After maintaining for a substantial period rates on coke from the Connellsville producing region in Pennsylvania to Chicago of $2.35 per ton when for furnace use, and $2.65 per ton when for foundry use, defendants, in conformity with ruling of the commission, abandoned the maintenance of rates dependent upon the use to which the commodity was put, and established a rate of $2.50 per ton from Connellsville to Chicago. Complaints attack the rate of $2.50 per ton as unreasonable, and pray for reparation; it is held that the rate of $2.50 per ton is not unreasonable *per se*, and the complaints are dismissed. (27 I. C. C., 151.)

Iron Ore Rates Found Unreasonable.

Pittsburgh Steel Co. v. Lake Shore & Michigan Southern et al. Opinion by Commissioner Meyer:

After careful deliberation upon all the elements in this case, together with a consideration of the relation of this case to all the other cases in the group of which it is one, and which together affect the vital part of the total traffic of all these carriers, it is held, that the rate on iron ore from Lake Erie ports to the Pittsburgh district should not be higher than to the Wheeling district, and an order is issued requiring the rates to be readjusted by August 15. (27 I. C. C., 173.)

Rates on Glass to High Point Found Too High.

Standard Mirror Company et al. v. Pennsylvania Railroad et al. Same vs. Lake Shore & Michigan Southern et al., and Snow Lumber Company et al. v. Pennsylvania Railroad et al. Opinion by Commissioner Meyer:

Present rates on window glass, rolled glass and plate glass from Pittsburgh, Pa., to High Point, N. C., found unreasonable to the extent that they exceed 40 cents per 100 lbs. on window glass and rolled glass, and 53 cents on plate glass. Present rate on plate glass from Toledo, Ohio, to High Point, N. C., found unreasonable to the extent that it exceeds 64½ cents per 100 lbs. The former differential from Reynoldsville, Pa., on window and rolled glass of 1 cent over Pittsburgh should be maintained Upon receipt of proper statements prepared by complainants and verified by defendants, the commission will issue orders of reparation. It is expected that the carriers will correct their tariffs by July 15; if they do not an order will be issued. (27 I. C. C., 200.)

Complaint Dismissed.

Merchants Freight Bureau of Little Rock, Ark., v. Waterloo, Cedar Falls & Northern et al. Opinion by the commission:

The complainant contends that the rates on canned goods in carloads from points in Iowa to Little Rock and Pine Bluff, Ark., are unreasonable. These rates were increased in May, June and July, 1912, the advances ranging from 5 to 7 cents per 100 lbs. The commission decided that the advances in the rates in question had been justified. (27 I. C. C., 111.)

STATE COMMISSIONS.

The Railroad Commission of Louisiana has ordered the Yazoo & Mississippi Valley to enlarge and improve its pagoda at Gurley. Pagoda, we infer, means flag station.

The Louisiana Railroad Commission will hold a hearing on June 24, at which the matter of whether or not the commission shall issue a compulsory order to install block signals will be considered. The commission hopes to issue at that time a final order.

Chairman O. F. Berry, of the Illinois Railroad & Warehouse Commission, has been investigating for several weeks the conditions with reference to the demand for and the supply of grain cars throughout the state, and, as a result he says that Illinois roads are not equal to the demands made upon them for cars of this kind.

The Montana Railroad Commission has filed a protest with the Interstate Commerce Commission against an increase in passenger rates from points in Montana to points in Wisconsin, Illinois and other eastern states, which amounts to about $2 over present rates, and was to have gone into effect July 1. An investigation of the reasonableness of the proposed increase is asked.

The Railway Commission of Canada has called upon the railway companies to show cause why the commission should not issue an order requiring all roads within three years to install interlocking signals at grade crossings of one railway with another, and also at all crossings of electric roads. The commission "is impressed with the large number of accidents occurring at grade crossings of one road with another."

The Kansas Public Utilities Commission on June 9 denied the application of the railroads of Kansas to increase the minimum carload weights on grain, grain products, salt, cement, and a number of other commodities, holding that if the application were allowed the increase would work a hardship on the small dealer, because the present minimum of these commodities is the maximum amount that the small dealer can buy.

The Public Service Commission of Missouri on June 13 made public its report on a butting collision between passenger trains at Brant Sidings, Mo., on the Missouri Pacific, May 27, in which four persons were killed. The cause was negligence of a train dispatcher in giving conflicting orders and the failure of a block signal operator in block working. The commission recommends that employees be instructed every six months in the operation of the manual block system.

The railroad commissioners of Massachusetts reporting on a collision which occurred on the New York, New Haven & Hartford, near Braintree, Mass., April 28—a butting collision between a local passenger train and a work train in a fog—orders the road forthwith to install block signals on the West Quincy branch, 5½ miles long, the style and location of signals to be subject to approval of the commission. The cause of the collision was failure of an engineman to look at a train register and failure of conductor and engineman to identify a passenger train. They saw train No. 5011 and assumed that it was 5037.

The Kansas Public Utilities Commission finds four causes for the annual car shortage. These are: (1) Failure of the carriers to add to their equipment proportionately with the increase of freight tonnage; (2) and to secure maximum use of the cars which they have; (3) the practice of consignees in using cars for storage purposes; and (4) the practice of farmers in selling their grain from the machine. "After reading practically everything that has been said," says the commission, "we are unable to discover a single suggestion that points to a remedy. The railroads can lessen the trouble by increasing the number of cars and improving the efficiency of their management; the millers and elevator men by being more expeditious in loading and unloading, and the grain grower by delaying the shipment of his grain."

C. M. Larson, assistant chief engineer of the Wisconsin State Board of Assessment and of the Railroad Commission of Wisconsin, has been appointed chief engineer, with headquarters at Madison, Wis., succeeding Professor W. D. Pence. Mr. Larson was born in 1874 in Wisconsin. He was graduated from the University of Washington in 1899, and from the University of Wisconsin in 1905. He became connected with the Wisconsin State Board of Assessment in 1903 as assistant inspector on steam railroad valuation and special investigations of land values. During 1905-06 he was in Mexico on railroad construction work for a year. He then returned to the Wisconsin State Board of Assessment, and the railroad commission. He was appointed real estate engineer of the Chicago & Alton; Toledo, St. Louis & Western; Minneapolis & St. Louis and the Iowa Central in 1909, remaining with those roads until 1911, when he returned to the Wisconsin State Board of Assessment

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Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 146, covering car balances and performances for February, 1913, says:

The miles per car per day, for February were 24.7, compared with 24.3 for January. This figure for February, 1912, was 22.9.

Ton miles per car per day, for February were 395, compared with 392 in January. This is an increase of 6.76 per cent. over the figure for February, 1912, which was 370.

The proportion of home cars on line increased one point over January, 1913, which was 51 per cent. This figure for February, 1912, was 54 per cent.

The per cent. of loaded mileage for February was 70.1 per cent., compared with 68.5 per cent. in January, 1913. This figure for February, 1912, was 71.9 per cent.

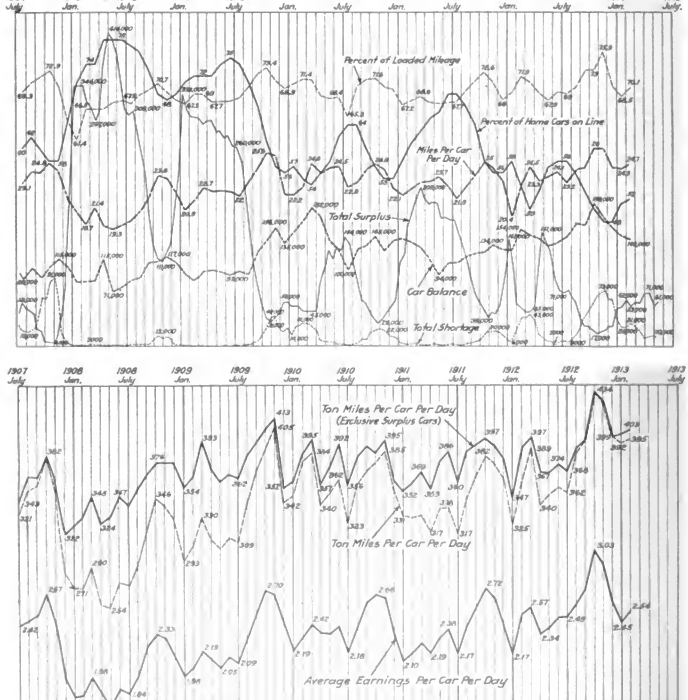
The average earnings per car per day for all cars on line were $2.54. This is an increase of 3.67 per cent. over the figure for January, 1913. This figure for February, 1912, was $2.49.

The table gives car balance and performance in the month covered by the report, and the diagrams show car surpluses, car shortages, car earnings and car mileage and different car performance figures monthly from July, 1907.

In bulletin No. 144, covering car balances and performances for January, 1913, Mr. Hale commented on the first diagram as follows:

Attention is called to the diagram which shows graphically the relation between car surplus and shortage with car balance, the cars away from home and the general performance of cars.

It will be noted that when there is a large car surplus the percentage of home cars on line is large, as the surplus drops this percentage decreases, that is, cars begin to go away from



Freight Car Mileage, Earnings and Performance.

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CAR BALANCE AND PERFORMANCE IN FEBRUARY, 1913.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and Ste. Miss., Ala., Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis. Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned—in use	88,749	681,407	241,913	189,981	172,493	480,235	17,915	144,346	29,305	134,646	132,864	2,232,179
Home cars on foreign lines	10,089	291,444	106,211	73,044	74,593	294,000	15,054	76,773	26,599	52,840	55,226	1,054,737
Railway-owned cars: Average foreign on line	36,158	316,356	115,095	91,161	85,370	167,770	11,189	76,773	26,599	52,840	55,226	1,054,737
Total Railway-owned cars on line	93,246	651,993	223,308	186,232	155,829	431,709	15,247	138,638	44,482	112,543	141,960	2,201,309
Excess (+) or deficit (—)	10,499	—29,414	—1,395	—2,833	—16,574	11,434	+2,708	—4,898	13,177	—22,093	9,864	—30,981
Per cent of cars on line to total owned:												
Home	49	49	49	51	41	63	23	43	61	45	65	52
Foreign	63	46	52	48	49	40	62	49	91	39	42	47
All railways	112	95	101	99	90	103	85	92	152	84	107	99
Private cars on line	4,027	38,425	10,872	6,712	9,256	14,849	1,263	7,468	4,050	13,272	5,287	113,990
Total, all cars on line	180,275	690,418	234,180	192,944	165,085	446,558	16,510	145,106	48,141	126,215	145,247	2,315,199
Per cent of cars in shops	9.70	8.43	8.59	5.63	8.23	3.47	8.77	6.90	8.29	5.02	5.03	6.17
Average cars on line per day	170	650	220	182	155	421	15	137	45	119	137	2,186
Average cars on line per freight engine owned	1.93	1.82	1.92	1.93	1.78	1.76	.90	.96	.86	2.42	1.04	1.68
Total freight-car miles—per day	31,236,900	107,243,231	146,026,015	139,980,852	122,449,516	290,999,903	21,284,624	89,214,963	35,697,323	111,037,848	91,656,008	1,586,852,273
Per cent loaded miles—per day	67.3	67.3	67.8	61.0	73.2	72.4	70.7	69.4	73.7	69.5	74.4	70.1
Per cent loaded miles—delivering company freight	618,992,577	8,194,200,001	2,353,747,450	2,246,996,138	1,927,860,830	5,488,282,734	346,094,2059	1,340,966,857	599,733,251	1,680,616,386	1,536,793,741	24,221,557,311
Average ton-miles, including company freight:												
Per loaded car-mile	12.1	15.0	14.9	15.0	15.9	14.6	16.8	11.4	10.5	13.4	14.3	13.9
Per car-mile	8.1	10.1	10.1	8.9	11.7	10.6	11.7	8.0	7.8	9.9	10.7	9.9
Per car per day	374	409	372	340	431	353	396	345	360	463	376	395
Gross train-load—tons	865,574,110	845,670,000	313,010,272	318,255,440	312,510,000	929,664,000	15,859,200	311,379,000	83,901,000	313,761,000	310,446,000	5,164,751,022
Average daily earnings per car owned	51.65	82.30	82.09	82.51	82.59	82.52	85.09	84.23	84.83	84.20	82.81	82.63
Per loaded car-mile	2.27	2.50	2.50	2.45	2.45	2.27	2.37	2.54	2.43	2.51	2.32	2.44
All cars on line	2.27	2.50	2.50	2.45	2.45	2.27	2.37	2.54	2.43	2.51	2.32	2.44

*Denotes deficiency.

home. After the surplus has reached a minimum and has begun to increase, the cars start home again.

If there were an equal interchange of cars, the car balance would, of course, remain constant, but with our present unequal interchange the originating roads do not receive an equivalent in cars as their own cars begin to leave home, and therefore when the surplus has dropped the car balance rises. The balance against the originating roads reaches a maximum before the minimum percentage of home cars on line is reached. Apparently the originating roads are enabled to hold on to foreign cars more effectually when surpluses are at a minimum.

The shortages, of course, become marked only after the surpluses are well reduced, so that the shortage line has points of resemblance with the car balance.

The succession seems to be: First, a reduction in the surplus; second, the cars leave home; third, the car balance is seriously affected; fourth, a car shortage develops; fifth, the car balance improves; sixth, the cars begin to go home again; seventh, the shortage diminishes; eighth, a surplus comes again. The other two lines showing miles per car per day and the percentage of loaded mileage follow very closely the lines of car shortage, that is, when cars are most needed, they are moved fastest and loaded oftenest, and this happens in the periods when a maximum number of them are away from home.

Certain seasonal conditions are manifest. There is always a shortage in October and November. Even in 1908 there was a little one. There is generally a shortage in March. In 1911-12 it was bigger than the October shortage. And these are the months of good mileage and heavy loaded mileage, and the times when cars are away from home. There are also general tendencies noted between 1907 and 1913. Cars leave home more year by year, the car balance tends to increase, the percentage of loaded mileage increases and so do the miles per day.

This looks like greater efficiency.

COURT NEWS.

Court of Claims Reverses Postmaster General's Weighing Orders of 1907.

In an opinion handed down June 2, the Court of Claims, at Washington, decides in favor of the Chicago & Alton in its suit to recover additional compensation for the carrying of the mails from July 1, 1907, to April 30, 1911, the suit being based on the charge that from the date first named the weighing of the mails had not been carried out in accordance with the law; and the amount of reparation awarded is $82,605. The government has appealed from this decision to the Supreme Court. If the decision is sustained other roads will also recover and it has been estimated that the aggregate amount of reparation, for the four years during which the compensation of the railways has been calculated on the wrong basis, will amount to $20,000,000.

The annual compensation made to railways for carrying the United States mails is based on the average weight per day and the number of miles carried; and prior to the issuance of the orders in question the average was ascertained by weighing the mails during periods of 105 days every four years. The weight having been thus ascertained the total was divided, not by 105 but by 90, Sundays being excluded. For a single week the weight could be ascertained for 7 days and the total divided by 6. The second and final order which was issued by Postmaster General Von Meyer was No. 412, dated June 7, 1907, and was to the effect that the whole number of days included in the weighing period should be used as a divisor for obtaining the average weight per day; in other words, by a stroke of the pen, the postmaster general reduced the pay of the railways about 8 per cent.

In its discussion of the case the Court of Claims goes back to the year 1867. The earlier practice of dividing by 6 rather than 7 is sustained by the court mainly on the ground that the practice had been of long standing, was fully known to Congress, as shown by debates on appropriation bills, and was more reasonable than the 7-day arrangement.

The postoffice department first weighed the mails systematically in 1867. The weighing period was five weeks and the aggregate was divided by 30. This was the practice until July 1, 1873. In that year the law was amended and the statute required the weighing of the mails for at least 30 successive working days, and at least every 4 years. Prior to 1876 the weighing was done

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by the railroads, but after that by the postoffice employees. Sunday mail trains were not numerous in 1873; but the practice of weighing for 7 days and dividing by 6 was continued for more than 30 years, until the issue of the special order referred to in 1907. In 1881 and 1884 the postmaster general, in reporting to Congress, explained the workings of the law, and a bill was introduced in the house cutting out the word "working" from "working days," but no action was taken on the bill. The postmaster general issued an order to divide by 7 instead of 6, away back in 1884, but the attorney general advised that the old practice was correct and this order was never put into effect. But another attorney general, 20 years later, said that the old plan was based on "an impossible construction of the law" of 1873. In 1885 the postmaster general again, complying with a resolution of the Senate, sent to Congress a detailed history of the railway mail service, calling attention to this detail. The appropriation act of 1905 again used the term "successive *working* days," and thereafter, in compliance with the law, the postmaster general had the mails weighed 105 days, once in 4 years, and used as the divisor 90. In the appropriation bill of 1907 it was proposed in the house to again direct the use of the larger divisor, but, after a good deal of discussion, the bill was passed without this provision. Then the postmaster general issued the order making the change.

The decision, by Justice Barney, says that the word "working" was doubtless used to designate particular days; if Congress had not intended to exclude Sundays why did it use that word? To weigh the mail for 35 days, including Sundays, and then divide by 35 would be unjust to roads which ran no mail trains on Sunday. If the mails had not been weighed on Sundays injustice would have been done to the roads carrying mails on that day.

A fair examination of the law of 1873, taking into consideration all of the circumstances then existing, shows that it was designed to provide payment upon the basis of the average weight of mails carried on six days, leaving to the postmaster general the problem of doing justice to those roads which carried mails on Sunday. He did this in the way before described. Even if some other reasonable basis could be calculated, the court thinks that the long continued construction given to the law, in the administration of the postoffice department, was equivalent to writing this method into the law. And, Congress having continued to make appropriations with full knowledge of the situation, it is to be assumed that Congress approved of the course taken by the postoffice department. The decision then goes on to cite many authorities to the effect that where a statute is ambiguous the uniform practice of the department in carrying out the law must be accorded much weight by the courts.

Prior to 1907 the laws had specified a *maximum* rate for the transportation of the mails and the postmaster general had some discretion; and he had always paid the full maximum; but in that year the law was made absolute; the pay on such and such routes "shall be," etc. Congress having thus made an absolute rate, and the order of June 7 having been found contrary to law, and therefore no regulation at all, the court sustains the Chicago & Alton claim.

State Rate Laws Sustained.

The Supreme Court of the United States this week rendered decisions in the remaining 22 cases, known as the Missouri rate cases. These opinions, handed down by Associate Justice Hughes were comparatively brief, following the principles laid down in the Minnesota decision reported last week.

The state laws of Missouri, Oregon, Arkansas and West Virginia were upheld. In the case of three roads in Missouri, where the state rates manifestly would result in confiscation, those rates were declared confiscatory but with permission to take future action as in the case of the Minneapolis & St. Louis.

The legislation dealt with in these decisions included the two-cent passenger laws in Missouri, Arkansas and West Virginia; maximum freight rate laws in Missouri and Arkansas and freight rates out of Portland in the Oregon cases. The only exception to the sweeping approval of state statutes was in the case of several weaker roads in Missouri. The West Virginia case was originally brought by the Chesapeake & Ohio to restrain the enforcement of the 2 cent fare law of that state passed in 1907.

The Oregon cases were brought to restrain the enforcement of an order of the State Railroad Commission made April 22, 1908, prescribing freight rates, and another similar order, made September 21, 1910. The question of confiscation did not arise in these cases. The Arkansas decision sustains the act of 1907 fixing passenger fares at 2 cents a mile, and orders of the railroad commission, made in June, 1908, prescribing maximum rates for both freight and passengers.

Justice Hughes in announcing the decisions referred back to the Minnesota cases where on the point was raised that the state laws interfered with interstate commerce.

"We need not review the arguments addressed to conditions of transportation in Missouri and the relation of intrastate to interstate rates," he said, "for while the case has its special facts by reason of location of the state and the use of the Mississippi and Missouri rivers as basing points the controlling question is not to be distinguished from that which was decided in the Minnesota rate cases."

The Oregon and West Virginia cases were decided in favor of the states in a few words, the only point raised by the railroads being that the laws interfered with interstate commerce. Justice Hughes went fully into the claims in the Missouri and Arkansas cases.

As a result of the court's action in the Missouri cases the state-prescribed rates will go into effect on the Chicago, Burlington & Quincy, the Atchison, Topeka & Santa Fe, the Kansas City Southern, the Missouri, Kansas & Texas, the Chicago, Rock Island & Pacific, the St. Louis & San Francisco, the St. Louis Southwestern, the Missouri Pacific, the St. Louis, Iron Mountain & Southern, the Wabash, the Chicago, Milwaukee & St. Paul and the Chicago & Alton. For the present the rates will not become operative on the St. Louis & Hannibal, the Kansas City, Clinton & Springfield, the Chicago Great Western, the Quincy, Omaha & Kansas City, and the St. Joseph & Grand Island.

The court refused to accept the valuation placed on railroads in Missouri by the state's assessing board as a basis for fixing "the fair value" for rate making. Justice Hughes took the case of the Burlington and showed that by applying the assessment value (multiplied three times as was done by the federal court in Missouri) to the whole system, a result would be obtained $115,000,000 in excess of the capitalization of the system. Besides, he said, there was nothing to show upon what the assessors fixed their valuation, nor was it demonstrated that the assessors avoided the mistakes criticised in the Minnesota rate decision.

"Manifestly, a finding of confiscation would not be based on such a valuation, in the absence of clear and convincing proof that the values actually existed and that the different items of property were estimated by correct methods and in accordance with proper criteria of value. . . . The proof was lacking. In the case of the other roads, although the special considerations applying to the Burlington property may not be applicable, still we are left in uncertainty as to the correctness of specific valuations which have been made." Apportionment of property values between interstate and intrastate passenger and freight traffic according to gross revenue was disapproved "for reasons stated in the Minnesota rate cases."

Justice Hughes said that the plan adopted by the lower court of applying the revenue basis in apportioning expenses was open to the same objection as in the Minnesota cases. However, as to the St. Louis & Hannibal and the Kansas City, Clinton & Springfield, he said, the experts of both the state and the railroads united in declaring that no basis could be found upon which the proposed rates would yield an adequate return. As to the Chicago Great Western, he said, errors of valuation and apportionment were not sufficient to warrant a reversal of the finding of the lower court that the rates were confiscatory. The rates as to the Quincy, Omaha & Kansas City and the St. Joseph & Grand Island were annulled because of a stipulation between the state and the railroads that the finding as to the Chicago Great Western should control them.

The Kentucky case was not decided. It involves an attack upon state rates from river points to inland distillery cities and involves in addition an attack on the constitutionality of the law enabling the state railroad commission to fix reasonable rates on intrastate commerce. The court adjourned until next October without announcing a decision in the intermountain rate cases

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REVENUES AND EXPENSES OF RAILWAYS.

THE MONTHS OF FISCAL YEAR, 1913.

Name of road.	Average mileage operated during period.	Freight.	Passenger.	Total, inc. misc.	Maintenance — Way and structures.	Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Atlanta & West Point	93	$547,498	$408,606	$1,052,514	$127,642	$191,643	$53,371	$341,974	$49,616	$764,246	$288,268	$1,442	$63,439	$226,276	—$44,544
Atlanta, Birmingham & Atlantic	641	2,074,417	549,032	2,763,348	433,404	435,506	153,470	1,096,279	114,660	2,243,319	520,029	.....	135,562	384,467	124,689
Atlantic City	167	637,023	1,025,177	1,762,540	103,941	146,262	24,114	13,339	1,416,892	1,845,708	—83,168	—32,086	90,000	173,082	—78,461
Belt Ry. Co. of Chicago	21	.....	.....	2,864,613	136,172	352,979	4,968	1,330,465	53,981	1,703,568	961,046	.....	80,444	880,604	89,321
Boston & Maine	2,244	23,994,083	13,394,083	40,491,208	3,283,241	6,423,303	847,106	19,861,334	1,670,547	32,035,931	8,455,277	147,330	1,790,720	6,811,887	—1,180,006
Buffalo & Susquehanna R. R.	265	1,399,679	83,467	1,543,909	286,499	227,854	12,168	525,988	59,235	1,111,736	413,173	.....	22,000	391,173	160,431
Buffalo & Susquehanna Ry.	91	419,841	92,440	537,008	115,368	229,796	4,201	228,952	26,195	655,015	—118,015	102	15,000	—133,713	—18,452
Butte, Anaconda & Pacific	74	886,957	109,462	1,094,718	129,884	220,383	7,142	534,432	29,739	921,370	173,348	.....	20,636	152,710	—20,935
Canadian Pacific Lines in Maine	233	1,668,652	319,378	1,303,945	276,696	170,147	59,974	594,353	51,373	1,116,963	186,982	.....	50,000	86,862	21,954
Central of Georgia	1,915	7,681,519	3,234,591	11,955,280	1,720,344	2,163,319	350,193	4,064,708	389,140	8,687,614	3,267,666	60,024	503,695	2,823,995	—296,062
Central of New Jersey	676	17,302,346	4,356,155	23,715,404	2,155,005	3,510,293	293,570	7,083,827	427,391	13,469,986	10,245,418	—60,004	1,238,800	8,946,614	953,203
Central Vermont	413	2,375,739	917,985	3,466,015	391,200	612,617	81,613	1,234,115	83,537	2,900,185	565,830	548	362,558	423,820	—1,176,870
Chicago & Ohio Lines	2,324	22,915,315	4,836,134	29,477,274	3,433,561	5,311,356	615,853	9,342,723	652,654	20,409,185	8,671,039	29,242	1,121,350	7,578,731	—1,226,820
Chicago & Erie	270	3,555,687	612,530	4,609,593	877,677	1,090,357	208,202	2,419,990	112,253	4,568,389	41,204	—7,140	134,685	—100,621	—379,532
Chicago, Indiana & Southern	359	2,726,876	253,999	3,676,680	427,641	915,103	81,214	1,268,321	97,849	2,925,159	751,521	1,763	164,936	680,450	275,358
Chicago, Indianapolis & Louisville	617	3,868,243	1,362,188	5,777,212	881,421	680,994	179,807	2,198,465	147,275	4,208,462	1,569,250	.....	236,883	1,332,367	60,719
Chicago, Peoria & St. Louis	255	388,707	88,999	507,063	74,240	98,669	27,912	269,591	25,787	496,199	10,864	.....	17,200	—6,336	—23,739
Chicago, Rock Island & Pacific	7,566	37,266,383	15,962,169	56,230,274	8,072,989	8,164,229	1,561,657	23,192,472	1,394,728	42,391,025	14,339,249	—162,756	2,382,339	11,794,154	1,561,957
Chicago, Terre Haute & Southeastern	351	1,416,858	172,036	1,633,170	228,235	331,018	31,257	756,062	76,171	1,372,468	260,252	—2,385	160,000	293,867	—124,052
Cincinnati Northern	245	932,681	176,706	1,166,394	207,197	251,355	26,152	489,236	32,410	1,006,350	160,044	.....	54,862	105,182	10,419
Cleveland, Cincinnati, Chic. & St. Louis	2,014	19,284,749	6,509,900	28,173,897	3,729,605	5,441,058	713,465	11,212,795	874,846	21,671,769	6,502,128	—15,155	1,035,443	5,451,530	—473,611
Colorado & Southern	1,004	5,163,163	1,128,562	7,325,045	939,513	1,459,436	110,762	2,197,992	222,316	5,130,033	2,194,912	9,464	292,000	1,912,839	18,496
Delaware & Hudson Co.—Railroad Dept.	854	16,564,817	2,592,533	20,132,892	1,590,929	2,655,146	232,283	6,885,892	577,250	12,142,545	7,805,452	65,766	504,666	7,325,020	1,066,188
Denver & Rio Grande	2,550	15,387,886	4,374,003	20,667,140	2,690,766	3,766,373	458,768	6,670,453	562,350	14,153,710	6,513,430	—4,507	804,100	5,704,823	1,240,719
Denver, Northwestern & Pacific	215	668,906	237,842	950,284	159,096	169,329	19,999	329,434	49,794	727,685	222,629	.....	35,000	187,629	—50,886
Detroit & Toledo Shore Line	79	1,103,822	.....	1,108,025	121,091	60,721	12,212	314,043	23,495	531,561	576,460	.....	54,865	521,594	46,206
Detroit River Tunnel	2	.....	.....	1,068,630	22,425	28,479	.....	88,634	393	139,922	928,716	.....	49,598	879,208	—61,599
Detroit, Toledo & Ironton	441	1,151,232	128,050	1,384,781	345,925	308,389	26,449	695,766	52,879	1,429,902	—45,121	—12	57,000	—102,133	—254,365
Duluth & Iron Range	227	14,805,065	8,216,611	25,114,361	3,670,143	3,560,434	59,476	11,199,632	1,122,642	22,562,322	2,552,039	311,320	1,248,951	13,314,403	—324,684
Erie	2,061	24,856,643	7,237,427	34,700,654	5,192,837	8,200,298	727,979	15,956,679	1,098,067	29,176,084	5,524,570	—319,434	1,453,000	3,752,136	—1,329,858
Galveston, Harrisburg & San Antonio	1,338	6,996,695	2,714,849	10,236,649	1,057,630	2,139,061	338,751	4,117,435	308,765	7,961,632	2,275,017	—36,336	314,025	1,924,656	316,834
Georgia	307	1,787,629	754,356	2,633,160	292,969	598,115	58,198	1,311,640	82,213	2,360,615	272,545	.....	29,902	242,643	—26,057
Georgia, Southern & Florida	395	1,190,076	710,693	2,174,825	261,536	406,669	77,845	873,929	93,187	1,713,215	461,610	—241	111,520	349,849	—29,248
Great Northern	7,264	48,201,143	12,434,980	64,848,951	9,830,211	7,926,750	1,062,293	12,878,085	1,079,666	36,917,505	27,931,446	104,295	3,295,142	24,750,599	2,639,812
Gulf, Colorado & Santa Fe	1,595	8,539,324	2,512,165	11,251,861	1,848,811	1,751,674	247,046	4,366,886	337,036	8,550,653	3,202,208	.....	392,091	2,805,117	763,720
Hocking Valley	352	5,145,043	1,235,874	6,338,692	849,172	1,136,109	96,085	1,744,180	130,660	3,111,128	3,227,564	.....	392,600	2,834,964	—3,300
Houston, East & West Texas	191	805,303	300,001	1,170,237	253,795	151,730	21,340	394,147	38,111	858,418	311,819	.....	36,072	276,247	—29,133
Houston & Texas Central	789	3,849,974	1,597,781	5,832,882	851,424	993,597	181,541	2,351,978	169,506	4,548,046	1,284,836	—11,065	193,351	1,080,400	43,147
Indiana Harbor Belt	101	.....	.....	2,699,344	311,629	319,605	25,478	1,191,357	68,125	1,916,244	783,100	17,286	55,554	744,932	158,872
Lake Erie & Western	906	4,070,643	740,523	5,040,329	719,681	1,078,576	119,194	2,044,568	116,802	4,080,821	1,220,251	.....	203,613	1,016,638	1,881,822
Lake Shore & Michigan Southern	1,823	34,270,734	10,351,952	48,403,719	5,746,503	8,457,358	828,483	15,200,868	845,144	31,578,267	16,825,452	102,464	1,531,038	15,396,818	1,438,213
Lehigh & Hudson River	92	1,419,054	90,062	1,611,170	141,379	222,525	11,283	548,516	44,083	1,010,036	593,679	.....	40,000	463,679	6,257
Louisiana & Arkansas	255	1,152,043	201,285	1,405,046	216,937	211,920	24,468	373,068	49,247	873,640	529,406	.....	41,902	487,504	100,195
Louisiana Ry. & Navigation	351	1,244,691	242,317	1,591,019	224,058	191,219	59,216	631,911	68,293	1,174,697	416,322	.....	81,000	365,322	—7,537
Louisiana Western	208	1,260,397	584,034	1,929,759	233,332	347,638	71,931	594,422	56,879	1,304,202	624,557	—650	75,842	548,065	155,875
Louisville, Henderson & St. Louis	760	2,485,863	387,921	3,024,177	265,815	372,314	42,741	1,044,921	70,799	1,941,591	1,082,586	1,231	180,000	901,817	154,425
Michigan Central	1,817	19,354,767	7,177,058	29,378,856	3,452,076	4,284,657	662,423	11,753,769	518,192	20,675,117	8,703,739	16,890	1,134,985	7,585,644	236,905
Missouri, Kansas & Texas System	2,817	18,051,746	7,856,280	27,585,043	3,819,120	3,477,322	633,247	10,250,941	875,431	19,045,961	8,539,082	—48,083	1,078,530	7,412,469	2,392,591
Mobile & Ohio	1,114	8,303,342	1,224,228	10,121,981	1,195,586	1,885,122	378,947	3,646,585	321,274	7,427,513	2,694,468	—14,583	300,182	2,379,698	201,910
Morgan's La. & Tex. R. R. & S. S. Co.	604	2,158,994	960,714	3,930,138	715,661	1,091,211	111,886	1,961,287	155,883	3,552,749	667,589	—21,104	161,250	484,234	440,211
Nashville, Chattanooga & St. Louis	1,331	7,777,269	2,567,654	11,111,544	1,696,501	1,973,163	395,964	4,271,378	292,761	8,679,667	2,483,977	—5,310	236,242	2,230,325	89,174
New Orleans, Mobile & Chicago	537	1,993,829	295,596	2,312,296	176,874	219,872	35,934	805,379	81,736	1,329,795	982,501	—913	54,646	884,032	111,589
New Orleans, Texas & Mexico	286	1,059,943	175,374	1,339,098	224,487	117,892	34,162	593,699	64,706	1,034,846	294,252	.....	19,162	275,090	77,212
New York Central & Hudson River	3,750	56,703,614	28,078,079	94,614,891	12,649,071	17,593,525	1,836,193	34,685,470	2,319,178	69,083,487	25,531,404	329,105	5,199,623	20,660,976	2,313,922
New York, Ontario & Western	566	6,669,521	1,398,491	7,843,420	991,096	1,272,569	108,551	2,892,762	165,573	5,435,551	2,407,869	—20,067	181,665	2,206,116	644,934
New York, Susquehanna & Western	154	1,644,605	423,578	2,446,469	261,399	303,696	20,074	1,013,365	49,519	1,667,998	778,471	—28,868	152,960	596,723	—152,576
Norfolk & Western	2,034	30,982,180	3,917,554	36,095,464	4,580,732	6,779,184	566,280	10,909,914	664,155	23,490,765	12,695,199	—21,980	1,208,000	11,465,219	1,035,233
Northern Pacific	6,314	44,299,039	12,932,389	60,855,499	8,026,446	7,021,530	1,054,292	19,915,390	870,133	36,787,291	24,067,708	278,913	3,369,618	21,070,983	2,152,753
Pecos & Northern Texas	482	1,585,707	415,276	2,136,842	266,604	420,710	37,204	688,681	65,212	1,446,511	688,331	.....	51,566	636,765	208,148
Peoria & Eastern	352	2,204,103	584,110	2,994,833	421,694	593,875	46,194	1,164,875	57,704	2,284,342	710,491	.....	110,348	590,143	—46,241
Philadelphia & Reading	1,015	34,388,368	5,810,020	42,208,096	3,727,249	7,031,933	410,596	13,550,119	613,005	25,372,902	16,917,104	308,274	883,252	16,362,126	3,143,417
Pittsburgh & Lake Erie	223	14,196,843	1,429,279	16,470,031	1,692,782	2,466,349	135,091	3,697,812	267,550	8,169,160	8,230,923	—4,108	369,589	7,857,226	2,018,097
Pittsburgh, Shawmut & Northern	279	1,550,065	93,332	1,669,714	272,160	365,563	11,677	534,423	40,486	1,224,203	445,011	.....	15,912	429,099	42,498

REVENUES AND EXPENSES OF RAILWAYS.

TEN MONTHS OF FISCAL YEAR, 1913—(CONTINUED).

Name of road.	Average mileage operated during period.	Operating revenues—Freight.	Passenger.	Total.	Maintenance—Way and inc. misc. structures.	Of equipment.	Operating expenses—Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decrease) comp. with last year.
Port Reading	21	1,212,976	.....	1,343,881	104,514	3,172	303	358,393	1,445	467,827	876,054	65,805	80,000	881,859	175,295
Richmond, Fredericksburg & Potomac	118	3,284,661	2,466,140	5,857,976	351,034	271,466	29,246	1,284,663	614,131	2,349,529	3,508,447	—2,599	273,353	831,465	234,172
St. Louis Merchants' Bridge Terminal	4.74	1,284,661	9,116	1,303,777	4,000	4,000	4,000	79,000	12,000	103,000	1,200,777	.....	1,000,000	200,777	1,423,000
St. Louis Merchants' Bridge Terminal	9	3,078	1,763,575	204,398	100,520	6,973	907,660	61,387	1,301,167	384,408	.....	58,050	324,058	103,177
San Antonio, San Fernando & Texas	244	911,569	294,541	1,205,586	141,230	251,236	251,236	339,739	209,827	1,001,844	.....	10,406	192,336	91,327
San Pedro, Los Angeles & Salt Lake	900	5,891,960	1,291,963	7,183,923	745,940	1,025,238	1,225,730	709,827	4,689,115	4,494,808	2,689,115	.....	449,259	2,239,856	587,459
Southern in Mississippi	1,110	5,231,924	2,005,353	8,416,598	928,256	1,446,298	311,284	2,244,990	190,346	5,031,137	3,385,461	—16,084	449,259	2,919,381	1,517,459
Southern in Mississippi	2,037	10,106,862	15,198,515	27,276,684	2,645,601	9,441,526	1,726,229	7,714,252	1,671,961	20,205,597	17,571,086	67,095	2,073,825	15,564,356	510,884
Southern Railway in Texas	1,110	5,231,924	2,005,353	8,416,598	928,256	1,446,298	311,284	2,244,990	190,346	5,031,137	3,385,461	—16,084	449,259	2,919,381	1,517,459
Southern Railway in Texas	1.5	1,039,549	181,085	1,288,768	97,665	267,355	22,543	366,323	36,599	812,535	476,233	.....	31,513	434,720	220,406
Southern Pacific Co.	6,329	47,272,435	26,644,641	79,421,533	8,554,202	10,953,180	1,717,230	22,300,059	2,157,910	45,684,261	33,737,272	1,361,990	3,667,433	31,462,809	2,469,746
Tennessee Central	326	2,705,161	1,253,100	4,203,274	343,636	294,007	79,595	1,047,328	122,371	2,230,109	1,973,165	1,232	324,000	1,650,396	192,840
Texarkana & Fort Smith	180	.....	.....	1,403,040	134,000	134,000	7,000	497,000	60,000	832,000	571,040	101,000	144,000	528,040	62,440
Texas & New Orleans	1,458	2,232,261	1,901,849	5,540,863	736,399	1,533,007	62,146	1,389,374	121,442	3,885,466	1,655,415	2,519	178,634	2,479,300	22,844
Texas & Pacific	1,453	5,911,844	3,901,849	12,350,693	1,373,000	2,453,000	147,000	3,000,000	300,000	7,273,000	5,077,693	3,000	1,142,000	3,938,693	1,139,307
Toledo & Ohio Central	443	3,745,359	1,538,491	6,512,675	675,445	1,015,879	69,884	1,603,223	91,390	3,455,701	3,219,980	.....	274,210	2,672,996	46,900
Trinity & Brazos Valley	463	1,961,060	404,449	2,550,217	443,396	342,716	102,096	1,003,648	122,227	2,219,193	322,024	.....	39,310	267,331	3,680
Virginia & Southwestern	250	1,311,379	644,966	2,155,473	237,400	344,192	19,311	412,441	65,417	1,078,761	1,076,712	419,946	186,796	309,426	53,101
Wabash	2,381	11,301,329	6,881,110	20,455,439	2,427,000	4,441,000	1,237,000	5,000,000	1,000,000	14,105,000	6,350,439	.....	2,000,000	5,350,439	1,202,132
Washington Southern	36	395,527	435,612	1,000,860	134,652	131,258	12,222	438,227	28,672	747,591	358,269	.....	31,984	322,285	33,797
Western Maryland	543	5,176,916	808,459	6,227,213	901,881	881,831	156,010	2,716,414	133,065	4,791,221	1,496,492	.....	260,000	1,236,492	635,780
Western Railway of Alabama	132	3,414,140	1,055,701	5,139,078	597,984	510,448	99,135	1,351,322	137,193	3,696,078	1,443,000	146	424,158	1,018,988	5,988
Wheeling & Lake Erie	137	3,414,140	1,055,701	5,139,078	597,984	510,448	99,135	1,351,322	137,193	3,696,078	1,443,000	146	424,158	1,018,988	9,913

Indicates Deficits, Losses and Decreases.

Railway Officers.

Operating Officers.

C. W. McCoppin has been appointed general manager of the Riviera Beach & Western, with headquarters at Riviera, Texas.

W. F. Sheridan has been appointed assistant superintendent of transportation of the Louisville & Nashville, with office at Louisville, Ky.

J. R. Jones has been appointed trainmaster of the International & Great Northern at San Antonio, Tex., succeeding J. L. Otis, assigned to other duties.

H. H. Smith, heretofore chief clerk to general manager of the Canadian Northern, Quebec, has been appointed car service agent of the same company, with office at Montreal.

J. J. Rhoads, hitherto division engineer of the middle division of the Pennsylvania, has been appointed superintendent of the central division of the Philadelphia, Baltimore & Washington, with office at Media, Pa.

George R. Sinnickson, hitherto division engineer of the West Jersey & Schuylkill and the Pennsylvania at Camden, N. J., has been appointed superintendent of the Schuylkill division of the Pennsylvania, with office at Reading, Pa.

N. W. Smith, heretofore division superintendent of the Philadelphia, Baltimore & Washington at Media, Pa., has been appointed superintendent of the middle division of the Pennsylvania, with office at Altoona, Pa., succeeding C. A. Preston.

James Fitzsimons, heretofore general eastern freight agent of the Delaware & Hudson, at Albany, has been appointed general manager of the Quebec, Montreal & Southern, with office at Montreal, Que. The Q. M. & S. is a subsidiary of the D. & H.

L. E. Abbott has been appointed safety commissioner of the Oregon Short Line, with headquarters at Salt Lake City, Utah. He will be in general charge, under immediate direction of the Central Safety Committee, of all matters pertaining to the "Safety First" movement of that road.

W. R. Scott, general manager of the Southern Pacific, announces that Paul Shoup will assume charge of the operation of the Oakland, Alameda and Berkeley suburban lines. The ferry boats and piers will be operated by the Western division, as at present. Effective June 8.

Joseph James Rhoads, whose appointment to the position of superintendent of the Central division of the Philadelphia, Baltimore & Washington, is noted above, has been in the service of the Pennsylvania Railroad and its controlled lines since March 1, 1899, when he entered the engineering department as rodman. He was born at Bellefonte, Pa., August 23, 1868, and was educated at Swarthmore College, whence he was graduated in the class of 1888 in the engineering department. His first railway service was on the Pittsburgh, Monongahela and Philadelphia divisions of the Pennsylvania. In June, 1892, he entered the office of the engineer of maintenance of way, at Altoona; January 15, 1893, he was appointed assistant supervisor on the Amboy division, at Jamesburg, N. J.; was transferred to the Maryland division of the P. B. & W. as assistant supervisor, at Washington, D. C., December 1, 1897; and 16 months later went back to New Jersey as supervisor on the Amboy division, at

J. J. Rhoads.

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Jamesburg. He was appointed supervisor on the New York division, at Tacony, Pa., March 1, 1901; assistant engineer of the Williamsport division, at Williamsport, July 1, 1905; division engineer of the Philadelphia Terminal division, West Philadelphia, April 1, 1907, and division engineer of the Middle division, at Altoona, January 15, 1910. This position he held up to the present month.

C. H. Marshall, formerly division superintendent of the Chicago, Milwaukee & St. Paul, at Missoula, Mont., and more recently superintendent of construction of the Chicago & Council Bluffs division, with headquarters at Marion, Iowa, has been appointed division superintendent, with headquarters at Perry, Iowa.

J. B. Carothers, who has been appointed assistant to the general superintendent of the Baltimore & Ohio Southwestern and the Cincinnati, Hamilton & Dayton, with office at Cincinnati, Ohio, was born on February 26, 1863, at Cutler, Washington county, Ind. He was educated at a normal university and began railway work in 1888, as a rodman in a surveying party. From 1889 to 1891, he was with the Seattle, Lake Shore & Eastern, and its successor, the Northern Pacific, as transitman, and was then for four years out of railway service. In June, 1895, he was appointed assistant engineer on the Baltimore & Ohio Southwestern at Cincinnati; a year later he was made division engineer on the Springfield division, at Flora, Ill., where he remained until April, 1902 except for a year, when he was out of service on leave of absence. He was later division engineer on the Ohio division, and also on the Indiana division. In February, 1904, he was made superintendent of the Ohio division at Chillicothe, Ohio, and in November of the following year, became superintendent of the Illinois division, with office at Washington, Ind. In April, 1910, he was appointed chief engineer of maintenance of way at Cincinnati, Ohio, and was then consecutively superintendent of the Philadelphia division of the Baltimore & Ohio at Philadelphia, Pa., and engaged in a special engineering capacity on the staff of the chief engineer.

J. B. Carothers.

George P. Johnson, for the past year receiver of the Detroit, Toledo & Ironton, has been appointed general manager of the Chesapeake & Ohio, with office at Richmond, Va., the appointment to take effect July 1. This office has been vacant since about one year ago when E. W. Grice, general manager, was appointed to the position of assistant to the vice-president in charge of operation. Mr. Johnson is 39 years old and is the son of President L. E. Johnson, of the Norfolk & Western. He was born at Aurora, Ill., where his father was an officer of the Burlington road. He began his railroad service on the Burlington as a clerk, January 1, 1890. He held this position only a few months, however, and then started to make himself an all around railroad man by working as brakeman, freight conductor, yard master, station master and in other positions, on the Burlington, the Great Northern and the Lake Shore & Michigan Southern, until July 1, 1898, when he was appointed general yardmaster of the Norfolk & Western, at Kenova, W. Va. A year later he was promoted to the position of trainmaster at Lynchburg, and in October, 1902, he was made superintendent of the Shenandoah division, at Roanoke. In 1904 he was sent to the Scioto division, and on July 1, 1907, was appointed general superintendent of the Western general division, with office at Bluefield, W. Va. In May of last year he resigned this position to take the management of the Detroit, Toledo & Ironton, as above noted.

Cecil Anthony Preston, whose appointment as valuation engineer of the Pennsylvania Railroad is noted above, has been superintendent of the Middle division of that road for the past ten years. He was born in Philadelphia and was graduated from the Polytechnic College of Philadelphia in 1872, as civil engineer. He at once entered actively into railroad construction work, but he did not enter the service of the Pennsylvania until 1879. In 1878 he was associated with the Collins Expedition in the construction of the Madeira & Mamore, in Brazil, where he served as engineer. His first service for the Pennsylvania was in connection with surveys for new lines. On March 1, 1880, he was appointed assistant supervisor of the Baltimore section of the Northern Central; but after a few months he resigned and went to Mexico, where he was engaged as principal assistant engineer of the Mexican National Construction Company. He returned to the United States in 1882 and again entered the service of the Pennsylvania (Northern Central), being appointed assistant supervisor at York, Pa. He was promoted to different positions (in 1882, 1890 and 1893) until, in July, 1900, he was made superintendent of the Elmira and Canandaigua divisions of the Northern Central, with office at Elmira, N. Y. Two years later he went to Williamsport as superintendent of the Eastern and Susquehanna divisions, and in the next year, 1903, was appointed superintendent of the Middle division of the Pennsylvania at Altoona, as above noted, the duties of which position he has now been relieved from.

C. A. Preston.

Traffic Officers.

R. O. Von Steuben has been appointed commercial agent of the New York Central, and all of its controlled lines, at Newark, N. J.

W. E. Taylor has been appointed commercial agent of the Chicago, Rock Island & Pacific, at Lincoln, Neb.; in place of E. O. Miller, deceased.

C. S. Blackman has been appointed general agent of the Missouri Pacific and St. Louis, Iron Mountain & Southern, at Hot Springs, Ark.

John J. Coyle, heretofore general southern agent of the Delaware & Hudson, at Philadelphia, has been appointed general eastern freight agent of the same company, at Albany, succeeding James Fitzsimons, promoted.

W. M. Hughes has been appointed traveling passenger agent of the Chicago, Burlington & Quincy, with headquarters at St. Paul, Minn., to succeed W. H. Snyder, who has been appointed city passenger agent at St. Paul.

A. M. Reinhardt has been appointed assistant general freight agent of the Atchison, Topeka & Santa Fe Coast Lines, with headquarters at Los Angeles, Cal. F. A. Bell has been appointed general agent at San Francisco, Cal.

J. M. Ball, division freight agent of the International & Great Northern at San Antonio, Tex., has been appointed cotton agent. He is succeeded as division freight agent by J. W. King, heretofore traveling freight agent for the St. Louis, Iron Mountain & Southern.

H. M. Mayo, assistant to the president of the Sunset-Central Lines of the Southern Pacific, has been appointed manager of the industrial, immigration and advertising bureau, with headquarters at Houston, Tex. This is a new department to be established by the Sunset Central Lines of Texas and Louisiana on July 1.

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George T. Bell, whose appointment as traffic manager of the Grand Trunk Pacific has been announced in these columns, was born at Montreal, September 7, 1861. He entered the railway service at the age of 17 as a clerk in the car mileage office of the Great Western Railway of Canada, now part of the Grand Trunk. He was soon transferred to the passenger department, and held various positions in that department until April, 1892, when he was appointed assistant general passenger agent of the Grand Trunk. Four years later he was made assistant general passenger and ticket agent, and in 1899 was promoted to a higher position at Chicago. In May, 1900, he was made general passenger and ticket agent, with headquarters at Montreal, which position he held until May 1, 1909, being also during the latter part of this time general passenger agent of the Grand Trunk Pacific; and for the last two years he has been assistant passenger traffic manager.

George T. Bell.

Engineering and Rolling Stock Officers.

Thomas B. Kennedy has been appointed engineer of the Cumberland Valley in place of George C. Koons, resigned, to go to the Pennsylvania.

The headquarters of B. B. Shaw, assistant engineer of the Chicago, Rock Island & Pacific, have been moved from El Reno to McAlester, Okla.

George C. Koons, hitherto engineer of the Cumberland Valley, has been appointed assistant engineer of maintenance of way of the Pennsylvania, in charge of bridges and structures, with office at Philadelphia.

C. A. Preston has been appointed valuation engineer of the Pennsylvania Railroad. Mr. Preston hitherto has been superintendent of the middle division at Altoona, in which position he is succeeded by M. W. Smith.

C. I. Leiper, hitherto division engineer of the New York division of the Pennsylvania Railroad, has been appointed principal assistant engineer of the Philadelphia, Baltimore & Washington, with office at Wilmington, Del.

F. S. Schorndorfer, general foreman of shops of the Cincinnati, Hamilton & Dayton, at Ivorydale, Ohio, has been appointed general foreman of shops of the Baltimore & Ohio Southwestern, at Chillicothe, Ohio, in place of J. G. Hyson, resigned.

Joseph T. Richards, chief engineer of maintenance of way of the Pennsylvania Railroad, Philadelphia, has been appointed consulting engineer of maintenance of way. L. R. Zollinger, engineer of maintenance of way, retains his present title.

A. B. Clark, hitherto assistant engineer of the Philadelphia, Baltimore & Washington, at Wilmington, Del., has been appointed assistant engineer of maintenance of way of the Pennsylvania, in charge of roadway and track, with office at Philadelphia.

E. D. Sabine has been appointed terminal engineer, at the Grand Central Terminal, New York City (N. Y. C. & H. R.), in place of W. L. Morse, who has gone to Florida, as noted below. Mr. Sabine has served in the engineering department at the Grand Central for several years past.

M. K. Barnum, heretofore general superintendent of motive power of the Illinois Central, has been appointed general mechanical inspector of the Baltimore & Ohio, the appointment to take effect July 1. A portrait of Mr. Barnum, with a sketch of his life, appeared in this paper May 23.

President Geo. W. Stevens, of the Chesapeake & Ohio, announces the appointment of a valuation committee, to devote its entire time to valuation work, the members of which are F. I. Cabell, chief engineer, chairman; J. P. Nelson, real estate; E. M. Thomas, accountant. These men are relieved of all duties in connection with their own departments. W. F. Steffens, assistant chief engineer, will perform the duties of chief engineer.

W. L. Morse, heretofore an engineer on the Grand Central Terminal improvement, New York City, has been appointed chief engineer of the Jacksonville Terminal Company, Jacksonville, Fla. Mr. Morse was graduated from Boston University in 1895 and began railroad work in 1896 in the surveying corps of the New York, New Haven & Hartford. He has been with the New York Central at Grand Central Terminal, New York City, since 1902, having been appointed resident engineer in 1906.

The Pennsylvania announces six appointments in the engineering department as follows: H. H. Russell, heretofore engineer of the Allegheny division, has been appointed engineer of the Middle division, with office at Altoona, Pa.; the appointment to take effect June 16. D. T. Easby, heretofore supervisor on the Middle division, has been appointed division engineer of the Allegheny division, with office at Oil City, Pa. F. W. Smith, Jr., heretofore engineer of the Conemaugh division, has been appointed engineer of the New York division, with office at Jersey City, N. J. C. E. Zortman, heretofore supervisor on the Pittsburgh division, has been appointed engineer of the Conemaugh division, with office at Pittsburgh, Pa. C. E. Brinser, heretofore on the New York, Philadelphia & Norfolk, has been made division engineer of the West Jersey & Sea Shore, at Camden, N. J. T. J. Skillman, heretofore on the Pennsylvania road at New York City, has been appointed division engineer of the New York, Philadelphia & Norfolk, with office at Cape Charles, Va.

Julius E. Willoughby, whose appointment as assistant chief engineer of the Atlantic Coast Line has been announced in these columns, was born at Arkadelphia, Ala., October 12, 1871, and was educated at the University of Alabama, from which institution he was graduated in 1892 as Bachelor of Civil Engineering. He had done some work on railway surveys when in college, and his first regular service was with the Louisville & Nashville, where he was engaged on surveys and new construction from 1892 to 1900. In April, 1900, he was appointed assistant chief engineer of construction of new lines, and the following year was made engineer of construction of the Alabama & Florida, a subsidiary of the L. & N. He was engaged in other similar positions until 1905, when he was appointed engineer of construction, which position he held until March, 1912. During this time he was chief engineer on a number of subsidiary lines. In 1912 he was chief engineer of the Caribbean Construction Company and of the National Railroad Company of Haiti, which position he held until the present month. He is a member of the American Society of Civil Engineers and of the American Railway Engineering Association.

OBITUARY.

John Heinrich, president of the Great Southern, died at his home in Portland, Ore., on June 11, aged 67 years.

William K. McAllister, general agent of the Southern Pacific at Denver, Colo., died in that city on June 12, aged 63 years. Mr. McAllister had been connected with the Southern Pacific since 1893, and was made general agent in March, 1895.

GEORGE-OUDTSHOORN RAILWAY, SOUTH AFRICA.—The very important George-Oudshoorn line has now been linked up at Doorn river. The line was commenced in 1908, and it is estimated that the cost will be something like $1,850,000. It will probably be open for traffic this month. After leaving George, the line winds in and out of the gorges of the Outeniqua range, passing through seven tunnels and climbing 1,600 ft. It then descends 1,300 ft. before reaching Oudtshoorn. From the tourist point of view, climbing along a precipitous mountain side and presenting a magnificent panorama of mountain, sea and plain, the line bids fair to be one of the show lines of a system that includes many stretches of very wonderful scenery.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE GRAND TRUNK has ordered 25 locomotives from the Baldwin Locomotive Works.

THE SIOUX CITY TERMINAL RAILWAY has ordered from the American Locomotive Company 1 six-wheel switching locomotive weighing 117,000 lbs. The cylinders are 19 x 24, and the driving wheels 50 in.

CAR BUILDING.

THE INTERCOLONIAL has ordered 500 steel underframe box cars from the Nova Scotia Car Works.

IRON AND STEEL.

GENERAL CONDITIONS IN STEEL.—New business is coming in at the rate of about 60 per cent. of shipments. Consumers are not making any objection to receiving deliveries, and manufacturers are more aggressive in their bidding for new business. The tariff situation still is used by consumers as an argument for waiting to place orders, and German steel conditions, which are demoralized, possibly have a bearing on the steel market in this country.

SIGNALING.

The Central of New Jersey has ordered from the Union Switch & Signal Company automatic block signals for its line between Red Bank, N. J., and Lakehurst, N. J., 28 miles of single track.

The seven mile line of the Butte, Anaconda & Pacific at the Anaconda Mines, Montana, recently electrified, is to be equipped with alternating current automatic block signals, the contract having been given to the Union Switch & Signal Company. The propulsion current is 2400 volts d. c. The track circuit has double rail return, and alternating current is used for everything including switch indicators and track circuits. Current will be distributed at 2080 volts, single phase, 60 cycles. The signals are semaphores, one arm, style B, moving in the upper left hand quadrant, similar to those which have been put up by the Union Company on the lines of the Illinois Traction Company.

The Canadian Pacific is to install five interlocking plants in Western Canada as follows, the contracts having been given to the Union Switch & Signal Company, Swissvale, Pa. Calgary, tower No. 1, mechanical interlocking with a 48 lever machine At tower No. 2, Calgary, a 60 lever machine. At Whittier Junction on the Manitoba division electric interlocking, type F, 28 working levers in a 41-lever frame. The signals will be style T-2 top post. This interlocking will control the draw bridge over the Red river. At North Transcona at the crossing of the Canadian Northern a 64-lever mechanical interlocking, Saxby & Farmer machine. At Transcona a 36-lever mechanical interlocking, with electric distant signals, style T-2. The Canadian Pacific has also contracted with the Union Company for the installation of automatic block signals on the seven miles of double track east and west of Calgary. These signals will be style T-2, three-position. There will be eighteen switch indicators.

OPENING OF THE LOTSCHBERG RAILWAY, SWITZERLAND.—The new Bernese Alps Railway, Berne-Lötschberg-Simplon, will be opened this month to traffic. This event will denote the deviation of a large proportion of Swiss railway traffic into new channels and the opening of a new important approach to Italy. The completion of this railway crowns the railway policy which has been followed by the canton of Berne during the last 50 years. It realizes the idea of a passage through or over the Bernese Alps which has been attempted again and again since the Middle Ages, and so solves an ancient traffic problem. Berne, besides taking a leading part in the construction of the new railway, has lately steadily worked for a consolidation of the several subsidized Berne railways.

Supply Trade News.

William C. Jones, Ltd., Boston, Mass., with head office in Manchester, England, have completed a new patented demonstration plant at Boston, Mass., for the manufacture of wiping waste in rope form, known as Boa waste. It is understood that the company has put up this plant for demonstration purposes only and does not intend to itself go into the manufacture of wiping waste in this country.

TRADE PUBLICATIONS.

STEAM COUPLERS.—The Gold Car Heating & Lighting Company, New York, has just issued an illustrated description of the Gold wedge lock steam coupler, together with a comparative diagram showing the action of the Gold steam couplers oscillating gasket and the non-oscillating soft gasket.

THE DENVER & RIO GRANDE.—The passenger department has just issued several little booklets of interest to tourists—one containing a list of hotels and ranch boarding houses, giving also specific information regarding rates, post office address, distance from railroad station, etc., and another devoted to Yellowstone Park.

A COMBINATION STEEL TIE AND TIE BAR.—A pamphlet has been published by J. F. Donahoo, Birmingham, Ala., describing the International Safety Railway Tie, which consists of a steel casing carrying two wooden blocks upon which the rail rests. The rail is held in position by special steel tie bars and bolts through the tie, eliminating the use of spikes.

COPPER RIVER & NORTHWESTERN.—This company has just issued a rather attractive little leaflet describing some of the Alaska country traversed by the Copper river route, which runs from Cordova to Kennecott, 196 miles. With this leaflet is being distributed a folder of the Alaska Steamship Company, giving information as to steamship routes to Alaska and along the coast.

COMPARATIVE STATISTICS.—Thompson, Towle & Company, New York, have prepared and are distributing to their customers a table showing "Essential Statistics on Important Railroads," covering results of operation for the year ended June 30, 1912. The table shows capitalization, dividend rate, fixed charges, net earnings, etc., and certain per mile of road figures, with the dividend record for six years, and high and low stock quotations for six years for about 55 roads.

RAILWAY DIFFICULTIES IN ARGENTINA.—Notwithstanding the remarkable progress which is manifested year by year by the great majority of Argentine railways, some of the troubles from which they have suffered, almost from the beginning of their successful career, have still to be faced. Among these difficulties may be included the native jealousy which exists in regard to foreign enterprises and which it would appear is most difficult to overcome. This jealousy manifests itself in particular in the relations existing between the companies and the municipalities; so acute is this at times that several important improvements had to be abandoned, and as a consequence the public suffers and the companies sustain financial losses. A case in point is the dispute which of late has raged between the Central Argentine Railway and the Cordoba municipality. It had been the wish of the company to erect a handsome station in the city of Cordoba. From the commencement, however, the company has met with scant consideration from the municipality; on the contrary, a spirit of opposition has been displayed even in regard to the most simple matters. At length the patience of the company has been exhausted and the board of directors in London, acting upon information sent to them from Cordoba, have telegraphed instructions to their local representatives in Cordoba, to suspend all work upon the new station building, to sell the materials already received and to dismiss all the workmen employed. The directors' action was precipitated by the persistent and unreasoning difficulties placed in the way of progress by the municipality, especially in regard to the matter of approaches to the new station building. While the interests of the company are bound to suffer by this drastic decision, those of the traveling public will be more seriously affected still.

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Railway Construction.

COLUMBIA & NEHALEM.—An officer writes that work is now going on, principally by the company's own forces, on this line which is being built from Ross Landing, south 30 miles. Contracts for part of this work would be let to outside contractors, if favorable bids could be obtained, the officer says. For the first 15 miles the work is quite heavy, and for the balance comparatively light. There will be one 225 ft. Howe truss bridge and one 1,300 ft. tunnel. A. S. Kerry, 716 Spaulding avenue, Portland, Ore., president, and G. A. Kyle, Portland, Ore., chief engineer.

HIAWASSEE VALLEY RAILWAY.—An officer writes that contracts will be let for grading, etc., on this road about July 15. The road is projecting from Andrews, N. C., on the Southern Railway via Marble, Peach Tree and Hayesville to Hiawassee. The work will not be difficult and the standard adopted has been a 2 per cent. grade and 10 deg. curves. J. Q. Barker, president, and W. C. Sanderlin, chief engineer, Andrews, North Carolina.

HUNTSVILLE, MOBERLY & RANDOLPH SPRINGS.—An officer writes that the Jennings Construction Company, of Joplin, Mo., has been given the contract for grading this electric road from Randolph Springs to Moberly, Mo., and that Edward Freed, of Moberly, Mo., has been given the contract for the concrete work.

KANSAS CITY, KAW VALLEY & WESTERN.—An officer writes that contracts will be let for grading about July 1 for this road which is projecting from Kansas City via Muncie, Kan., Edwardsville, Bonners Springs, Lanape, Loring and Linwood to Lawrence. About three miles of track have been laid. The work is fairly easy except on one three-mile section. One and one-half per cent. grades and 70 deg. curves have been adopted as standard. There will be a steel bridge about 1,000 ft. long across the Kaw River. J. D. Waters, president, and O. W. Williamson, chief engineer, Bonners Springs, Kansas.

SALT LAKE & UTAH.—An officer writes that this road is being built in two sections, the first running from Salt Lake City, Utah, via Taylorsville, West Jordan, Riverton, Lehi, American Fork and Pleasant Grove to Provo, Utah, about 24 miles. The second section is projected from Provo via Spanish Fork and Springville to Payson, Utah, between 18 and 20 miles. Contracts are now being let for the grading from Provo to a point between Lehi and West Jordan. Two miles of track has been laid in Salt Lake City, and about two miles each in Provo and American Fork. This work has been done by the Inter-Urban Construction Company, which has been incorporated to build and equip the roads. Contracts for steel construction will be let in the near future. The road is to be operated by electricity as an interurban passenger and freight road. It is expected that freight will consist largely of farm products and supplies for farmers. The orders for rolling stock have already been largely placed. W. C. Orem, Newhouse building, Salt Lake City, Utah, is president, director and general manager; Jas. G. Berryhill, Des Moines, Iowa, is vice-president and a director.

TEMPLE, NORTHWESTERN & GULF.—An officer writes that 3.3 miles of track have been laid and the company expects to immediately build a line from Temple northwest to Gatesville and Dublin, Tex., 100 miles. The company's own construction company is the general contractor. The work to be done in the near future consists of track laying, and in about 90 days two steel bridges of about 150 ft. each are to be begun. There is one rock cut to be excavated about a mile and a half long, and from 3 to 7 ft. deep. J. F. Sadler, president, Houston, Tex.; W. E. Dozier, chief engineer, Temple, Tex.; W. A. McGregor, vice-president and general manager, Temple, Tex.

RAILWAY STRUCTURES.

BONNERS SPRINGS.—See Kansas, Kaw Valley & Western under Construction.

TEMPLE, TEX.—Gulf, Colorado & Santa Fe. This company asked for bids on June 9 on a $25,000 six-stall engine house.

TOPEKA, KAN.—The Atchison, Topeka & Santa Fe has begun work on an addition to its shops to cost about $30,000.

Railway Financial News

BALTIMORE & OHIO.—The $20,000,000 1-year 5 per cent. secured notes, which were bought from the railroad company by Kuhn, Loeb & Company, and Speyer & Company, both of New York, are being offered to the public at 99¼. The notes are dated July 1, 1913, and are secured by the deposit of $29,000,000 Baltimore & Ohio Chicago Terminal first mortgage 4 per cent. bonds, due April 1, 1960.

John F. Stevens, at the request of President Williard, has made an inspection of the Baltimore & Ohio. In commenting on this inspection, he said in part: "The road's gross earnings this year will be about $100,000,000. I haven't a doubt that in ten years it will be earning fully $150,000,000. The only difficulty will be to furnish facilities and to avoid congestion. That is a matter of raising the capital, and I hold that the Baltimore & Ohio will be able to find the money, if any railroad will. Baltimore & Ohio flood damage, with the exception of bridges, has been substantially made good. Baltimore & Ohio construction work is a good deal like that of the continental European roads, done to last for all time."

CHICAGO & WESTERN INDIANA.—W. J. Jackson, president of the Chicago & Eastern Illinois, has been elected a director of the Chicago & Western Indiana, succeeding B. L. Winchell, resigned.

KANSAS CITY, MEXICO & ORIENT.—Application for a final decree to permit a foreclosure sale has been made to Judge Pollack in the United States District Court by the United States & Mexican Trust Company. The new company has been in process of organization for several weeks.

MISSOURI, KANSAS & TEXAS.—Frank Trumbull, chairman of the board, after an inspection trip, said in part: "This company will earn between 2½ and 3 per cent. on its common stock for the year ending June 30. The road was never in better physical condition. In the southwest, through Kansas, Oklahoma and Texas, the crop prospects are excellent, and bankers through the territory told me that they looked for a big business in the fall. One of the most encouraging features of my trip was the evidence of a more friendly spirit toward railroads in the west and southwest."

PENNSYLVANIA RAILROAD.—See editorial comments in regard to the exchange of Baltimore & Ohio stock for Southern Pacific stock.

PITTSBURGH, YOUNGSTOWN & ASHTABULA.—The Public Service Commission of Ohio has authorized the company to issue $640,000 series A first general mortgage, 4 per cent. bonds of 1908-1948 at not less than par, the money to be used to reimburse the Pennsylvania Company for advances for additions and betterments amounting to $640,296.

SAN PEDRO, LOS ANGELES & SALT LAKE.—This company has recently applied to the Railroad Commission of California for authority to issue $1,119,000 of bonds, the proceeds to be expended for new equipment, extensions and improvements.

SAN PEDRO, LOS ANGELES & SALT LAKE.—The company has asked permission of the California Railroad Commission to issue $1,119,000 bonds, to pay for new equipment and for the carrying out of certain betterment work, including grade reduction and construction of branch lines.

SOUTHERN PACIFIC.—This company has authorized an issue of $30,000,000 1-year 5 per cent. notes, of which $20,000 are to be underwritten by the syndicate headed by Kuhn, Loeb & Company, New York, who expect to offer them to the public at 99. The notes will be dated June 16, 1913, and are to be secured by the deposit of $17,500,000 Northwestern Pacific first and refunding mortgage 4½ per cent. bonds, due 1957; $17,500,000 Pacific Electric Railway refunding mortgage series A, 5 per cent. bonds, due 1961, and $4,000,000 Galveston, Harrisburg & San Antonio, Galveston-Victoria division, first mortgage 6 per cent. bonds, due 1940.

UNION PACIFIC.—See editorial comments in regard to the exchange of Southern Pacific stock for Baltimore & Ohio stock.

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Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$6.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 8,150 copies were printed; that of these 8,150 copies, 6,096 were mailed to regular paid subscribers and 845 were provided for counter and news companies' sales; that the total copies printed this year to date were 284,000—an average of 5,860 copies a week.

VOLUME 54. JUNE 27, 1913. NUMBER 26.

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*Illustrated.

THE State Railroad Commissioners of Massachusetts have investigated a collision which occurred between slowly moving passenger trains, injuring ten persons at a junction on the Boston & Maine at South Lawrence, June 3, and they report that the use of ball signals was largely instrumental in causing the collision; and they have issued an order requiring all such signals to be replaced by July 1, 1914, throughout the state of Massachusetts, by more dependable signals; that is to say, adequate interlocking. To many an old New Englander this will seem like desecration. Not that New England is the only old fashioned part of the world—ball signals and other archaic contraptions may be found not so very far from Philadelphia and Chicago, Kansas City and St. Paul—but the serene contentment based on the virtues of a couple of bushel baskets painted red and hung aloft has become ingrained in the eastern Yankee's character, like his pride in the Boston Public Library. Moreover, the ball signal deserves honor for its past. It is not very effective in fog, and nobody claims that its raised position and its lowered position are interlocked against each other; but think of the useful function it performed when it supplemented the former practices at grade crossings. Those practices were exactly like what we see on city street railways today (where the speed is only four miles an hour). In those old days Americans, in their conceit and ignorance, looked upon John Saxby (if they had ever heard of him) as a doctrinaire, and his interlocking machine as not worthy of the attention of practical railroad men. However, the world does move; and now, after Mr. Saxby is dead, though his departure was delayed till he was past 90, the Massachusetts Commissioners recognize his worth by ordering the adoption of his ideas.

THE Missouri, Kansas & Texas has been trying a new experiment this last year in the way of industrial development of its territory. A comprehensive description of the work that has been done by railroad industrial departments would fill a fairly large volume. Most of this work has been along the lines of educating farmers and manufacturers as to the benefits to be derived from certain natural advantages reached by the particular railroad employing the industrial department. Of course, railroads having land grants found the most obvious and direct advantage from attempting to induce immigration on to their lands. In their efforts to accomplish this praiseworthy object they have established demonstration farms, have run demonstration trains, have given demonstration lectures and have conducted a general campaign of education. The Long Island's success in the establishment of demonstration farms which produced rich yields of truck produce on land which had previously been considered nearly worthless, was a notable and well known example of the material advantages which a railroad company could gain from such work, even when it had no land to sell. The Missouri, Kansas & Texas' experiment is not a demonstration or a campaign of education as to what *can* be done, but simply an opportunity which has been given to farmers along its lines to make an experiment for themselves at the expense of the railroad company. Fertilizer, so extensively used in the southeast for cotton growing, is comparatively little used in Texas. Texas black lands will raise a heavy crop of cotton without the use of fertilizer; but even on these black lands it is an established fact that the use of fertilizer will increase the yield of cotton or of other crops out of all proportion to the cost of its purchase and application. The Missouri, Kansas & Texas industrial department made an offer to a certain number of farmers in each community along its line to furnish free enough fertilizer to make a thoroughly practical try-out of its use. It will be a year or two until definite figures can be given for the results of this experiment; but in the meantime it is worth while calling attention to this departure, because it conforms to principles which are well recognized in modern educational methods. There is no argument so convincing as that furnished by a man's own experience, and it almost seems surprising that this experiment has not been tried before. To guard against the unintelligent use of the fertilizer the railroad company has selected with some care the farmers to whom it has made the offer, and the industrial department is keeping a close watch on the results that are being obtained. The cost of publicity, if we may call it so, is much less than would be that of the purchase and installation of experimental farms. Two farmers supplied with fertilizer in a community will draw the attention of the great mapority of that community even more surely than would the establishment of an experimental farm. While the results that these men may get will not be quite as striking, probably, as would be the results on a farm under the management of experts, these results will have a home application far stronger than would the results obtained by experts. The local interest that has been aroused already is quite intense, and it will now remain to be seen whether this interest will result in the purchase by the farmers of fertilizer at their own expense next year.

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TO MAKE COMPETENT ENGINEMEN.

THE inquiries into the Stamford collision by the coroner, the Interstate Commerce Commission, the Connecticut Commissioners and the officers of the road, have been continued on four days during the past week. Not many additional facts have been brought out. Just what were Engineman Doherty's errors or omissions cannot be told with certainty; but all the evidence goes to confirm the opinion, expressed last week, that he simply waited too long before applying the brakes. The theory that he had made repeated applications unnecessarily, thus reducing the pressure in the main reservoir, has no support, and the theory that the brakes did actually go on effectively, when applied, is sustained by the testimony of the conductor of the train, who was thrown to the floor of the car by the sudden checking of the speed, and by the fact that the train broke in two. The conductor picked himself up as quickly as he could, and immediately thereafter the crash occurred. The brakes had acted satisfactorily at Noroton and at Bridgeport and also at another point where the engineman was alarmed by a man walking on the track, heedless of the train.

But the lesson to be learned does not depend on the facts of this particular case. It is admitted on all hands that Doherty had not had sufficient training in the management of fast and heavy passenger trains. Whatever may have been the drawbacks at Stamford he, by his own testimony, had had such clear warning of the possibility of inefficient action of the brakes that Mr. Bardo's conclusion, that no competent man in his right mind would have approached the distant signal at such high speed, seems to be the only conclusion possible. The road foreman, had told Doherty that on [all] the new engines, as a class, the operation of the brakes was unsatisfactory. Doherty himself, on at least one occasion, had been unable to make a satisfactory stop, and Harmon had had that trouble three days before. No competent engineman reporting to the roundhouse man that an engine's brakes were "no good" would resume operation ot the same engine on a fast train without knowing by personal trial whether the faults had been corrected. One is almost, if not quite, forced to the conclusion that Doherty, being a few minutes late, was so anxious to reach Stamford on time that he delayed the application of the brakes longer than his own judgment would have dictated.

The only remedy for such a condition is training. "Experience" is the word usually used, but the thing really meant is such a quality and quantity of experience as shall have taught the engineman how to guard against all possible pitfalls. Mr. Bardo, in speaking before the commissioners, said that safe service demanded that the men be made to understand that they are responsible to the public. This is an excellent idea; but no railroad manager can depend on it for practical results. His own reputation is bound up with that of his enginemen as a body and he must have something more tangible than such an undefined sentiment. To be loyal to the public involves not alone moral integrity but also intelligent knowledge of one's duties; and that is as definite as the study of the multiplication table. The public cannot go to a hundred enginemen and demand loyalty; the public does not know precisely what loyalty means. To the engineman it may mean that he must confess to inadequate knowledge of some detail of the brake apparatus, or of its manipulation. To be wholly loyal to the passenger he may some day have to stay at home and skip a trip, and lose $5 or $10, because he is worried about a sick wife or a troublesome debt, and cannot keep his mind on his work. To make perfect enginemen under the restrictions suggested here, calls for a course of education; and the superintendent is the only man who can effectively administer it. Even if the enginemen of a division generally are disposed to educate themselves, what assurance can there be that 100 per cent. of them will do the thing and do it successfully? Mr. Bardo said that 50 to 95 per cent. of the New Haven men were all right. That means, simply, that the other 5 or 10 per cent constitute the problem. And the only way to reach the 10 is to examine these and also the other 90.

In short, the responsibility of running a fast train is so great that the only satisfactory standard of training is the highest possible standard. An inquiry into Doherty's qualifications would have to be very comprehensive, for his fault may be hard to define. So far as knowledge of air-brake operation is concerned, he ought to make a good showing, for his experience had been on freight trains, which usually are much more difficult to manage than are 8-car passenger trains. Mr. Bardo told the commission that he would proceed to revise the rule which was the subject of discussion. But if 90 per cent. of his men are satisfactory, perhaps the need is not for a revised rule but for more attention to the details of the enforcement of the rule. Surely, some men will learn in one-third the time necessary to educate others; why hold the bright ones back? The essential thing is a certain amount of education, not a certain number of months or miles which may be assumed to afford opportunity for education. There should, indeed, be a minimum number of months' service in each kind of work and each kind always in the proper order. On most roads the order is—1, firing on switcher or easy freight; 2, firing on freight (general); 3, firing on easy passenger; 4, firing on fast passenger; 5, running switcher; 6, running freight; 7, running fast freight; 8, running easy passenger; 9, fast passenger; but the main thing is that a competent man—the road foreman—shall be able to testify to the superintendent that each runner has demonstrated his ability. On a road where, as was the case formerly on the New Haven, there are not enough freight trains to serve as schools for passenger runners, the task of education is more complicated and more costly; but the course to be pursued is plain, nevertheless.

If the course here indicated seems too rigid and costly for every-day practice the reply is that rules are necessarily rigid; and that in matters where rigidity is in any respect intolerable, the rule should be suspended, but that the suspension should be attended to personally by a competent officer, in every instance. The best lesson in railroad discipline that has appeared for many a day is that published by the New York State Public Service Commission in its report on the Corning collision (*Railway Age Gazette*, January 17 and 31, 1913). In that report emphasis is laid on the necessity that the manager shall see that roundhouse foremen and trainmasters—the men who supervise train running—are individuals of strong character and that they shall be made to feel secure in their places. Here we see one of the main elements in the training of runners. It is to be added that these division officers should be paid well. What officer is more important, from the standpoint of safety? Some of these officers draw less pay than some of the enginemen whom they rule over. It may be added, also, that there should be enough of them. Many road foremen supervise the work of 100 runners, and often of more than that. It is difficult to see how one foreman can look after 100, or even 50, unless his territory is compact and he knows the runners pretty thoroughly *and favorably*, from long acquaintance.

We are not laying down an impossible standard, based only on academic considerations. If firemen have to be promoted rapidly the superintendent cannot always get his knowledge of the ability of young runners from the road foreman. Old runners must temporarily perform this function of the foreman. But these must be runners really qualified to instruct young enginemen and to clearly state the situation to the superintendent. A routine requirement, treating all the old runners as competent in this matter, is pretty sure to fall short of the needs of the situation. One of the four critics who were invited to New Haven from other roads said at one of the hearings that he would have kept Doherty on freight trains two years longer. That, however, does not meet the situation; the question is, What specific knowledge did Doherty lack, and what things must be done to supply the lack? This work might take one year and it might take three. Very much depends on what the

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young runner learned while he was firing. Some learn much, others far less. No number of years could be considered a satisfactory training for a fireman who had to gather his knowledge from an unfriendly runner; and the unfriendliness which is known to exist between the enginemen's and firemen's brotherhoods is said to show its effects in the everyday life of the men in many cabs.

There is room for an extensive enlargement of the road foreman's work. Not only should there be an ample number of men; they should have the aid and co-operation of the enginemen in more thoroughly instructing firemen. The process of educating men to be runners begins, of course, while they are still firing. Why should not substantial premiums be paid to the enginemen who should best fit their firemen to be runners? If there is anything of the nature of unfriendliness in the cab, it is an indication of an intolerable situation, demanding to be cured.

Mr. Bardo quite directly charged the brotherhoods with weakening discipline. We shall not dispute a word that he said. There are all too many instances of such results on many roads. But it is pertinent to say that he did not show any connection whatever between this wrong influence and the particular failure now under discussion. Those newspapers which recognize the bad influence of the labor unions are quick to take up the matter of the abrogation of the two-year rule, and to argue from it. But it must be noted that two years, or four, might not have cured Doherty's deficiencies; and that two months, possibly two weeks, of instruction, rightly used, in all probability would either have made Doherty competent to handle the big new engine, or else would have demonstrated his lack of the qualities necessary for that position.

THE SIGNIFICANCE OF THE STATE RATE CASE DECISIONS.

THE meaning of the part of the Supreme Court's opinion in the state rate cases dealing with state interference with interstate commerce is clear enough. It is, in effect, that Congress has discretionary power to pass any legislation it may deem necessary to stop and prevent state regulation that directly or indirectly burdens or interferes with interstate commerce, but that Congress has not exercised its full authority, and until it does so the states may practically fix rates as they see fit as long as they do not make them confiscatory. This squarely "puts up" to Congress the entire question of regulation of rates. State legislatures and commissions repeatedly have so adjusted rates as to interfere with interstate rates and to promote local at the expense of national interests. The Interstate Commerce Commission and the Commerce Court, in their opinions in the Shreveport case, have described and discussed the heretofore successful effort of the Texas Railroad Commission to compel the railways to discriminate unfairly in favor of shippers in Texas as against shippers in Louisiana who were competitors against them for business in Northeast Texas.

Such state regulation has not been confined to Texas. For years the regulating authorities of certain states have sought to so adjust intrastate rates as to give the producers and jobbers of those states a practical monopoly of their markets. It is the plain duty of Congress, in the interest of the national welfare, to give the Interstate Commerce Commission power to so control state regulation as to prevent national interests from being subordinated to local interests. Likewise there is much state regulation of operation, such as full crew laws, that burdens interstate commerce without conferring the slightest benefit on the public. Whatever action may be necessary to relieve commerce of these burdens, Congress ought to take it.

While the meaning of the part of the opinion relating to state interference with interstate commerce is clear enough, the significance of the portion relating to valuation will be found, on a careful reading of the whole, to be far from certain. The court evidently accepts the view that valuation should be based on the present value of the property. It also evidently accepts the view that the main factor in present value is the cost of reproduction. But it does not make clear its idea as to how the present cost of reproduction is to be ascertained. The railways contended that it would cost them more to acquire their land for railway purposes than its value for other purposes, and that on the reproduction theory, land should be appraised at what it would cost them to acquire it. On this phase of the matter the court says:

> It is said that the company would be compelled to pay more than what is the normal market value of property in transactions between private parties; that it would lack the freedom they enjoy, and in view of its needs it would have to give a higher price. It is also said that this price would be in excess of the present market value of contiguous or similarly situated property. . . . It is impossible to assume in making a judicial finding of what it would cost to acquire the property that the company would be compelled to pay more than its fair market value. It is equipped with the governmental power of eminent domain. In view of its public purpose it has been granted this privilege in order to prevent advantage being taken of its necessities. It would be free to stand upon its legal rights and it cannot be supposed that they would be disregarded.

In other words, the court flatly refuses to see that railways, even when they take land under the power of eminent domain, do have to pay more than other persons, and says that their valuations must be made upon the theory that they do not have to pay more. It takes the theory and lets the true facts go. The Supreme Court must know, regardless of its dialectics, that in cases arising under the law of eminent domain juries habitually hold railways up. In the case of a new railway which has had to pay perhaps $200 an acre to acquire land that is worth only $100, the rigorous application of the principle laid down would mean the confiscation of $100 of its investment in every acre of its land.

The court also shows in another respect a singular aptitude for disregarding patent facts. In all the state rate cases decided last week and the week before it apparently holds that if a certain schedule of rates is confiscatory as to one of two competing railways and not confiscatory as to another, the railway as to which they are not confiscatory must accept them. It gives the weak railway Hobson's choice saying, in effect: "You may take either confiscatory or non-confiscatory rates. But in any event your competitor must make rates which as to you are confiscatory, and if you are not bankrupted by making the confiscatory rates you will be bankrupted by losing business because you do not meet them." The principle laid down is a principle of confiscation by indirection as distinguished from a principle of confiscation by direction. The conclusion of the Supreme Court is in substance, that a given schedule of rates may be unreasonable as to one road, and reasonable as to another operating in the same territory and handling the same kind of traffic. Only the judicial mind can tell how a given schedule of rates may at the same moment be both reasonable and unreasonable. This is law because the Supreme Court says so. But it is neither economics nor business. When Lord Eldon said that the law was common sense he did not foresee the decision in the Minnesota rate case.

The court is destructive, but justifiably so, in its criticism of the way in which some of the valuations made by the railways themselves and introduced in testimony in these state rate cases were made. Some of these valuations were hardly scientific guesses. It was on equally solid ground in criticising the use of gross earnings as a basis for dividing the value of railway property between state and interstate business. As it clearly pointed out, to use gross earnings as the basis of division is to reason in a circle. There will, however, be great difficulty in working up the data regarding "use units" and the cost of the various kinds of service which the decision will make it necessary for the railways to introduce in testimony in future cases involving the question of confiscation.

The more one studies the opinions in these state rate cases the stronger will his impression grow that the future of the

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railways of the United States is in the hands of the public and the regulating commissions, and not of the courts. The Supreme Court seems to make plain that it will not set aside government made rates on any railway—at least those made by the authority of the national government—unless they are proved by each railway to be confiscatory as to it. Now, rates may be such that at least the more prosperous railways in each territory cannot prove they are confiscatory as to them, and yet such as to so reduce the net earnings of the railways as a whole as to gravely interfere with the adequate development of transportation facilities. As a matter of law, the question may be whether the rates are confiseatory. As a matter of public policy, the question always is, not whether they are confiscatory, but whether they are such as to promote the development of railway facilities and thereby further the public welfare. The courts, in determining whether rates are confiscatory, merely fix the minimum below which they may not be reduced. Congress and the Interstate Commerce Commission have a legislative discretion which they may so exercise as to permit the railways to earn whatever return public expediency demands that they shall be allowed to earn. The maximum which railways should be allowed is an economic question, a question of public policy, and it is to be hoped that it will be dealt with as such.

EQUIPMENT NOTES AND A BAD BOND MARKET.

NOW is a time when new issues of railroad long-term bonds are particularly difficult to float. Since this unfavorable bond market coincides with a heavy demand for improved railroad facilities, particularly equipment, and with prospects of further heavy demands for equipment, due to large crops, the comparative advantages of an issue of notes, secured by collateral or general credit, and of the issue of equipment trust certificates is a question that has faced a good many railroad officers. Recently there has been issued $19,700,000 Pennsylvania general freight equipment trust 4½ per cent. certificates, $4,410,000 5 per cent. equipment gold notes of the Chicago, Rock Island & Pacific, $5,000,000 Southern Pacific equipment trust 4½ per cent. certificates, and $1,900,000 Missouri, Kansas & Texas equipment trust 5 per cent. notes, and it was announced not long ago that the Boston & Maine had sold $7,500,000 equipment trust 4½ per cent. notes, which announcement superseded a previous announcement of the issue of 20-year debenture notes. On the other hand, the companies making up the New York Central system have outstanding more than $100,000,000 one-year notes.

The bankers for the Pennsylvania offered that company's equipment trust certificates at prices to yield 5 per cent. The Southern Pacific 4½'s were offered at 98; the Missouri, Kansas & Texas 5 per cent. equipment notes on a basis to yield 5½ per cent., and the Chicago, Rock Island & Pacific on a basis to yield about 5½ per cent. The New York Central's various issues of notes were offered at slightly varying prices, yielding in the neighborhood of 5¼ to 5½ per cent. The New York Central itself issued earlier in the year $12,540,000 4½ per cent. equipment trust certificates on a basis to yield 4.65 per cent.

It would seem that equipment trust certificates command a somewhat higher price from investors than would notes of the same company, secured by an issue of general bonds. Certainly they command a better price than would notes secured simply by the general credit of a railway company. In the past it has been customary to require the payment of at least 10 per cent. of the cost of equipment on which equipment trust certificates are issued to be paid by the railroad company in cash. Sometimes this has been as high as 15 per cent.; and in the case of the Missouri, Kansas & Texas equipment trust notes, 20 per cent. was paid by the railroad company in cash. Thus from the investor's viewpoint, not only has he when buying equipment trust notes security directly on tangible property, but he is also assured of a substantial equity directly back of his investment. Furthermore, equipment is in the nature of a salable asset Even if in the reorganization of a bankrupt property the receivers should decide to permit a default on equipment trust certificates and to let the security for these certificates be sold, a bidder other than the reorganization committee representing this railroad might possibly be obtained for the equipment. As a matter of fact, in the only instance that we know of where equipment trust notes were allowed to go to default by the receivers, these notes were guaranteed by the company which sold the equipment, and the equipment itself was taken back by the builders and resold without, so far as is known, loss to the holders of the certificates.

Receiverships, however, have never come at the beginning of a period of great car surplus when the roads going into bankruptcy also had a surplus of equipment. Whether a receiver might not feel justified in defaulting on an equipment issue under such circumstances is a question. If the condition of car surplus was country wide and severe, second-hand equipment would not probably be a salable asset. Under conditions such as these it is quite conceivable that holders of car trust certificates of a bankrupt road might suffer at least temporary loss in interest; but even then their position would probably be better than holders of unsecured notes or junior securities of the second or third class. There is a certain simplicity in the security of an equipment trust issue which is entirely lacking in the position of junior securities, even when secured by a mortgage on specific property. These are all points which the market price of equipment trust certificates reflects.

The chief advantage from the railroad company's point of view for the issue of equipment trust certificates is in the comparatively high market price for which they can be sold. There are, however, certain rather obvious disadvantages to a railroad company in burdening itself with equipment trust issues. The general use of equipment trust or car trust certificates is comparatively recent. Certain companies, however, have issued equipment trust certificates for a number of years. In 1874 the Pennsylvania had one thousand leased coal cars presumably represented by some sort of equipment trust or car trust certificates. At the end of 1912 the Pennsylvania had issued a total of 105,300,000 equipment trust certificates, the greater part of which, of course, have been retired at various times. Since the indenture securing equipment trust certificates usually provides for the retirement of a certain proportion of these certificates semi-annually or annually, the railroad company has to be continually providing cash to meet these maturing instalments of principal, and this to a road which cannot afford to carry a very large amount of cash on hand, is in itself a source of continual care. It may be under certain circumstances, an actual menace. It is not generally possible to renew equipment trust certificates. The road with a sound credit can always renew short term notes if it is willing to pay a high enough price for its money, but an issue of short term notes, part of the proceeds of which were to be used to provide funds for the retirement of equipment trust certificates, would not presumably be looked on with favor by bankers or investors.

The Interstate Commerce Commission's rules for accounting, provide for a charge to be made each month to expenses for depreciation of equipment. If a railroad company is forced to make a charge for depreciation of equipment and at the same time to provide funds out of current earnings to pay the principal of equipment certificates falling due periodically, it is in a position of both setting up a charge for depreciation and providing a sinking fund to take care of depreciation. Since, however, the charge to operating expenses is a bookkeeping charge only, it would seem that a railroad company might so adjust its equipment certificate maturities as to make the amounts in a given half year about equal the charges for depreciation. By doing this the company would overcome one of the objections to the Interstate Commerce Commission system of charging for depreciation—namely, that this charge is a matter of bookkeeping only—and at the same time avoid the duplication involved in setting up a sinking fund and a depreciation charge for the same property.

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ILLINOIS CENTRAL MECHANICAL TERMINAL.

Construction of an Important Division Terminal at Centralia, Ill., Which Was Carefully Designed and Well Equipped.

The Illinois Central has recently installed at Centralia, Ill., a mechanical terminal for the handling of cars and locomotives that is one of the most complete and up-to-date terminals in this country. Centralia is one of the most important freight terminals on the Illinois Central system, being located on the main line from Chicago to New Orleans north of the junctions where the traffic from the Y. & M. V., the Birmingham line, the Kentucky division, and the southern Illinois coal fields joins that of the main line from New Orleans and just south of Branch Junction, where the northbound traffic separates that for Chicago and the east going up the main line and that for central Illinois, Iowa, Omaha and the west, going over the Springfield and Wisconsin divisions. This makes Centralia the logical poiht for a very complete classification of freight, so that a large part of the traffic can move to northern and western points in full train lots, thus relieving congestion and reducing switching in the yards north of Centralia, and making possible somewhat quicker delivery to northern and western points. To handle this classification, the company completed and put in operation last summer, a 3,000 car yard with a hump for northbound business, provision being made in the design for an ultimate capacity of 9,000 cars. The design and construction of this yard were described in the *Railway Age Gazette* of August 9, 1912. The new mechanical terminal cares for the engines of the St. Louis, Springfield and Illinois divisions, which terminate there, and includes complete facilities for making both heavy and light repairs to these locomotives, and also for repairing any bad order cars received at this point.

General View of Locomotive Group.

YARDS.

On account of the topography of the ground available for use, it was necessary to make the locomotive and car departments practically independent of each other, except for the common use of water, air, heat and electricity. The car group is located about 2,000 ft. north of the north end of the locomotive group. The arrangement of yards and buildings is shown in the accompanying illustrations. The engine house has a single opening, to the south, enabling all freight engines to enter and leave the house without reverse movements, but requiring passenger engines leaving or taking trains at the Centralia station, which is north of the yard, to run about 2,500 ft. south of the roundhouse and reverse. Passenger locomotives inbound to the house, leave the main track north of the extreme limits of the yard, taking an engine lead alongside the double track lead to the southbound tail switching yard. Passing just west of the roundhouse this track connects with the main ladder of the engine yard, at the south end of which connection is made with the inbound tracks to the house. Southbound freight engines pull their trains into the southbound switching yard, run through to the south end of this yard and return on the thoroughfare track which connects directly with the inbound engine tracks to the roundhouse. Northbound freight engines leaving their trains in the northbound receiving yard at the extreme south end of the terminal, use this same thoroughfare track to reach the house. There are two inbound engine tracks, one running straight into the house without passing over either the inspection pits or the cinder pits. The other crosses the inspection pit and the three cinder pits, with crossovers just beyond each cinder pit to enable an engine on the rear pit to run around an engine still standing on one of the pits ahead. Crossovers are also provided to reach the coaling station if it is desired to coal an engine before taking it into the house. Inbound engines may water at a penstock just back of the inspection pit.

Outbound engines from the house can use one of three tracks, two of which pass the coaling station. A penstock located just outside of the roundhouse, and another just beyond the coaling station, allowed outbound engines to take water conveniently. Freight engines take the southbound thoroughfare track directly from the outbound engine tracks to reach either the northbound or southbound departure yards. Passenger engines run down one of the outbound tracks to the main ladder, down this ladder to the thoroughfare tracks, take a crossover to the northbound thoroughfare tracks, reverse and take that track over to the old southbound main, which they use as a northbound thoroughfare track, to the north end of the yard.

In addition to the running tracks, the engine yard includes a wrecker track close to the roundhouse, an oil car track along-

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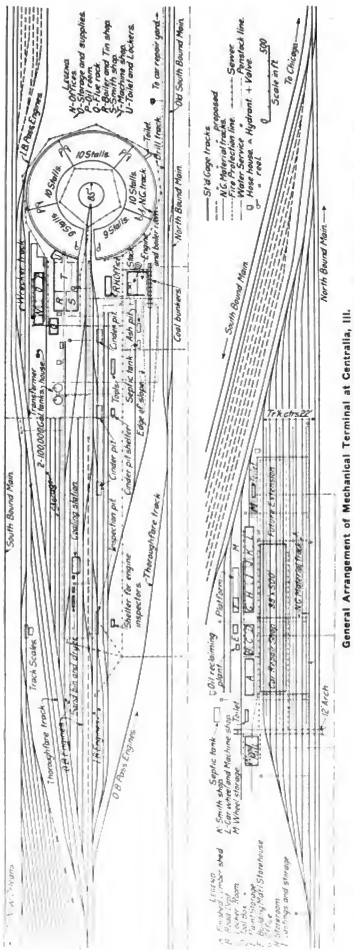
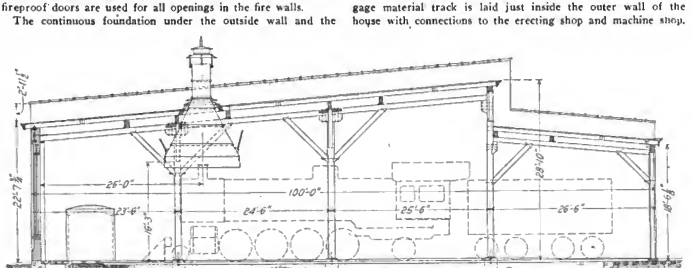

South Bound Main
Thoroughfare track
Track Scales
Coaling Station
Transformer
Cinder pit
Inspection pit
Shelter for engine inspectors
Thoroughfare track
Engine and boiler room
Coal bunkers
North Bound Main
Old South Bound Main
Old North Bound Main
Trackage
Scale in Ft.
To Chicago
To car repair yard
Turntable
Ash pit
Septic tank
Edge of slope
Crane
Tool and Lockers
Water Service
Hose house
Hydrant
Valve
Proposed line
Sewer
Standard Gage tracks
Narrow Gage tracks
Pipe line
Telephone
Electric Power
Compressed Air
Steam
Gas
Oil
Water
Drainage
Fuel Oil
Sand
Cinders
Ashes
Coal
Engines
Cars
Men
Material
Supplies
Tools
Waste
Waste Material
Scrap
Ice
Refuse
Sewage
Passengers
Mail
Express
Baggage
Milk
Live Stock
Perishable Freight
Other Freight
Coal
Coke
Lumber
Ore
Sand
Gravel
Stone
Brick
Cement
Lime
Agricultural Products
Animal Products
Manufactures
Miscellaneous
Empties
Locomotives
Passenger Cars
Freight Cars
Caboose Cars
Work Cars
Floating Equipment
Roadway Maintenance Machines
Roadway Tools and Supplies
Passenger Train Service
Freight Train Service
Yard Service
Train Switching
Miscellaneous Operations
General Administration
Transportation
Maintenance of Way and Structures
Maintenance of Equipment
Traffic
Miscellaneous
Operating Income
Operating Expenses
Net Operating Revenue
Taxes
Operating Ratio
Equipment Rents
Joint Facility Rents
Net Railway Operating Income
Non-Operating Income
Gross Income
Deductions from Gross Income
Net Income
Balance Sheet Items
Investment in Road and Equipment
Improvements on Leased Property
Sinking Funds
Investments in Affiliated Companies
Other Investments
Current Assets
Working Funds
Deferred Assets
Unadjusted Debits
Current Liabilities
Loans and Bills Payable
Deferred Liabilities
Unmatured Interest, Dividends and Rents
Accrued Depreciation
Funded Debt
Corporate Stock
Profit and Loss
Additions and Betterments
Contributions for Additions and Betterments
Miscellaneous Physical Property
Grade Crossings
Gauge
Weight of Rail
Ballast
Ties
Rail Fastenings
Turnouts
Frogs
Switches
Guard Rails
Signals
Interlocking Plants
Telegraph and Telephone Lines
Buildings
Shops
Engine Houses
Roundhouses
Turntables
Coaling Stations
Water Stations
Fuel Stations
Storehouses
Docks
Grain Elevators
Stockyards
Wharves
Coal Chutes
Ore Docks
Miscellaneous Structures
Miscellaneous Equipment
Power Plants
Power Transmission Systems
Electric Distribution Systems
Shop Machinery
Power Plant Machinery
Steam Locomotives
Electric Locomotives
Gasoline Motor Cars
Other Motor Cars
Trailers
Dining and Buffet Cars
Sleeping Cars
Parlor and Chair Cars
Observation Cars
Baggage Cars
Express Cars
Mail Cars
Postal Cars
Combination Cars
Horse Cars
Box Cars
Stock Cars
Refrigerator Cars
Coal Cars
Gondola Cars
Flat Cars
Tank Cars
Ore

width of stalls center to center of posts being 14 ft. The circle is divided into five sections by four brick fire walls, three containing 10 stalls each and two containing nine each. One of the nine stall sections is designed for an erecting shop. Kinnear fireproof doors are used for all openings in the fire walls.

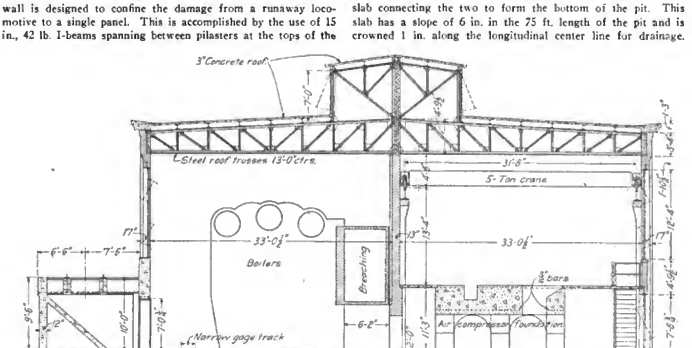
The continuous foundation under the outside wall and the sash. The smoke jacks are Dickinson 36 in. cast iron. The roof is five ply tarred felt and pitch with composition surface. The floor of the house between pits is of vitrified paving brick, laid on rolled sand with cement grout filling. A continuous 24 in. gage material track is laid just inside the outer wall of the house with connections to the erecting shop and machine shop.



Section Through Engine House.

pedestals under the interior columns are of concrete, designed for a bearing pressure on the soil of 3,000 lbs. per sq. ft. The outer wall is designed to confine the damage from a runaway locomotive to a single panel. This is accomplished by the use of 15 in., 42 lb. I-beams spanning between pilasters at the tops of the

The concrete walls of the engine pits are carried down 4 ft. below top of rail, each wall being 2 ft. 4 in. wide with a 7 in. slab connecting the two to form the bottom of the pit. This slab has a slope of 6 in. in the 75 ft. length of the pit and is crowned 1 in. along the longitudinal center line for drainage.



Section Through Power House.

windows, which carry the wall above that level. The windows and the portion of the wall between the pilasters may be torn out without injuring the support of the roof or the adjacent panels. Fenestra steel sash are used for the windows in all of the buildings, with the Peerless tension operating device for movable

The 85 lb. rails used on the pits rest directly on the concrete, being secured by rail clips through which are passed ¾ in. bolts set in the concrete. The 3 in. x 3 in. x ¼ in. angles protecting the inner corner of the concrete and the 6 in. x 12 in. and 6 in x 10 in. creosoted timbers which are placed outside of each rail

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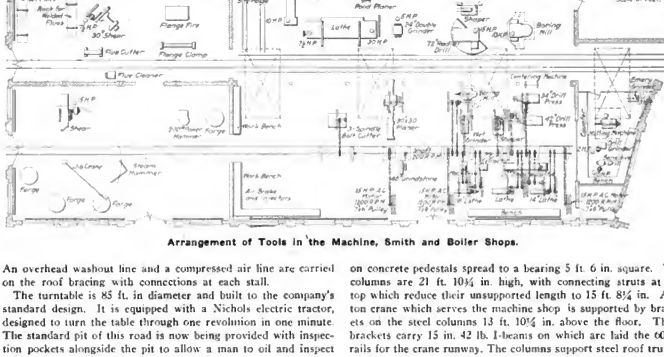
to protect the surface of the concrete, are also held in place by ¾ in. bolts set in the concrete. The water accumulating in the pits is drained to a concrete duct one foot square, laid around the inner circle of the house which collects all drainage into five manholes spaced at equal intervals about the circle from which an outlet to the sewer system is obtained.

The engine house, as well as all the other buildings in the locomotive department, is heated by exhaust steam from the power house. This steam is distributed through a pipe laid in a concrete duct about 3 ft. square just inside the foundation for the outer wall. A branch of this pipe at each pit leads to the pit radiators and other branches are carried up to the wall radiators which are supported on the pilasters between windows. Cast iron was used in preference to the ordinary iron or steel coils, as the latter are so susceptible to corrosion from gases and water. Each pit has 432 sq. ft. of radiation, and the total for the house, including wall radiation, is 26,000 sq. ft. The house is lighted by tungsten lamps, three of 250 c. p. each, being provided between engine pits with a switch and cutout box for each stall. Four Westinghouse receptacles for extension cord plugs are also provided for each pit, and a three phase, 440 volt power circuit along the wall of the outer circle allows the use of portable electrical tools, such as lathes, boring bars and flue cutters.

that of the roundhouse. Latticed steel columns support steel roof trusses on which is laid a timber roof of the same type as that used on the roundhouse. The steel construction in the erecting shop is necessary to support the cranes and is feasible, since no live engines are kept in this shop, the gases from which would corrode the steel. No smoke jacks are necessary in this section of the house, and the height of the roof is increased to allow room for the operation of the cranes and to provide additional light and ventilation. The ventilation is ample to remove any gases that may accumulate while getting locomotives in and out of the shop.

MACHINE, BOILER AND SMITH SHOPS.

The machine, boiler and smith shops are contained in a building 80 ft. x 160 ft., which closely adjoins the erecting shop, the triangular space between the square end of the machine shop and the curved outer wall of the erecting shop being enclosed to form part of the former. The shop is a steel frame building, latticed channel columns being set in the brick walls flush with the inner surface of the wall, and another row of columns being located on the center line of the building. The wall columns and the brick walls between them are carried on a continuous concrete foundation, and the center row of columns is carried



Arrangement of Tools in the Machine, Smith and Boiler Shops.

An overhead washout line and a compressed air line are carried on the roof bracing with connections at each stall.

The turntable is 85 ft. in diameter and built to the company's standard design. It is equipped with a Nichols electric tractor, designed to turn the table through one revolution in one minute. The standard pit of this road is now being provided with inspection pockets alongside the pit to allow a man to oil and inspect the tractor thoroughly and easily.

The erecting shop is located in the nine-stall section of the roundhouse west of the entrance. It is designed for handling the heavy repairs to locomotives at this plant, the light running repairs being made in the roundhouse proper. Seven of the tracks are provided with driving wheel drop pits equipped with two 30-ton Watson-Stillman hydro-pneumatic jacks. The other two tracks have truck drop pits which are equipped with a 15-ton jack of the same type. A 7½-ton Whiting crane having a span of 52 ft. serves this shop, being of the special compensated gearing type for operating on circular runways. Standard and narrow gage connections between the erecting shop and machine shop are provided to allow engine parts handled either by the jacks or the crane to be moved easily into the machine shop, where work is to be done upon them.

The roof construction in the erecting shop is different from

on concrete pedestals spread to a bearing 5 ft. 6 in. square. The columns are 21 ft. 10¼ in. high, with connecting struts at the top which reduce their unsupported length to 15 ft. 8¼ in. A 5-ton crane which serves the machine shop is supported by brackets on the steel columns 13 ft. 10¼ in. above the floor. These brackets carry 15 in. 42 lb. I-beams on which are laid the 60 lb. rails for the crane runway. The columns support steel roof trusses designed for a span of 40 ft., having a depth of 4 ft. at the wall and 6 ft. 2 in. at the center line of the building. These trusses are built up of angles with the exception of the lower chord of the trusses on one side of the building, which support a line of shafting. These chords have channel sections to facilitate the hanging of this shafting. On the roof trusses are laid 8 in. 18 lb. I-beam purlins 5 ft. center to center, spanning the 16 ft. between trusses and supporting the 3 in. concrete roof slab. This roof slab is reinforced with American Steel & Wire No. 4 triangular mesh reinforcement, and is covered with four ply tarred felt and pitch with a composite surface. Skylights and 36 in. ventilators are provided over the center of the building. Two lines of narrow gage and one of standard gage track serve these shops. The floor is of concrete 5 in. thick, with a granitoid finish. The machine shop proper is divided into two 40 ft. bays, all the tools in one bay being motor driven, and those in the

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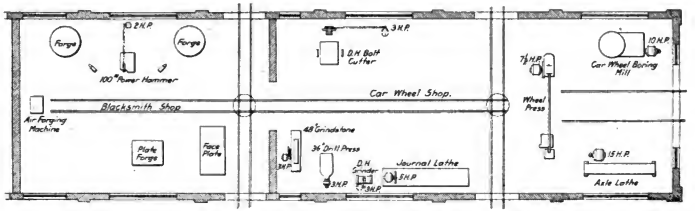
other being belt driven. The tool equipment is very complete, many new machines being installed besides those used in the old shops. The motor driven tools are operated on a three phase, 60 cycle, 440 volt a. c. circuit.

THE POWER HOUSE.

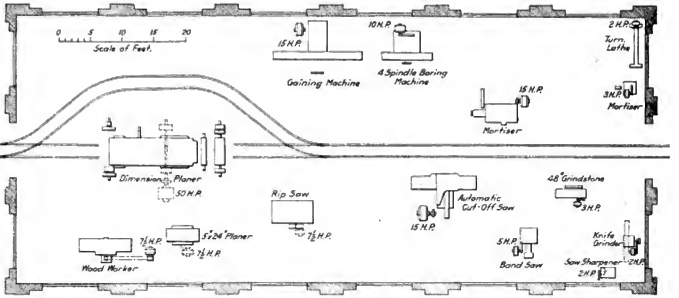
The power house is one of the most important buildings in the locomotive group. On account of the arrangement of the terminal it is necessary to drive all the machinery either directly or indirectly by electricity, and since there was not adequate central station service it was decided to install an up-to-date electric plant. The building is 60 ft. x 80 ft., divided longitudinally in the middle by a 13 in. brick wall into an engine room and boiler room. A heavy concrete foundation is required under the boilers and under the machinery in the engine room. The roof trusses and monitor framing are of steel carried directly on the brick walls. A 5-ton Whiting hand operated crane in the engine room is carried on 9 in. brick pilasters with stone caps which support longitudinal I-beam girders for the runways. The roof slabs are the same as in the machine shop. The floors are of concrete with granitoid finish.

The equipment consists of four 250 h. p. Stirling water tube hand fired boilers operating at 150 lbs., a 2,000 h. p. Cochrane horizontal feed water heater, two 250 k. v. a., 3 phase, 60 cycle, 400 volt General Electric, non-condensing, turbo-generators, two 1,000 cu. ft. air compressors, besides other auxiliary power equipment. An automatic oil storage and filtering system handles all the oil used by the turbines, air compressors and pumps. Space has been reserved in the engine room for the installation of a locomotive boiler washing and refilling system. The electric power is distributed to the other buildings by cables carried on steel transmission towers with concrete pedestals. The pipe lines from the power house to the roundhouse are carried in a 5 ft. x 6 ft. concrete tunnel, and the hot water pipes for heating the car department buildings are carried in a concrete conduit having special provision for expansion, which was an important consideration in the adoption of hot water in preference to steam for heating the buildings of the northern group. The pipes, which are about 2,500 ft. long, are carried on expansion rollers to allow free movement due to expansion and contraction, and two loops are provided in the line to take up this movement.



Arrangement of Equipment in the Car Department Wheel and Smith Shops.

The coal bunker alongside the boiler room is of reinforced concrete of a special design, having a capacity of 400 tons. The outer wall of the bunker is 1 ft. 3 in. thick, reduced in the panels to 12 in. The inner wall is formed by the wall of the power-



Layout of Machine Tools in the Wood Mill.

house. Concrete beams 12 in. thick and 3 ft. 9 in. deep on 13 ft. centers support the 6 in. floor slab of the bunker, and 6 in. vertical walls over these beams support a similar slab which is sloped up from the floor level at the inner wall on a slope of about 1 to 1 serving to hopper the bunker. The track over the bunker is carried by 24 in. 80-lb. I-beams under each rail, which are connected to the web of similar I-beams set transversely on the concrete walls at intervals of 13 ft. These beams are covered with concrete for protection. The base of rail is 10 ft. above

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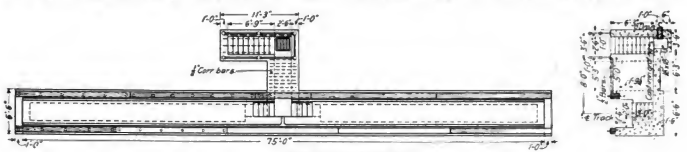
the floor of the boiler room and the extreme width of the bunker is 12 ft. 8 in. There are six 7 ft. doors in the wall between the bunker and the boiler room, allowing the coal to fall through on the boiler room floor. These doors have cast iron jambs and lintels. A drain pit is provided at the lowest point of the bunker to lead to the sewer any water which may collect.

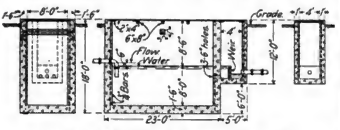
The chimney for the power house is of concrete, the shaft being 204 ft. high, and the footings carried down 5 ft. and spread to 28 ft. square. The outside of the shaft is tapered, the diameter at the bottom being 14 ft., and at the top 8 ft. 6 in. The concrete shall has a thickness of 15 in. at the bottom and 6 in. at the top, being reinforced with vertical bars. A lining of fire blocks is carried up 70 ft. from the top of the footing, this lining having a uniform inner diameter of 8 ft. The inside diameter above this lining is 7 ft. 6 in. The lining is 4½ in. thick, and is entirely separate from the concrete shell, leaving an air space between the two which is 16½ in. wide at the bottom. The smoke opening into the chimney is 4 ft. 6 in. x 12 ft. 3 in., the fire block lining being carried through this opening to connect with the flue lining. The chimney is designed to allow for a boiler overload of 50 per cent., and provides for the burning of low grade coal.



Detail of Inspection Pit.

STORE HOUSE AND OFFICE BUILDING.

The store house is 30 ft. wide and 170 ft. long. The south end, which is devoted to offices, is two stories high. The store keeper and master mechanic have offices on the first floor, and the second floor is taken up with a record room, rest room for engineers and firemen, and an apprentice classroom. The store house proper is one story high, with an oil room at the north end, separated from the rest of the building by a brick fire wall.



Details of Septic Tank for Sewage Disposal.

The oil room is provided with the Bowser system of distribution, power pumps being provided for handling fuel, car and kerosene oils from the storage tanks in the basement to faucets for filling barrels on the platform. Hand pumps of the self-measuring type are also provided for all kinds of oil held in storage. Some long distance rotary pumps are located in the erecting shop about 800 ft. from the oil room and have given satisfactory service.

The concrete platform 45 ft. wide across the north end of the building with extensions along both sides, is built at car floor level to allow material to be unloaded directly. The building is of brick construction with the same type of roof as that used on the roundhouse. The store house and oil room are to have a concrete floor which will be placed as soon as the danger of settlement in the fill is passed.

The roundhouse office is a single story brick building 20 ft. x 65 ft., with a slate roof. In addition to the office of the roundhouse foreman it contains shower baths, toilet rooms and locker rooms for the enginemen. Special care has been taken in the design of this terminal to provide for the comfort of the men off duty. Many of them have runs which allow them only a few hours at Centralia, and such men are enabled to take a shower bath and change clothes in the roundhouse office building, and then spend their spare time in the rest room in the store house building, where comfortable chairs, games and reading matter are provided for them. The comfort of the shop men is also well looked after, a large toilet and locker room being provided between the machine shop and the erecting shop, and special toilet rooms being included in each of the principal buildings.

CINDER, INSPECTION, COAL AND WATER FACILITIES.

The three cinder pits and the inspection pit are of concrete construction. The cinder pits are not unusual in design, the surface of the concrete being reinforced with old rails in the usual manner to prevent damage by the clam shell which is used in removing the cinders. The inspection pit is unique in having an underpass which allows the inspector to get under the locomotive without the danger and inconvenience incident to crawling under in the usual manner. It is the intention to develop the use of this pit as much as possible, and to handle as many of the minor repairs as can conveniently be done at this

Typical Engine Pit.

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place instead of in the roundhouse. The pit is 75 ft. long, 4 ft. wide and 3 ft. 6 in. deep below the top of rail. It is formed by two concrete walls 1 ft. 3 in. thick supporting 8 in. x 10 in. timbers to which the rails are spiked. The footing connecting these two walls is carried down 8 ft. below the top of rail with a slab 1 ft. 6 in. thick at the bottom of the walls, and another 6 in. thick forming the bottom of the pit. The entrance for the inspector is opposite the center of the pit and 9 ft. 9 in. from the center line of track. A flight of 10 concrete steps leads down to a cross passage 6 ft. 6 in. below the top of rail, which is covered by a 4 in. reinforced concrete slab. After passing under the near rail in this passageway, the inspector goes up a flight of five steps toward either end to reach the pit level. All drainage from the pit and the entrance is led to a sump at the bottom of the entrance stairway from which an 8 in. drain leads to the sewer. The details of this design are shown in one of the accompanying drawings. The pit required 99.5 cu. yds. of concrete.

A number of small frame shelter buildings are provided for the men stationed in the yard, such as the inspector and the cinder pit men. No old box car bodies which are so frequently used as shelters in such yards will be allowed.

The coaling station was built by the T. W. Snow Construction Company. It is of timber construction with a storage capacity of 600 tons of coal and 20 tons of dry sand. The elevating machinery is of the double bucket, or semi-balanced skip hoist type, and is able to handle 75 tons of coal per hour. The track over the depressed hopper has a 0.5 per cent. grade rising from the hopper so that a switch engine can set in a string of loads on this track beyond the station to be dropped down by gravity one at a time and unloaded. The empties are allowed to accumulate on the other side of the station until an engine is available to remove them. A sand drying stove is provided in the building which shelters the motor equipment adjacent to the coaling station. The dry sand is elevated to the storage pocket by compressed air.

The supply of engine water is secured from two 100,000 gal. tanks, four Peague type penstocks being provided in the yard. These penstocks are set in concrete frost proof pits. The tanks are of select long leaf cypress, creosoted, the hoops being of wrought iron. Each tank support is carried on five piles.

CAR DEPARTMENT BUILDINGS.

The buildings in the car department consist of a covered shed over four repair tracks in which repairs can be made in weather which would prevent men working without shelter, and the service buildings arranged alongside the repair yard to facilitate the handling of material. The car repair shed is 500 ft. long x 88 ft. wide, and is of timber construction throughout. Three lines of posts support wooden roof trusses, the lower chords of which are 22 ft. above the top of rail. The ends of the shed are covered with siding down to the bottom of these trusses, and the sides are enclosed for 7 ft. below that line, a large portion of this space being occupied by windows, however. Skylights are provided in the roof in every other bay alternating on opposite sides. The posts are set on concrete pedestals 2 ft. square. The posts in the middle row are 8 in. x 10 in., and those in the outer rows 8 in. x 8 in. The roof trusses are framed of four 2 in. x 8 in. timbers in the lower, and four 2 in. x 10 in. timbers in the upper chord, with 2 in. x 8 in. timbers double latticed. These trusses have a roof pitch of ½ in. per ft. They are spaced 16 ft. center to center and support 2 in. x 8 in. purlins on 16 in. centers, which carry the roof boards covered with the composition roofing. The four standard gage tracks provide a capacity of about 50 cars, and the yard outside of the shed will accommodate about 200 cars more. The narrow gage material tracks in the shed and the yard make it possible to carry material on roller bearing cars to within 25 ft. of any desired point.

The service buildings are of brick, with the exception of the

Open Car Repair Shed Before the Yard Was Surfaced.

finished lumber shed, which is of timber construction. The wood mill has steel roof trusses supporting a 3 in. concrete slab of the same design as that used in the machine shop and power house. The other brick buildings have composition roofs laid on timber.

An innovation in railroad shop practice is the use of hot water for heating all buildings of the car department. Heat for the system is obtained from a heater located in the engine room of the power house which utilizes exhaust steam for heating the water. Circulation of the water is effected through two 3 in. pipe lines. From the power house to the various buildings of the car department the two 5 in. circulating lines of the system are contained in a concrete conduit described above. The radiation in all of the buildings is of the cast iron wall type, and from observations taken during the past winter the hot water system has proved to be a decided success, satisfactory temperatures being maintained in the various buildings, even during extremely low temperatures outside.

The maximum distance through which the hot water is transmitted in one direction in the heating system is 2,635 ft., the extreme building being the toilet located north of the service building in the car repair yards. The obtaining of satisfactory heat

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in buildings located over 2,600 ft. from the source of heat supply is practically impossible with the use of low pressure steam under ground conditions prevailing at Centralia, and the results obtained have fully justified the judgment of the engineers in departing from the usual practice of either using high pressure steam or providing a separate boiler plant conveniently located to furnish the required amount of steam. The heating plant was installed by the Kehm Brothers Company, Chicago.

WATER SERVICE FACILITIES.

The water service facilities of the terminal include three separate systems, the fire protection line, the penstock supply, and the service line which supplies water for drinking, flushing sanitary sewers, flushing cinder pits, boiler water supply, etc. All hydrants are plainly marked to eliminate confusion and errors due to using the wrong one. The water is secured from the city mains at 40 lbs. pressure. Since the water at times is unfit for drinking purposes, an alum filter and purifier is installed in the roundhouse from which the treated water is piped to drinking fountains at various points about the plant.

The elevation of the tanks gives a pressure of about 20 lbs. on the fire line, which carries 125 lbs. pressure, however, when the centrifugal fire pump is in operation. This pump has a capacity of 1,500 gals. per minute. The fire line runs from the tanks to the fire pump in the power house and, leaving this pump, divides, one branch going north to the car group and the other

Service Buildings Adjoining the Car Repair Shop.

subdividing to reach the buildings of the locomotive group. The line to the roundhouse is connected to the overhead washout line along which are located 10 swing wall hose reels, each with 100 ft. of 2½ in. hose. A similar hose reel is provided in the machine shop. An automatic sprinkling system is installed in the coaling station and there are four hydrants protecting the buildings of the south group, the one back of the roundhouse being enclosed in a hose house which is provided with 200 ft. of hose. The line to the northern group of buildings serves eight hydrants located at convenient points for the protection of the buildings and cars in the repair yard. The fire line from tanks to the pump is of 12 in. pipe, the main line to the northern group is 8 in., and most of the branches are 6 in., with a few short ones 4 in. The penstock line divides at the tank, one branch going north to the penstock at the roundhouse, the other going south to the three penstocks in the yard. These lines are all of 12 in. pipe. The service line has numerous branches reaching the machine shop, power house and cinder pits in the locomotive group and a locker room and toilet in the northern group. The three water systems required 5,000 ft. of 8 in., and 9,000 ft. of 6 in. wood stave pipe, and 3,400 ft. of 4 in., 2,730 ft. of 6 in., 3,865 ft. of 8 in. and 2,600 ft. of 12 in. cast iron pipe.

Separate storm and sanitary sewer systems were installed. All down spouts on buildings empty into 6 in. pipes leading to the storm water sewers, which also receive the drainage from the turntable pit, coal bunker, penstock pits, inspection pit, etc. Vitrified pipe in 8 in., 10 in., 12 in., 15 in., and 18 in. sizes is used for these sewer lines. The outlet for the storm water sewers of the southern group is a 60 in. pipe laid under the yard and for the northern group a standard 12 ft. arch. The sanitary sewers lead to septic tanks, as the terminal is surrounded by a farming district making necessary some treatment of the sewage before discharging it into drainage ditches. Two tanks are provided which are practically identical, being designed to retain the sewage for 24 hours. The one serving the southern group of buildings is a concrete pit 23 ft. x 11 ft. in plan and 18 ft. deep with the top of the concrete 1 ft. above grade. The walls are 1 ft. 6 in. thick, reinforced with ¾ in. rods set vertically and horizontally. The tank is covered with a wooden frame on which 2 in. x 4 in. timbers are nailed with narrow openings between in order to allow circulation of air over the contents of the tank. The sanitary sewer empties into this tank 8 ft. 6 in. above the bottom, the discharge pipe being turned down inside the tank to keep its open end below the level of the contents of the tank. This level is fixed by the outlet at the opposite end of the tank at an elevation 8 ft. above the bottom. The outflow is through three 6 in. holes in the concrete wall which connect with a second tank 5 ft. x 6 ft. in plan and 12 ft. deep with 1 ft. walls, attached to the large tank, having its top at the same elevation. The outlet from the large tank is just above the bottom of the small one and near the water level in the big tank. A weir is provided in the small tank over which the discharge flows to reach the outlet pipe.

The construction of the buildings in the mechanical terminal was carried on in connection with the construction of the yard. Work on the buildings was begun during July, 1912. The filling was handled with a standard gage steam shovel outfit. When the fill at a building was over 8 ft. deep, as in the case of the wood working shop, the concrete foundation was put in up to the floor level, the fill made around this foundation and the walls of the building placed afterward. The piers for the car repair shed and the lumber shed were also built before the fill was placed. In this case the fill was carried as close as possible to a row of piers, the construction track thrown over the piers and the process of filling continued. The car repair yard was put into operation December 10, 1912, and the locomotive facilities January 10, 1913.

The construction of both the yard and the mechanical terminal was carried out under the direction of A. S. Baldwin, chief engineer, and D. J. Brumley, formerly engineer of construction. The design of the mechanical terminal was under the direction of F. L. Thompson, formerly engineer of bridges; J. A. Taggart, architect, supervising the design of the buildings. The late M. H. Dance, division engineer of construction, was in charge of the field work. The mechanical details were handled by Willard Doud, formerly shop engineer, under the supervision of M. K. Barnum, formerly general superintendent motive power. T. S. Leake & Co., Chicago, were the general contractors for all masonry and building work, except the coal chute.

SHORTENING THE ROUTE BETWEEN PARIS AND NICE.—A scheme is afoot for shortening the present route between Paris and Nice. Some years ago the Paris Chamber of Commerce of the Maritime Alps passed a resolution in favor of constructing a new direct railway, but this recommendation was pigeonholed until recently. A congress was recently held at Nice, and an official commission has also been formed to investigate the proposal. The Nice congress had a number of schemes before it, each of which forms part of the main project. The first step advocated is the buying up of the Southern Railway, which it is proposed to hand over to the Paris, Lyons & Mediterranean. Then it is proposed to build several cut-off lines, specially built for fast running, and finally the construction of a new railway line from Draginganan to Castellane has been suggested. If these schemes are carried out, the present roundabout journey via Marseilles will become a thing of the past

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TRAIN ACCIDENTS IN MAY.[1]

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of May, 1913:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
1.	C. C. C. & St. L....	Middletown.	bc.	P. & F.	0	22
12.	Mobile & O.....	Vick.	bc.	P. & F.	0	4
13.	Chi. R. I. & P.....	Seneca.	rc.	F. & F.	2	2
19.	Int. & G. Nor.....	Kouns.	bc.	P. & F.	1	27
23.	C. C. C. & St. L....	Belle Center.	bc.	P. & P.	0	9
26.	Baltimore & Ohio....	Parkersburg.	xc.	P. & F.	1	3
26.	Pitts. S. & N.....	Camp Burke.	bc.	F. & F.	1	1
27.	Missouri Pacific.....	Brant.	bc.	P. & P.	4	40
27.	Pennsylvania	Niles.	bc.	P. & F.	2	2
30.	Southern	Sheffield, Ala.	bc.	P. & P.	0	36

Derailments.

Date.	Road.	Place.	Cause of Derailm't.	Kind of Train.	Kil'd.	Inj'd.
1.	Chi. R. I. & P.....	Colby, Kan.	washout.	F.	2	0
9.	Baltimore & Ohio....	Triadelphia.	.....	F.	2	1
†13.	Northern Pacific	Lake View.	unx.	P.	4	8
14.	Seaboard Air Line....	Rice.	exc. speed	F.	3	0
18.	Erie	Preble, Ind.	exc. speed	P.	2	2
21.	Mobile & Ohio.....	Holman.	sand.	P.	1	2

The trains in collision near Middletown, Ohio, on the 1st, were southbound passenger No. 25 and northbound freight No. 82, first section. Both engines were wrecked and several cars in both trains badly damaged. Sixteen passengers, four employees and two postal clerks, were injured. The cause of the collision was improper block working.

The trains in collision at Vick, Ala., on the 12th were southbound passenger No. 103 and northbound freight No. 178. Both engines were wrecked and four trainmen were slightly injured. The men in charge of the freight forgot about the passenger train.

The trains in collision at Seneca, Ill., on the 13th were eastbound freights, the leading train being at rest. Two passengers in the caboose of the standing train were killed and two others injured. The collision was due to disregard of automatic block signals, the second train having passed a distant and a home, both set against it.

The trains in collision near Kouns, Tex., on the 19th were southbound passenger No. 7 and a northbound freight. The fireman of the freight was killed and 8 trainmen and 19 passengers were injured. Both trains were running at good speed and the engines were badly wrecked. The front end of the baggage car of the passenger train was demolished and three cars of cattle in the freight train were crushed. The passenger train had passed Kouns in disregard of an order requiring it to wait there for the freight.

The trains in collision near Belle Center, Ohio, on the night of the 23rd were southbound passenger No. 43 and northbound passenger No. 126. Five passengers and four employees were slightly injured. The collision is attributed to the failure of the headlight of the engine of No. 43. This train had right over No. 126 and later was given a meet order with No. 126 at Yelverton, a non-telegraph station. Under the orders No. 126 should have taken the siding. No. 43 arrived at the meeting point half a minute ahead of No. 126 and held the main track. The headlight being out, the engineman on No. 126, seeing no headlight, thought that No. 43 had arrived at the meeting point first and had taken the siding and covered the headlight in order to avoid delay.

The trains in collision at Parkersburg, W. Va., on the 26th were an engine drawing one sleeping car, and a freight train moving slowly. Two passengers and the conductor and the engineman of the freight were injured, the engineman fatally. There was a dense fog at the time.

The collision at Camp Burke, N. Y., on the 26th was between a northbound work train and an extra freight train, southbound. The engineman of work train was killed and its conductor slightly injured. Both engines and three freight cars were badly damaged. The cause of the collision was failure of the operator at Angelica to deliver an order to the work train.

The trains in collision near Brant, Mo., on the 27th were westbound passenger No. 11 and eastbound passenger No. 12. Both enginemen and two other trainmen were killed and 40 passengers were injured. The cause of the collision was the issuance of conflicting meeting orders by the despatcher, and a false clear manual block signal. Both men experienced.

The trains in collision on the Pennsylvania Lines near Niles, Ohio, on the night of the 27th of May were westbound passenger No. 215 and an eastbound freight. The engineman of the passenger and the fireman of the freight were killed and two other trainmen were injured.

The trains in collision at Sheffield, Ala., on the 30th were passenger No. 106 of the Northern Alabama and passenger No. 35, second section, of the Southern Railway. The N. A. engine was wrecked and 33 persons injured; few seriously. The collision was due to the neglect of the men in charge of Second 35, who overlooked the schedule of No. 106, which was superior.

The train derailed near Colby, Kan., on the 1st was a work-train consisting of an engine, caboose and platform car, the latter being ahead of the engine. The cause was the undermining of the roadbed because of an unusual flow of water following a cloudburst. The roadmaster, riding on the engine, was killed, and the fireman was fatally injured.

The train derailed at Triadelphia, W. Va., on the 9th was a southbound through freight, and ten cars fell down a bank. Two trespassers riding on the train were killed and a brakeman was injured. A part of the wreck fell on the track of the West Virginia Traction Company's street railroad.

The train derailed on the Northern Pacific, near Lake View, Wash., on the 13th, was a southbound passenger of the Oregon-Washington R. & N. Company. Three passengers and one brakeman were killed and 8 passengers were injured. The derailment occurred at a point where track repairs were in progress.

The train derailed at Rice Station, Ga., on the night of the 14th consisted only of a locomotive, running backward. It was running at high speed around a curve. The only explanation of the cause is that probably speed was excessive. Of the 3 men on the train, the engineman and the flagman were killed and the fireman was fatally injured. A tramp walking along the track saw the wreck and ran to the aid of the injured men; and he was severely scalded on the arms and hands in his efforts to rescue them. A passenger train following the engine was stopped by a farmer who had heard the sound of the wreck.

The train derailed at Preble, Ind., on the 18th, was eastbound passenger No. 8. The train was running at high speed and was not properly slackened on entering a detour track. The engineman and fireman were killed and two passengers were injured.

The train derailed near Holman, Ala., on the night of the 21st was southbound passenger No. 105, and the engine and baggage car were overturned. The fireman was killed and the engineman and one passenger were injured. The cause of the derailment was sand on the track which had been washed down from the bank by a heavy rain.

[1]Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——I, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc, obst., Accidental obstruction——malice, Malicious obstruction of track, etc——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Fr., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

HSIN-NING RAILWAY, CHINA.—The construction of a section for nearly 25 miles between Niuwan opposite Kungi and Kongmoon via Hsinhui on the Hsin-Ning Railway was started in October, 1909, and was opened to traffic in October, 1911. A distance of 3 miles from Kongmoon to Peichiehkow will be ready for traffic soon. Tracks are already laid from Kungi up to Toushan, but from Toushan to Sanchiahai the work is not completed.

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NARROW GAGE EQUIPMENT FOR THE EAST BROAD TOP.

The East Broad Top Railroad & Coal Company, which operates about 50 miles of 3 ft. gage track in the mountains of Pennsylvania, has recently added to its rolling stock a mikado locomotive and a number of steel hopper cars, the latter, it is believed, being the only all-steel narrow gage hopper cars in use in the United States.

The locomotive was built by the Baldwin Locomotive Works, Philadelphia, and was designed to meet the following conditions: Curves, 17 deg. on main line, 23 deg. on Ys; grades, 2½ per cent.; rails, 60 lbs. per yard; tunnel clearances, height 13 ft., width, 8 ft. 8 in.; weight on driving wheels, not to exceed 124,000 lbs.; total weight of locomotive, not to exceed 150,000 lbs. It is similar to a lighter locomotive of the same type, constructed for this company in 1911. The increase in tractive effort and total weight is in each case about 25 per cent., while on a heating surface basis the new locomotive shows an increase of 32 per cent. over the design of 1911. With a boiler providing 283 sq. ft. of heating surface per cubic foot of cylinder volume, and a ratio of adhesion of 4.43, the new locomotive is similar in its proportions to many of the most successful standard gage locomotives having the same wheel arrangement and using saturated steam. The tractive effort exerted is 27,700 lbs.

The boiler is of the straight top type and designed for a working pressure of 200 lbs., but the safety valves are set at 180 lbs. in service.

The steam distribution is controlled by balanced slide valves, which are set with a lead of ¼ in. and are driven by a straight line arrangement of Walschaert valve gear. The structural parts supporting the gear are arranged to serve also as frame braces. The trailing truck is of the Rushton radial type, with outside journals.

The tender has capacity for 4,000 gal. of water and 7 tons of coal. The frame is composed of 8 in. channels, and the trucks are of the arch-bar type. All truck wheels under the locomotive and tender are steel tired. Air sanders, automatic couplers and Westinghouse schedule 6 ET combined automatic and straight air brakes are used, with two 9½ in. compressors.

Narrow Gage Mikado Locomotive for the East Broad Top Railroad & Coal Company.

The following are the principal dimensions and data:

General Data.

Gage	3 ft. 0 in.
Fuel	Soft coal
Weight on drivers	122,700 lbs.
Weight on front truck	9,000 lbs.
Weight on back truck	15,450 lbs.
Weight, total engine	147,150 lbs.
Weight, total engine and tender	230,000 lbs.
Wheel base, driving	13 ft. 0 in.
Wheel base, rigid	13 ft. 0 in.
Wheel base, total engine	27 ft. 5 in.
Wheel base, total engine and tender	53 ft. 0 in.

Boiler.

Type	Straight
Working pressure	180 lbs.
Diameter	62 in.
Thickness of sheets	13/16 in.

Narrow Gage All-Steel Hopper Car of 60,000 lbs. Capacity.

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Staying	Radial
Firebox, length and width	96 in. x 54 in.
Firebox, depth, front	56½ in.
Firebox, depth, back	53¾ in.
Firebox, thickness of sheets, sides	5/16 in.
Firebox, thickness of sheets, back	5/16 in.
Firebox, thickness of sheets, crown	⅜ in.
Firebox, thickness of sheets, tube	½ in.
Tubes, number and diameter	230—2 in.
Tubes, length	17 ft. 6 in.
Heating surface, firebox	131 sq. ft.
Heating surface, tubes	2,097 sq. ft.
Heating surface, total	2,228 sq. ft.
Grate area	36 sq. ft.

Cylinders.

Kind	Simple
Diameter and stroke	19 in. x 24 in.

Wheels.

Driving, diameter	48 in.
Driving journals	8½ in. x 8 in.

Tender.

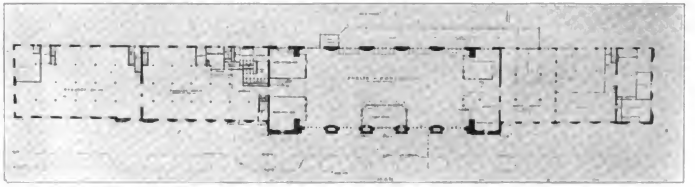
Wheels, number	8
Wheels, diameter	26 in.
Journals	4½ in. x 8 in.
Water capacity	4,000 gals.
Coal capacity	7 tons

The hopper cars, which were built by the Pressed Steel Car Company, Pittsburgh, Pa., are of 60,000 lbs. capacity and weigh about 20,700 lbs. each, the body weighing 12,000 lbs., and the trucks 8,700 lbs. The body bolsters are built integral with the underframe and each bolster consists of one ¼ in. open hearth steel web plate with a malleable iron center brace, and is reinforced at the top with a flange and the floor of the car and at the bottom with a 12 in. x ¾ in.-plate and 3 in. x 3 in. x 5/16 in. rolled angles. There is one cross bearer located at the center of the car and composed of angles and 3/16 in. plates. The car is equipped with four doors, operated by the Lind door gear. The end sheets are ¼ in. thick, and are reinforced at the top and bottom with a flange; the floor and side sheets are 3/16 in. thick. The two center sills are made of 10 in., 20 lb. channels and extend between the bolsters, being tied together and reinforced at the top with a 15½ in. x ¼ in. plate. The draft sills are also 10 in., 20 lb. channels extending from the end of the car to about 2 ft. back of the bolster. The end sills are 6 in., 8 lb. channels, and the sub-end sills are of ¼ in. pressed steel, reinforced at the top and bottom with flanges; the side sills are 6 in., 8 lb. channels extending from the bolsters to the end sills. The general dimensions of the car are as follows:

Length inside	25 ft. 7 in.
Width inside	7 ft. 6 in.
Width over side stakes	8 ft. ⅜ in.
Length over striking plates	27 ft. 4¾ in.
Height from rail to center of coupler	2 ft. 2 in.
Distance center to center of trucks	18 ft. 4 in.
Height from rail to top of body	8 ft. 6 in.
Height from rail to top of brake mast	8 ft. 11½ in.

NEW SOUTHERN PACIFIC PASSENGER STATION AT LOS ANGELES.

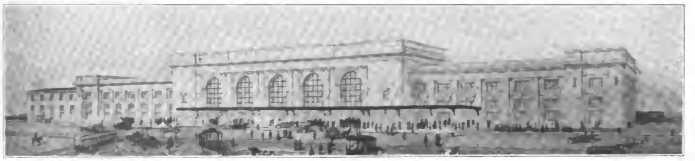
Plans are now being completed for a new passenger station for the Southern Pacific, to be built at Fifth street and Central avenue, Los Angeles. This station and yard are designed to furnish facilities ample for a city of 1,500,000 inhabitants. As shown in the drawings, the classic style of architecture has been adopted. The station building proper and the approaches will cover an area 110 ft. x 600 ft., while the depot and yards will cover 15 acres. The station will be a through station with 14 tracks, each designed to hold 15 passenger cars and 2 engines.



Floor Plan of Proposed New Los Angeles Passenger Station.

Access to the trains will be gained by means of a subway running under the main passenger tracks and connected with each platform by an incline on an easy grade. This subway opens into a public exit concourse 50 ft. x 70 ft. in area. Adjacent to this will be the main concourse and waiting room, 80 ft. x 210 ft. in size, reached by four main entrances. Mezzanine floors provided with lounging chairs, writing tables and current magazines will be located at either end of the main concourse. Other facilities, including information bureau, baggage and check rooms, news stands, etc., will be provided. One important feature will be a dining room, kitchen and lunch counter, to which a space of 70 ft. x 80 ft. will be devoted.

A marquis 220 ft. long and about 30 ft. wide will be located in front of the building for taxicab and automobile passengers. The building will be wainscoted throughout with mosaic marble floors. An indirect lighting system will be installed. The upper floors in the north and south wings, comprising upwards of 25,000 sq. ft., will be occupied by division offices.



Front Elevation of Proposed New Southern Pacific Passenger Station at Los Angeles.

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THE STAMFORD COLLISION.

The continued hearings have brought out little of value to add to our report of the Stamford collision printed last week. The air brake inspectors from other roads invited to Connecticut by the New Haven road gave testimony as to the condition of brake apparatus, but for evidence throwing real light on the question whether the collision was in any degree due to faults of the brake it will be necessary to await the full stenographic report. Evidence as to the extent of Doherty's experience as a runner is conflicting, as are his own statements as to where he applied brakes.

General Manager Bardo's statement, abstracted below, was in part denied by F. S. Evans, representative of the enginemen's committee. He said that his committee did not protest against the two-year rule but against the manner in which it was promulgated. He declared that the enginemen of the road were well qualified, all having fired on passenger trains for from two to six years. He said that the men involved in the accidents at Bridgeport and Westport were not inexperienced. Mr. Evans denied that the brotherhood had forced the adoption of any rule detrimental to safe operation.

STATEMENT BY GENERAL MANAGER BARDO.

Speaking at the hearing held by the Interstate Commerce Commission, C. L. Bardo, general manager of the road, explained the existing agreements between the engineers and the company. When Mr. Bardo came to the road on February 15, of this year, he found an agreement in force, made in 1910, which provided that—

> Spare engineers shall be run first in and out so far as it is possible with the requirements of the service and, when engineers are assigned to temporary vacancies, they shall remain on same provided they are competent, until the regular engineer returns. They shall receive rates of the regular engineers while on the road.

This rule had been in effect ten years or more. For many years the New Haven road had fewer men in freight service than passenger, so that the rule was necessarily different from that on most roads. Until recently firemen were promoted quite slowly and were probably better qualified than are the men who have been promoted during the past four years. On December 11, 1912, an order from the general manager directed a modification of the rule, to the effect that spare engineers who had less than two years, experience, or two years' rating as engineers, would not be allowed to run through passenger trains, and that engineers with less than one year's service would not be allowed to run local passenger trains. The enginemen protested against this rule and the protest was one of the first subjects for discussion when Mr. Bardo took charge of the road. He could not find that there had been a single case of accident or other trouble under the old rule of 1910; no case where a young engineer had been the cause of trouble. To this extent the protest of the enginemen against a change was well founded.

Mr. Bardo held long discussions with the general committee of engineers, the chairman of which is a salaried officer. He was dealing, he said, not with the Brotherhood of Locomotive Engineers, but with the road's employees. He held that the old rule ought to be modified and the men went back to discuss it with their constituents. After a month or so another conference was held and the committee submitted a rule to the effect that "no engineer who has less than one year's roster rating as an engineer shall be allowed to run through passenger trains." Though not entirely satisfied, Mr. Bardo accepted this, because of the uncertain situation at that time. "The forces were in many respects disorganized. The train service was bad and things generally were out of gear." He and the vice-president had long discussions with the men at a number of division terminals. In every discussion the men were told that the question of safe operation was more important than anything else. As late as June 1 he had had a long conference with the division superintendents, and on the following day discussed a half day with the engineers' committee in an effort to find, if possible, "what had crept into our engineers." Until within eighteen months the New Haven road has compared favorably with other roads. He believes that 90 per cent., probably 95 per cent., of the men in train and engine service are as good as there will be found on any road. "We had a right to expect that Doherty was a competent man. In all general matters he was. But I am satisfied now that his judgment was unjustifiably bad, and I cannot conceive how an engineer in charge of a train, following, as he did, the first section, and practically on the time of that train, could approach a place where he knew that he was to stop, where he knew that the other train must be ahead of him, would float down in there, and wait until he got within 300 ft. of the distant signal, before he took the necessary steps to stop. I cannot conceive of any man in his right mind doing a thing of that kind. . . . The brotherhoods have not intended to enforce rules which necessarily tend to break down the safety of the service, but they have been edging in, inch by inch. They have been encouraged by the milk and water investigations.

"The general manager of a railroad should have power to say what is right and wrong, and he should have the power to enforce what he says. He cannot have the power if the organization is going to point the pistol at him every time that he attempts to do something which he knows, from his own best judgment, is the right thing to do.

"It is time that the public should understand that this question of railroad safety is one in which they are vitally interested. There is a certain percentage of men in every organization who are going to take advantage of everything they can hear of. . . . You cannot expect, if you are going to criticize a railroad as this railroad has been criticized, but what that criticism is going to reach into the ranks. It is going to result in disloyalty and insubordination.

"When a man sees that the man he is working for is being criticized, he has got an axe to grind, and necessarily he is on the other side of the fence right away. . . . You cannot expect if your division superintendents have not got the power to inflict and enforce discipline and to make it stick that they are going to be able to enforce anything else."

As to whether he was being coerced when the committee refused to accept the two-year rule, Mr. Bardo said: "I would not say that I was being coerced, but under other circumstances I would have insisted upon an enforcement of that which I believe to be right. I was exceedingly anxious to avoid doing anything which might be misconstrued, on the part of the men, as an attempt to take away from them anything which they heretofore had had. I did not want to disturb their peace of mind. I wanted them to get back on their engines and begin to railroad, and to stop worrying about something that was not going to hurt anybody."

RAILWAY EXTENSION IN WESTERN AUSTRALIA.—One of the most important features of the policy of the enterprising government of Western Australia is that of railway extension, by which the new settlers and producers are enabled to get their goods on the markets of the world. At the present time this policy is being pursued. There are now authorized and under construction in Western Australia nine new railways, totaling in length 631 miles. This is in addition to the Trans-Continental Railway, 1,030 miles in length, which the federal government is building to connect the famous mining center of Kalgoorlie with Port Augusta in South Australia, and thereby linking Perth, the chief center of Western Australia, with all the capitals of the eastern states. One of the lines under construction by the state government, that from Wickepin to Merridin, is a part of the new state railway which is to connect with the Transcontinental Railway at Kalgoorlie. Another important line is that from Wengan Hills to Mullewa, which traverses 83 miles of country, much of it admirably suited for wheat growing. It connects the Murchison Railway with the Eastern Goldfields Railway. The other lines under construction are being taken into new agricultural districts with the object of promoting settlement and development.

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AMERICAN SOCIETY FOR TESTING MATERIALS.

The American Society for Testing Materials held its sixteenth annual meeting at Atlantic City this week, commencing on Tuesday, the twenty-fourth. At the first session the subject of preservative coatings for structural material was under discussion, and in the report by the committee a very prominent place was given to the annual inspections of the paints that are being tested on the Havre de Grace bridge and the panels at Atlantic City. The report in regard to the former is very elaborate, but inasmuch as the paints are referred to by number only, and there is no key appended to indicate what these numbers mean, it is worthless as a matter of reference and information.

The fourth annual inspection of the panels at Atlantic City is given in great detail both for the inspections of 1912 and 1913. From this it appears that American vermilion (chrome scarlet) is in an almost perfect condition. In fact four out of five of the inspectors so marked it, and the fifth marked it as 9, 10 being the perfect mark. This cut the average down to 9.8. The next highest average is zinc and lead chromate at 8.3; then comes zinc chromate at 8.0, followed by zinc and barium chromate and magnetic black oxide, both of which are at 7.8. Red lead and natural graphite are about the same, being 6.3 and 6.2 respectively, while artificial graphite drops down to 2.6.

The only discussion was brought out by the suggestion to the committee that it publish a key to the paints in the test on the Havre de Grace bridge, so that the data would be available to the members. It was explained that this would be impossible because the paints used were being tested in confidence and that they were known only by chemical composition. To which it was pertinently asked, what was the use of tests if no one was to know what they meant?

A report was made on the corrosion of metals in connection with a series of tests that have been conducted on plates exposed to the gases of the Weehawken tunnel, where the fumes from locomotives are very dense. The report gave, in considerable detail, the rate of corrosion of the different plates on the basis of a calculated rate over the whole of the exposed surface. The report was severely criticized on the basis that it was misleading to assume that the loss of metal was an indication of the value of a metal as a resistant to corrosion. For example, attention was called to the fact that if the corrosion extended uniformly over a plate the destructiveness would be much less than it would be if it occurred as pitting, even though the loss of metal might be greater. It is segregated corrosion that is most to be dreaded. Then it is quite important that the surface condition of the plates be considered in estimating the rate of corrosion. If the plates are exposed as they come from the mill with the scale on, it is evident that the results obtained will be dependent on the character of the scale with which each is covered. Again, to expose unprotected plates to the gases from locomotives is not to follow practice in any particular. No one does such a thing in actual work. Plates of iron or steel are always protected by some coating that is to protect them from rust. But if it is desired to obtain data as to the rust resisting qualities of metals they should always be freed from mill scale, as it will promote rust and it will be found that corrosion is always more rapid, so long as there is any scale on the metal, than it is afterwards.

M. McNaughton, of the Dixon Crucible Company, presented a paper on an "Outline of a Test for Indicating the Relative Priming and Top Coat Values of Different Paints."

The generally accepted conclusion, reached as a result of the experience of the past few years, is that the best protection against the corrosion of iron and steel is not to be secured by the use of any one kind of paint, but by the use of different kinds of paint in combinations. Certain paints are excellent as primers, while others give the best service when used as top coatings. The importance of a simple form to determine the value of paints in these particulars seems evident. Three years ago the writer started a test with this idea in view.

Briefly the scheme is as follows. The upper half of a steel plate (10 in. x 16 in. is a good size) is painted with one of the two paints being tested, while the lower half is painted with the other. When dry, the left half of the plate is painted with the first paint, and the right half with the second paint. This is the simplest form of the test, and gives four combinations of coats. The plate may be divided into thirds and three paints tested, giving nine combinations of two coats each.

It is quite evident that tests made on one plate are much more easily compared than when made on separate plates, with the added advantage of there being no uncertainty as to the character of the metal itself. The discussion drifted away from the text of the paper and centered about the value of red lead of 98 per cent. purity, as compared with one of 85 per cent. and 15 per cent. litharge, with the general opinion that the addition of litharge increases the protective qualities of the coating.

NEW RAILROAD LAW IN MASSACHUSETTS.

The law increasing the powers of the Massachusetts State Board of Railroad Commissioners was noticed in the *Railway Age Gazette* last week, page 1580. The full text of the law, which consists of thirty sections, shows that it includes in the term "common carrier" all railroads, street railways (which are called railways), electric railroads, steamships, express service, car service, telephone lines and telegraph lines. The commission—now to be called the Public Service Commission—has general supervision and regulation of and jurisdiction and control over all these facilities. The law takes effect July 1, and the governor is to appoint two additional members, so as to make a board of commissioners of five. The commissioners choose their own chairman. The salary of the chairman is $8,500, and of the other members $8,000 each. Not more than three commissioners shall be appointed from the same political party. The powers of the State Highway Commission, so far as they relate to telegraph and telephone lines, are transferred to the new commission.

No contested matter upon which a public hearing is required shall be heard or decided by less than three members of the new commission. The commission may appoint a counsel and may employ all necessary engineers, accountants, etc. It may inquire into rates, practices, etc; may be represented at public hearings before any legislative committee or public board, of any state, with respect to proposed legislation in Massachusetts, and may confer with or appear before boards of other states having power over common carriers. It may provide for an annual audit of all accounts of common carriers, whenever found desirable. It may prescribe a system of accounts and shall make these conform as nearly as may be to the forms of the Interstate Commerce Commission. The commission may determine the fair value of property, for any purpose, and may make a revaluation when deemed necessary.

Sections 15 and 16 regulate the issuance of stocks and bonds, under the supervision of the commission. Authority must be secured from the commission for all issues which run over twelve months. The decision of the commission as to the amount of stock necessary for any given purpose must be based on the price at which such stock is to be issued. Under the old law bonds could be issued only to an amount equal to the par value of stock. The present law permits bonds to the amount of twice the par value of stock. Penalties are provided against directors, treasurers, etc., who vote for any illegal issue.

Section 17 requires all charges for service to be just and reasonable. Charges now lawfully in effect shall be deemed prima facie lawful until the commission otherwise orders; but this provision shall not give to such rates any greater weight,

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as evidence of the reasonableness of other rates, than they would otherwise have.

Section 18 prohibits free transportation, with the usual exceptions, among the excepted classes being officers or employees of the legislature.

Section 19. Common carriers may make commodity rates and other special rates. Rates now in force by virtue of existing contracts, are not to be deemed discriminatory unless the commission so determines, but the commission shall not be prevented from taking action because of a contract now in force. Common carriers may issue mileage, school and other special tickets, unless the commission shall forbid. All season tickets, before issuance, shall be subject to the approval of the commission as to form and conditions.

Section 20 has provisions for publication of tariffs, etc., similar to the provisions of the Interstate Commerce Law. Section 21 allows the commission to suspend for six months any proposed increase in rates. In case of suspension, the burden of proof, to show that an increase is necessary, rests on the carrier. In case of a proposed decrease in a rate the commission may fix a minimum rate, if the one proposed is held to be insufficient to yield reasonable compensation.

Section 22. Whenever the commission, after hearing, finds that rates are unjust or are insufficient to yield reasonable compensation, it shall determine and prescribe reasonable rates. The commission may suspend the long and short haul provision of the law.

Section 23 gives powers in regard to practices, equipment, service, etc., similar to those relating to rates. The commission may, after hearing, require any standard gage railroad to be equipped for electric power, but shall consider the relative importance and necessity of the proposed changes, and other changes which may be needed; all in regard to the financial ability of the carrier and its duties to the public.

Section 24 gives power to regulate the number of men in the crew of a train.

Section 25 authorizes the establishment of through routes and through rates. The commission may grant locations for connecting tracks. Each road shall have full authority over trains on its own tracks. The commission may order connecting tracks laid to private side tracks if the probable amount of business is deemed sufficient.

The Supreme Judicial Court has jurisdiction in equity to review, annul, modify or amend the orders of the commission, to the extent only of the unlawfulness of such orders. This court shall have jurisdiction to enforce all valid orders of the commission and all provisions of the Act.

THE SERVICE RECORDER.

The "service recorder" is a time-piece which carries on its face a paper dial for making a continuous record, like a pencil mark, throughout a period of 24 hours, and connected with which is a large pendulum that swings only when the clock is disturbed. The device is used on moving vehicles, such as automobiles or locomotives, for making a record, independent of the person in charge of the car or engine, of the time that it has been in motion; in other words, the time that the engine has been at work. When the engine is absolutely still a continuous thin line is recorded, but when it is in motion the pencil moves transversely, as related to the thin line, and the difference between time in motion and time at rest is thus clearly indicated to the inspector. Automobile trucks used largely on city streets for carrying merchandise, and switching locomotives used in extensive industrial plants, as well as in railroad yards, have been equipped with large numbers of these recorders, and the users express marked satisfaction with the results. A truck driver or a switching foreman who wastes time while out of sight of headquarters finds, next morning, when the clerk at headquarters takes out the day's record sheet and puts in a new blank for the succeeding day, that the amount of time that has been lost is revealed.

The recorder is contained in a cylindrical iron box about 8 in. in diameter, which can be fastened to the front wall of the locomotive cab, or to any vertical surface of the vehicle which is transverse to the road over which it travels. There is no connection from the clockwork to the running gear or to anything outside the case. When locked up, every part of the apparatus is concealed. Closing the door (the clock being wound up) starts the record, and at the same time makes a small cut in the edge of the record paper. Opening the door cuts the paper again, thus making a record of the times of opening and closing, which cannot be tampered with.

A record sheet is about 6 in. in diameter. A sample record, reduced somewhat less than one-half in diameter, is reproduced in the accompanying engraving. This record was made on a factory truck, and the periods that the vehicle was in motion are indicated by the heavy black spots. The longest one is that from 10:40 a. m. to 11:15 a. m. Work was begun at 6:35 a. m., and terminated at 4:47 p. m. The longest time not in motion was from 11:15 to 12:58. The thin line, showing that

A Sample Record.

the truck was at rest, extends completely around the circle, except for the black sections, but is not distinctly shown in the engraving. If the driver had taken the truck out for a joy ride at midnight black marks at the bottom of the circle would have revealed the fact.

The makers of the service recorder give the following names of owners of locomotives who use it: American Car & Foundry Company; American Steel Foundries; Ann Arbor Railroad; Arizona & New Mexico Railway; Baltimore & Ohio; Buffalo Creek; Chicago, Burlington & Quincy; Chicago Great Western; Chicago Junction; Chicago & North Western; Chicago Short Line; Chicago & Western Indiana; Colorado & Southern; Columbia & Puget Sound; Delray Connecting; Duluth, Missabe & Northern; Grand Rapids & Indiana; Great Northern; Ivorydale & Millcreek Valley; Kentucky & Indiana Terminal; Lake Shore & Michigan Southern; Lake Superior & Ishpeming; Lake Superior Terminal & Transfer; Manufacturers' Railway (St. Louis); Michigan Central; Newburgh & South Shore; New York Central & Hudson River; Pacific Portland Cement Company; Pennsylvania Railroad; Philadelphia, Baltimore & Washington. Many of these roads have given second orders for the service recorder.

The factory of the Service Recorder Company is at Cleveland, Ohio, and it has offices in Boston, New York, Philadelphia and Chicago.

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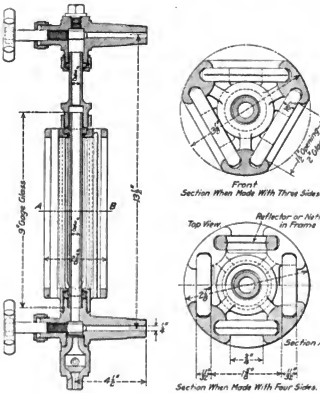
DELCO SAFETY WATER GLASS SHIELD.

The Interstate Commerce Commission requires very close attention to be given to the protection of water glass gages in order to prevent injury to the occupants of locomotive cabs in case of the bursting of the gage glass. The Delco safety water gage shield, which is shown in the illustration, was devised to prevent the flying of broken glass and also the scalding of the hands of persons engaged in turning off the gage cocks after a water glass bursts. It consists of a one-piece body fitted with glands to receive the regular tubular glass, and with slots for the heavy glass protecting plates. The glass shield is omitted at the rear and a perforated plate or netting is inserted in its place to permit of the escape of the water and steam when a gage glass bursts; this prevents the steam and water from blowing down and scalding the hands of any one engaged in turning off the gage cocks. The shield is made in a standard length which permits the use of tubular glasses with fused ends, thus overcoming breakages due to rough edges which frequently start progressive fractures. The one-piece construction



Delco Safety Water Glass Shield.

also permits the water glass to be perfectly alined and overcomes the difficulty of the glass breaking due to a twisting action on account of one of the fittings being out of line. Tubular extensions are provided so that the shield may be assembled complete before application to the boiler, and may be applied between boiler fittings placed any distance apart. As the water glass is contained in the shield itself, it is impossible for any one in renewing a glass to forget the application of the shield.

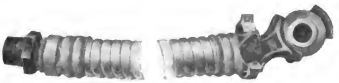
A straight passage is provided entirely through the water glass and boiler fittings so that a wire may be passed through to clean out obstructions, as is required by law.

The Delco shield is the invention of H. C. Manchester, superintendent of motive power and equipment, Delaware, Lackawanna & Western, and over 750 of them are in use on that road. It is manufactured by the American Safety Lamp & Mine Supply Company, Scranton, Pa.

IMPROVED FLEXIBLE STEEL AIR BRAKE HOSE.

In addition to the troubles with the standard air brake hose, due to bursting, blowing off of fittings, chafing, etc., difficulty is encountered on some roads by uncoupling or pulling off of the fittings on the long passenger equipment when taking short cross-overs. Armored hose, when applied to this equipment, did not uncouple, which increased the already high strain on the hose beyond the strength of the armor clamp on the nipple end, and this was remedied by eliminating the sharp corner at the base of the finger which extends forward to engage with the fittings. The design of clamp shown in the illustration was adopted after subjecting two lengths of hose, fitted with several types of clamps, to a reciprocating motion, approximating the hardest conditions to which it could be subjected in service. The hose, when extended the maximum distance, was on the point of uncoupling, and if the gaskets were not changed very frequently it was impossible to keep them connected. The new clamp withstood 51,900 alternations as compared with 1,400 with the old type. The old style failed in a manner exactly similar to those in service, while the new type corrected this trouble. The test of the new design showed that although the strain developed was so great that one of the fingers of the clamp slightly cracked, where it bends down to engage with the collar on the nipple, yet, even if this condition occurred in service, no danger would result as the other clamp, being intact, would prevent the danger of failure due to blowing out of fittings.

The armored air brake hose is intended not only to overcome chafing and kinking, but also to eliminate the source of other air brake hose troubles. The stretching test in the M. C. B. specifications explains this very thoroughly, as the quality of the



Armored Air Brake Hose with Improved Clamp.

rubber is governed by its ability to resist deterioration when under strain. The armor offers very high resistance to internal pressures, thereby relieving the duck or canvas of the hose; consequently it is claimed there is no deterioration of the rubber due to stretching. Further, porosity enters into the question, as the tendency of internal pressure is not to develop defects, as in the case of unarmored hose, but to compress the wall of the rubber hose against the armor with exactly the opposite effect. Chafing of the inner tube by the nipple is also greatly reduced, and recent improvements in the flexibility of the armor showed, in the tests referred to, that there was no evidence of trouble from that source. This hose is manufactured by the Sprague Electric Works, 527 West Thirty-fourth street, New York.

BABCOCK SAFETY WATER GAGE.

In the designing of safety water gages it is most important that the passage provided for the escape of the steam and water after a water glass bursts be amply large, as otherwise pressure will accumulate and cause the breakage of the protective glass in the shield, and the steam will pass directly into the cab. In the gage which has been adopted as standard on the Pittsburgh & Lake Erie a pipe, shown in the illustrations, has been provided to carry off the broken glass, as well as the steam and water during the interval while the gage cocks are being closed. This safety gage is provided with two sets of heavy glass plates, an outer and an inner, the latter being held in place by steel springs.

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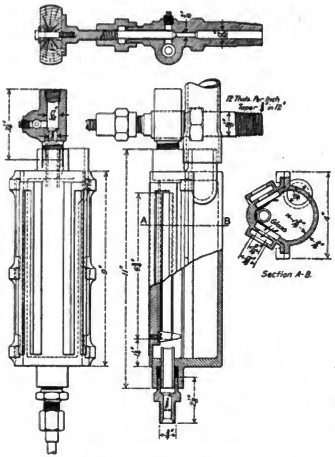
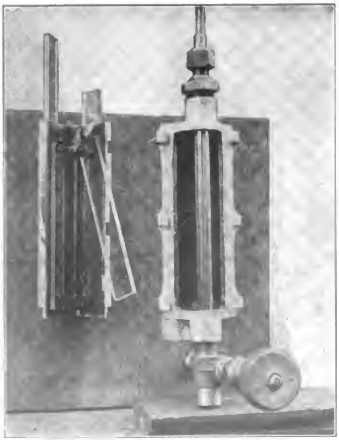


Babcock Safety Water Gage.



Babcock Safety Water Gage with Glass Removed.

The purpose of the inner plate is to absorb the shock of the explosion and in case the inner plates should break there is still left the outer set to prevent the escape of the steam and broken glass into the cab. These protecting plates are set at such an angle that both the engineman and the fireman can get a plain view of the inner tubular glass. It is further claimed that the breakage of the inner plates is very unlikely, owing to their location permitting only a glancing blow from particles of broken glass.

This safety gage is the invention of F. H. Babcock, assistant boiler shop foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa., and is manufactured by the American Car & Ship Hardware Manufacturing Company, New Castle, Pa.

ARMORED SQUIRT HOSE.

In our issue of May 2, 1913, page 976, attention was directed to the fact that the report of the chief inspector of locomotive boilers for the year ending June 30, 1912, showed that 243 accidents, or more than 28 per cent. of the total number, were due to defective squirt hose and connections. That the seriousness of this has not been more fully recognized before this is doubtless because none of these accidents prove fatal, and usually the men recover within a very short time. They are caused by the bursting of the hose or by the hose being forced off its connection, thus allowing the steaming hot water to scald the firemen, and in some instances the enginemen as well. In many cases a cheap grade of garden hose is used, which soon fails under the

Armored Squirt Hose.

severe service to which it is subjected and in other cases the hose is very insecurely fastened to its connection.

Various schemes are being devised to overcome this defect. These include the attempt to use cold water from the tender tank, or to use an ejector. Another means is to use a stronger hose, which is proof against bursting, and with fastenings such that it cannot be forced from its connection to the boiler. The Woven Steel Hose & Rubber Company of Trenton, N. J., has for a number of years been manufacturing a flexible armored hose. It was first adapted for use as a squirt hose about three years ago, and is reported to have given good results and to have an exceptionally long life. Five thousand locomotives are said to be equipped with it, on such roads as the Pennsylvania, Baltimore & Ohio, New York, New Haven & Hartford and the Boston & Maine.

The hose is made with a steam tube instead of a water tube,

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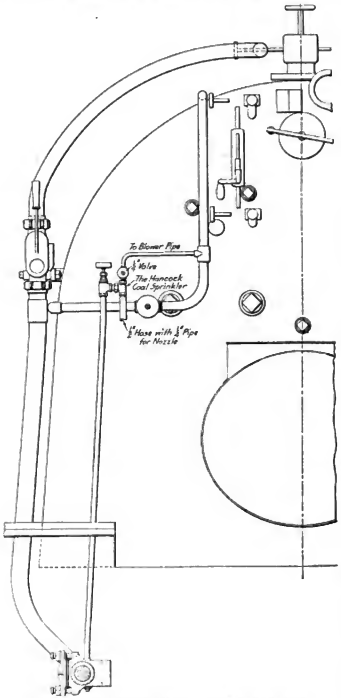
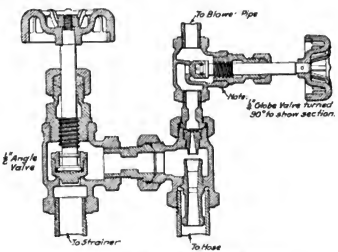
and will therefore last much longer under the action of the hot water. It is covered with a strong flexible covering of steel, protecting it against exterior wear and the chafing caused by the constant vibration of the locomotive. Special fastenings, which are clearly shown in the illustration, have been devised to prevent it from blowing off the nipple. Obviously the first cost will be much higher than for that of the ordinary type, but it is said to last so much longer that its cost per unit of time is considerably less.

EJECTOR FOR COAL SPRINKLING.

It is the general custom in wetting down the coal on locomotives to take the water supply from the delivery pipe of one of the injectors through a squirt hose and the necessary connections. The water in the injector delivery pipe is at a temperature and pressure sufficiently high to cause serious accidents in cases where the hose bursts. The device shown in the two illustrations, for the sprinkling of locomotive coal, is entirely independent of the injector, taking its steam supply from a pipe branching off from the blower pipe. The principle is the same as that of a lifting injector; steam is admitted through a ¼ in. globe valve and raises the water through the suction pipe which is connected to the main delivery pipe from the tender. A ½ in. valve is placed in this suction pipe to prevent waste of water in case the apparatus is located below the highest water level in the tender, and also to prevent air being drawn into the suction of the injector should there be an obstruction in the suction hose. The quantity of steam used is very small, and although there is an ample supply of water under sufficient pressure to sprinkle the coal, the temperature is so low that no serious accident can occur and there is an absence of the steam which is very commonly seen in the cab of a locomotive when the squirt hose is being used.



Application of Hancock Ejector for Sprinkling Coal.



Section Through Ejector for Coal Sprinkling.

This device was developed and is being manufactured by the Hancock Inspirator Company, Boston, Mass., and is being applied to 150 Baltimore & Ohio locomotives.

AUSTRALIAN RAILWAY CONSTRUCTION PLANS.—A commission will be appointed to advise the government on railway matters affecting the Northern Territory in Victoria, particularly as regards the adequacy of the present line, the necessity for further developmental work, and also the prospect of linking up the territory railways with the system of the other states. The committee will consult and ascertain precisely the railway construction program to be carried out in Queensland, Western Australia and South Australia, all of which states adjoin the Northern Territory. The final recommendations will include a large amount of construction work and will necessitate the expenditure of large sums of money.

TRANSPORTATION IN MADRAS.—It is suggested that the needs of better transportation facilities in the Madras presidency might be met, in the absence of railway extensions, by putting industrial motors on the roads. A Madras correspondent of an Indian contemporary remarks that the leap from railways to motor traffic is easy and that the increased utilization of road traction would be justifiable, if only from the point of view of not putting all your traffic eggs in one basket. The demand for more ample traveling and freight car facilities forms one of the principal themes at the meetings of the District Boards. It is constantly coming under the consideration of trades people and of their Chambers of Commerce. The need is universal and insistent.

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General News.

Representative Willis of Ohio has introduced in Congress a bill to give the Interstate Commerce Commission certain authority over intrastate railroad rates.

Representative Levy of New York has introduced in Congress a bill to allow competing railroads to make traffic contracts, subject to the supervision of the Interstate Commerce Commission.

Maurice Prevost, a French aviator, on June 19, flew 217 miles at the rate of 117 miles an hour. This was a straightaway flight. The previous record made by Prevost was made on a circular course.

Officers of the conductors' and the brakemen's brotherhoods have distributed blank ballots for the purpose vote in regard to authorizing the officers to declare a strike if they deem such action necessary.

The United States Civil Service Commission announces examinations July 28 for candidates for the position of examiner of accounts, under the Interstate Commerce Commission; salary from $1,860 to $3,000.

The Missouri, Kansas & Texas has established a refrigeration department, in charge of G. D. Shafer, under the supervision of the superintendent of transportation, to encourage the use of refrigerator cars for fruit and vegetable shipments.

William H. Schroeder, engineman of Delaware, Lackawanna & Western train No. 11, and responsible for the collision at Corning, N. Y., July 4, 1912, was last week tried on a charge of manslaughter and was acquitted. The jury deliberated on the case two hours and 38 minutes. The trial lasted nine days.

Mr. Stevens of Minnesota has introduced in Congress a bill to amend the 28-hour law, relative to feeding and watering animals in transit, so as to exempt switching railroads over which live stock is carried for a distance of less than ten miles. The bill was referred to the House committee on interstate and foreign commerce.

The shops of the Denver & Rio Grande at Salt Lake City were mostly destroyed by fire on the night of June 18; estimated loss $200,000. The paint shop, blacksmith shop, planing mill, engine room and wheel shop were destroyed, together with 25 freight cars, 6 passenger cars and 3 cabooses. Officers of the road announce that the shops will be replaced by much larger ones, but the exact location has not yet been announced.

A. W. Smallen, chairman of the general safety committee of the Chicago, Milwaukee & St. Paul, has addressed a petition to the municipal court judges of Chicago, asking them to impose penalties on all trespassers brought before the courts. With the petition was a statement showing the number of persons killed while trespassing on railway tracks during the past 20 years, and a comparison of the number of trespassers killed and injured, and passengers and employees killed and injured during the year 1912.

The Illinois legislature, in its closing session, last week, passed a bill providing for a state public utilities commission with broad powers. It is being strongly opposed by the city of Chicago and by civic organizations because it does not provide "home rule" for Chicago, and the governor is being urged to veto it. He has agreed to give a hearing to the opponents of the bill. The legislature adjourned without passing the anti-pass law, and without taking action on a large number of railway bills, including the full crew bill and an electric headlight bill.

The Monthly Bulletin of the traffic department of the Chicago & North Western has recently begun a series of articles on station efficiency, in which questions pertaining to details of station organization and system will be discussed for the purpose of giving encouragement to agents by pointing out the importance of their work, and of assisting them by describing methods of obtaining better results. The first article is preliminary and calls attention to the need of system to prevent lost motion and to obtain better results with less work.

The new double-track railway and highway bridge to be built across the Mississippi river at Memphis by the Chicago, Rock Island & Pacific, Missouri Pacific, and St. Louis Southwestern, is to be called the "J. T. Harahan Bridge," in honor of the late president of the Illinois Central, who was killed in a collision at Kinmundy, Ill., in January, 1912, while on his way to Memphis on work in connection with the bridge. Mr. Harahan at that time was president of the Arkansas & Memphis Railway Bridge & Terminal Company, the corporation organized to build the bridge.

A petition for a receiver for the Southern New England Railroad has been filed in the Supreme Court of Massachusetts on behalf of John Marsch, one of the contractors for the proposed line between Providence and Palmer. The ground for the petition was the alleged neglect of the company to pay a claim of Marsch. Marsch says that he has already been paid about $500,000; that he is entitled to $1,510,000 damages for the breaking of the contract and that the officers of the defendant company and the Grand Trunk have admitted that he is entitled to receive $240,000.

Chapter 462 of the Laws of New York, passed this year, makes 10 hours' labor within 12 consecutive hours a legal day's labor in the operation of railroads and street railroads, except where the mileage system of [paying men engaged in] running trains is in operation. This law applies to all roads 30 miles long or longer. It forbids the employment of trainmen for more than 16 consecutive hours; and whenever a man has been on duty for 16 hours he must have at least 10 consecutive hours off duty. Among the exceptions allowed are cases where a man is delayed by "unexpected delays of connecting trains."

The bill, prepared by the committee of the Civic Federation, to amend the Erdman law relative to arbitration and conciliation, was introduced in Congress last week, and on Monday of this week was favorably reported by Senator Newlands, chairman of the Interstate Commerce Committee of the Senate. At a hearing before the Senate committee the bill was opposed by the Secretary of Labor, who argued that no amendment to the Erdman law was needed except to provide for a larger number of arbitrators. The bill has the effect of repealing that clause of the present law which designates the former Commissioner of Labor, now a subordinate in the Department of Labor, as mediator.

The Chicago city council committee on railway terminals, at a meeting on June 23, decided by a vote of 9 to 4 against the idea of a central union passenger station for all roads entering the city, which has been proposed in some of the plans submitted to the committee. No action was taken on the ordinances asked by the roads now entering the Union station in connection with their plans for a station between Jackson and Adams streets, but a conference was held in Mayor Harrison's office between the mayor, members of the terminal committee, the city subway commission, Vice-Presidents Wood and Turner of the Pennsylvania lines, President Miller, of the Chicago, Burlington & Quincy, and President Earling, of the Chicago, Milwaukee & St. Paul. The City Club has presented a resolution to the committee asking that it engage experts and engineers to make a complete investigation of the subject of the location of railway terminals before taking any action on the union station ordinances.

A Correction.

In the article on Mechanical Stokers from Operating Standpoint in the issue of June 13, 1913, the mileage on the Chesapeake & Ohio between Hinton and Clifton Forge should have been 80 instead of 180; and the 6000 ton rating given between Handley and Hinton should have been 3,750, the former applying between Handley and Russell.

Another View of the Case.

We hate to look at it that way, but since Professor Taft took to bobbing in and out of New Haven so frequently the railroad has been all out of order. But this does not in the least exonerate the passengers. Reckless to the point of criminality, they have neglected the most elementary precautions. Perfect jumping daredevils, those passengers! Watch them! See them rush to that ominous little grated window and buy tickets of an inmate whose record they never stop to pry into! See them fling themselves aboard their trains without counting the wheels or so much as investigating the engine, whereas we have beheld

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engines brazenly inscribed "1812," "1776," and even "1620"! And just consider their indifference to the engineer! Do they ask his age, and if his mother knows he is an engineer? Do they rub his back? Not they! Why, sakes alive, you might think they were off for a trip in a mere aeroplane!—*New York Tribune.*

Railway Boom in China.

A great wave of enthusiasm for the construction of new railway lines has of late been spreading through the provinces of China. The issue alone affords significant evidence of the awakening of the people to the need of new lines of communication. There is in all quarters a spirit of inquiry abroad. This is in marked contrast with the attitude of opposition adopted on all sides but a year ago to projects having for their object the opening of the country by railways. The revolution would seem to have wrought the change. It may or it may not have done so. What is certain, though, is that the prime mover of the agitation which led to the revolution has done more than any other person in the country to dispel the popular prejudices which militated against progress in railway development. Dr. Sun Yat-sen, by his campaign in the various sections of the country which he has visited, has opened the eyes of the people to the fact that in easy communication is the secret of strength and independence.

Safety of Passengers on the Pennsylvania.

One road—the Pennsylvania—has the courage to publish its passenger-accident record without waiting until it can show non-fatal statistics for a whole year. In 1912, 27 passengers were killed; but 85 per cent. of them were due to other than train accidents; falling off trains, walking in front of trains at stations, and getting on and off moving trains. A total of 837,121 trains were run for an aggregate distance of 40,000,000 miles, carrying all told 100,000,000 people, and two trains suffered wrecks causing loss of life. Of the passengers injured in 1912, 321 were hurt getting on and off trains. Two hundred and fifty-five persons classed as "passengers" were hurt in falling while on railroad property other than trains. In five years the number of passengers carried was nearly five hundred millions, and sixteen of them lost their lives in accidents to trains, nine having been killed in one accident. In five years, only five trains out of over 4,000,000 operated suffered wrecks which caused the death of any of the passengers carried on them. The figures are:

Year.	Passengers carried.	Train accidents in which passengers were killed.	Passengers killed in train accidents.
1908	88,328,604	0	0
1909	92,391,356	1	1
1910	100,844,427	0	0
1911	97,978,839	2	11
1912	101,755,061	2	4
	481,298,337	5	16

The company's statement says: "The management regards every accident of any kind as one too many. The number of accidents must be cut down. To that end efforts are being directed more definitely and systematically than ever before."

A Bold Statistician.

It is estimated by a Chicago alderman, Mr. Long, that smoke costs the city $18,461,106 annually, and this does not include cigarettes and other forms of the tobacco evil. The railroads are responsible for $7,938,276 of it, and factories for a great part of the rest. The average loss to each family is put at $15.48, which is greater than the annual personal property tax. To do about $21,000 damage a day the 1636 locomotives burn 5,691 tons of coal, which makes the damage from burning a ton of coal come to $3.75 or the value of the coal itself. Alderman Long is a bold statistician, but his figures suggest that it might be cheaper to push the freight trains by hand, provided the workers were not allowed to smoke short black pipes.—*Springfield Republican.*

137,804,768 Eggs B. O. at N. Y.; Not O. R.

This is the record for the year 1909, according to a pamphlet issued by the Bureau of Chemistry, Department of Agriculture. In an effort to reduce the enormous breakage of eggs in transit —to prevent the accidental scramble that means such a large loss to producers and consumers—the department is conducting extensive experiments to determine the safest manner of packing. The waste noted, over 11½ million dozen, is 9 per cent. of a total consumption in 1909 of 127,689,600 dozen eggs. In other words, this percentage of all eggs received in New York were cracked, and of these a large number were unfit for food use. The egg supply of large cities, and particularly New York, has to come from a long distance. The Middle Atlantic States in 1909 sold only about 110,000,000 dozen eggs, or not enough to supply New York alone, if every egg had been sent to that city. For the eastern coast cities, the distant corn districts are practically the sole source of supply, because the little gray hen does not have to scratch so hard for a living there as she does where grain is scarce. The Bureau of Chemistry regards the investigation of the methods of preventing egg breakage as particularly important because the many millions of dozens of eggs now broken in shipment naturally tend to keep the price of this valuable food higher than if there were no breakage, or if the breakage were materially reduced. The bureau, through the Food Research Laboratory, is now engaged in shipping eggs handled in different ways on long journeys to different points in the United States, and is carefully noting their condition on receipt at their destination. The situation is growing acute, for the railroads are claiming that their damage losses are such as to make the carrying of eggs unprofitable. Shippers and consignees have large sums of money tied up in claims and litigation with the roads.

New York Law of Signalmen's Work Days.

The new law of the state of New York requiring railroads to grant two days of 24 hours each off in every calendar month for rest, with regular compensation, applies to signalmen, tower men and gatemen; and to telegraph operators and telephone operators receiving or sending train orders. The same law says that train despatchers and train order operators must not work more than eight hours in a day of 24 hours; but extraordinary emergencies caused by accident, fire, flood, or danger to life or property may be treated as exceptions. For each hour worked beyond eight hours, in emergencies, employees must be paid at the rate of at least one-eighth their daily compensation. The provision for two days off in each month does not apply to operators working less than eight hours a day. Violation of the law is subject to a penalty of $100 and the fine, when collected, is to be paid one-half to the informer and the balance to the Free School Fund of the State. The law does not apply to any part of a railroad where the number of regular passenger trains each day, daily, is not more than eight, though if there are usually 20 freight trains each way daily, the law applies, even with less than eight passenger trains.

Rest Days in New York.

Chapter 740 of the Laws of New York for the present year establishes the rule of one day of rest in seven for the employees of all factories and mercantile establishments. Every such employee must have at least twenty-four consecutive hours of rest in every seven consecutive days; but there are exceptions in regard to bakeries, and persons caring for live animals are also excepted, as are superintendents, foremen and men who maintain fires or make necessary repairs to boilers or machinery. The proprietor of a shop must post in a conspicuous place the names of men who are required or allowed to work on Sunday, with the rest-day of such employee designated. The State Industrial Board, when necessary to preserve property, life or health, may make temporary exceptions to the law. This law goes into effect October 1 next.

Good Use of Nicotine.

The Long Island Railroad has had a strenuous fight against caterpillars or web-worms, millions of which have been infesting its tracks for some weeks, and reports a final victory; but what has become of the unfortunate farmers Mr. Peters does not tell us.

Early in June "tent caterpillars," as they are called, were reported "traveling westward a foot deep." President Peters instructed the road's agricultural department to go over the Montauk division and endeavor to exterminate the worms, which were causing many delays to trains. At one place for a mile and a quarter, the track, running through thickly wooded hills, was

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covered with a sticky mass of caterpillars that had been crushed by trains. The first thing done was to destroy the worms already on the rails. This was accomplished by means of hand spray pumps containing "sulfocide" and a concentrated solution of nicotine, applied by men traveling slowly along the track on a hand-car. The army of caterpillars on the rails and ties was exterminated by these chemical solutions and the mass of crushed and cooked insects was softened so that the slippery coating that had caused so many delays to trains could be removed with a hoe.

To check further inroads on the right-of-way, from other armies of caterpillars leaving woods which they had defoliated completely, a stream of heavy crude oil was poured along the outer edge of the ties, and later ditches were dug on both sides of the track and filled with oil, to prevent the caterpillars from reaching the rails.

A Distant Hope.

William B. Wilson, Secretary of Labor, in an address at the annual memorial service of the railroad brotherhoods in Philadelphia, last Sunday, said that he hoped for a universal eight-hour law for railroad men and a system whereby trainmen may spend their off time at their homes.

"There is no economic reason why a railroad labor schedule should call for sixteen hours as the maximum of a day's labor, and the time will come when the day will be shortened. Such a change is essential in order that accidents may be prevented. I don't expect this in the near future, but I say it will come. I also hope to see the time when railroad men, instead of spending every other night or so away from home, will be enabled to spend all their off hours at home with their families."

President Rea on the Situation.

I can take no gloomy view of this great country and its possibilities, notwithstanding the present unfavorable outlook. I have unbounded confidence in the business men of this country that nothing approaching confiscation or unfair dealing to lower the standards of service will ultimately be permitted, provided the railroads themselves will put their cases in the hands of the business public and clearly emphasize their needs; it is for that purpose that we are in conference with you.

So far as the Pennsylvania Railroad itself is concerned, and stripping it of all obligations connected with the lines in its system which act as feeders, it perhaps cannot be said that at present it absolutely needs an increase in transportation rates for the ordinary maintenance of its property, the payment of its present fixed charges on the outstanding capital, or to maintain the present rate of dividend.

This is the result of the conservative management I have already alluded to, which has conserved its capital account and applied all above a fair dividend to the betterment of the property; but the company itself cannot ignore the other companies in its system upon which it relies to be fed with traffic, and upon their investment and its own, as above stated, it received the low return of 4.83 per cent. in 1912.

One railroad, as you know, cannot be favored in this wise and the others excluded. If the position of the Pennsylvania system, as above stated, leaves it in need of the moderate advance in freight rates now requested, it is clear that such an advance is urgently needed on sound business reasons, by all other railroad companies, not to pay for inefficient management or undue capitalization of the past, but after exercising the best ability and foresight that can be obtained in the administration of the property, the railroads are not receiving just compensation under present rates.

Unless this reasonable treatment is accorded to the railroad companies and a fair return can be earned upon the money invested in railroad facilities, the railroads will come to a standstill because capital cannot be exacted from the public unless it is suitably rewarded. Therefore, is it not time for business men of your experience to take a hand and see that only fair-minded and impartial men are sent to legislatures and regulative bodies who will co-operate with these governmental agencies of transportation—for that is what they have become in fact, although privately owned—to the end that continued good service and facilities may be assured, necessary improvements made, protection secured for the capital already invested, and the new capital raised on a basis that shall yield a fair return to the owners of the properties?

And, furthermore, can you not also do something to guard against the unwise acts of organized labor when directed to securing what might be termed coercive and class legislation as illustrated in the extra crew laws? Railroads, like other corporations, are now generally prohibited from contributing to political parties, and rightfully, but without apologizing for what existed in the past, I do believe that such contributions were made oftener for the purpose of preventing unjust legislation than to influence legislation favorable to the railroad companies.

What, however, is the difference in morals between railroads currying favor with political parties through contributions to the party purse, and so-called labor committees sitting in almost every capital and in many cases, as we are informed, promising votes in return for such unnecessary legislation as the extra crew laws? I say there is no difference, and such action should also be prohibited, and you business men can do much in this direction, if you believe the railroad position just and will make your power effective.

Such action will also be in the most enlightened interest of the employees, and encourage those who intrust their capital to us. We must all work and advance together on a mutually fair basis if we desire our country to progress.—*From an address before the Shippers of Boston, June 12, 1913.*

Meeting of Valuation Engineers.

The Valuation Board of the Interstate Commerce Commission held its first meeting at Washington, June 30, and conferred with a number of railroad officers. The object of the conference was to consider arrangements for co-operation between the commission and the carriers in the preparation of maps, profiles and other necessary data. T. W. Hulme, general secretary of the railroads' valuation committee, headed the railroad delegation, which consisted of fourteen engineers and five attorneys.

O. P. Gothlin, of Ohio, president of the National Association of Railway Commissioners, has appointed a committee, with representation from several different states, to consider the matter of valuations and to keep in touch with the Federal Board at Washington; and one of this committee, W. H. Stutsman, of North Dakota, was present at the Washington conference. The chairman of the committee is Commissioner Martin, of Kansas. The committee will hold a meeting in Chicago on Saturday of this week.

In connection with this movement a number of the western state commissions have submitted their views to President Wilson and to Congress, demanding that "the people" shall be represented by special counsel and by experts in the valuation of physical properties.

The New Haven's Accident Record.

The New York, New Haven & Hartford, because of what it characterizes as the many erroneous statements and false reports placed before the public in the Brandeis campaign, which has been almost continuous now for six years, and which finds its opportunity in accidents as well as labor and political agitation, has issued an abstract of its record of passenger train accidents for ten years from June 30, 1903, to June 15, 1913. In that time the company ran 5,078,750 trains a distance aggregating 158,531,541 miles, and in these trains carried 755,678,338 passengers paying fare. In these ten years there were 6 accidents to trains in which persons traveling on them were killed, and the number of passengers killed was 29.

In six of these ten years not a single passenger was killed in a train accident. To correct the many erroneous statements that have appeared in print, the figures by years are here given:

Years.	Passengers carried.	Train accidents in which passengers were killed.	Passengers killed in train accidents.
1903 (Last six months)	34,690,448	0	0
1904	63,234,687	0	0
1905	66,507,138	0	0
1906	72,571,069	0	0
1907	75,453,778	0	0
1908	74,382,923	1	1
1909	79,849,297	0	0
1910	83,860,031	0	0
1911	83,768,348	2	12
1912	85,350,409	2	10
1913 (to June 15)	36,661,110	1	6
Total	755,678,338	6	29

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The statement continues: "In the five accidents preceding 1913 no coroner's verdict or investigation by state or national authorities found any defect in the construction of roadbed, the condition of motive power, or equipment, or in condition or operation of signals. It is because of this record for safety and because of the superior roadbed and equipment that the public is shocked over every accident, of any character, from any cause, that takes place on this road."

Work for the Accountants.

The decision of the Supreme Court in the Arkansas rate cases was not issued in complete form until June 24; and it then appeared that, in accordance with the Court's mandate, the adjudication of the cases will call for the presentation by the carriers of actual book accounts of receipts and expenditures in intrastate business. Nothing less will be accepted as a basis for annulling state rates as confiscatory.

Justice Hughes briefly announced the decision of the court that the freight and two-cent passenger rates in that state were not confiscatory on the court's last decision day, June 16, and has been engaged in writing the opinion in the cases since that day.

He pointed out in the opinion that the railroads in attacking the rates failed to sustain their case, because of too general methods employed in separating the intrastate operations from the interstate. And the value of the railroad property was improperly divided between intrastate and interstate business on a gross revenue basis. He also eriticized the lower court's conclusion that intrastate freight traffic cost 210 per cent. more on the Iron Mountain road and 250 per cent. more on the St. Louis Southwestern than interstate traffic, and the intrastate passenger service on the Iron Mountain cost 10 per cent. more than the interstate.

Railroad Police.

The seventeenth annual convention of the International Association of Railway Special Agents and Police was held at Salt Lake City, Utah, June 18 and 19. The president of the association for the ensuing year is J. W. Connelly, Washington, D. C. The meeting next year will be held at Norfolk, Va. The secretary of this association is W. C. Pannell, Baltimore, Md.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 19, 1914, St. Louis.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—H. G. McConnaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, November 19, 1913, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga. Next convention, July 22-24, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesday, June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, JANUARY 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—F. W. Drew, 112 West Adams St., Chicago.

ASSOCIATION OF TRANSFER AND CAB ACCOUNTING OFFICERS.—G. P. Conrad, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—A. S. Dennerly, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Keller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Secretariat permanent, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MASTER CAR OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assn., Chicago, and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—French McLean, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, 1223 Oliver Bldg., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—Frank Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Sommit, Mo. Next meeting, August 12-13, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. Quigley, 1128 Ames, 284 Pearl St., New York. Meetings with Assoc. of Ry. Telcg. Supt.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & E. I., Chicago; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL ASSISTANCE ASSOCIATION.—W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—W. Jaquith, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. C. Vandewater, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wing, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., Lake Shore, Cleveland, O.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

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Traffic News.

The federal grand jury at Detroit has returned five indictments against the Michigan Central, charging failure to observe its published tariffs regarding the assessment of demurrage charges at Detroit. Three of the indictments refer to demurrage accrued against the American Car & Foundry Company, and two to demurrage accrued against the National Fireproofing Company.

The Chamber of Commerce of Indianapolis, which was recently asked by a committee representing the eastern roads to approve their plan for a 5 per cent. advance in freight rates, has passed resolutions declining to approve the advance until the question has been determined by the Interstate Commerce Commission. As to intrastate rates the Chamber of Commerce declares that it will strenuously oppose any advance.

The New England Lines Industrial Bureau conducts a hundred-acre farm in Maine and this year is raising potatoes, sugar beets, grain and garden truck. This farm does not take in a whole county, as would seem to be indicated by some of the newspaper items which have been published concerning it, but it is an extensive experiment, nevertheless. The managers hope to show that potatoes can be grown as successfully in Washington County as in Aroostook County.

The Central of Georgia is the latest newcomer in the ranks of the railroads which publish a periodical for the benefit of ticket agents, conductors, baggage men, etc. "The Right Way" is the title of this paper, and Vol. 1, No. 3, is dated June, 1913. It is a small four-page sheet and is issued by the Passenger Traffic Department, Savannah. "Safety First" appears also to be a prominent feature of the publication, and an article by D. C. Boy, assistant chief of the Educational Bureau, contains exhortations to the employees in this line. The illustrations in this issue are one of a new station which has been opened at Barnesville, and one of Commodore W. H. Fisher, of the company's Ocean Steamship Line, who has retired after 41 years' continuous service.

The Lehigh Valley has remodeled one of its large dining cars, 77 ft. 8 in. long, to serve as a traveling exhibition and meeting hall to promote the road's industrial opportunities and its agricultural territory. This car will be put to much more diverse uses than the ordinary agricultural demonstration car. At times it will be divided into a kitchen, dining room and bedroom, and used to teach and illustrate domestic science. Experts from the New York State College of Agriculture at Ithaca have volunteered to carry on this work of teaching food values, proper methods of cooking and sanitary care of the home. At other times the car will be provided with literature, maps, models, photographs, drawings, blueprints, stereopticons, and moving pictures of factory sites and local industries along the line.

Reductions in Passenger and Freight Rates.

The railroads affected by the recent decision of the Supreme Court of the United States in the Minnesota cases, are quite generally announcing changes to be made in tariffs in compliance with the decision. The Chesapeake & Ohio will reduce passenger fares in West Virginia to 2 cents a mile, July 1. There are outstanding thousands of coupons which have been issued with tickets in West Virginia since the beginning of the lawsuits, entitling passengers to a refund of the difference between what they have paid and what is now declared to be the legal rate.

The railroads in Missouri affected by the decision announce that they will put the new rates in force "at the earliest practicable date." Attorneys representing thirteen roads concerned have notified J. M. Atkinson, chairman of the Missouri Public Service Commission, of their desire to meet the commission as soon as possible to formulate a method of putting the rates in operation and fixing the date when they shall be effective. Though the Supreme Court upheld the two-cent passenger rate, the matter of equitable adjustment of rates, the attorneys say, lies with the State Public Service Commission. It is expected that the new rates, both passenger and freight, will go into effect by July 1.

Seven roads operating in Minnesota have announced that they will take action under the terms of the recent decision of the court in the Minnesota cases, and that probably the new rates will be placed in effect by July 10. Refunds of overcharges will be made in all cases where proper proofs of such overcharges are produced.

At Red Wing, Minn., indictments have this week been returned by the county grand jury charging violation of the two-cent passenger rate law against the Chicago Great Western, the Chicago & North Western and the Chicago, Milwaukee & St. Paul. The indictments are the result of action taken by Judge Albert Johnson of the County Court nearly a month ago. At that time the United States Supreme Court had not rendered its decision in the Minnesota cases, and it was generally supposed that all state and county officers were restrained from acting in the matter; but Judge Johnson charged the grand jury that it should indict the railroads which have violated the two-cent law in the state. The jury failed to return any indictments; the judge was indignant and instead of discharging the jury at that time, said he would call the members together later. This week he repeated his demand that they indict the railroads, and the present action of the jury follows his charge.

Car Location.

The accompanying table, which is taken from bulletin No. 7 of the American Railway Association, gives a summary of freight car location by groups on May 31, 1913.

Car Location on May 31, 1913.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	87,886	680,074	274,106	202,821	121,227	465,896	17,208	151,695	31,157	130,539	120,128	2,333,387
Home Cars on Home Roads	41,989	382,622	95,992	108,433	84,395	308,147	5,471	77,893	14,704	74,665	82,121	1,276,432
Home Cars on Foreign Roads	45,897	297,452	178,114	94,388	37,282	157,749	11,737	73,802	16,453	55,874	38,107	1,056,955
Foreign Cars on Home Roads	50,676	319,025	227,177	86,489	79,785	171,929	8,513	62,030	20,604	52,223	44,711	1,123,192
Total Cars on Line	92,665	701,647	323,169	194,922	164,180	480,106	13,984	139,923	35,308	126,888	126,832	2,399,624
Excess or Deficiency	4,779	21,573	49,063	*7,899	*7,597	14,210	*1,224	*11,772	4,151	*3,651	6,704	66,237
Surplus	1,409	3,779	2,122	6,434	2,344	9,915	950	8,416	3,869	15,721	3,332	60,291
Shortage	138	1,166	351	2,278	1,264	1,623	188	190	14	519	1,650	9,383
Shop Cars—												
Home Cars in Home Shops	4,398	36,020	17,882	12,217	13,674	23,262	835	10,582	2,101	6,189	4,003	131,163
Foreign Cars in Home Shops	1,134	9,404	7,617	2,329	2,495	4,074	602	2,363	847	2,935	736	34,736
Total Cars in Shops	5,532	45,424	25,499	14,746	16,169	27,336	1,437	12,945	2,948	9,124	4,739	165,899
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	47.78	56.26	35.02	53.46	49.13	66.14	31.79	51.35	47.19	57.20	68.30	54.70
Total Cars on Line	102.74	103.17	117.80	96.11	95.56	103.05	81.26	90.53	113.32	97.20	105.49	102.84
Home Cars in Home Shops	5.01	5.30	6.32	6.02	7.96	5.35	4.85	6.97	6.74	4.74	3.33	5.70
Foreign Cars in Home Shops	.88	1.38	2.78	1.25	1.45	.92	3.50	1.45	2.72	2.25	.61	1.51
Total Cars in Shops	5.89	6.68	9.30	7.27	9.41	6.28	8.35	8.42	9.46	6.99	3.94	7.21

*Denotes deficiency.

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Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 145-A, giving a summary of car surpluses and shortages by groups from March 13, 1912, to June 14, 1913, says: The total surplus on June 14, 1913, was 71,126 cars; on May 31, 1913, 60,291 cars; and on June 20, 1912, 73,464 cars. Compared with the preceding period; there is an increase in the total surplus of 10,835 cars, of which 9,331 is in box, 100 flat, 1,907 in miscellaneous, and a decrease of 503 in coal car surplus. The increase in box car surplus is in groups 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 3 (Ohio, Indiana, Michigan and western Pennsylvania), 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 6 (Iowa, Illinois, Wisconsin and Minnesota), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), 10 (Washington, Oregon, Idaho, California, Nevada and Arizona), and 11 (Canadian lines). The increase in flat car surplus is in groups 4 (the Virginias and Carolinas, 8 (as above), 9 (Texas, Louisiana and New Mexico), and 10 (as above). The increase in miscellaneous car surplus is in groups 3, 5, 7, 8, 10 and 11 (as above). The decrease in coal car surplus is in groups 2, 4, 6, 7, 8 and 9 (as above).

The total shortage on June 14, 1913, was 7,199 cars; on May 31, 1913, 9,383 cars; and June 20, 1912, 5,746 cars. Compared with the preceding period; there is a decrease in the total shortage of 2,184 cars, of which 958 is in box, 23 in flat, 1,076 in coal and 127 in miscellaneous cars. The decrease in box car shortage is in groups 3, 5, 6, 7 and 10 (as above). The decrease in flat car shortage is in all groups except 1 (New England lines), 3 and 11 (as above). The decrease in coal car shortage is in groups 1, 2, 4, 10 and 11 (as above). The decrease in miscellaneous car shortage is in groups 3, 8, 10 and 11 (as above).

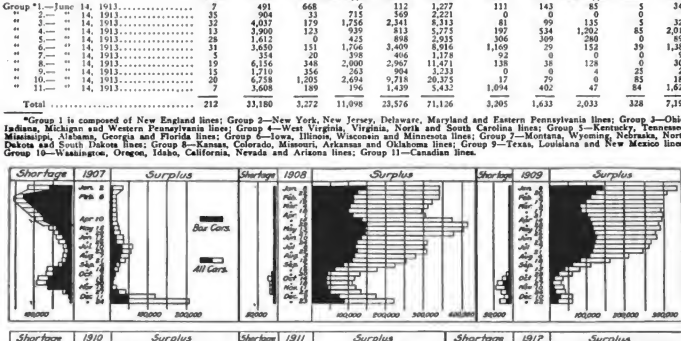
Compared with the same date of 1912; there is a decrease in the total surplus of 2,338 cars, of which 51 is in flat, 8,221 in coal, 640 in miscellaneous, and an increase of 6,574 in box car surplus. There is an increase in the total shortage of 1,453 cars, of which 36 is in box, 78 in flat, 1,583 in coal, and an increase of 244 in miscellaneous car shortage.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report and a diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses—Coal, gondola and hopper.	Box.	Flat.	Other kinds.	Total.	Shortages—Coal, gondola and hopper.	Box.	Flat.	Other kinds.	Total.
Group *1.—June 14, 1913	7	491	668	6	112	1,277	111	143	85	5	344
" 2.— " 14, 1913	25	904	33	715	569	2,221	0	0	0	0	0
" 3.— " 14, 1913	32	4,037	179	1,756	2,341	8,313	81	99	135	5	320
" 4.— " 14, 1913	13	3,900	123	939	813	5,775	197	534	1,202	85	2,018
" 5.— " 14, 1913	28	1,612	0	425	898	2,935	306	369	260	0	895
" 6.— " 14, 1913	31	3,650	151	1,766	3,409	8,916	1,169	29	152	39	1,389
" 7.— " 14, 1913	5	354	20	398	406	1,178	92	0	0	0	92
" 8.— " 14, 1913	19	6,156	348	2,000	2,967	11,471	138	38	128	0	304
" 9.— " 14, 1913	15	1,710	356	263	904	3,233	0	0	4	25	29
" 10.— " 14, 1913	20	6,758	1,205	2,694	9,718	20,375	17	79	0	85	181
" 11.— " 14, 1913	7	3,608	189	196	1,439	5,432	1,094	402	47	84	1,627
Total	212	33,180	3,272	11,098	23,576	71,126	3,205	1,633	2,033	328	7,199

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

Summary of Revenues and Expenses of Steam Roads in April.

The Bureau of Railway Economics' summary of revenues and expenses and comments thereon for April, 1913, are as follows: The railways whose returns are included in bulletin

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No. 49 operate 222,156 miles of line, or about 90 per cent. of the steam railway mileage in the United States. Total operating revenues for the month of April, 1913, amounted to $237,362,424. Compared with April, 1912, the total operating revenues show an increase of $22,893,968. These total operating revenues per mile of line averaged $1,068 in April, 1913, and $974 in April, 1912, an increase of $93, or 9.7 per cent. Freight revenue per mile increased 12.4 per cent., and passenger revenue per mile 2.5 per cent.

Operating expenses amounted to $179,024,950. This was $21,059,895 more than for April, 1912. These operating expenses per mile of line averaged $806 in April, 1913, and $717 in April, 1912, an increase of $89 per mile, or 12.3 per cent.

Net operating revenue amounted to $58,337,434. This was $1,834,073 more than for April, 1912. Net operating revenue per mile of line averaged $263 in April, 1913, and $257 in April, 1912, an increase of $6 per mile, or 2.4 per cent.

Taxes for the month of April amounted to $10,482,492, or $47 per mile, an increase of 7.9 per cent. over April, 1912.

Operating income averaged $214 per mile of line, and in April, 1912, $212, thus increasing $2, or 0.9 per cent. Operating income for each mile of line for each day in April averaged $7.13, and for April, 1912, $7.07.

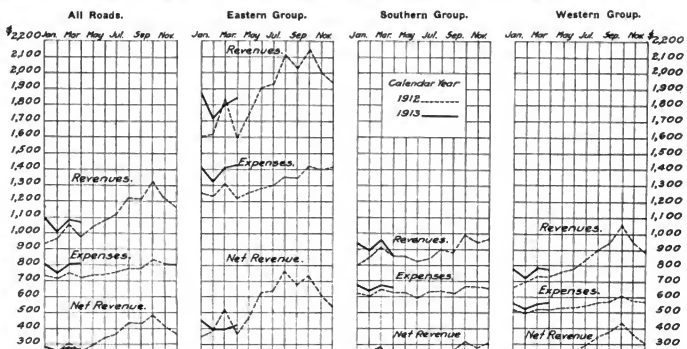
The operating ratio for April was 75.4 per cent., which is comparable with 73.9 per cent. in March, 1913, and 73.6 per cent. in April, 1912.

The railways of the eastern district show an increase in total operating revenues per mile of line as compared with April, 1912, of 16.5 per cent., the railways of the southern district show an increase of less than one-tenth of 1 per cent., while the railways of the western district show an increase of 7.0 per cent. Operating expenses per mile increased 17.0 per cent. on the eastern railways, 4.9 per cent. on the southern railways, and 10.7 per cent. on the western railways. For the eastern railways net operating revenue per mile increased 15.0 per cent., for the southern railways it decreased 13.5 per cent., and for the western railways it decreased 1.9 per cent. The increase in taxes per mile was 10.3 per cent. in the eastern district, 6.7 per cent. in the southern district, and 6.2 per cent. in the western district. Operating income per mile increased 14.6 per cent. in the East, decreased 16.5 per cent. in the South, and decreased 3.2 per cent. in the West.

Comparison of the returns for the ten months of the fiscal year 1913, with those of the corresponding months of the previous fiscal year reveals an increase in total operating revenues per mile of 9.5 per cent., an increase in operating expenses per mile of 9.3 per cent., and an increase in net operating revenue per mile of 9.9 per cent. This net operating revenue per mile of the eastern railways increased 7.1 per cent. as compared with the corresponding period of the previous year, that of the southern railways increased 4.1 per cent., and that of the western railways increased 14.8 per cent.

When the returns for the four months of the calendar year 1913 are compared with those of the corresponding months of 1912, they show an increase in total operating revenues per mile of 8.7 per cent., an increase in operating expenses per mile of 9.2 per cent., and an increase in net operating revenue per mile of 7.0 per cent. This net operating revenue per mile increased 2.6 per cent. in the eastern district as compared with the corresponding period of the previous year, increased 8.9 per cent. in the southern district, and increased 11.0 per cent. in the western district.

The diagram shows the variations in operating revenues, operating expenses, and net operating revenue per mile for the



Monthly Revenues and Expenses Per Mile of Line in 1912 and 1913.

separate months of the calendar year 1912 and of the calendar year 1913 to date. The following table shows the per cent. of operating revenues consumed by each class of expenses:

Per Cent. of Total Operating Expenses.

	April,		Fiscal year ended June 30,		Calendar year ended December 31,	
	1913.	1912.	1912.	1911.	1912.	1911.
Maintenance of way and structures	15.5	13.5	12.7	12.9	12.8	12.7
Maintenance of equipment	17.8	16.8	15.8	15.5	16.0	15.7
Traffic expenses	2.1	2.3	2.2	2.2	2.0	2.1
Transportation expenses	37.4	38.3	35.9	35.5	35.5	35.4
General expenses	2.6	2.7	2.5	2.5	2.4	2.5
Total operating expenses	75.4	73.6	69.1	68.6	68.7	68.4

Important Change in Traffic Sources.

The steady development in recent years of the country between St. Louis and eastern Texas is demonstrated by a table issued by the St. Louis Southwestern, showing the decline in carload lots of farm products shipped to St. Louis from Texas.

The high-water mark for strawberries was in 1907, when 126 cars were shipped. The following year the number dropped to 50, in 1909 to 39, and to two in 1911.

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This year's mark is 39. Cabbages have dropped from 39 cars in 1908 and 1909 to two cars this year. The largest drop is in potatoes, of which 853 cars were shipped in 1908, against 28 this year. A total of 411 cars has been shipped so far in 1913, and only 239 in 1912, against 1,883 in 1908.—*St. Louis Republic.*

A Shipper's Views as to Why Freight Rates Should Be Higher.

The following paragraphs are from an address by George W. Simmons, vice-president, Simmons Hardware Company, St. Louis, Mo., before the Traffic Club of Philadelphia on March 17 last, repeated before the Transportation Club of Indianapolis, April 10:

Ever since early in 1908, our firm and its officers have been advocating publicly that the railroads should be allowed to increase their rates. While the Simmons Hardware Company pays in freight charges to the railroads probably as much as any firm in the country, and from the nature of our business we could not add to our selling prices any increase in transportation charges, we still earnestly advocate an increase in freight rates, feeling absolutely confident that in the immense volume of business which would immediately result through the wonderful prosperity of the country caused by increased railroad development, we will reap our share of the harvest far and away in excess of the amount of increased expenses for freight. When we started talking this way five years ago, few shippers agreed with us and even many railroad men thought we were playing to the grandstand, or in some way bidding for railroad favor. Today, however, practically every one who studies this subject agrees with us and thousands of shippers in various states who vigorously opposed such an idea five years ago, are now convinced of the logic of it. That is but one of the many evidences of the change in public sentiment on this subject. The public is beginning to realize that in the event of calamity and disaster, such as occurred from the storms in this section a couple of weeks ago, the dollars and cents loss to the railroads from unexpected causes beyond their control is, in many cases, more than they might pay out in dividends to their stockholders in an entire year, and in others sufficient to change an entire year's profits into loss.

There is no longer any general desire to persecute the railroads, but simply the feeling that the rights of the public must be conserved. On the other hand, the impression is growing throughout the country that the railroads have gotten the sharp end of the stick in a good many ways of late—in labor disputes about wages and in the advance in the cost of everything they buy. Sooner or later this feeling will spread so that the members of the Interstate Commerce Commission will reason with the wisdom and common sense of such public opinion, and be influenced by it. The members of that commission are reasonable, honorable, sincere men of great ability. I believe that they will soon realize that the time has come to modify their policy towards the railroads, so that they may expand and grow upon conservative lines.

In considering the railroad problem, if we lay aside all technical arguments and look at it only from the basis of common fairness, and after all no transaction can be permanently successful unless it is based on fairness to all parties concerned, we find that the railroads' expenditures have increased in every way, most of them beyond the power or control of the railway management, partly from public demand and partly by legislation; therefore, common fairness would permit them to advance their selling prices to offset at least a part of this advance in cost, but the fact remains that railroad rates in this country have been constantly decreasing and are less today than they were thirty years ago.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended from June 30 until September 29, certain schedules in the tariff of the Hocking Valley, which would advance rates on brick, c. l., from certain Ohio points to Huntington, W. Va.

The commission has further suspended from July 1 until January 1, the operation of the items in a supplement to Agent W. H. Hosmer's tariff which would advance rates on brick from Chanute and other points in Kansas to points in Iowa and Illinois.

The commission has suspended from July 1 until January 1, the supplement to Agent W. H. Hosmer's tariff which would advance rates on hay, in carloads, from St. Paul and Minneapolis, Minn., and points taking same rates to Ohio river crossings.

The commission has denied the petition of the eastern roads for the reopening of Case No. 3400—the application filed in 1910 for leave to increase freight rates—but has intimated that an original investigation of the whole rate question, to be made on the commission's own motion will soon be ordered.

The commission has suspended from June 20 until October 18, certain schedules in Agent R. H. Countiss' tariff, which by the elimination of routing from points in the state of Washington on the Bellingham & Northern via Sumas, Wash., the Canadian Pacific, North Portal, N. D., and the Minneapolis, St. Paul & Sault Ste. Marie, sought to increase rates applicable to the transportation of lumber and articles taking same rates to points in North Dakota and other states. The present rate applicable to shipments of cottonwood, fir, hemlock, larch and spruce lumber, in carloads, from Columbia, Wash., for example, to points in North Dakota on the line of the Minneapolis, St. Paul & Sault Ste. Marie is 40 cents per 100 lbs.; the proposed rate is 43 cents per 100 lbs. Rates to other destinations are affected in like manner.

Rates on Glazed Paper Reduced.

Eggerss-O'Flyng Company v. Chicago Great Western, et al. Opinion by the commission:

The commission decided that first-class rating on glazed or surface-coated paper in less than carloads from Chicago and Mississippi river crossings to Omaha, Neb., was unreasonable, and prescribed third-class rating for the future. In official and southern classifications this commodity in less than carloads is rated third class. (27 I. C. C., 280.)

Rates on Fertilizer Reduced.

Virginia-Carolina Chemical Company v. Atlantic Coast Line. Opinion by the commission:

The commission decided that the advanced rates for the transportation of fertilizer in carloads from Wadesboro, N. C., to various local stations in South Carolina were unreasonable and ordered the defendants to restore the rates in effect prior to February 26, 1912. (27 I. C. C., 234.)

Complaint Dismissed.

Clinton Manufacturers' & Shippers' Association v. Chicago & Alton et al. Opinion by Commissioner Harlan:

The commission decided that the rates on sugar and molasses from certain producing points in Louisiana to Clinton, Iowa, were not unjustly discriminatory as compared with the lower rates on such products from the same points of origin to Chicago. (27 I. C. C., 230.)

Dixie Cotton Oil Company v. St. Louis, Iron Mountain & Southern et al. Opinion by the commission:

A charge by defendants of $3 per car for switching service performed by the St. Louis Southwestern in transporting cars between its junction with the St. Louis, Iron Mountain & Southern's track and complainant's plant in Argenta, Ark., was not found to be unduly discriminatory. (27 I. C. C., 295.)

Rates on Bags, Bagging, etc., Reduced.

Corporation Commission of Oklahoma v. Arkansas, Oklahoma & Western et al. Opinion by Commissioner McChord:

The commission decided that the rates on bags, bagging, cotton-bale ties, and tie buckles from Galveston, Tex., to Oklahoma destinations were unreasonable and discriminatory, and prescribed reasonable rates for the future on a mileage basis. (27 I. C. C., 210.)

Rates on Barrels Reduced.

Alexandria Barrel Company v. Chicago, Rock Island & Pacific et al. Opinion by the commission:

The rate of 39 cents per 100 lbs., with a minimum weight of 20,000 lbs. for the transportation of tight barrels from Alexandria, La., to Houston, Tex., group points and Texas common

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point territory was found to be unreasonable to the extent that it exceeds 25 cents to Houston group points and 39 cents to Texas common point territory, with a minimum weight in each instance of 12,000 lbs., subject to rule 6-B of Western classification. Reparation was awarded. (27 I. C. C., 196.)

Import Rates from Boston and New York.

Chamber of Commerce of the State of New York et al. v. New York Central & Hudson River et al. Opinion by Chairman Clark:

The original and supplemental reports in this case are at 24 I. C. C., 55 and 674, mentioned in the *Railway Age Gazette* of October 11, 1912, page 704, and November 1, 1912, page 855, respectively. After exhaustive consideration of all the matters presented on the rehearing the commission decided that the conclusions announced in the original and supplemental reports are correct. (27 I. C. C., 238.)

Import Rates.

The original and supplemental reports in this proceeding are at 24 I. C. C., 78 and 678, mentioned in the *Railway Age Gazette* of November 1, 1912, page 856. Prior decision herein adhered to upon the findings in *Chamber of Commerce case*, 27 I. C. C., 237, which is mentioned above. (27 I. C. C., 245.)

Export Rates on Flaxseed Products.

In re investigation and suspension of advances in rates by carriers for the transportation of linseed oil cake, linseed oil meal, and flaxseed screenings in carloads from Minneapolis and St. Paul, Minn., to Galveston, Tex., and other gulf ports. Opinion by Commissioner Meyer:

Certain respondents, by cancellation of the export rate of 16½ cents per 100 lbs. on flaxseed products from Minneapolis and St. Paul to Galveston and other gulf ports, attempted to withdraw from participation in this traffic. The commission decided that 16½ cents is an unreasonably low rate, but ordered the respondents to keep the route open at a rate not to exceed 22½ cents per 100 lbs. (27 I. C. C., 246.)

Macon, Ga., Discriminated Against.

Freight Bureau of Chamber of Commerce of Macon, Ga., v. Cincinnati, New Orleans & Texas Pacific et al. Opinion by Commissioner Meyer:

In this case the complainant alleges that in the transportation of leather in various forms from Cincinnati, Ohio, and various other points to Macon, Ga., Macon is discriminated against by the maintenance of differentials over Atlanta, Ga., of 27 cents per 100 lbs. in less than carloads and 13 cents in carloads. The commission decided that the present rates in effect to Macon are discriminatory and ordered that for the future rates be established based upon a differential of 3 cents over Atlanta on is rated when no commodity rates are in effect. (27 I. C. C., less-than-carload shipments and 2 cents on carload shipments, which are the differentials above Atlanta on second class in less than carloads and fourth class in carloads under which leather 263.)

Shipment Misrouted.

Lathrop Lumber Company v. Alabama Great Southern et al. Opinion by the commission:

A carload of lumber was forwarded by the initial carrier from Fleming, Ala., to Huntsville, Ala., via an interstate route over which the rate was higher than via an intrastate route. The commission decided that the shipment was misrouted, and that complainant is entitled to reparation on basis of rate via the intrastate route. (27 I. C. C., 250.)

Chicago-Duluth Grain Rates.

In re investigation and suspension of the Chicago-Duluth Grain Rates. Opinion by Chairman Clark:

The suspended tariffs were filed pursuant to the findings in *Superior Commercial Club of Superior, Wis., v. G. N. Ry. Co.*, 24 I. C. C., 96, mentioned in the *Railway Age Gazette* of June 28, 1912, page 1622, and supplemental reports in same case, 25 I. C. C., 342, mentioned in the *Railway Age Gazette* of January 3, 1913, page 33. The commission decided that the previous findings should be adhered to and the order of suspension was vacated. The new adjustment will result in direct rates to Milwaukee for reconsignment to the East one cent per 100 lbs. higher than upon shipments moving through Minneapolis. (27 I. C. C., 216.)

Containers and Classification Rules.

Sea Gull Specialty Company, v. Baltimore Steam Packet Company et al. Opinion by Commissioner Meyer:

The complainant attacks the charge of 20 per cent. above third-class rates on shipments of baking powder in a fiber board container which the defendants allege does not comply with the provisions of classification rules. Refund is asked of charges in excess of third class and the amendment of rules so as to include complainant's container without penalty. The commission found that rule 4 (c) of southern classification No. 38 did not authorize the assessment of a 20 per cent. penalty in this particular instance.

The requirement in rule 9 (a) of southern classification No. 39 that metal bands should encircle the ends of Sea Gull boxes is unjust, unreasonable, and discriminatory. Complainant's box should be accepted without penalty.

"It is not just or fair to the shipping public to promulgate as a basis for determining rates a classification the terms of which are indefinite or impracticable of application, either in whole or in part."—*Pacific Coast Biscuit Co.* v. *S. P. & S. Ry. Co.*, 20 I. C. C., 546.

The duty should be placed upon carriers' agents to notify shippers whenever their containers do not comply with specifications laid down in classification rules. This responsibility should rest upon the initial carrier. Reparation was awarded. (27 I. C. C., 267.)

Milling-in-Transit Privileges at Decatur, Ill.

William H. Suffern Grain Company v. Illinois Central et al. Opinion by Commissioner McChord:

The commission decided that the refusal of the defendants to grant an elevation allowance on grain at Decatur, Ill., while such allowance is made at Cairo, Ill., was not unjustly discriminatory.

Decatur now has transit privilege under which it reaches a large portion of Mississippi valley territory at rates not higher than the combination on Cairo. Defendants proposed to extend this privilege via Illinois Central and connections to all points in Mississippi valley and the Southeast, and to accord to Decatur whatever Cairo has in respect of transit on through rates to Louisiana. When this is done, the complaint will be dismissed. (27 I. C. C., 192.)

Proportional Rates on Grain Products to Texas.

In re investigation and suspension of advances in rates by carriers for the transportation of grain products from southern Illinois points to points in Texas. Opinion by Commissioner Meyer:

The respondents attempted to cancel the proportional rates on grain and grain products from certain interior milling points in southern Illinois via St. Louis, Kansas City and other river crossings to various groups in Texas. The commission decided that the carriers should free these Illinois millers of the threatened disadvantage and remove the inconsistencies prevailing in the flat rates. Such relief may be by way of a milling-in-transit privilege specifically described in the tariffs at a charge not to exceed one-half cent per 100 lbs., or otherwise, as the carriers may elect. (27 I. C. C., 282.)

Boat Lines and Connecting Railways.

Truckers Transfer Company v. Charleston & Western Carolina. Opinion by Commissioner Meyer:

The complainant, a boat line, seeks the establishment of through routes and joint rates from certain river landings near Port Royal, S. C., and asks that it be made a connecting carrier upon the same basis as its competitor, the Beaufort Transportation Company. The commission held that as interstate commerce was not subject to state law, it would not fall within the prohibition of a charter granted by a state legislature. Incorporation is not a condition precedent to the right to be a common carrier, so far as interstate transportation is concerned.

The question of establishing joint rates or declining to do so rests in the discretion of the commission.

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When boat lines have met all reasonable requirements of connecting railways with respect to security for freight charges, adequacy of service, efficiency of management, and any other guaranty which may justly and lawfully be required, they should be permitted to establish through routes and publish joint rates with their connecting railways.

The record does not show that complainant is capable financially and physically of assuming the obligations which through routes and joint rates would impose upon it. The complaint was dismissed. (27 I. C. C., 275.)

Pig Iron Rates Not Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of pig iron in carloads from Buena Vista, Va., and other points to Philadelphia, Pa., and other destinations. Opinion by Commissioner McChord:

The commission decided that the proposed advances in the rates on pig iron, ranging from 10 cents to 45 cents per ton from producing points in Virginia to points in Pennsylvania and New Jersey were not shown to be reasonable and ordered the suspended tariffs withdrawn. (27 I. C. C., 343.)

Wharfage Practices Discriminatory.

In re discriminations in the use of wharfage facilities at Pensacola, Fla. Opinion by Commissioner Marble:

The Louisville & Nashville has wharfage facilities, including docks and spur tracks at Pensacola, Fla., which it claims are private facilities. Complaints were made against certain practices of the railroad in the administration of these facilities. The railroad admits that it affords ship-side delivery at these wharves on domestic traffic to or from non-competitive points, as well as on export and import traffic, while refusing such delivery in the case of shipments to or from points which are reached by it or its connections. It admits that it has refused to deliver shipments at the warehouse of a certain steamship company, while making delivery on these so-called private facilities to other consignees. It admits also that when it has application for more berth room than it can provide, it gives a preference in berthing to vessels consigned to the Gulf Transit Company, which is owned by it. In support of its contention that the wharf facilities are private, the railroad refers to the decision of the Supreme Court, *L. & N. R. R. Co. v. West Coast Naval Stores Co.*, 198 *U. S.* 483. That case was decided in 1905, and the commission found that since then the interstate commerce act had been amended so as to bring docks within its jurisdiction. The commission decided that the practice of refusing to deliver at ship side to vessels other than those belonging to or consigned to the Gulf Transit Company, or to receive at ship side from such vessels, property transported, or to be transported in commerce, subject to the act to regulate commerce, while delivering like property at ship side to, and receiving like property at ship side from vessels consigned to or belonging to the Gulf Transit Company, is unreasonable and unduly discriminatory. The refusal of the railroad to make deliveries of carload freight transported, or to be transported in commerce, subject to the act to regulate commerce, consigned to or in care of the Pensacola, St. Andrews & Gulf Steamship Company, at the Jefferson street wharf, while affording such delivery to Avery & Company, or any other person or corporation, is unreasonable and unjustly discriminatory. The practice of the railroad of discriminating in favor of the Gulf Transit Company in the berthing of vessels, is also unreasonable and discriminatory. An order was entered, forbidding the continuation of these practices. (27 I. C. C., 252.)

STATE COMMISSIONS.

The Public Service Commission of Massachusetts, provided for by the new law, which is noticed on another page of this paper, consists of the five persons named below, the governor having appointed the two new members on June 25: Frederick J. McLeod, of Cambridge, five years; George W. Anderson, of Boston, four years; George P. Lawrence, of North Adams, three years; Clinton White, of Melrose, two years; George W. Bishop, of Newton, one year. McLeod, White and Bishop are the members of the railroad commission, which goes out of existence after a life of 44 years.

COURT NEWS.

The Supreme Court of Illinois has handed down a decision holding that the extension of the charter of a railroad corporation does not require the corporation to again pay the original incorporation fee.

A decision of the Court of Claims declaring illegal certain collections made by the government from the Chicago & Alton for transportation of mails—illegal because of a wrong method of ascertaining average daily weight—is reported in another column of this issue.

The Court of Errors and Appeals on June 18 sustained the order of the Public Utility Commissioners requiring the railroads terminating in Jersey City, Hoboken and Camden to establish commutation fares, and not require passengers to buy tickets to New York or Philadelphia.

The decision of the Supreme Court of the United States in the Minnesota rate cases was reported last week, page 1318. An abstract of that part of the decision dealing with the question of valuation of railway properties for purposes of rate making is given in another column of this issue.

Judge Remster, of the Indiana Circuit Court, has rendered a decision which overrules demurrers of the Lake Erie & Western and the Cincinnati, Hamilton & Dayton, and holds that the Indiana law requiring the installation of automatic block signals is valid. The law as first passed was declared unconstitutional by the Supreme Court, because of uncertainty in its terms, and the railways contended that the same objection applied to recent amendments.

The Public Service Commission of Ohio has won its suit in the Supreme Court of that state, to compel compliance by the Baltimore & Ohio, with an order of the commission, requiring the company to load milk into the cars at all stations where agents are maintained. In this decision the Supreme Court sustains the action of the lower courts in refusing to enjoin the enforcement of the commission's order to abolish the rule which compels shippers to load the milk themselves.

The Supreme Court of the United States on Monday of this week, in the suit of the Missouri Pacific against Tucker, involving rates for the transportation of oil, decided in favor of the railroad, holding that damages awarded by the lower court were excessive. The law of Kansas fixing a minimum rate for the transportation of oil is declared unconstitutional because of the severe penalties provided for violation of the law. The railroad would have been unable to test its validity.

Adams Express Subject to I. C. Law.

The United States Supreme Court, in an opinion by Justice Holmes, deciding a case against the Adams Express Company, in Ohio, holds that the company was rightfully indicted for a violation of the interstate commerce law, requiring exact compliance with the tariff for the transportation of parcels. The decision reverses that of the District Court, which allowed the indictment to be quashed on the ground that the company is not a corporation, but is only a joint stock association. It has been notorious for many years, says the court, that some of the great express companies are organized as joint stock associations [and they have evaded certain responsibilities because of this fact] but, says Justice Holmes, the amendment of the interstate commerce law, in 1910, putting express carriers under the regulations of the law, could hardly have had any other purpose than to bring these joint stock associations under control. Moreover, the Adams Express Company, in filing tariffs as required by the law, seems to have accepted the plain, ordinary meaning of the statute. If the statute imposes on express carriers the duty of filing tariffs, it is reasonable to suppose that the same law intended to impose upon them the penalty prescribed where the law is not obeyed. In the interstate commerce law, originally, there was doubt, in connection with the wording of Section 10, whether corporations were indictable or not, but this defect was corrected by the law of 1903. The interstate commerce law is constitutional as regards corporations, and no reason is suggested why Congress has not equal power over partnerships, including power to charge the partnership assets with a liability; and to personify the company, so far as to collect a tax, by proceeding against it by the company name. Under the laws of New York

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a judgment against a joint stock company binds only the joint property. These express companies have had a semi-corporate standing in the popular mind, and the action of Congress was natural and to be expected.

Interstate Commerce Law Not Applicable to Street Railroads.

The decision of the Supreme Court of the United States holding that the street railroad of the Omaha & Council Bluffs Company between the two cities named, is not subject to the interstate commerce law, was reported in the *Railway Age Gazette* of June 13, pages 1304 and 1336. The full text of the opinion, which is by Justice Lamar, shows that the decision was based on the conclusion that the interstate commerce law, as passed by Congress in 1887, did not apply to street railroads. Congress did not intend that the word "railroad" should include such lines. Senator Cullom, in the debate on the passage of the interstate commerce law, said expressly that it did not apply to street railways in cities. This fact was brought up in the lower court, but the Supreme Court, agreeing with the Commerce Court, decides that the meaning of the statute cannot be determined from statements used in debates. It must be interpreted by its own terms. On this basis the conclusion is that Congress did not mean to apply the term "railroad" to street railroads. In 1887 the word "railroad" had no fixed, accurate meaning. The appellants cited decisions from twelve states holding that in a statute the word does not mean street railroads, but the other side cited decisions to the contrary from an equal number of states. There is a similar disagreement in the federal courts. The Commerce Court and the Circuit Court took opposite views, and the members of the Interstate Commerce Commission were divided on the subject.

But while the authorities differ on many points, they all agree that the meaning of the word is to be determined by the construction of the statute as a whole. The street railways crossing a state line are, indeed, engaged in interstate commerce, but not the commerce which Congress had in mind when legislating in 1887. Street railways carry passengers from street to street, and from ward to ward, from city to suburbs, etc.; but the Act refers to railroads which are required to post schedules and tariffs, not at street corners, but in "every station," etc. The law requires railroads to make joint rates and provide facilities for interchange of traffic. Every provision of the statute is applicable to railroads, but only a few to street railroads. The evils which the law was intended to cure did not exist on street railroads.

The rise of interurban railroads since 1887 is considered, but the road in question cannot be treated as an interurban. Its line is on private property to some extent, but to how great an extent does not appear.

In amending the interstate commerce law in June, 1910, Congress took notice of street railroads by providing that the commission should not establish any through route between street electric passenger railways, not carrying freight, and railroads of a different character. But this provision was inserted out of abundant caution. This law was passed after the order made by the commission in the Council Bluffs case; it cannot be given a retrospective operation. There is nothing to show that Congress expected to ratify the action of the commission, and it cannot be assumed that the amendment was intended to confer a jurisdiction which had not been originally granted.

The decision reverses the Commerce Court and makes the decree of the Circuit judges permanent.

Decision in the International Coal Mining Suit.

The Supreme Court of the United States, in the case of the Pennsylvania Railroad, plaintiff in error, against the International Coal Mining Company, holds that the coal mining company, claiming damages because secret rebates were given to another company, must prove that it suffered some loss or injury. The court below had sustained a verdict of $12,013 against the road, but the Supreme Court now orders a new trial. The decision is by Justice Lamar.

The International Company shipped large quantities of coal over the Pennsylvania during the seven years ending April 1, 1901. In 1904 it sued for $37,268, the difference between what it had paid and what it would have paid if it had got the same rebates as rival shippers. Prior to 1899, the International Company itself had received rebates and made a claim because it did not receive so large sums as did the rivals, but these claims were thrown out of court at an early stage of the proceedings. After 1899 the International paid tariff rates, while other companies received rebates of 5, 10, 15, 25 and 35 cents a ton, the differences being caused by the different rates in force at previous dates, the rebates being in the nature of adjustments to meet the conditions of long-time contracts. The road, on April 1, 1899, increased tariff rates and discontinued the payment of rebates, except that thereafter the varying rebates above noted were made to save shippers against loss on their contracts. The road claimed that, as these adjustments were in the nature of rate-making, and the rightfulness of the freight bills would be a question for the commission instead of the courts; but the court said that as the whole of the doings of the company in this matter were illegal, the jurisdiction of the court could not be defeated; the statute required the road to abide absolutely by its tariff.

The suit was brought under that section of the law which makes a carrier liable to any person injured; but the coal company did not allege specific damage or injury. A year before the passage of the Interstate Commerce Law a bill was passed, in the Senate, making carriers liable to shippers who had been discriminated against, and stipulating that the amount of the liability should be measured by the difference between the high rate charged and the lowest rate charged to others, but this provision did not get into the law, as it was finally passed.

The court finds very few decisions or authorities which treat of the elements and the measure of damages in cases of this kind, and therefore goes into a long discussion to determine the question on general principles. A number of illustrations are set forth by the court, for example:

If plaintiff and one of the favored companies had both shipped coal to the same market on the same day, the rebate on contract coal may have given an advantage which may have prevented the plaintiff from selling, or may have directly caused it expense, or may have diminished or totally destroyed its profits. The plaintiff, under the present statute in any such case being then entitled to recover the full damages sustained;—

But the plaintiff may have sold at the usual profit all or a part of its 40,000 tons at the regular market price, the purchaser, on his own account, paying freight to the point of delivery. In that event not the shipper but the purchaser, who paid the freight, would have been the person injured, if any damage resulted from giving rebates. To say that seller and buyer, shipper and consignee, could both recover would mean that damages had been awarded to two where only one had suffered;—

Or, to take another example—a favored dealer may have shipped 10,000 tons of coal to the open New York market, receiving thereon a rebate of 35 cents a ton, or $3,500. The plaintiff at the same time may have shipped 20,000 tons and sold the same at the regular market price. Under the rule contended for it would then be entitled to 35 cents a ton on 20,000 tons, or $7,000 as damages. Such a verdict, instead of compensating it for losses sustained, would have given to the plaintiff a profit on the carrier's crime in paying a rebate of $3,500 and would have made it an advantage to it instead of an injury for the carrier to violate the law.

It is suggested that the plaintiff should only recover a rebate on 10,000 tons, or on the same weight upon which the carrier had allowed a drawback to the competitor. But, while less drastic, this is still an arbitrary measure and ignores the fact that the same anomalous result would follow if there had been, say, ten dealers, each shipping 10,000 tons on the same day. For each of the ten would have been as much entitled as plaintiff to recover $3,500 on their several shipments of 10,000 tons, and the ten verdicts would aggregate $35,000, because of the payment of $3,500 to the favored shipper.

It was further claimed that an injured shipper could recover if rebate had been habitually given, so as to establish a practice of discrimination. But, says the court, there would still be no adequate proof of the extent of damage; and to adopt the arbitrary basis proposed would create an endless chain of departures from the tariff and would extend the effect of the original crime. The law makes the lawbreaker pay a fine to the government, but this does not give a right of action for a private injury. Three decisions in somewhat similar cases are cited in support of the view that the right to recover is limited to the pecuniary loss suffered and proved. A new trial is ordered.

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REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses					Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Trans-portation.	General.	Total.				
Arizona Eastern	366	$175,998	$43,915	$231,422	$48,050	$21,788	2,513	57,065	7,078	137,494	93,929	—105	11,800	82,024	14,269
Central New England	227	275,344	35,983	327,099	52,220	33,515	1,144	80,765	4,641	172,309	154,790	—896	10,000	143,894	720
Cincinnati, Hamilton & Dayton	1,015	366,114	99,069	553,798	82,772	148,069	7,730	303,684	20,015	572,258	—18,460	.....	54,712	—73,172	—182,346
Fort Worth & Denver City	454	247,007	109,092	376,827	56,402	88,164	7,176	168,483	13,340	333,565	43,312	—591	9,087	33,634	—29,381
Illinois Central	4,763	2,906,847	944,353	4,513,974	845,248	1,051,382	103,123	1,939,613	130,494	4,069,860	444,114	1,650	245,750	196,714	50,932
Lehigh Valley	1,452	3,046,297	576,106	3,530,768	413,071	699,704	80,057	1,143,355	69,270	2,405,457	1,125,311	—50,882	118,500	955,929	904,117
New Orleans & North Eastern	196	227,494	46,198	296,430	34,332	67,005	9,765	111,473	12,170	234,945	61,485	—1,167	11,450	48,868	—17,340
New York, New Haven & Hartford	2,091	2,958,581	2,198,916	5,703,842	773,814	906,540	51,032	2,457,179	163,530	4,352,095	1,349,747	—18,353	315,000	1,016,394	—636,423
Ohio Ry. & Land Co	101	67,008	23,448	96,600	8,658	8,226	535	25,190	5,272	47,881	48,719	—1,998	6,500	40,237	56,624
Oregon-Washington Railroad & Nav. Co.	1,914	898,386	301,499	1,391,771	212,474	153,202	46,040	524,141	51,825	987,682	404,089	—7,538	96,674	299,877	—28,967
Pecos & Northern Texas	482	$152,830	$36,129	$199,679	$26,113	$41,991	$3,694	$70,238	$8,856	$150,892	$48,787	.....	$6,324	$42,463	—$13,942
Peoria & Eastern	351	140,089	47,313	204,308	96,932	25,812	4,726	111,041	6,207	296,519	—91,931	.....	10,400	—102,331	—130,414
Philadelphia & Reading	1,015	3,417,375	527,336	4,174,078	414,629	796,905	38,423	1,348,266	66,371	2,664,593	—1,509,485	$571	86,371	1,423,685	816,222
Pittsburgh & Lake Erie	223	1,141,619	135,363	1,674,911	176,027	285,422	9,647	597,373	30,898	896,412	775,494	—1,451	55,200	718,843	347,393
Pittsburgh, Shawmut & Northern	279	162,710	8,594	173,746	37,681	40,998	1,310	57,874	5,464	143,327	30,419	.....	1,615	28,804	31,621
Port Reading	21	134,576	.....	142,532	12,584	7	30	33,627	92	46,340	96,192	9,750	8,000	97,942	62,406
Richmond, Fredericksburg & Potomac	88	161,435	102,708	296,140	31,550	26,319	3,355	95,805	7,213	164,042	132,098	—851	721	130,526	48,310
St. Louis & San Francisco	4,742	2,340,321	721,608	3,302,346	381,841	511,275	79,334	1,267,852	103,178	2,343,480	958,866	.....	163,200	795,666	181,511
St. Louis, Brownsville & Mexico	518	199,856	75,159	290,723	15,874	15,342	5,725	109,207	9,973	182,120	108,603	.....	5,180	96,102	—19,280
St. Louis Merchants' Bridge Terminal	9	.....	396	154,963	32,969	15,412	781	82,678	5,755	137,595	17,368	.....	5,600	11,768	7,474
St. Louis, San Francisco & Texas	244	87,975	22,581	118,546	18,589	18,359	2,730	82,613	5,537	127,828	—9,282	.....	1,225	—10,507	—31,765
St. Louis Southwestern	906	492,215	99,472	654,993	64,910	107,582	26,571	172,769	25,156	397,188	257,805	—1,036	37,691	219,168	119,701
St. Louis Southwestern of Texas	703	214,574	68,869	311,782	95,901	74,436	11,759	151,825	20,190	354,111	—42,329	—263	—19,221	—23,871	30,144
San Pedro, Los Angeles & Salt Lake	1,135	960,851	269,980	1,830,874	97,452	167,179	22,647	391,892	29,102	707,485	1,123,389	—718	72,708	1,049,963	1,466
Southern	7,037	3,861,151	1,334,515	5,657,681	787,871	930,622	189,724	2,037,744	172,323	4,118,284	1,539,397	12,255	209,028	1,342,614	—144,703
Southern in Mississippi	281	38,773	24,744	70,053	23,546	8,666	1,988	43,116	3,866	81,182	—11,129	.....	8,191	—19,320	4,638
Southern Kansas of Texas	125	121,724	16,270	143,342	8,191	14,370	2,242	41,800	3,673	90,276	53,066	.....	2,328	50,738	—14,436
Southern Pacific Co.	6,329	4,310,709	2,589,696	7,346,528	811,695	1,057,177	170,048	2,163,061	244,976	4,448,957	2,899,571	88,464	349,561	2,638,472	—145,881
Spokane, Portland & Seattle	556	253,057	128,782	408,461	69,678	44,118	8,460	103,000	12,415	237,671	170,790	—172	53,400	117,218	17,307
Terminal R. R. Ass'n of St. Louis	34	.....	294	229,163	33,423	26,009	1,006	83,659	5,143	149,240	79,923	6,867	25,560	61,230	39,411
Texas & New Orleans	458	241,392	100,906	364,129	102,119	52,469	8,469	149,608	12,463	325,128	39,001	2,318	13,137	28,182	4,530
Texas & Pacific	1,885	952,108	298,791	1,333,765	192,380	234,121	34,205	693,360	43,978	1,198,044	135,741	121	48,000	87,862	55,104
Toledo & Ohio Central	443	345,424	44,359	391,554	61,018	84,372	8,013	149,053	8,936	311,995	79,559	—478	21,604	57,477	113,109
Trinity & Brazos Valley	463	118,749	36,176	164,340	57,383	44,251	9,582	103,774	11,781	226,771	—62,431	.....	3,500	—65,931	—59,930
Ulster & Delaware	129	76,214	17,438	97,463	9,438	14,259	1,716	36,007	2,595	64,015	33,448	36	1,300	30,184	18,260
Virginia & Southwestern	240	144,151	12,641	160,392	24,801	36,967	1,933	43,285	3,751	110,737	49,655	.....	7,332	42,423	1,305
Wabash	2,515	1,730,785	522,190	2,483,489	365,958	386,778	76,702	1,081,836	75,353	1,986,607	496,882	—4,417	77,384	415,081	532,490
Washington Southern	36	44,393	5,026	127,921	15,202	16,319	1,130	46,175	2,973	82,199	45,722	—124	1,340	42,258	10,560
Western Maryland	541	532,229	71,585	630,252	85,923	87,376	14,830	267,752	15,010	470,891	159,361	.....	20,000	139,361	—47,579
Western Pacific	907	267,542	119,326	516,996	80,304	42,496	33,277	195,481	26,983	382,631	134,365	.....	25,000	109,631	—19,509
Western Ry. of Alabama	133	57,792	38,906	106,301	22,239	23,269	5,780	36,175	5,748	93,211	13,090	—42	4,928	8,120	—2,179
Wheeling & Lake Erie	458	312,022	38,100	379,728	167,439	176,647	10,389	193,230	17,228	514,933	—135,204	3,973	27,063	—158,294	—147,520

TEN MONTHS OF FISCAL YEAR, 1913.

Arizona Eastern	366	$1,719,948	$385,301	$2,222,973	$271,193	$174,742	$25,998	$561,352	$85,004	$1,119,009	$1,103,964	$862	$92,343	$1,012,483	$342,923
Central New England	227	2,654,286	299,398	3,104,781	427,590	289,444	11,966	854,978	35,874	1,619,752	1,485,029	—4,680	100,000	1,380,349	11,368
Cincinnati, Hamilton & Dayton	1,015	6,103,577	1,328,149	8,300,954	1,025,115	1,538,381	193,708	3,605,838	194,038	6,555,080	1,745,874	.....	354,950	1,390,924	—340,252
Fort Worth & Denver City	454	2,096,414	1,135,509	4,551,600	479,124	819,181	68,350	1,464,760	146,180	3,113,995	1,437,605	—6,175	106,870	1,324,983	—2,097
Illinois Central	4,763	35,128,363	11,331,213	53,347,611	7,225,286	11,466,258	1,115,788	20,857,496	1,263,687	41,928,515	11,419,096	—64,927	2,401,500	8,952,669	3,102,471
Lehigh Valley	1,452	30,307,580	3,991,006	35,504,676	4,210,911	6,093,339	796,303	11,621,995	697,048	23,919,596	11,585,080	—188,737	1,179,000	10,217,353	1,807,980
New Orleans & North Eastern	196	2,309,303	538,913	3,085,110	330,789	602,152	98,181	1,201,134	122,448	2,354,904	730,206	—3,491	123,531	603,184	—154,838
New York, New Haven & Hartford	2,091	28,778,295	23,181,813	57,457,545	6,460,244	7,866,833	505,037	23,107,284	1,614,972	39,384,240	18,073,305	696,145	3,210,000	15,559,450	—1,304,419
Ohio Ry. & Land Co	101	677,343	228,935	971,894	88,119	64,878	5,965	216,059	46,328	421,349	550,545	7,968	62,016	496,437	1,527
Oregon-Washington Railroad & Nav. Co.	1,914	10,005,913	4,213,366	15,234,928	2,049,826	1,659,990	457,304	5,547,478	490,605	10,205,203	5,029,725	—45,265	960,113	4,024,347	394,929
St. Louis, Brownsville & Mexico	518	1,512,290	767,481	2,442,096	377,251	247,122	47,812	1,133,341	95,027	1,900,553	541,543	.....	57,447	484,096	—105,703
St. Louis Southwestern of Texas	703	2,839,187	943,212	4,054,143	829,640	785,298	133,950	1,647,089	198,464	3,594,441	459,702	—2,035	108,620	349,047	—21,785
Ulster & Delaware	129	557,989	307,065	930,700	118,421	131,314	12,997	391,284	26,063	680,039	250,661	646	13,000	238,307	13,086
Wheeling & Lake Erie	459	5,441,518	523,464	6,325,104	953,079	1,292,606	83,702	2,126,708	174,033	4,630,128	1,694,976	26,969	298,335	1,423,610	—320,707

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Railway Officers.

Executive, Financial and Legal Officers.

E. W. Beatty, general solicitor of the Canadian Pacific at Montreal, Que., will succeed A. R. Creelman as general counsel on July 1.

Alexander Robertson, whose appointment as assistant to the president of the Missouri Pacific System, with headquarters at St. Louis, Mo., has already been announced in these columns, was born at Albany, N. Y., in 1860, and began railway work in 1885 with the Fitchburg Railroad. He remained with that road until April, 1897, successively as brakeman, conductor, general yardmaster, station master and trainmaster. In November of that year he went to the Wabash, and until August, 1903, was consecutively general yardmaster, trainmaster and superintendent of the Middle division. He then became manager of operations of the Western Maryland and West Virginia Central and Pittsburgh, resigning in January, 1904, to become general manager of the Terminal Railroad Association of St. Louis. In November of the following year Mr. Robertson returned to the Western Maryland and West Virginia Central & Pittsburgh as general manager. In April, 1907, he was made vice-president and general manager of the Western Maryland, which absorbed the West Virginia Central & Pittsburgh, and in May, 1911, he was chosen president of that road, resigning January 1 of this year. His appointment as assistant to the president of the Missouri Pacific, as above noted, took effect June 9.

A. Robertson.

Charles R. Thompson, of the Missouri Pacific, has been appointed assistant to the first vice-president of the Texas & Pacific, with headquarters at New Orleans, La.

It is understood that E. N. Brown, president of the National Railways of Mexico, has tendered his resignation. The board of directors have not as yet taken action on this resignation.

Operating Officers.

John McCraw, acting superintendent of the Central Vermont at New London, Conn., has been appointed superintendent of the Southern division, with office at New London.

W. P. Berger, chief train despatcher of the San Antonio & Aransas Pass, has been appointed assistant superintendent, with headquarters at Yoakum, Tex., succeeding H. E. Jones, resigned.

B. B. Tolson, trainmaster of the Mobile & Ohio at Jackson, Tenn., has been appointed superintendent of the St. Louis division, with headquarters at Murphysboro, Ill., succeeding E. W. Moore, deceased.

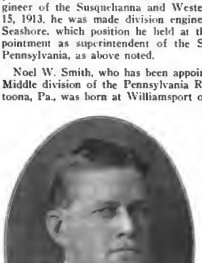
S. A. Morrison, trainmaster of the Chicago & North Western at Chicago, has been appointed superintendent of the Wisconsin division, with headquarters at Chicago, succeeding F. O'Brien, who has been appointed superintendent of the St. Louis, Peoria & Northwestern. L. M. Davis, chief train despatcher, succeeds Mr. Morrison.

G. H. Trenary, division superintendent of the Chicago & Alton at Salem, Ill., has been appointed superintendent of the Chicago division, with headquarters at Danville, Ill., in place of E. N. Brown, resigned. J. O. Bell, superintendent of the Evansville division at Evansville, Ind., succeeds Mr. Trenary as superintendent of the Illinois division. E. R. Glidden succeeds Mr. Bell. J. E. Epler, acting assistant to the general manager, has been appointed assistant to the general manager in charge of maintenance of equipment, with headquarters at Chicago.

George R. Sinnickson, who has been appointed superintendent of the Schuylkill division of the Pennsylvania Railroad, with office at Reading, Pa., was born on December 24, 1874, in Philadelphia, and graduated from Princeton University in the class of 1896. He entered the service of the Pennsylvania Railroad in 1897, as a chainman on the Delaware & Raritan Canal, and later was made rodman. In September, 1897, he was transferred in the same capacity to the Philadelphia & Erie and the Northern Central, and the following year became rodman on the Delaware & Raritan Canal. He returned to the Philadelphia & Erie in April, 1899, and the following month was made rodman on the Sunbury division. In 1900 he was appointed assistant supervisor on the Amboy division, and the following year was transferred to the New York division in the same capacity, becoming supervisor on the Tyrone division in March, 1903, and the following year he went to the Monongahela division. He also served as supervisor on the West Jersey & Seashore and the Philadelphia division, and in March, 1911, he was appointed division engineer of the Susquehanna and Western division. On January 15, 1913, he was made division engineer of the West Jersey & Seashore, which position he held at the time of his recent appointment as superintendent of the Schuylkill division of the Pennsylvania, as above noted.

G. R. Sinnickson.

Noel W. Smith, who has been appointed superintendent of the Middle division of the Pennsylvania Railroad, with office at Altoona, Pa., was born at Williamsport on December 25, 1869, and was educated in the public schools of his native town. He entered the service of the Pennsylvania as a student in telegraphy at Williamsport, and then until September, 1889, was clerk in the division freight agent's office at the same place. He left railway work in 1889, to enter Lehigh University, and after graduation from that university returned to the service of the Pennsylvania as a rodman on the Sunbury division in April, 1893. He was subsequently assistant supervisor on the Baltimore division of the Northern Central; Renovo and Williamsport divisions of the Philadelphia, Baltimore & Washington, and engaged on experimental track work for the chief engineer of maintenance of way at Harrisburg. In January, 1900, he was promoted to supervisor at Williamsport, and was then transferred in the same capacity, first to Middletown and then to Harrisburg on the Philadelphia division. In December, 1903, he was made supervisor in the office of the principal assistant engineer at Altoona, and in May of the following year was promoted to assistant to the principal as-



N. W. Smith.

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sistant engineer at Altoona. In April, 1907, he was made division engineer of the Middle division, and on January 15, 1910, was appointed superintendent of the Central division of the P. B. & W., which position he held at the time of his recent appointment as superintendent of the Middle division of the Pennsylvania as above noted.

Traffic Officers.

L. K. Redman has been appointed general agent of the Chicago & Eastern Illinois at Terre Haute, Ind.

A. W. Davis has been appointed industrial commissioner of the Houston & Brazos Valley, with headquarters at Freeport, Tex.

R. P. Buckingham, soliciting agent of the Missouri, Kansas & Texas, at Houston, Tex., has been appointed traveling freight agent, with headquarters at Waco, Tex.

H. A. Fidler, formerly division freight agent of the Detroit, Toledo & Ironton, is now traffic manager of the Big Sandy & Kentucky River Railway, with headquarters at Ashland, Ky.

C. B. Foster, general passenger agent of the Canadian Pacific, at Winnipeg, Man., has been appointed assistant traffic passenger manager of the Eastern Lines with headquarters at Montreal, Que.

W. E. Downing has been appointed general eastern agent of the Illinois Central, with office at New York, to succeed L. F. Klein, resigned to accept service with another company, effective July 1.

Robert Burns has been appointed traveling freight agent of the Sunset-Central lines of the Southern Pacific, with headquarters at Waco, Tex., succeeding C. W. Higgins, resigned to go to the Southern Pacific Steamship Lines at Galveston, Tex.

J. T. Burke, traveling freight agent of the Delaware & Hudson, with headquarters at Buffalo, N. Y., has been appointed traveling freight agent, with office at New York, succeeding T. J. Lynch, promoted. H. J. Sheffer, general southern freight agent at Philadelphia, Pa., succeeds Mr. Burke, and W. H. Chase succeeds Mr. Sheffer.

Frank H. Plaisted, assistant to the director of traffic of the Southern Pacific, has been appointed assistant director of traffic with headquarters at New York. He was born on June 9, 1866, at Cincinnati, Ohio, and was educated at Central High School, Kansas City, Mo. He began railway work on October 7, 1884, as a clerk on the Kansas City, Fort Scott & Gulf, now a part of the St. Louis & San Francisco. On March 20, 1889, he went to the Union Pacific at Salt Lake City, Utah, and was traveling freight agent of that road for nine years, from 1892; first at Salt Lake City, then at San Francisco, and from April, 1897, when the Oregon Short Line was segregated from the Union Pacific, again at Salt Lake City. From 1902 to October, 1905, he was district freight and passenger agent at Boise, Idaho, of the Oregon Short Line, and then was promoted to assistant general freight agent at Salt Lake City. On January 1, 1912, he was appointed assistant to director of traffic of the Union Pacific and the Southern Pacific systems. In consequence of the order of the Supreme Court, separating the Southern Pacific and the Union Pacific, he resigned on February 6, 1913, as assistant to director of traffic of the Union Pacific, remaining with the Southern Pacific, which position he held at the time of his recent appointment as assistant director of traffic of the same road as above noted.

Engineering and Rolling Stock Officers.

William Stiles has been appointed roadmaster of the Missouri, Kansas & Texas at Atoka, Okla.

William M. Mitchell has been appointed fuel supervisor of the Chicago Great Western, with office at Chicago.

Joseph Smith has been appointed roadmaster of the Second district of the Northern Pacific, with headquarters at Duluth, Minn.

C. J. Rist, formerly division engineer of the Erie at Huntington, Ind., has been appointed assistant engineer maintenance of way of the Pere Marquette, with office at Detroit, Mich.

F. L. Guy has been appointed division engineer of the Eastern division of the Atchison, Topeka & Santa Fe at Emporia, Kan., in place of M. C. Blanchard. H. J. Moore has been appointed division engineer of the Oklahoma division at Arkansas City, Kan., to succeed Mr. Guy. O. West has been appointed acting roadmaster of the Western division, with office at Dodge City, Kan., succeeding W. E. Bohl. E. B. Dehart has been appointed roadmaster of the Colorado division, with headquarters at Pueblo, Colo., in place of B. A. West.

Thomas Benjamin Kennedy, who has been appointed engineer of the Cumberland Valley, with headquarters at Chambersburg, Pa., was born on September 22, 1870, at Chambersburg. He graduated from Chambersburg Academy in 1887, and then took an engineering course at Lafayette College, and at Princeton University. He began railway work in October, 1890, as a rodman and instrument man on the Great Northern. He went to the Cumberland Valley in November, 1892, as a clerk in the auditor's office, and later was transferred to the superintendent's office. From February, 1894, to January of the following year he was draughtsman and instrument man in the maintenance of way department of the same road, and then was appointed assistant supervisor. In May, 1903, he was made supervisor of division B, and later was transferred in the same capacity to division A. He was appointed freight trainmaster in November, 1906, and two years later was made general trainmaster. In July, 1911, he was appointed assistant to engineer in the maintenance of way department, which position he held at the time of his recent appointment as engineer of the same road as above noted.

Arthur Besore Clark, who has been appointed assistant engineer of maintenance of way of the Pennsylvania Railroad, in charge of roadway and track, with office at Philadelphia, Pa., was born at Green Village, on October 1, 1867. He was educated at Mercersburg College, and in 1891, graduated from Lafayette College, with the degree of C.E. During his summer vacations in 1889 and 1890, he was a rodman on the Pennsylvania. After graduation he was rodman on the Philadelphia division, at Philadelphia, and in July, 1896, was promoted to assistant supervisor on the Altoona division, and later held the same position on the Pittsburgh division. In July, 1900, he became supervisor on the Baltimore division, Northern Central Railway, and one year later

A. B. Clark.

was transferred to the Pittsburgh division, at Pittsburgh. He was made assistant engineer of the Middle and Western division, Philadelphia & Erie, on December 15, 1905, and was subsequently transferred in the same capacity to the West Jersey & Seashore, and later to the Maryland division of the Philadelphia, Baltimore & Washington. On January 15, 1910, he was appointed principal assistant engineer of the same road, with office at Wilmington, Del., which position he held at the time of his recent appointment as assistant engineer of maintenance of way of the Pennsylvania, as above noted.

The following supervisors on the Pennsylvania Railroad have been transferred: W. T. Hanly from the Pittsburgh division to the Middle division at Newport, Pa.; H. C. Bolenius from the Maryland division to the Pittsburgh division at Conemaugh; Robert Faries from the Trenton division to the Maryland division of the P. B. & W. at Washington, D. C.; E. O. Wood from the Sunbury division to the Trenton division at Trenton, N. J.; J. O. Hackenburg from the Baltimore division to the Pittsburgh division at East Liberty, Pa.; John Atlee from the Buffalo division to the Baltimore division of the P. B. & W. at Parkton, Md.; R. R. Nace from the Cresson division to the Buffalo division at Buffalo, N. Y.; M. W. Clement, su-

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pervisor in the office of assistant to the general manager, to the Manhattan division at New York City; B. O. Hultgren, supervisor on the Monongahela division, to the office of assistant to the general manager at Broad Street Station, Philadelphia; M. de K. Smith, Jr., from the Bedford division to the Monongahela division at West Brownsville Junction, Pa.; J. C. Smith, from the Central division to the Bedford division at Bedford, Pa., and Fredrick Evans, assistant supervisor on the Middle division, has been appointed supervisor on the Sunbury division of the Northern Central, at Sunbury, Pa.; F. D. Davis, assistant supervisor on the New York division, has been appointed supervisor on the Cresson division at Barnesboro, Pa.; E. C. Silvius, assistant supervisor of the Pittsburgh division, has been appointed supervisor on the Central division of the P. B. & W. at Media, Pa. The following assistant supervisors have also been transferred: E. C. Smith from the Conemaugh division to the Middle division at Huntingdon, Pa.; J. H. Cooper from the Tyrone division to the Conemaugh division at Blairsville; N. D. Vernon from the Maryland division of the P. B. & W. to the New York division at Jersey City, N. J.; J. D. Archibald from the Baltimore division to the Maryland division of the P. B. & W. at Chester, Pa.; W. T. Bevan, from the Monongahela division to the Baltimore division of the P. B. & W. at Baltimore, Md.; E. L. Koch from the Conemaugh division to the Pittsburgh division at East Liberty, Pa.; R. L. Kell from the West Jersey & Seashore to the Conemaugh division at Freeport, and the following transitmen in the office of the engineer maintenance of way, have been appointed assistant supervisors: G. L. Hoffman, of the Monongahela division at Dravosburg, Pa.; C. W. Leach, of the West Jersey & Seashore, at Millville, N. J., and W. G. McNees, of the Tyrone division, at Tyrone, Pa.

John H. Tinker, acting superintendent of motive power of the Chicago & Eastern Illinois, at Danville, Ill., has been appointed superintendent of motive power and machinery, with headquarters at Danville. He was born in August, 1864, at Altoona, Pa., and received a high school education at Altoona and began railway work in July, 1881, as machinist apprentice with the Pennsylvania Railroad. He was made vise shop foreman of the Meadows shops in June, 1896, and in December of the following year was appointed roundhouse foreman at Jersey City, N. J. He again returned to the Meadows shops in December, 1898, as erecting shop foreman, and in January, 1900, was promoted to master mechanic at South Amboy, N. J. He resigned the latter position in November, 1902, to go to the Baltimore & Ohio as master mechanic of the Chicago division, leaving in November, 1903, to become connected with the Model Gas Engine Works as machine foreman. In May, 1904, Mr. Tinker went to the Illinois Central as general foreman at Mounds, Ill., and in May, 1906, left that road to accept the position of assistant master mechanic of the Louisville & Nashville at South Louisville, Ky. Four months later he returned to the Illinois Central as master mechanic at Danville, Ill., and on February 1 of this year he was appointed acting superintendent of motive power. He now becomes superintendent of motive power and machinery, as above noted.

J. H. Tinker.

Purchasing Officers.

J. H. Beggs, maintenance equipment accountant of the Chicago & Eastern Illinois, has been appointed purchasing agent, with headquarters at Chicago, succeeding T. J. Powell.

OBITUARY.

E. W. Moore, superintendent of the St. Louis division of the Mobile & Ohio, with headquarters at Murphysboro, Ill., died in the latter city on June 17. Mr. Moore was born in 1862 at Keokuk, Iowa, and began railway work in 1877 as brakeman on the Keokuk & Des Moines Valley. He was subsequently until October, 1890, brakeman and conductor on the Cairo & St. Louis and the Mobile & Ohio. From the latter date to August, 1902, he was trainmaster of the St. Louis division of the Mobile & Ohio, and was then made superintendent of that division.

Edwin Tracy Jones, auditor of revenue of the Southern Railway, with headquarters at Washington, D. C., died in the Garfield hospital in that city on June 16. He was born at Decatur, Ala., and was educated in the public schools of his native town. He began railway work at the age of 16, as a messenger on the Memphis & Charleston, now a part of the Southern, and then to 1885 held various clerical positions, including that of ticket agent. In 1885 he was in the local office of the same road at Memphis, Tenn., and subsequently was chief clerk and cashier of the Chesapeake & Ohio Southwestern at Memphis, returning to the service of the Memphis & Charleston in 1888, as assistant agent at Decatur, Ala. The following year he entered the auditor's office of the same road at Memphis, and then to 1895 was consecutively cashier of the Louisville, New Orleans & Texas, now a part of the Yazoo & Mississippi Valley, and agent of the Tennessee Midland, now a part of the Nashville, Chattanooga & St. Louis, at Memphis. From 1895 to 1898, he was with the Mallory Steamship Company at Galveston, Tex., and in October of the latter year, was made a clerk in the freight auditor's office of the Southern Railway. In June, 1901, he was appointed auditor of freight accounts, and since July, 1904, was auditor of revenue of the same road. Mr. Jones was in good part responsible for the unusually efficient organization of the Southern Railway auditor of revenue's office.

PROPOSE CHINESE LINE.—It is understood that a party of engineers, Chinese and foreign, left Shanghai recently with northern Kiangsu as their objective. The visit is in connection with the projected railway from Hsuchowfu to Tsingkiangpu, and it is reported that their intention is to make the necessary purchases of land for the line if this can be done.

RAILWAY CONSTRUCTION IN INDIA.—The Southern Shan States Railway is now open for traffic as far as Kywedatson, about 16 miles from Thazi. It will be open before long to Yinmabin, 22 miles; and it is hoped to get up to Kala by next year. Were the line pushed on to Kentung and the Chinese frontier it would mean another 300 miles beyond Taunggy; and the cost would be very heavy. A line, however, continued right through the Southern Shan States would open up a wonderfully rich country.

BAGGAGE SUBWAYS IN PARIS.—There has recently been provided at the Gare du Nord in Paris, France, a subway to facilitate the transfer of baggage from cabs to departing trains. The barrows with baggage descend by seven elevators placed near the ticket offices, baggage registration bureaus and weighing machines, to a subway which passes under five tracks. The empty barrows are brought up by separate elevators, four in number, in the booking hall. The 15 elevators are worked by electricity and are capable of lifting a load of 2,000 lbs., including the weight of the barrow, a distance of 1 ft. 6 in. per second.

PEKIN-KALGAN LINE, CHINA.—The Pekin-Kalgan Railway continues to prove its value to the Chinese government as a profit-earning medium. It is the pioneer of railways built with Chinese capital and operated by Chinese engineers and that its business continues to increase, considering the heavy grades and great cost of negotiating the Nankou Pass, speaks volumes for the capacity of those who are in control. The unusually high gradients not only compel a heavy fuel consumption but also demand good train crews. The total distance now covered by the line is 141 miles. It was originally built more with a view of its strategic value than with the idea of developing commerce, but its effectiveness in opening up the rich grain producing areas of the table-land has surprised even the most sanguine of its original advocates.

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Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE GULF, TEXAS & WESTERN has ordered 1 ten-wheel locomotive from the Baldwin Locomotive Works.

THE BIRMINGHAM & SOUTHWESTERN has ordered 1 ten-wheel locomotive from the Baldwin Locomotive Works.

THE NEW YORK CENTRAL LINES have ordered 1 Mallet locomotive from the American Locomotive Company.

THE HASLAM LAKE TIMBER & LOGGING COMPANY has ordered one locomotive from the Baldwin Locomotive Works.

THE DETROIT & TOLEDO SHORE LINE has ordered 3 consolidation locomotives from the Baldwin Locomotive Works.

THE BOSTON & ALBANY has ordered 6 Pacific type locomotives and 14 mikado locomotives from the American Locomotive Company.

CAR BUILDING.

THE GRAND RAPIDS & INDIANA is in the market for 85 flat cars and 60 gondola cars.

THE SOUTHERN RAILWAY has ordered 250 hopper cars from the Pressed Steel Car Company.

THE ATLANTIC COAST LINE has ordered 100 flat cars from the American Car & Foundry Company.

THE GREAT NORTHERN is said to have ordered 1,000 coal cars from the American Car & Foundry Company. This item has not been confirmed.

IRON AND STEEL.

GENERAL CONDITIONS IN STEEL.—A large number of consumers are holding back orders in the belief that prices will be reduced in the near future. It is not probable, however, that there will be any general reduction in prices for several months, as the mills are in a strong position with a large number of orders on their books. If there is any price cutting it will most likely be on the part of the smaller independent companies. The mills are operating at full capacity and it is expected that the ingot production this month will establish a new high record. A reduction in the output of pig iron is looked for and this will be followed by a shrinkage in the production of steel later on. Many producers feel that the productions of steel in the last half of the year will show a shrinkage, compared with the first half.

A RAILWAY IN ICELAND.—The Consul-General at Copenhagen reports that a railway six and one-half miles long is to be built around the harbor of Reikiavik, Iceland, the first railroad in that country.

AUSTRALIAN RAILWAY PROPOSALS.—A short time ago the Queensland Premier said he had not heard anything definite as to the proposal to link up New South Wales and Queensland railways, via Kyogle and Beaudesert, but there had been some talk of establishing connection between Kyogle and Killarney, via Acacia Creek. The government did not intend to consider any railway proposals this year, but when some of the railway problems now in hand were disposed of, it would be time enough to deal with interstate linking up.

RAILWAYS IN SUMATRA.—The Dutch Indies government now has in Sumatra a line known as the West Coast of Sumatra Railway, which is 152 miles in length, of 3 ft. 6 in. gage, and equipped with 65 locomotives, 74 passenger coaches, and 634 freight cars. This line serves only a very small portion of the west coast of the island, connecting the port of Padang with Fort de Kock, and having three short branches. The only other existing railway in Sumatra is the Deli Railway, a private line on the northeast coast in the rich tobacco-growing district of Deli. This railway radiates in several directions from the capital city of Medan, and comprises about 80 miles of 3 ft. 6 in. gage.

Supply Trade News.

The Isthmian Canal Commission will, until July 9, receive bids on miscellaneous supplies, including switch stands, tie plates, track bolts, track spikes, valves, etc. Circular No. 781.

Judge Sneidiker, on June 23, appointed Charles L. Harrison receiver and H. M. Estabrook co-receiver for the Barney & Smith Car Company, Dayton, Ohio. Mr. Estabrook is president of the company. The receivers were appointed on the application of Joseph Brothers & Co., Cincinnati, Ohio, creditors to the extent of $11,139. E. F. Platt, a stockholder of the Barney & Smith company gave out a statement that the company was perfectly solvent and that the trouble had been caused by the recent floods.

C. A. Coffin has resigned his position as president of the General Electric Company, Schenectady, N. Y., and has been made chairman of the board of directors. Edwin Wilbur Rice, Jr., senior vice-president and a director of the company, has been made president, succeeding Mr. Coffin. Mr. Coffin was one of a group, who, in 1882, bought control of the American Electric Company, New Britain, Conn., which had been founded in 1880 by Professor Elihu Thomson. This company made arc-lighting apparatus under the Thomson-Houston patents. The plant was moved to Lynn, Mass., and the name of the company was changed to the Thomson-Houston Company. The company grew rapidly under the administration of Mr. Coffin. In 1892, the Thomson-Houston Company was consolidated with the Edison General Electric Company under the name of the General Electric Company, with Mr. Coffin as president. It was he who brought about the agreement between the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., and the General Electric Company in regard to the exchange of licenses under their respective patents, by which a long struggle over patents was avoided and large sums of money saved. Mr. Coffin foresaw that a large amount of capital would be necessary for the growth and expansion of electrical undertakings and was largely responsible for the education of investors to a correct appreciation of the value of securities of electrical enterprises. For this reason the present development of electrical public utilities is largely due to the efforts of Mr. Coffin.

E. W. Rice, Jr., who has just been elected president of the General Electric Company, Schenectady, N. Y., as mentioned above, was born at La Crosse, Wis., May 6, 1862. After graduating from the Central High School of Philadelphia Mr. Rice became associated with Professor Thomson as assistant and confidant in the American Electric Company, New Britain. When this company was moved to Lynn in 1882, Mr. Rice went with it. In 1884 he was made superintendent and soon after technical director in charge of manufacturing. Shortly after the organization of the General Electric Company Mr. Rice was promoted to the position of chief engineer of that company. He was made third vice-president in 1896, having charge of the technical and manufacturing departments. In 1903 he was made a director and subsequently became senior vice-president of the company. Over one hundred patents have been issued in his name. Mr. Rice was instrumental in the development of high tension apparatus, the successful transmission of power at extra high voltages, and did much to improve the design of the rotary convertor and the revolving field generator, as well as electric traction equipment. Mr. Rice is a member of the American Institute

E. W. Rice, Jr.

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of Electrical Engineers, the Institution of Civil Engineers, the Institution of Electrical Engineers of Great Britain, and a member of the Engineers' Club of New York. After the Paris exposition in 1900 he was created Chevalier of the Legion of Honor. In 1903 the degree of A. M. was conferred on him by Harvard University, and in 1906 he was given the degree of D.Sc. by Union College, Schenectady.

The Canadian General Electric Company, Ltd., which owns and controls as subsidiary companies the Canada Foundry Company, Ltd., and the Canadian Allis-Chalmers, has decided to consolidate the selling organizations of the two latter companies, dropping the name Canada Foundry Company, Ltd., and conducting the selling organizations of both companies under the name of Canadian Allis-Chalmers, Ltd. Hereafter all sales of electrical apparatus and supplies will be in the name of the Canada General Electric Company, Ltd., and all general engineering contracts and sales of mechanical appliances in the name of Canadian Allis-Chalmers, Ltd.

John L. Nicholson, who has been southern sales manager of the American Locomotive Equipment Company, has been elected director, vice-president and general sales manager of the Locomotive Arch Brick Company, with headquarters at 1201 Chamber of Commerce building, Chicago. Mr. Nicholson was connected with the Chicago & North Western for 13 years as fireman, engineer and road foreman of engines. He entered the employ of the American Locomotive Equipment Company in 1904, after that company had purchased the Wade-Nicholson Hall Arch, of which he was one of the inventors, and he has had a great deal of experience in the development of the brick arch to its present state of efficiency. When the American Arch Company was formed and took over the business of the American Locomotive Equipment Company, he was appointed southern sales manager, which position he held to May 1, this year.

TRADE PUBLICATIONS.

Trap Doors and Fixtures.—The O. M. Edwards Company, Syracuse, N. Y., has published catalog H, giving illustrations and descriptions of its various types of steel trap doors and fixtures for cars.

Pneumatic Tools.—The Chicago Pneumatic Tool Company, Chicago, has issued bulletin No. 127, describing its pneumatic drills, reamers, wood borers, flue rolling and packing machines, and grinders.

Fountain Drawing Pens.—The Keuffel & Esser Company, New York, has published an illustrated leaflet describing the Smith fountain drawing pen, which has just been patented and put upon the market.

Air Brake Hose.—The Sprague Electric Works of General Electric Company, New York, has published an illustrated booklet on its Sprague steel armored air brake hose. The illustrations show this hose fitted to cars.

Terminal Facilities.—The Bush Terminal Company, New York, has published an illustrated booklet entitled How to Reduce Overhead Expense, pointing out the advantages to be derived from the use of its terminal facilities.

Industrial Lighting.—The Cooper Hewitt Electric Company, Hoboken, N. J., has published an illustrated booklet entitled Industrial Lighting. This booklet deals with the theory and practice of the artificial illumination of factories, shops and works.

Locomotive Cranes.—The Brown Hoisting Machinery Company, Cleveland, Ohio, has published catalog No. 1 of Brownhoist locomotive cranes. The catalog is devoted largely to excellent photographs of these cranes in action but contains also some interesting descriptive matter.

Blue Printing Machinery.—The C. F. Pease Company, Chicago, has issued an illustrated catalogue entitled "Everything for Blue Printing," which describes and illustrates all its latest and most improved automatic machinery for blue-printing work and various accessories used for this work.

Lubricators.—The Detroit Lubricator Company, Detroit, Mich., has published catalog No. 36L, of the Detroit bullseye locomotive lubricators and locomotive specialties. The bulletin includes dimension tables and valuable information on the care and cleaning of the lubricators.

Steam Couplers.—The Gold Car Heating & Lighting Company, New York, has published an illustrated folder, pointing out the advantages of Gold's Wedge Lock steam coupler, and a comparative diagram on a separate sheet, showing the action of the Gold steam couplers' oscillating gasket and the non-oscillating, soft gasket.

Locomotives.—The Baldwin Locomotive Works has issued in pamphlet form an illustrated article on the "Recent Development of the Locomotive," by George R. Henderson, consulting engineer of the Baldwin Locomotive Works, reprinted from the Journal of the Franklin Institute; also an attractive illustrated booklet on gasolene industrial locomotives.

Mikado Locomotives.—The American Locomotive Company, New York, has devoted bulletin No. 1013 to its mikado locomotives, which are designed to combine increased train loads, sustained high speeds, and a high degree of economy in fuel consumption. The bulletin gives a table, showing the results of comparative service tests of mikado and consolidation locomotives, and another table showing the principal dimensions and specifications of mikado locomotives built and building by the company. Illustrations of 16 different mikado locomotives are also shown, together with train tonnage figures for each at different speeds and on different grades.

Swiss Railway Employees.—There are employed on Swiss railways 42,000 persons, 35,200 of whom are with the state lines and 6,800 on private roads. This does not include tramways or funiculars, the majority of which are owned by municipalities or Cantons.

High Price of Oil Fuel in Austria.—It is only a very short time ago that, at the instance of the petroleum producers of Galicia, the Austrian authorities agreed to have the locomotives on a considerable mileage equipped to burn oil. Now the price of oil has gone up so much that the Austrian government is preparing to change back to coal again on part of these engines.

Rosario-Mendoza Line, Argentina.—The financing of the first 175 miles of the line from Rosario to Mendoza has been arranged by the original holders of the concession with the Banco Frances del Rio de la Plata. The bank will issue stock and bonds to cover an estimated expenditure of $3,000,000. The cost of the entire line is calculated at about $25,000,000. The national congress has approved the construction of numerous branches from the line authorized by the original concession.

Electric Railway Construction in Switzerland.—Electric railway building has been active during the past few years, this being particularly noticeable in the Lugano district. The lines completed and put into operation in the Canton of Tessin within the past twelve months are: Locarno-Bignasco, 17 miles; Bellinzona-Mesocco, 16 miles; Biasca-Acquarossa, 9 miles; Capolago-Chiasso, 8 miles; Lugano-Ponte Tresa, 8 miles; Lugano-Tesserete, 5 miles; Lugano-Cardo-Dino, 5 miles.

New Railways for Sumatra.—In 1908 the surveys were made for two railway systems to be built by the Dutch Indies government, which together would extend from Telok Betoeng, at the extreme southern end of Sumatra, through the very middle of the island to Medan. These surveys have since been approved, and money allotted by the government to begin the work. Although these railways will actually form one continuous line, they are nominally divided, for construction purposes into two distinct systems, as follows: The South Sumatra Railway, extending from Telok Betoeng to Petanang, with a branch to Palembang, near the east coast; and another branch to Benkoelen, on the southwest coast. This system, with branches, will total 840 miles. It is to be of 3 ft. 6 in. gage, and the estimated cost of construction is $43,200,000, to be extended over a period of 21 years. In other words, about 40 miles will be built, and $2,050,000 expended each year on this system alone. The Middle Sumatra Railway will extend northward from Petanang, the north end of the South Sumatra system, to Medan.

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Railway Construction.

ASHLEY, DREW & NORTHERN.—Regular service is now in operation between Crossett, Ark., and Ladelle, 33 miles, and between Ladelle and Monticello, 10 miles, there is irregular train service. The plans call for building from Crossett, north via Whitlow, Fountain Hill and Monticello to Gillett, about 90 miles. (November 15, p. 936.)

CENTRAL OF MARYLAND.—This company has been granted permission to build from Keymar, Md., east to Union Bridge, about 10 miles. B. T. Scott, president. W. J. O'Brien, Jr., Calvert building, Baltimore, and C. R. Foutz, Westminster, are interested.

CHESAPEAKE & OHIO.—The Coal River district of the Huntington division has been extended from Helen, W. Va., to Sovereign, 5 miles.

CHICAGO, MILWAUKEE & ST. PAUL.—A new branch has been opened for business on the Columbia division, known as the Moses Lake line, from Tiflis, Wash., west to Neppel, 15 miles. On the Puget Sound lines the Beverly-Ilanford extension has been opened for business, and the Montesano line has been opened for freight traffic from South Montesano to Montesano.

CHICAGO & NORTH WESTERN.—An officer writes that a contract has been given to Winston Brothers Company, Minneapolis, Minn., for the grading and bridge work on an eight-mile coal spur from Benld, Ill., south to Staunton, thence southwesterly into Madison county. The work is now under way.

COLORADO & SOUTHERN.—The former Denver & Eastonville line of the Northern division has been extended from Eastonville, Colo., to Falcon, 10 miles.

DALLAS, FAIRFIELD & GULF.—Incorporated in Texas with $105,000 capital and headquarters at Fairfield, to build from F[illegible]as southeast via Ferris and Fairfield to Jewett, about 110 [illegible]. The incorporators include: W. F. Storey, Fairfield; T. F[illegible]x-ander, Teague; W. J. Hall, Corsicana, and J. W. Wright[illegible]ris.

DELAWARE, LACKAWANNA & WESTERN.—A contract [illegible] been given to C. W. Reynolds, New York, for double-track [illegible] work on seven miles between Jamesville, N. Y., and Syra[illegible].

DULUTH & IRON RANGE.—The main line has been extended from Ely, Minn., northeast to Winton.

GREAT NORTHERN.—An officer writes regarding the reports that a new line is to be built in British Columbia, that the Great Northern has had negotiations under way for a joint line with the Kettle Valley from Hope, B. C., to Coquihalla Summit, but the negotiations have not been completed, and no contracts have been let for the work.

LEXINGTON & EASTERN.—See Louisville & Nashville.

LOUISVILLE & NASHVILLE.—According to press reports the Lexington & Eastern is locating a 10-mile branch from Mason, Ky., up Mace's creek on the Letcher-Perry border to tap extensive coal and timber lands. It is understood that construction work on the branch will be started at once.

MANSFIELD RAILWAY & TRANSPORTATION.—This company which operates a line from Mansfield, La., southwest to Hunters, 14 miles, is planning to build an extension, it is said, east to Naborton, about 12 miles.

MOTLEY COUNTY.—Incorporated in Texas with $100,000 capital and headquarters at Matador. The plans call for building from a point 3½ miles north of Roaring Springs, on the Quanah, Acme & Pacific, north through the counties of Motley, Hall and Childress, to Memphis, on the Fort Worth & Denver City. The incorporators include J. N. Gaines, J. E. Russell, T. E. Leckie, R. P. Moore and A. C. Traweek, all of Matador.

NATCHEZ, COLUMBIA & MOBILE.—This line has been extended to Tilton, Miss.

NEW YORK SUBWAYS.—The Dock Contractor Company, New York, submitted the lowest bid, $2,578,000, for the construction of section No. 4 of the Broadway-Lexington avenue rapid transit railroad in the borough of Manhattan. This section extends from a point about midway between Houston and Bleecker streets, northeast under Broadway and Union Square to a point about 390 feet north of the southerly building line of Fourteenth street. It will include half of the express station to be built in Union Square and there will also be a local station at Eighth street. The subway is to be a four-track line. The contractor will not be required to lay tracks, ties or ballast, or to do the interior work in stations. (May 29, p. 1205.)

PEORIA, CANTON & GALESBURG (Electric).—An officer writes that contracts will probably be let in July, to build the line from Peoria, Ill., west to Farmington, thence northwest to Galesburg, 52 miles. The line is to have maximum grades of 2 per cent. and 6 deg. curves. There will be one 850 ft. steel bridge, and another of 120 ft., also about 6,000 ft. of trestle work. Horace Clark, president, Peoria, and L. L. Summers & Co., engineers, Chicago. (June 6, p. 1245.)

SAN ANTONIO, UVALDE & GULF.—An officer writes that a grading contract has been given to Ward & Lee, Mathis, Texas, for work on the extension south from Pleasanton, via Mathis, to Corpus Christi. (May 9, p. 1053.)

VANCOUVER ISLAND HYDRO-ELECTRIC & TRAMWAY.—This company it is understood is planning to build an electric railway at Lady Smith, Vancouver Island, B. C., with an interurban extension to Nanaimo via Chemainus, Duncans and Nanoose. Montaque Yates, Victoria, B. C., is interested in the company.

VIRGINIA-CAROLINA.—This company has given a contract to the Callahan Construction Company, Knoxville, Tenn., to build 40 miles of railroad from Abingdon, Va. Arrangements are being made by the contractors to sublet the work. The plans call for building southeast through Ashe county, N. C., to Jefferson, thence southwest to Todd. (May 9, p. 1053.)

RAILWAY STRUCTURES.

CARLETON POINT, PRINCE EDWARD ISLAND.—Bids are wanted by L. K. Jones, assistant deputy minister and secretary, Department of Railways and Canals, at Ottawa, Ont., on July 2, 1913, for a car ferry terminal at Carleton Point.

CHRISTIE, ONT.—See Hornby.

DALLAS, TEX.—Stone & Webster announce the construction in the near future of an interurban terminal station in Dallas. The building will be nine stories high and, with its yard, will occupy an entire city block. The new terminal will cost $2,000,000, and will be used by all of the interurban lines running into Dallas.

FREEPORT, TEX.—The Houston & Brazos Valley Terminal Company has been organized with a capital stock of $300,000 to build railway terminals at Freeport. Directors, C. E. Schaff, president of the Missouri, Kansas & Texas; W. A. Webb, general manager of the Missouri, Kansas & Texas; Felix Jackson, Jas. A. Baker and F. R. Cobb.

HORNBY, ONT.—The Railway Commissioners of Canada have authorized the Canadian Pacific to build bridges on the Ontario division, London sub-division, as follows: One near Hornby; two near Christie, and one over Etobicoke river, near Summerville.

LOCKPORT, N. Y.—The New York Central & Hudson River expects to build in the near future a brick freight house and a team yard at Park avenue, at a cost of between $50,000 and $100,000. The building will be 400 ft. x 40 ft., one story high, except at the eastern end, where a second story for offices will be added.

MUSKOGEE, OKLA.—The Missouri, Oklahoma & Gulf has let a contract to Rooney & Culp for the foundation, and to the Central States Bridge Company for structural work, for its new shops to be built at this point. The main building will be 148 x 200 ft.; the car repair shed 46 x 180 ft.; the carpenter shop 32 x 38 ft.; and the store room 52 x 80 ft.

NONCONNAH, TENN.—It is announced that the Yazoo & Mississippi Valley will at once begin work on construction of two roundhouses in connection with plans that provide for the ultimate construction of car and machine shops at this point.

SUMMERVILLE, ONT.—See Hornby.

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Railway Financial News

ATCHISON, TOPEKA & SANTA FE.—The Kansas railroad commission has approved of the lease of the Dodge City & Cimarron Valley for 10 years, at an annual rental of $120,000. The Dodge City & Cimarron Valley runs from Dodge City, Kan., to Elkhart, Okla. (See Railroad Construction, September 27, 1912, page 599.)

ATLANTIC NORTHERN & SOUTHERN.—A decree of sale of this property has been entered providing for the sale of the north end for $87,000 to J. A. McWaid, representing the bondholders, and of the south end for $98,000 to Ables & Taussig, preferred creditors.

BOSTON & ALBANY.—This company has applied to the New York Public Service Commission, Second district, for permission to issue $2,015,000 bonds.

BUFFALO & SUSQUEHANNA.—The New York Supreme Court has authorized the receiver to issue $500,000 six months' receiver's certificates to provide for the $500,000 5 per cent. receiver's certificates matured June 1. Of these certificates, $105,000 6 per cent. certificates have been sold and £69,000 ($345,000) certificates have been discounted. The remaining $50,000, which may be issued either as sterling certificates or as interest bearing dollar certificates, have not as yet been sold.

CANADIAN PACIFIC.—The company has called for redemption on July 1 the £7,161,500 ($35,807,500) first mortgage 5 per cent. bonds which are due July 1, 1915. The company is to pay £102 ($510) for each £100 ($500) bond.

CHESAPEAKE & OHIO.—See Kanawha & Michigan.

DELAWARE & HUDSON.—This company has applied to the New York Public Service Commission, Second district, for permission to issue $5,000,000 first and refunding mortgage bonds.

EL PASO & SOUTHWESTERN.—The Arizona Corporation Commission has granted permission to the El Paso & Southwestern to consolidate with it the six roads which form the El Paso & Southwestern system.

KANAWHA & MICHIGAN.—The semi-annual dividend of 2½ per cent. and an extra dividend of 1 per cent. have been declared on the $9,000,000 stock, of which $8,054,500 is owned jointly by the Chesapeake & Ohio and the Lake Shore & Michigan Southern. The annual rate in 1912 was 5 per cent., and in June, 1911, the first dividend of 4 per cent. was declared.

KANSAS CITY, MEXICO & ORIENT.—In ruling on the application for a final decree of foreclosure sale, Judge Pollock has held that before this decree can be granted the bankruptcy proceedings of the International Construction Company and the Union Construction Company, which companies built the K. C. M. & O., must be disposed of.

LAKE SHORE & MICHIGAN SOUTHERN.—See Kanawha & Michigan.

LEHIGH VALLEY.—The *Railway* company has applied to the New York Public Service Commission, Second district, for permission to issue $717,000 debenture bonds to the *Railroad* company for improvements.

MOBILE & OHIO.—The plan for the exchange of St. Louis & Cairo collateral 4 per cent. bonds for bonds of a new issue of $3,000,000 Mobile & Ohio St. Louis division 5 per cent. bonds of August 1, 1913, has become effective, a sufficient number of old bonds having been deposited with A. Iselin & Co., New York, and deposits of the remaining bonds are asked for.

NEW YORK CENTRAL & HUDSON RIVER.—The supreme court of New York has upheld the legality of the New York Central Lines equipment trust issue of 1913. The legality of this issue, which had been approved by the New York Public Service Commission and by the Michigan Railroad Commission, was made the subject of a suit by a minority stockholder on the ground that the agreement under which the equipment certificates were issued should be condemned as a violation of the Sherman law.

NEW YORK, NEW HAVEN & HARTFORD.—The stockholders' protective committee has named a sub-committee of five to confer with a sub-committee of directors. Thus far the stockholders' committee has received proxies for about 250,000 shares of stock.

See New York, Ontario & Western.

NEW YORK, ONTARIO & WESTERN.—A dividend of 2 per cent. has been declared on the $58,113,582 common stock, payable August 14. No dividends were paid in 1912, but annual dividends of 2 per cent. were paid in 1911 and in previous years, including 1906. The New York, New Haven & Hartford owns $29,160,000 of the stock.

J. P. Morgan and Edward Milligan have been elected directors, succeeding J. P. Morgan, deceased, and L. C. Ledyard, resigned.

OMAHA, RALSTON & PAPILLION.—This interurban road, which runs for 18 miles out of Omaha, has been sold under foreclosure for $110,000 to William B. McKinley.

ST. LOUIS & SAN FRANCISCO.—The receivers are, it is understood, making arrangements with Judge Sanborn, at St. Paul, for the payment of the July interest on the St. Louis & San Francisco refunding mortgage 4 per cent. bonds. Up till Wednesday no action had been taker by the Interstate Commerce Commission in regard to any investigation of the St. Louis & San Francisco receivership.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—The temporary directors who were elected to comply with the Arkansas law that directors of a corporation filing a new mortgage must be residents of Arkansas, have resigned, and J. Gould, F. J. Shepard, James Speyer, J. G. Metcalf, E. L. Marston and E. T. Jeffries have been elected to fill the vacancies.

UNION PACIFIC.—Judge Lovett, chairman of the board, in testifying before the lobby investigation committee of the United States Senate, said that the lawyer whom he was advised to employ if he wished to make the carrying out of the Union Pacific-Southern Pacific dissolution as easy as possible, and also to avoid any adverse legislation, was Edward Lauterbach, of New York. Judge Lovett said that he had not been approached personally by Mr. Lauterbach, but a man had called him up on the telephone and made the above suggestion to him.

RAILWAY CONSTRUCTION IN CUBA.—A recent presidential decree grants to the North Coast Railway a subsidy of $9,500 per mile of road to be built between Carbarien and Nuevitas, and also between Camaguay and Santa Cruz del Sur.

SWISS RAILWAY EARNINGS.—The receipts of the Swiss State Railways for 1911 were as follows: Passenger traffic, $15,001,890; freight traffic, $21,263,588; other receipts, $1,458,926, a total of $37,724,804. Expenditures were $22,664,762, making a balance in favor of the government of $15,060,042.

PASSENGER CAR VENTILATION IN GERMANY.—The rule as to windows in passenger cars in Germany has been that they must not be opened on both sides of the car without the consent of all occupying the compartment. Now on city and suburban trains in Berlin neither window in the front compartment of each car may be opened without such unanimous consent.

MOTOR CAR SERVICE IN BAVARIA.—In Bavaria the administration which operates the railways maintains also an automobile service on 53 routes permanently, and on 8 more during the summer, carrying passengers and mail and parcels. The service has been profitable, the expenses per motor car mile being 15 cents and the earnings nearly 20 cents, and the net for all the lines amounting to $88,000.

NEW RAILWAY IN RHODESIA.—The railway from Mazoe to Shamva, in Rhodesia, to connect the Shamva goldfield at Abercorn with Salisbury and the Rhodesia, Mashonaland and Beira Railway systems, has been completed and opened to traffic. The line is constructed on the standard South African 3-ft. 6-in. gage, and is about 50 miles in length. It is constructed with 60-lb. rails and steel sleepers. There are 24 plate girder bridges varying from 6 ft. to 20 ft. in span, and one of 75 ft. span, in addition to a lattice girder bridge of 100 ft. span. Over 90 culverts from 2 ft. to 4 ft. in diameter have been built. Stations have been provided at Concession Siding, Glendale, Mazoe River, Pimento Park, Kimberley Reefs and Shamva.

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